# Appendix M: Objectives Assessment Project Concept Briefs

Appendix M provides the MCG-approved assessment of project concepts against each of the program objectives and consequences to be avoided.

# 1a: Upper Mokelumne Anadromous Fish Restoration

## Foothill Conservancy; CSPA

### Overview

Conduct a study to determine the feasibility of transporting anadromous fish above and below Camanche and Pardee dams. Based on the results, implement the project. Expected results of transportation include expanding fish habitat, improving resiliency in the face of climate change, and enhancing upper ecosystems and recreational opportunities. Project proponents do not anticipate negative impacts to water agencies as a result of implementing this concept.

**Sponsor(s):** Foothill Conservancy; California Sportfishing Protection Alliance (CSPA)

**Concept type:** Planning and implementation

**Estimated Costs:** unknown

**Funding Source(s):** unknown

**Concept location:** Immediately downstream and upstream of Camanche and Pardee dams.

This concept is well suited with concept 1e: Pardee Riparian Restoration; these two concepts could be integrated and pursued in tandem.

### Assessment

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| ● ***Fully addressed*** | ◗ ***Partially addressed*** | ○ ***Not addressed*** |
| WS-1: Promote demand-side management strategies | ○ | The concept does not have elements that include promoting demand-side management strategies. |
| WS-2: Increase supply reliability | ○ | The concept would not address and/or increase supply reliability. |
| WS-3: Increase amount of stored water | ○ | The concept would not increase the amount of stored water. |
| WS-4: Promote smart, responsible development | ○ | While the concept does not prohibit or preclude smart, responsible development, it does not directly promote it. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| WS-5: Reduce reliance on groundwater for irrigation | ○ | The concept would not reduce reliance on groundwater for irrigation. |
| WS-6: Promote a long-term groundwater balance | ○ | The concept would not help to promote a long-term groundwater balance. |
| WS-7: Maximize water resource availability for all beneficial uses | ○ | The concept does not involve maximizing water resource availability. |
| WS-8: Decrease the need to import water | ○ | The concept would not decrease the need to import water. |
| WD-9: Review and understand existing agency demand estimates | ○ | The concept does not include reviewing and understanding existing agency demand estimates. |
| WD-10: Identify water demand issues for timely consideration by the water agencies during their UWMP update | ○ | The concept does not include identifying water demand issues for consideration in the upcoming UWMP update. |
| WQ-11: Protect and improve surface and groundwater quality | ○ | The concept would not protect or improve surface and/or groundwater quality. |
| WQ-12: Match delivered water quality use | ○ | The concept does not involve treating water, nor does it involve delivering treated water. |
| WQ-13: Use water purification technology as a tool to maximize beneficial uses | ○ | The concept does not include water purification elements. |
| R-14: Increase access for water-based recreation | ○ | The concept does not include elements that would increase access to the Mokelumne River from Highway 12 to the headwaters. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| R-15: Increase angling and other recreational opportunities (increase spawning habitat, etc.) | ● | Presence of anadromous fish would result in many measures which would enhance habitat in the upper watershed. For instance, successful implementation could create positive biogeomorphic benefits through substrate rejuvenation during spawning, and in providing a reintroduction of marine nutrients into the upper watershed ecosystem when spawners die. Relocating adult anadromous salmonids from the lower Mokelumne River to the upper Mokelumne River offers the opportunity to bring marine nutrients into the upper watershed and, if accomplished using steelhead, would provide advantages of increasing genetic diversity of the resident rainbow trout population in the upper watershed. |
| R-16: Increase angling and other recreational opportunities (stock hatchery-raised fish) | ● | The concept involves transporting fish (potentially hatchery-raised trout) above Camanche and Pardee dams, which would result in stocking hatchery-raised trout in the upper Mokelumne. The description for the concept does not explicitly state that wild trout sections would be designated and managed on the upper Mokelumne. |
| R-17: Increase angling and other recreational opportunities (reintroduce salmon in upper Moke) | ● | The purpose of the concept is to transport anadromous fish (salmon, etc.) into the upper Mokelumne above Camanche and Pardee dams. If implemented, the concept would increase angling and other recreational opportunities by reintroducing salmon to the upper reaches of the River. |
| R-18: Increase angling and other recreational opportunities (increase opportunities) | ● | The purpose of the concept is to transport anadromous fish (salmon, trout, etc.) into the upper Mokelumne above Camanche and Pardee dams. If implemented, the concept would increase angling and other recreational opportunities by reintroducing these anadromous fish to the upper reaches of the River. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| WR-19: Resolve existing water rights conflicts in the watershed | ○ | The concept is not focused on resolving existing water rights protests to achieve a common understanding of the application of relevant water rights law in the watershed. |
| F-20: Enhance flood protection and management | ○ | The concept does not include elements that would enhance flood protection and/or flood management, nor would the concept enhance ecosystem function in a way that would provide flood protection. |
| D-21: Use sound, agreed-upon data to evaluate program alternatives (hydrology dataset) | ○ | The concept does not involve producing an agreed-upon hydrology dataset and Water Availability Analysis separate from that which was produced as part of the MokeWISE program. |
| D-22: Use sound, agreed-upon data to evaluate program alternatives (describe in sufficient detail) | ○ | Because the concept is not well-defined enough to complete a quantitative assessment, a qualitative assessment was performed. |
| D-23: Promote the contribution of sound scientific data to current body of knowledge | ● | The concept would contribute data to the current body of knowledge by collecting and reporting program information, including number of fish transported upstream, number of fish transported downstream, and other information that would help determine the success of the program. |
| O-24: Increase investment in forest management | ○ | The concept does not include elements that would promote forest management, nor would it help reduce the economic impact of wildfires and other natural disasters. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| O-25: Maximize socio-economic, cultural, recreational, public health, and public safety benefits with a particular emphasis on disadvantaged communities (DACs) | ● | The concept would maximize benefits for DACs, as a number of the surrounding towns, including the City of Jackson, are designated as DACs |
| O-26: Achieve equity | ● | The benefits realized from implementing the concept would not be limited to a narrow group; rather, concept benefits would be spread across regions, cultures, incomes, and time. |
| E-27: Protect and enhance natural environment (enhance natural envt) | ● | The concept would protect and enhance the natural environment by relocating adult salmonids to the upper parts of the watershed. |
| E-28: Protect and enhance natural environment (wild & scenic designation) | ○ | The concept does not incorporate or seek a wild and scenic designation. |
| E-29: Protect and restore fisheries | ● | Relocating adult anadromous salmonids from the lower Mokelumne River to the upper Mokelumne River offers the opportunity to bring marine nutrients into the upper watershed and, if accomplished using steelhead, would provide advantages of increasing genetic diversity of the resident rainbow trout population in the upper and lower watershed. |
| A-30: Enhance or maintain the water supply for the beneficial use in ag practices | ○ | The concept does not include elements that would increase agricultural water supply. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| C-31: Foster long-term regional relationships and avoid unnecessary conflict and litigation | ● | The concept would likely require coordination between a number of entities (including non-governmental organizations and water agencies) that would contribute to fostering long-term regional relationships and help to avoid unnecessary conflict and litigation. Additionally, the feasibility study would help to identify and resolve issues prior to implementation. |
| C-32: Promote broadly-supported outcomes that benefit a wide range of interests | ● | Implementation of the concept would increase recreational opportunities within Camanche reservoir and upstream, while also enhancing ecosystems in the upper watershed. These outcomes are supported by a wide range of interests within the watershed. |
| C-33: Promote broadly-supported outcomes that benefit a wide range of interests (least controversial projects) | ● | The concept has passed the preliminary four screening criteria, including the beneficial and compatible screens. |
| C-34: Promote broadly-supported outcomes that benefit a wide range of interests (agreements that reduce conflict) | ● | The concept would likely result in agreements between federal and/or state agencies and water agencies that would reduce conflict, particularly related to dams, and other barriers limiting fish migration. |
| C-35: Develop a program consistent with all existing licenses, permits, and agreements affecting the River | ● | As a condition of implementation, the concept would be consistent with all existing licenses, permits, and agreements affecting the Mokelumne River. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| C-36: Develop a program consistent with all existing licenses, permits, and agreements affecting the River (CEQA/NEPA) | ● | As a condition of implementation, the concept would be required to adhere to all applicable regulatory requirements, including applicable CEQA/NEPA documentation, etc. |
| CA-37: Avoid basing decisions on incomplete or inaccurate information | ● | Prior to implementation, the concept would undergo a planning phase that would collect and analyze data that is considered, at the time, to be most complete and accurate. |
| CA-38: Avoid demand for new or larger on-stream dams | ● | The concept would not result in construction of a new or larger on-stream dam. |
| CA-39: Avoid harmful impacts to fisheries and other wildlife | ● | While predation mortality occurring within the reservoirs could be high, the benefits of transporting fish to fisheries and other wildlife is high. |
| CA-40: Avoid conversion of agricultural lands to developed uses | ● | The concept does not include elements that would convert agricultural lands to developed uses. |
| CA-41: Avoid shifting environmental impacts from one area to another | ● | The concept does not include elements that would shift environmental impacts from one area to another. |
| CA-42: No diminishment of the benefits of existing in-stream flow | ● | The concept does not include elements that would alter existing in-stream flows. |
| CA-43: Avoid closing the process to the public | ● | As a condition of planning and implementation, the concept would include public involvement to the extent appropriate. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| CA-44: Avoid dependency on potentially unreliable supply | ● | The concept does not include elements that would facilitate downstream users becoming dependent on an unreliable supply. |
| CA-45: Minimize adverse socio-economic and public health and safety impacts | ● | The concept does not include elements that would create adverse socio-economic and public health and safety impacts. |
| CA-46: Avoid end use harm | ● | The concept does not include elements that would allocate water in ways that create end use harm. |
| CA-47: Avoid violating procedural or substantive laws | ● | As a condition of implementation, the concept would be required to complete relevant CEQA/NEPA analysis prior to implementation. |
| CA-48: Avoid interregional inequity | ● | The concept involves the transportation of anadromous fish above and below Camanche and Pardee dams. These benefits would be experienced by both regions, with the potential to provide benefit to the state. |

# 1b: High Country Meadow Restoration Program

## Foothill Conservancy

### Overview

**Sponsor(s):** Foothill Conservancy

**Concept type:** Planning

**Estimated Costs:** unknown

**Funding Source(s):** unknown

**Concept location:** High country meadows

Develop a program to restore high-elevation meadows to approximate natural function to provide water supply, storage, and ecosystem enhancement benefits. The program would involve mapping, identifying, and assessing potential meadows for restoration as well as seek funding for the planning phases of identified meadow restoration opportunities in the Mokelumne River Watershed. The project would require coordination with local groups such as the Amador Calaveras Consensus Group, which is currently involved in meadow restoration projects in the watershed.

### Assessment

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| ● ***Fully addressed*** | ◗ ***Partially addressed*** | ○ ***Not addressed*** |
| WS-1: Promote demand-side management strategies | ○ | As an implementation plan, the concept does not have elements that promote demand-side management strategies. Implementation of the project described in the concept would also not have elements that would promote demand-side management strategies. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| WS-2: Increase supply reliability | ◗ | As an implementation plan, the concept itself would not increase supply reliability. If implemented, restoration of meadow functions would likely decrease peak flow and sediment transport rates during episodic flood events. This could contribute to increased supply reliability if less flood water was spilled and agencies were able to capture more flood event water. Decreasing peak flows would shift the flow duration curve, potentially releasing water more slowly over a longer period throughout the summer months. |
| WS-3: Increase amount of stored water | ◗ | The concept does not include elements that would store water, nor would it increase the amount of stored water. If implemented, restoration of meadow functions would likely increase groundwater supplies and baseflows at least in the upper watershed via greater infiltration rates as waters slow from draining hillslopes to crossing meadows prior to entering streams. However, the amount of water stored would likely be negligible. |
| WS-4: Promote smart, responsible development | ○ | As an implementation plan, the concept itself would not promote smart, responsible development. And if implemented, while the concept does not prohibit or preclude smart, responsible development, it does not directly promote it. |
| WS-5: Reduce reliance on groundwater for irrigation | ○ | As an implementation plan, the concept itself would not reduce reliance on groundwater. Implementation of the plan would also not reduce reliance on groundwater for irrigation. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| WS-6: Promote a long-term groundwater balance | ◗ | As an implementation plan, the concept itself would not promote a long-term groundwater balance. If implemented, while restoring meadow function would likely increase groundwater supplies via greater infiltration rates as waters slow, the amount of water infiltrated into the groundwater basin would likely be small. |
| WS-7: Maximize water resource availability for all beneficial uses | ◗ | As an implementation plan, the concept itself would not maximize water resource availability for all beneficial uses. However, implementing the implementation plan would maximize water resource availability for multiple beneficial uses by increasing base flows in the summer, which is beneficial for fish and other wildlife, and decreasing peak flood flows, which is beneficial for water agencies and downstream communities that experience flooding. |
| WS-8: Decrease the need to import water | ○ | As an implementation plan, the concept itself would not decrease the need to import water. If implemented, while the restoration could help to increase supply reliability for users on the Mokelumne, this would likely not result in a substantial decrease in the need to import water. |
| WD-9: Review and understand existing agency demand estimates | ○ | The concept does not include reviewing and understanding existing agency demand estimates. Restoration would also not review existing agency demand estimates. |
| WD-10: Identify water demand issues for timely consideration by the water agencies during their UWMP update | ○ | The concept does not include identifying water demand issues for consideration in the upcoming UWMP update. Restoration would also not identify water demand issues. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| WQ-11: Protect and improve surface and groundwater quality | ◗ | As an implementation plan, the concept itself would not protect or improve surface and/or groundwater quality. However, restoration would improve geomorphic functions in the upper watershed, which could result in an increase in baseflows leading to better water quality. |
| WQ-12: Match delivered water quality use | ○ | As an implementation plan, the concept itself would not involve treating water, nor does it involve delivering treated water. Restoration would also not involve treating water, nor would it involve delivering treated water. |
| WQ-13: Use water purification technology as a tool to maximize beneficial uses | ○ | As an implementation plan, the concept itself would not use water purification technology as a tool to maximize beneficial uses. Restoration would also not include water purification elements. |
| R-14: Increase access for water-based recreation | ○ | As an implementation plan, the concept itself does not include elements that would increase access to the Mokelumne River from Highway 12 to the headwaters. Restoration would also not include these elements. |
| R-15: Increase angling and other recreational opportunities (increase spawning habitat, etc.) | ◗ | The concept would not contribute to increasing spawning habitat. If the implementation plan were implemented, protecting existing high elevation meadows, in combination with implementing the meadow restoration program, provides environmental benefit through the protection and preservation of sensitive habitat as well as promoting habitat diversity within the watershed. High elevation meadows serve a variety of environmental functions that can be easily lost if adequate protections and restoration mechanisms are not implemented. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| R-16: Increase angling and other recreational opportunities (stock hatchery-raised fish) | ○ | The concept does not involve stocking hatchery-raised trout in designated areas on the upper Mokelumne, nor does it involve designating and managing wild trout sections. Restoration would also not meet this objective. |
| R-17: Increase angling and other recreational opportunities (reintroduce salmon in upper Moke) | ○ | The concept does not include reintroducing salmon into the upper Mokelumne. Restoration would also not meet this objective. |
| R-18: Increase angling and other recreational opportunities (increase opportunities) | ◗ | As an implementation study, the concept itself would not increase angling, harvesting, or other recreational opportunities. However, meadow restoration would improve geomorphic functions in the upper watershed, which have been shown to result in a cascade of positive effects locally and downstream. Locally, groundwater retention of flows in a healthy meadow aquifer may result in continuous flows through a dry summer. A cascade effect may occur downstream, which could include an increase in baseflows leading to better water quality and geomorphic functionality, which may improve fish habitat and riparian corridor health. These outcomes would increase angling and other recreational opportunities. |
| WR-19: Resolve existing water rights conflicts in the watershed | ○ | The concept is not focused on resolving existing water rights protests to achieve a common understanding of the application of relevant water rights law in the watershed. This objective would also not be achieved if restoration were implemented. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| F-20: Enhance flood protection and management | ◗ | The concept does not include elements that would enhance flood protection and/or flood management, nor (depending on the scale of the project) would the concept enhance ecosystem function in a way that would provide flood protection. Restoration would contribute to decreased peak flow and sediment transport rates during episodic flood events. Thus, the concept would enhance flood protection and management by helping to slow and attenuate floodwaters. |
| D-21: Use sound, agreed-upon data to evaluate program alternatives (hydrology dataset) | ○ | The concept does not involve producing an agreed-upon hydrology dataset and Water Availability Analysis separate from that which was produced as part of the MokeWISE program. Restoration would also not meet this objective. |
| D-22: Use sound, agreed-upon data to evaluate program alternatives (describe in sufficient detail) | ○ | Because the concept is not well-defined enough to complete a quantitative assessment, a qualitative assessment was performed. |
| D-23: Promote the contribution of sound scientific data to current body of knowledge | ● | The concept would contribute data to the current body of knowledge by collecting and reporting program information, including information on groundwater recharge, delayed release/flow regime, surface water temperature, and water quality. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| O-24: Increase investment in forest management | ◗ | As an implementation plan, the concept would not meet this objective. However, if restoration were implemented, meadow morphology may be returned to approximate natural capabilities, which should provide increased levels of geomorphic and ecologic processes in restored meadows, including a possible shift from xeric plant species such as sage back to mesic meadow species such as grasses and sedges that have the added benefit of greater bank stability properties. |
| O-25: Maximize socio-economic, cultural, recreational, public health, and public safety benefits with a particular emphasis on disadvantaged communities (DACs) | ◗ | As an implementation plan, the concept would not meet this objective. However, if restoration implementation were located in or near a DAC, restoration could contribute to socio-economic, cultural, recreational, public health, and public safety benefits of a DAC. |
| O-26: Achieve equity | ◗ | As an implementation plan, the concept would not directly achieve equity. However, the benefits realized from restoration activities would not be limited to a narrow group; rather, project benefits would be spread across regions, cultures, incomes, and time. |
| E-27: Protect and enhance natural environment (enhance natural envt) | ◗ | The concept itself would not enhance the natural environment. However, if restoration were implemented, protecting existing high elevation meadows, in combination with implementing the meadow restoration program, provides environmental benefit through the protection and preservation of sensitive habitat as well as promoting habitat diversity within the watershed. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| E-28: Protect and enhance natural environment (wild & scenic designation) | ○ | The concept does not incorporate or seek a wild and scenic designation. Restoration activities would also not meet this objective. |
| E-29: Protect and restore fisheries | ◗ | As an implementation plan, the concept itself would not protect and restore fisheries. However, restoration would result in increased baseflows, which benefit fish and other wildlife. However, if the meadows restored are above Camanche and Pardee, lower Mokelumne fish would not experience these benefits. |
| A-30: Enhance or maintain the water supply for the beneficial use in ag practices | ○ | The concept does not include elements that would increase agricultural water supply. Implementation of restoration activities would also not meet this objective. |
| C-31: Foster long-term regional relationships and avoid unnecessary conflict and litigation | ● | The concept would likely require coordination between a number of entities, including non-governmental organizations and state/federal agencies, that would contribute to fostering long-term regional relationships and help to avoid unnecessary conflict and litigation. |
| C-32: Promote broadly-supported outcomes that benefit a wide range of interests | ● | The concept would promote broadly-supported outcomes by identifying areas for restoration. Restoration activities would restore high country meadows and help attenuate flood flows. These outcomes are supported by a wide range of interests within the watershed. |
| C-33: Promote broadly-supported outcomes that benefit a wide range of interests (least controversial projects) | ● | The concept has passed the preliminary four screening criteria, including the beneficial and compatible screens. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| C-34: Promote broadly-supported outcomes that benefit a wide range of interests (agreements that reduce conflict) | ◗ | The concept would not directly address any current watershed conflicts. Restoration activities could reduce conflict as there have been long-standing disagreements between ranchers and land-managers regarding restoration. Implementation of restoration could result in agreements that reduce these conflicts. |
| C-35: Develop a program consistent with all existing licenses, permits, and agreements affecting the River | ● | As a condition of implementation, the concept would be consistent with all existing licenses, permits, and agreements affecting the Mokelumne River. As such, the concept would not interfere with any entity exercising a water right. |
| C-36: Develop a program consistent with all existing licenses, permits, and agreements affecting the River (CEQA/NEPA) | ● | As a condition of implementation, the concept would be required to adhere to all applicable regulatory requirements, including applicable CEQA/NEPA regulations documentation, etc. |
| CA-37: Avoid basing decisions on incomplete or inaccurate information | ● | The purpose of this concept is to develop an implementation plan which will help avoid basing decisions on incomplete or inaccurate information. |
| CA-38: Avoid demand for new or larger on-stream dams | ● | The concept will not result in construction of a new or larger on-stream dam. Restoration activities would not seek new or larger on-stream dams. |
| CA-39: Avoid harmful impacts to fisheries and other wildlife | ● | The concept would not create harmful impacts to fisheries and other wildlife. Restoration would also not create any harmful impacts. |
| CA-40: Avoid conversion of agricultural lands to developed uses | ● | The concept does not include elements that would convert agricultural lands to developed uses. Restoration activities would also not include these elements. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| CA-41: Avoid shifting environmental impacts from one area to another | ● | The concept does not include elements that would shift environmental impacts from one area to another. Restoration activities would also not include these elements. |
| CA-42: No diminishment of the benefits of existing in-stream flow | ● | The concept does not include elements that would alter existing in-stream flows. Restoration activities would also not diminish existing flow benefits. |
| CA-43: Avoid closing the process to the public | ● | As a condition of planning and implementation, the concept would include public involvement to the extent appropriate. This also applies to any restoration activities. |
| CA-44: Avoid dependency on potentially unreliable supply | ● | The concept does not include elements that would facilitate downstream users becoming dependent on an unreliable supply. This also applies to any restoration activities. |
| CA-45: Minimize adverse socio-economic and public health and safety impacts | ● | The concept does not include elements that would create adverse socio-economic and public health and safety impacts. This also applies to any restoration activities. |
| CA-46: Avoid end use harm | ● | The concept does not allocate water in ways that create end use harm. This also applies to any restoration activities. |
| CA-47: Avoid violating procedural or substantive laws | ● | As a condition of implementation, the concept would be required to complete relevant CEQA/NEPA analysis prior to implementation. This also applies to any restoration activities. |
| CA-48: Avoid interregional inequity | ● | Implementation of the concept would not create interregional inequity, either in realized benefits or in costs. This also applies to any restoration activities. |

# 1c: Mokelumne River Day Use Area Floodplain Habitat Restoration Project

## San Joaquin County Resource Conservation District; CSPA

### Overview

This concept intends to restore a portion of the seasonal floodplain habitat located along the stretch of the Mokelumne River downstream of East Bay Municipal Utility District's (EBMUD or the District) Camanche Reservoir by working with willing participants consistent with the Lower Mokelumne River Watershed Stewardship Plan. Floodplain habitat has been lost as a result of mining and modification of geomorphic processes that has taken place since the advent of the gold rush days in the 1800s.

**Sponsor(s):** San Joaquin County Resource Conservation District (SJCRCD); California Sportfishing Protection Alliance (CSPA)

**Concept type:** Implementation

**Estimated Costs**: $111,110 (capital)

**Funding Source(s):** USFWS Partners for Fish and Wildlife Program, Anadramous Fish Restoration Program, USDA NRCS, NOAA FIsheries, DWR (Floodplain Corridor Protection Program), CA Fish and Wildlife, Dept. of Conservation, Riparian Habitat Joint Venture, San Joaquin Council of Governments, Lower Mokelumne River Partnership (EBMUD, USFWS, CAFW). Private landowners could also provide funding in the form of irrigation lines, water for new plants, some weed control and invasives removal.

**Concept location:** Approximately 38.225 -121.025; a roughly 0.8 mile reach of the lower Mokelumne River below Camanche Dam and McIntire Road.

EBMUD owns land immediately downstream of the Camanche Dam that it uses to support the District's water supply operations (EBMUD's Mokelumne River Day Use Area (MRDUA)). Those lands include properties that have deteriorated riparian and aquatic habitat associated with the above-noted historic human modifications. Lands included in EBMUD's MRDUA would be reconfigured to create a seasonal floodplain. Reclaiming dredger pools with dredger tailings would serve as a source of construction material for habitat creation.

Dredged material would be excavated, screened and washed to remove the fines; placed in the dredger pool and graded to allow seasonal flows >500 cubic feet per second (cfs) in the lower Mokelumne River to inundate an area approximately 1 acre area in size. The source of gravel for the seasonal floodplain restoration project would be from within the project boundaries. The area created / restored would provide habitat for juvenile salmonids. Fines would be deposited in low-lying upland areas and revegetated.

## Assessment

| *Objective* | ● ◗ ○ | *Justification* |
|---|---|---|
| ● *Fully addressed* | ◗ *Partially addressed* | ○ *Not addressed* |
| WS-1: Promote demand-side management strategies | ○ | The concept does not have elements that promote demand-side management strategies. |
| WS-2: Increase supply reliability | ○ | While the concept could provide some degree of supply reliability by creating floodplain that would facilitate groundwater recharge, this amount is likely negligible and would not increase supply reliability. |
| WS-3: Increase amount of stored water | ○ | While the concept could increase the amount of stored water by creating floodplain that would facilitate groundwater recharge, this amount is likely negligible and would not significantly increase the amount of stored water. |
| WS-4: Promote smart, responsible development | ◗ | The concept would restore and enhance floodplain, which would reduce the impact of development on the watershed. |
| WS-5: Reduce reliance on groundwater for irrigation | ○ | The concept would not reduce reliance on groundwater for irrigation. |
| WS-6: Promote a long-term groundwater balance | ○ | The concept would not help to promote a long-term groundwater balance. |
| WS-7: Maximize water resource availability for all beneficial uses | ◗ | The concept would create habitat and provide flood control, which maximizes water resource availability for beneficial uses. |
| WS-8: Decrease the need to import water | ○ | The concept would not decrease the need to import water. |
| WD-9: Review and understand existing agency demand estimates | ○ | The concept does not include reviewing and understanding existing agency demand estimates. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| WD-10: Identify water demand issues for timely consideration by the water agencies during their UWMP update | ○ | The concept does not include identifying water demand issues for consideration in the upcoming UWMP update. |
| WQ-11: Protect and improve surface and groundwater quality | ● | The concept would reduce sedimentation/erosion by reducing and attenuating flood flows. Additionally, creating riparian buffers can filter sediments and pollutants. |
| WQ-12: Match delivered water quality use | ○ | The concept does not involve treating water, nor does it involve delivering treated water. |
| WQ-13: Use water purification technology as a tool to maximize beneficial uses | ○ | The concept does not include water purification elements. |
| R-14: Increase access for water-based recreation | ○ | The concept does not include elements that would increase access to the Mokelumne River from Highway 12 to the headwaters. |
| R-15: Increase angling and other recreational opportunities (increase spawning habitat, etc.) | ● | A number of studies are currently emerging from the Yolo Bypass, Cosumnes River, and many other watersheds that have demonstrated the benefit of seasonally inundated floodplain habitat as juvenile rearing areas for Chinook salmon and steelhead. The concept would revitalize floodplain habitat, which has been shown to be productive and results in increased growth rates of juvenile salmonids. Increased growth rates have been identified as a factor increasing the probability of survival during downstream migration through the Delta and ocean. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| R-16: Increase angling and other recreational opportunities (stock hatchery-raised fish) | ○ | The concept does not involve stocking hatchery-raised trout in designated areas on the upper Mokelumne, nor does it involve designating and managing wild trout sections. |
| R-17: Increase angling and other recreational opportunities (reintroduce salmon in upper Moke) | ○ | The concept does not include reintroducing salmon into the upper Mokelumne. |
| R-18: Increase angling and other recreational opportunities (increase opportunities) | ◗ | The concept would result in increased angling opportunities by providing habitat for fish. As noted above, floodplain habitat can increase growth rates, which contribute to migration survival. |
| WR-19: Resolve existing water rights conflicts in the watershed | ○ | The concept is not focused on resolving existing water rights protests to achieve a common understanding of the application of relevant water rights law in the watershed. |
| F-20: Enhance flood protection and management | ● | The concept revitalizes floodplains, which helps to reduce and attenuate flood flows, thereby enhancing flood protection and management. |
| D-21: Use sound, agreed-upon data to evaluate program alternatives (hydrology dataset) | ○ | The concept does not involve producing an agreed-upon hydrology dataset and Water Availability Analysis separate from that which was produced as part of the MokeWISE program. |
| D-22: Use sound, agreed-upon data to evaluate program alternatives (describe in sufficient detail) | ● | The concept is well-defined enough to complete a quantitative assessment. |
| D-23: Promote the contribution of sound scientific data to current body of knowledge | ● | The concept would contribute data to the current body of knowledge by collecting and reporting program information, including flood flow attenuation, effects on spawning and juvenile fish, and potential geomorphic effects. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| O-24: Increase investment in forest management | ○ | The concept does not include elements that would promote forest management, nor would it help reduce the economic impact of wildfires and other natural disasters. |
| O-25: Maximize socio-economic, cultural, recreational, public health, and public safety benefits with a particular emphasis on disadvantaged communities (DACs) | ● | While the concept is not located within a DAC, it does provide health and safety benefits to DACs by attenuating flood flows which can flood DACs downstream. |
| O-26: Achieve equity | ● | The benefits realized from implementing the concept would not be limited to a narrow group; rather, concept benefits would be spread across regions, cultures, incomes, and time. |
| E-27: Protect and enhance natural environment (enhance natural envt) | ● | The concept would protect and enhance the natural environment. The ability of flows greater than the natural "bankfull" (i.e. unimpaired, average 2-yr flow) to spread out across additional floodplain space would increase potential sediment deposition. Flood flow attenuation may decrease flood effects on downstream structures and communities. Reconnection would promote increased channel morphodynamics, as the river and the floodplain adjust to locally refreshed hydraulics. |
| E-28: Protect and enhance natural environment (wild & scenic designation) | ○ | The concept does not incorporate or seek a wild and scenic designation. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| E-29: Protect and restore fisheries | ● | The concept would protect and restore fisheries by providing spawning and rearing habitat for fish. As noted above, floodplain habitat has been shown to be productive and results in increased growth rates of juvenile salmonids. Increased growth rates have been identified as a factor increasing the probability of survival during downstream migration through the Delta and ocean. |
| A-30: Enhance or maintain the water supply for the beneficial use in ag practices | ○ | The concept does not include elements that would increase agricultural water supply. |
| C-31: Foster long-term regional relationships and avoid unnecessary conflict and litigation | ● | The concept would likely require coordination between a number of entities (including EBMUD, non-governmental organizations, state/federal government agencies, and private landowners) that would contribute to fostering long-term regional relationships and help to avoid unnecessary conflict and litigation. |
| C-32: Promote broadly-supported outcomes that benefit a wide range of interests | ● | The concept would attenuate flood flows, provide valuable habitat for fish and other wildlife, and recharge the groundwater basin. These outcomes are supported by a wide range of interests within the watershed. |
| C-33: Promote broadly-supported outcomes that benefit a wide range of interests (least controversial projects) | ● | The concept has passed the preliminary four screening criteria, including the beneficial and compatible screens. |
| C-34: Promote broadly-supported outcomes that benefit a wide range of interests (agreements that reduce conflict) | ○ | The concept would not directly address any current watershed conflicts. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| C-35: Develop a program consistent with all existing licenses, permits, and agreements affecting the River | ● | As a condition of implementation, the concept would be consistent with all existing licenses, permits, and agreements affecting the Mokelumne River. |
| C-36: Develop a program consistent with all existing licenses, permits, and agreements affecting the River (CEQA/NEPA) | ● | As a condition of implementation, the concept would be required to adhere to all applicable regulatory requirements, including applicable CEQA/NEPA documentation, etc. |
| CA-37: Avoid basing decisions on incomplete or inaccurate information | ● | Prior to implementation, the concept would undergo a planning phase that would collect and analyze data that is considered, at the time, to be most complete and accurate. |
| CA-38: Avoid demand for new or larger on-stream dams | ● | The concept would not result in construction of a new or larger on-stream dam. |
| CA-39: Avoid harmful impacts to fisheries and other wildlife | ● | The concept would not result in harmful impacts to fisheries and other wildlife. On the contrary, floodplain habitat would be created that would benefit fisheries and other wildlife. |
| CA-40: Avoid conversion of agricultural lands to developed uses | ● | The concept does not include elements that would convert agricultural lands to developed uses. |
| CA-41: Avoid shifting environmental impacts from one area to another | ● | The concept does not include elements that would shift environmental impacts from one area to another. |
| CA-42: No diminishment of the benefits of existing in-stream flow | ● | The concept does not include elements that would alter existing in-stream flows. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| CA-43: Avoid closing the process to the public | ● | As a condition of planning and implementation, the concept would include public involvement to the extent appropriate. |
| CA-44: Avoid dependency on potentially unreliable supply | ● | The concept does not include elements that would facilitate downstream users becoming dependent on an unreliable supply. |
| CA-45: Minimize adverse socio-economic and public health and safety impacts | ● | The concept does not include elements that would create adverse socio-economic and public health and safety impacts. |
| CA-46: Avoid end use harm | ● | The concept does not include elements that would allocate water in ways that create end use harm. |
| CA-47: Avoid violating procedural or substantive laws | ● | As a condition of implementation, the concept would be required to complete relevant CEQA/NEPA analysis prior to implementation. |
| CA-48: Avoid interregional inequity | ● | Implementation of the concept would not create interregional inequity, either in realized benefits or in costs. |

# 1d: Fish Screens for Riparian Diversions in the Lower Mokelumne

## Trout Unlimited

### Overview

Develop and implement a program to identify and prioritize riparian diversions for fish screens on the Lower Mokelumne River, working with willing landowners. The program would secure and install fish screens on prioritized riparian diversions to reduce entrainment of fish. Currently, the four largest pumps/diversions are screened, but according to a late 1990's assessment, approximately 60 remain unscreened. Additionally, the California Fish Passage Assessment Database by CalFish identifies over 400 diversions on the main stem of the Mokelumne.

**Sponsor(s):** Trout Unlimited

**Concept type:** Planning and implementation

**Estimated Costs**: $9,700 per cfs of the diversion that is screened (Capital and O&M)

**Funding Source(s):** EBMUD

**Concept location:** Lower Mokelumne River

### Assessment

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| ● ***Fully addressed*** | ◗ ***Partially addressed*** | ○ ***Not addressed*** |
| WS-1: Promote demand-side management strategies | ○ | The concept does not have elements that promote demand-side management strategies. |
| WS-2: Increase supply reliability | ◗ | The concept could potentially increase supply reliability by assuring diverters that use of their diversion would not be restricted due to potential impacts to fish. |
| WS-3: Increase amount of stored water | ○ | The concept would not increase the amount of stored water. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| WS-4: Promote smart, responsible development | ○ | While the concept does not prohibit or preclude smart, responsible development, it does not directly promote it. |
| WS-5: Reduce reliance on groundwater for irrigation | ○ | The concept would not reduce reliance on groundwater for irrigation. |
| WS-6: Promote a long-term groundwater balance | ○ | The concept would not help to promote a long-term groundwater balance. |
| WS-7: Maximize water resource availability for all beneficial uses | ○ | The concept does not involve maximizing water resource availability. |
| WS-8: Decrease the need to import water | ○ | The concept would not decrease the need to import water. |
| WD-9: Review and understand existing agency demand estimates | ○ | The concept does not include reviewing and understanding existing agency demand estimates. |
| WD-10: Identify water demand issues for timely consideration by the water agencies during their UWMP update | ○ | The concept does not include identifying water demand issues for consideration in the upcoming UWMP update. |
| WQ-11: Protect and improve surface and groundwater quality | ○ | The concept would not protect or improve surface and/or groundwater quality. |
| WQ-12: Match delivered water quality use | ○ | The concept does not involve treating water, nor does it involve delivering treated water. |
| WQ-13: Use water purification technology as a tool to maximize beneficial uses | ○ | The concept does not include water purification elements. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| R-14: Increase access for water-based recreation | ○ | The concept does not include elements that would increase access to the Mokelumne River from Highway 12 to the headwaters. |
| R-15: Increase angling and other recreational opportunities (increase spawning habitat, etc.) | ● | The more fish and supporting food web organisms killed because of diversions, the fewer that can contribute to river bed and bank bioturbation processes such as salmonids revitalizing the channel bed during spawning activities. Diversions alter hydraulic gradients and shear stresses, dependent on a given river discharge and the diversion rate and volume. Any reduction in kill rate would be very beneficial to the river ecosystem. |
| R-16: Increase angling and other recreational opportunities (stock hatchery-raised fish) | ○ | The concept does not involve stocking hatchery-raised trout in designated areas on the upper Mokelumne, nor does it involve designating and managing wild trout sections. |
| R-17: Increase angling and other recreational opportunities (reintroduce salmon in upper Moke) | ○ | The concept does not include reintroducing salmon into the upper Mokelumne. |
| R-18: Increase angling and other recreational opportunities (increase opportunities) | ◗ | The concept would reduce the number of fish entrained as a result of unscreened diversions in the lower Mokelumne. Consequently, more fish would be left in the river, which would increase angling and other recreational opportunities. However, these opportunities are incremental based on the numbers and size of installed screens. |
| WR-19: Resolve existing water rights conflicts in the watershed | ○ | The concept is not focused on resolving existing water rights protests to achieve a common understanding of the application of relevant water rights law in the watershed. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| F-20: Enhance flood protection and management | ○ | The concept does not include elements that would enhance flood protection and/or flood management, nor would the concept enhance ecosystem function in a way that would provide flood protection. |
| D-21: Use sound, agreed-upon data to evaluate program alternatives (hydrology dataset) | ○ | The concept does not involve producing an agreed-upon hydrology dataset and Water Availability Analysis separate from that which was produced as part of the MokeWISE program. |
| D-22: Use sound, agreed-upon data to evaluate program alternatives (describe in sufficient detail) | ○ | Because the concept is not well-defined enough to complete a quantitative assessment, a qualitative assessment was performed. |
| D-23: Promote the contribution of sound scientific data to current body of knowledge | ● | The concept would contribute data to the current body of knowledge by collecting and reporting program information, including number of screens installed, cost of each screen, and reduction in number of fish entrained. |
| O-24: Increase investment in forest management | ○ | The concept does not include elements that would promote forest management, nor would it help reduce the economic impact of wildfires and other natural disasters. |
| O-25: Maximize socio-economic, cultural, recreational, public health, and public safety benefits with a particular emphasis on disadvantaged communities (DACs) | ○ | The concept is not located within a DAC. As such, it would not directly contribute to socio-economic, cultural, recreational, public health, and public safety benefits of a DAC. |
| O-26: Achieve equity | ● | The benefits realized from implementing the concept would not be limited to a narrow group; rather, concept benefits would be spread across regions, cultures, incomes, and time. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| E-27: Protect and enhance natural environment (enhance natural envt) | ● | In general, reducing sources of direct mortality, such as entrainment into unscreened diversions, provides a positive incremental benefit to the natural environment by increasing survival and abundance of juvenile salmonids produced in the lower Mokelumne River. |
| E-28: Protect and enhance natural environment (wild & scenic designation) | ○ | The concept does not incorporate or seek a wild and scenic designation. |
| E-29: Protect and restore fisheries | ● | Installation of positive barrier fish screens is identified as an environmental benefit through reducing the risk of juvenile salmonid entrainment. The greater the volume of unscreened diversions that can be equipped with intake screens, the greater the potential biological benefit. However, the magnitude of biological benefit varies in response to a number of factors such as the magnitude and seasonal timing of diversion as well as the location of the diversion. Relatively large unscreened diversions located in areas where juvenile salmonid rearing occurs typically pose the greatest risk of entrainment. Providing intake screening of the largest diversions (by volume) located in sensitive habitat are expected to offer the greatest biological benefit. Installation of positive barrier fish screens on the lower Mokelumne River will result in direct benefits to improving juvenile survival. |
| A-30: Enhance or maintain the water supply for the beneficial use in ag practices | ◗ | The concept could potentially enhance and maintain agricultural water supply by assuring diverters that use of their diversion would not be restricted due to potential impacts to fish. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| C-31: Foster long-term regional relationships and avoid unnecessary conflict and litigation | ● | The concept would likely require coordination between a number of entities (including non-governmental organizations, state/federal government agencies, water agencies, and private diverters) that would contribute to fostering long-term regional relationships and help to avoid unnecessary conflict and litigation. |
| C-32: Promote broadly-supported outcomes that benefit a wide range of interests | ● | Implementation of the concept would reduce fish entrainment and help build relationships between diverters, NGO's, and state/federal agencies. These outcomes are supported by a wide range of interests within the watershed. |
| C-33: Promote broadly-supported outcomes that benefit a wide range of interests (least controversial projects) | ● | The concept has passed the preliminary four screening criteria, including the beneficial and compatible screens. |
| C-34: Promote broadly-supported outcomes that benefit a wide range of interests (agreements that reduce conflict) | ● | The concept would likely result in agreements between federal and/or state agencies, water agencies, private diverters, and non-governmental organizations that would reduce conflict, particularly related to fish entrainment, and other barriers limiting fish migration. |
| C-35: Develop a program consistent with all existing licenses, permits, and agreements affecting the River | ● | As a condition of implementation, the concept would be consistent with all existing licenses, permits, and agreements affecting the Mokelumne River. |
| C-36: Develop a program consistent with all existing licenses, permits, and agreements affecting the River (CEQA/NEPA) | ● | As a condition of implementation, the concept would be required to adhere to all applicable regulatory requirements, including applicable CEQA/NEPA documentation, etc. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| CA-37: Avoid basing decisions on incomplete or inaccurate information | ● | Prior to implementation, the concept would undergo a planning phase that would collect and analyze data that is considered, at the time, to be most complete and accurate. |
| CA-38: Avoid demand for new or larger on-stream dams | ● | The concept would not result in construction of a new or larger on-stream dam. |
| CA-39: Avoid harmful impacts to fisheries and other wildlife | ● | The concept would not result in harmful impacts to fisheries and other wildlife. On the contrary, installing fish screens would result in fishery benefits. |
| CA-40: Avoid conversion of agricultural lands to developed uses | ● | The concept does not include elements that would convert agricultural lands to developed uses. |
| CA-41: Avoid shifting environmental impacts from one area to another | ● | The concept does not include elements that would shift environmental impacts from one area to another. |
| CA-42: No diminishment of the benefits of existing in-stream flow | ● | The concept does not include elements that would alter existing in-stream flows. |
| CA-43: Avoid closing the process to the public | ● | As a condition of planning and implementation, the concept would include public involvement to the extent appropriate. |
| CA-44: Avoid dependency on potentially unreliable supply | ● | The concept does not include elements that would facilitate downstream users becoming dependent on an unreliable supply. |
| CA-45: Minimize adverse socio-economic and public health and safety impacts | ● | The concept does not include elements that would create adverse socio-economic and public health and safety impacts. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| CA-46: Avoid end use harm | ● | The concept does not include elements that would allocate water in ways that create end use harm. |
| CA-47: Avoid violating procedural or substantive laws | ● | As a condition of implementation, the concept would be required to complete relevant CEQA/NEPA analysis prior to implementation. |
| CA-48: Avoid interregional inequity | ◗ | While benefits would be realized by the entire region, costs would likely be accrued by those diverting entities seeking to screen diversions. To avoid interregional inequity, any cost sharing would need to be carefully considered. |

# 1e: Riparian Restoration Program – Upstream of Pardee

## Foothill Conservancy

### Overview

This concept will develop and implement a program to analyze and address riparian restoration needs by identifying potential areas for restoration, identifying partnership opportunities with willing landowners, and developing a funding base for restoration projects that provides benefits to water users. The project may include removing invasive species, restoring native species, and restoring identified habitat.

**Sponsor(s):** Foothill Conservancy

**Concept type:** Planning and implementation

**Estimated Costs:** unknown

**Funding Source(s):** unknown

**Concept location:** Upstream of Pardee Reservoir

This concept is well suited with concept 1a: Anadromous Fish Restoration; these two concepts could be integrated and pursued in tandem.

### Assessment

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| ● ***Fully addressed*** | ◗ ***Partially addressed*** | ○ ***Not addressed*** |
| WS-1: Promote demand-side management strategies | ○ | The concept does not have elements that promote demand-side management strategies. |
| WS-2: Increase supply reliability | ○ | The concept would not address and/or increase supply reliability. |
| WS-3: Increase amount of stored water | ○ | The concept would not increase the amount of stored water. |
| WS-4: Promote smart, responsible development | ◗ | The concept will restore and enhance riparian conditions on existing developed parcels in coordination with willing landowners, reducing the impact of development on the watershed. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| WS-5: Reduce reliance on groundwater for irrigation | ○ | The concept would not reduce reliance on groundwater for irrigation. |
| WS-6: Promote a long-term groundwater balance | ○ | The concept would not help to promote a long-term groundwater balance. |
| WS-7: Maximize water resource availability for all beneficial uses | ● | The concept would provide habitat and increase water quality for fish and other wildlife, which contributes to maximizing water resource availability for all beneficial uses. |
| WS-8: Decrease the need to import water | ○ | The concept would not result in a substantial decrease in the need to import water. |
| WD-9: Review and understand existing agency demand estimates | ○ | The concept does not include reviewing and understanding existing agency demand estimates. |
| WD-10: Identify water demand issues for timely consideration by the water agencies during their UWMP update | ○ | The concept does not include identifying water demand issues for consideration in the upcoming UWMP update. |
| WQ-11: Protect and improve surface and groundwater quality | ◗ | The concept would likely protect and improve surface water quality in the Mokelumne, as healthy riparian corridors can filter pollutants and provide carbon storage and transport resulting from the decay of streamwood and other organic material. However, the magnitude of these benefits is unknown. |
| WQ-12: Match delivered water quality use | ○ | The concept does not involve treating water, nor does it involve delivering treated water. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| WQ-13: Use water purification technology as a tool to maximize beneficial uses | ◗ | Depending upon the restoration approach(es) implemented, the project may achieve an increased level of water purification through natural treatment systems. |
| R-14: Increase access for water-based recreation | ○ | The concept does not include elements that would increase access to the Mokelumne River from Highway 12 to the headwaters. |
| R-15: Increase angling and other recreational opportunities (increase spawning habitat, etc.) | ● | Protecting and improving riparian vegetation is an important watershed management activity that contributes directly towards increased habitat diversity, habitat complexity, and habitat function not only for terrestrial species, but also for those aquatic species inhabiting the Mokelumne River. Restoring greater continuous areas versus smaller fragmented areas would maximize these benefits. |
| R-16: Increase angling and other recreational opportunities (stock hatchery-raised fish) | ◗ | The concept could include stocking hatchery-raised trout in designated areas on the upper Mokelumne and designating and managing wild trout sections. |
| R-17: Increase angling and other recreational opportunities (reintroduce salmon in upper Moke) | ◗ | The concept could include reintroducing salmon in the upper Mokelumne. |
| R-18: Increase angling and other recreational opportunities (increase opportunities) | ● | Restoring riparian habitat maximizes beneficial conditions for aquatic species, including juvenile salmonids. The concept increases angling and other recreational opportunities by maximizing these conditions. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| WR-19: Resolve existing water rights conflicts in the watershed | ○ | The concept is not focused on resolving existing water rights protests to achieve a common understanding of the application of relevant water rights law in the watershed. |
| F-20: Enhance flood protection and management | ◗ | While the concept is not directly designed to enhance flood protection and management, restoring riparian habitat could provide flood attenuation. |
| D-21: Use sound, agreed-upon data to evaluate program alternatives (hydrology dataset) | ○ | The concept does not involve producing an agreed-upon hydrology dataset and Water Availability Analysis separate from that which was produced as part of the MokeWISE program. |
| D-22: Use sound, agreed-upon data to evaluate program alternatives (describe in sufficient detail) | ○ | Because the concept is not well-defined enough to complete a quantitative assessment, a qualitative assessment was performed. |
| D-23: Promote the contribution of sound scientific data to current body of knowledge | ● | The concept would contribute data to the current body of knowledge by collecting and reporting program information, including number of acres restored and the resulting number of species restored. |
| O-24: Increase investment in forest management | ◗ | The concept could increase investment in forest management by restoring riparian habitat, which could improve riparian/forest health and strength forest connectivity to the river. |
| O-25: Maximize socio-economic, cultural, recreational, public health, and public safety benefits with a particular emphasis on disadvantaged communities (DACs) | ◗ | There are a number of DACs upstream of Pardee. The concept could potentially maximize benefits for a DAC, depending on the location of restoration activities. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| O-26: Achieve equity | ● | The benefits realized from implementing the concept would not be limited to a narrow group; rather, project benefits would be spread across regions, cultures, incomes, and time. |
| E-27: Protect and enhance natural environment (enhance natural envt) | ● | The concept would protect and enhance the natural environment by allowing streamwood and other organic materials to remain undisturbed in the river in the patterns in which they fall or come to rest. Streamwood breaks down stochastically via decay and disintegration. This process is meant to contribute to carbon storage and carbon transport from upper watershed to the ocean in a range from entire trees to dissolved organic carbon. Additionally, an increase in the amount of wood available to fall into the channel (i.e. streamwood) would improve habitat diversity through structural additions to flow fields, refugia during high flows and from predation, and provide additional nutrients to aquatic organisms. Restoring greater continuous areas versus smaller fragmented areas would maximize these benefits. |
| E-28: Protect and enhance natural environment (wild & scenic designation) | ○ | The concept does not incorporate or seek a wild and scenic designation. |
| E-29: Protect and restore fisheries | ● | The concept would protect and improve riparian vegetation, which contributes directly towards increased habitat diversity, habitat complexity, and habitat function for fish and other aquatic species. Insect production from riparian areas provides a valuable foraging resource for juvenile salmonid and other fish species inhabiting the river. These benefits are limited to the upper Mokelumne. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| A-30: Enhance or maintain the water supply for the beneficial use in ag practices | ○ | The concept does not include elements that would increase agricultural water supply. |
| C-31: Foster long-term regional relationships and avoid unnecessary conflict and litigation | ● | The concept would require coordination between a number of entities, which could include non-governmental organizations, PG&E, and state/federal agencies. This coordination would contribute to fostering long-term regional relationships and help to avoid unnecessary conflict and litigation. |
| C-32: Promote broadly-supported outcomes that benefit a wide range of interests | ● | The concept would restore riparian habitat and increase recreational and angling opportunities. These outcomes are supported by a wide range of interests within the watershed. |
| C-33: Promote broadly-supported outcomes that benefit a wide range of interests (least controversial projects) | ● | The concept has passed the preliminary four screening criteria, including the beneficial and compatible screens. |
| C-34: Promote broadly-supported outcomes that benefit a wide range of interests (agreements that reduce conflict) | ○ | The concept would not directly address any current watershed conflicts. |
| C-35: Develop a program consistent with all existing licenses, permits, and agreements affecting the River | ● | As a condition of implementation, the concept would be consistent with all existing licenses, permits, and agreements affecting the Mokelumne River. As such, the concept would not interfere with any entity exercising a water right. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| C-36: Develop a program consistent with all existing licenses, permits, and agreements affecting the River (CEQA/NEPA) | ● | As a condition of implementation, the concept would be required to adhere to all applicable regulatory requirements, including applicable CEQA/NEPA regulations documentation, etc. |
| CA-37: Avoid basing decisions on incomplete or inaccurate information | ● | Prior to implementation, the concept would undergo a planning phase that would collect and analyze data that is considered, at the time, to be the most complete and accurate. |
| CA-38: Avoid demand for new or larger on-stream dams | ● | The concept would not result in construction of a new or larger on-stream dam. |
| CA-39: Avoid harmful impacts to fisheries and other wildlife | ● | The concept would not create harmful impacts to fisheries and other wildlife. |
| CA-40: Avoid conversion of agricultural lands to developed uses | ● | The concept does not include elements that would convert agricultural lands to developed uses. |
| CA-41: Avoid shifting environmental impacts from one area to another | ● | The concept does not include elements that would shift environmental impacts from one area to another. |
| CA-42: No diminishment of the benefits of existing in-stream flow | ● | The concept does not include elements that would alter existing in-stream flows. |
| CA-43: Avoid closing the process to the public | ● | As a condition of planning and implementation, the concept would include public involvement to the extent appropriate. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| CA-44: Avoid dependency on potentially unreliable supply | ● | The concept does not include elements that would facilitate downstream users becoming dependent on an unreliable supply. |
| CA-45: Minimize adverse socio-economic and public health and safety impacts | ● | The concept does not include elements that would create adverse socio-economic and public health and safety impacts. |
| CA-46: Avoid end use harm | ● | The concept does not allocate water in ways that create end use harm. |
| CA-47: Avoid violating procedural or substantive laws | ● | As a condition of implementation, the concept would be required to complete relevant CEQA/NEPA analysis prior to implementation. |
| CA-48: Avoid interregional inequity | ● | Implementation of the concept would not create interregional inequity, either in realized benefits or in costs. |

# 1f: Riparian Restoration Program – Below Camanche

## San Joaquin County Resource Conservation District; Foothill Conservancy

### Overview

Support the implementation efforts of the Lower Mokelumne Watershed Stewardship Plan, which analyzes and addresses riparian restoration needs. The project may include developing a funding base for projects identified in the Plan.

**Sponsor(s):** San Jaquin County Resource Conservation District (SJCRD), Foothill Conservancy

**Concept type:** Implementation

**Estimated Costs:** dependent on resoration contractor--average is ~$8,000/acre for invasive/non-invasive species removal (Capital)

**Funding Source(s):** USFWS Partners for Fish and Wildlife Program, Anadramous Fish Restoration Program, USDA NRCS, NOAA Fisheries, DWR (Floodplain Corridor Protection Program), CA Fish and Wildlife, Department of Conservation

**Concept location:** Approximate midpoint between Camanche Dam and confluence with Cosumnes River (38.149, -121.273)

### Assessment

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| ● ***Fully addressed*** | ◗ ***Partially addressed*** | ○ ***Not addressed*** |
| WS-1: Promote demand-side management strategies | ○ | The concept does not have elements that promote demand-side management strategies. |
| WS-2: Increase supply reliability | ○ | The concept would not address and/or increase supply reliability. |
| WS-3: Increase amount of stored water | ◗ | The concept could increase the amount of stored water as floodplains develop natural levees that serve to capture |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| | | high flows that then spread out on the adjacent floodplain, thus providing a natural sink for particulate organics and minerals along with a percolation basin into which still waters can recharge the local aquifer while contributing to flood attenuation downstream. However, the amount of recharge could be minimal depending on the size of floodplains in the more populated areas in the lower Mokelumne. |
| WS-4: Promote smart, responsible development | ◗ | The concept will restore and enhance riparian conditions on existing developed parcels in coordination with willing landowners, reducing the impact of development on the watershed. |
| WS-5: Reduce reliance on groundwater for irrigation | ○ | The concept would not reduce reliance on groundwater for irrigation. |
| WS-6: Promote a long-term groundwater balance | ◗ | The concept could help to promote a long-term groundwater balance by providing opportunities for groundwater recharge. |
| WS-7: Maximize water resource availability for all beneficial uses | ● | The concept would provide habitat and increase water quality for fish and other wildlife, which contributes to maximizing water resource availability for all beneficial uses. |
| WS-8: Decrease the need to import water | ○ | The concept would not result in a substantial decrease in the need to import water. |
| WS-9: Review and understand existing agency demand estimates | ○ | The concept does not include reviewing and understanding existing agency demand estimates. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| WD-10: Identify water demand issues for timely consideration by the water agencies during their UWMP update | ○ | The concept does not include identifying water demand issues for consideration in the upcoming UWMP update. |
| WQ-11: Protect and improve surface and groundwater quality | ◗ | The concept would likely protect and improve surface water quality in the Mokelumne, as healthy riparian corridors can filter pollutants and provide carbon storage and transport resulting from the decay of streamwood and other organic material. However, the magnitude of these benefits is unknown. |
| WQ-12: Match delivered water quality use | ○ | The concept does not involve treating water, nor does it involve delivering treated water. |
| WQ-13: Use water purification technology as a tool to maximize beneficial uses | ◗ | Depending upon the restoration approach(es) implemented, the project may achieve an increased level of water purification through natural treatment systems. |
| R-14: Increase access for water-based recreation | ○ | The concept does not include elements that would increase access to the Mokelumne River from Highway 12 to the headwaters. |
| R-15: Increase angling and other recreational opportunities (increase spawning habitat, etc.) | ● | Protecting and improving riparian vegetation is an important watershed management activity that contributes directly towards increased habitat diversity, habitat complexity, and habitat function not only for terrestrial species, but also for those aquatic species inhabiting the Mokelumne River. Restoring greater continuous |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| | | areas versus smaller fragmented areas would maximize these benefits. |
| R-16: Increase angling and other recreational opportunities (stock hatchery-raised fish) | ◗ | Because restoration work would be conducted below Camanche, the concept does not include elements that would stock hatchery-raised fish in the upper Mokelumne. However, the concept could designate and manage wild trout sections. |
| R-17: Increase angling and other recreational opportunities (reintroduce salmon in upper Moke) | ○ | Because restoration work would be conducted below Camanche, the concept does not include reintroducing salmon in the upper Mokelumne |
| R-18: Increase angling and other recreational opportunities (increase opportunities) | ● | Restoring riparian habitat maximizes beneficial conditions for aquatic species, including juvenile salmonids. The concept increases angling and other recreational opportunities by maximizing these conditions. |
| WR-19: Resolve existing water rights conflicts in the watershed | ○ | The concept is not focused on resolving existing water rights protests to achieve a common understanding of the application of relevant water rights law in the watershed. |
| F-20: Enhance flood protection and management | ● | In lowland environs, riparian corridors connect river corridors and floodplains. In many cases, floodplains develop natural levees that serve to capture high flows that then spread out on the adjacent floodplain, thus providing a natural sink for particulate organics and minerals along with a percolation basin into which still waters can recharge the local aquifer while contributing to flood attenuation downstream. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| D-21: Use sound, agreed-upon data to evaluate program alternatives (hydrology dataset) | ○ | The concept does not involve producing an agreed-upon hydrology dataset and Water Availability Analysis separate from that which was produced as part of the MokeWISE program. |
| D-22: Use sound, agreed-upon data to evaluate program alternatives (describe in sufficient detail) | ○ | Because the concept is not well-defined enough to complete a quantitative assessment, a qualitative assessment was performed. |
| D-23: Promote the contribution of sound scientific data to current body of knowledge | ● | The concept would contribute data to the current body of knowledge by collecting and reporting program information, including number of acres restored and the resulting number of species restored. |
| O-24: Increase investment in forest management | ◗ | The concept could increase investment in forest management by restoring riparian habitat, which could improve riparian/forest health and strength forest connectivity to the river. |
| O-25: Maximize socio-economic, cultural, recreational, public health, and public safety benefits with a particular emphasis on disadvantaged communities (DACs) | ● | Restoration activities would benefit DACs in Lodi and Stockton by reducing attenuating flood flows that would otherwise cause flooding in these DACs. |
| O-26: Achieve equity | ● | The benefits realized from implementing the concept would not be limited to a narrow group; rather, project benefits would be spread across regions, cultures, incomes, and time. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| E-27: Protect and enhance natural environment (enhance natural envt) | ● | The concept would protect and enhance the natural environment by allowing streamwood and other organic materials to remain undisturbed in the river in the patterns in which they fall or come to rest. Streamwood breaks down stochastically via decay and disintegration. This process is meant to contribute to carbon storage and carbon transport from upper watershed to the ocean in a range from entire trees to dissolved organic carbon. Additionally, an increase in the amount of wood available to fall into the channel (i.e. streamwood) would improve habitat diversity through structural additions to flow fields, refugia during high flows and from predation, and provide additional nutrients to aquatic organisms. Restoring greater continuous areas versus smaller fragmented areas would maximize these benefits. |
| E-28: Protect and enhance natural environment (wild & scenic designation) | ○ | The concept does not incorporate or seek a wild and scenic designation. |
| E-29: Protect and restore fisheries | ● | The concept would protect and improve riparian vegetation, which contributes directly towards increased habitat diversity, habitat complexity, and habitat function for fish and other aquatic species. Insect production from riparian areas provides a valuable foraging resource for juvenile salmonid and other fish species inhabiting the river. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| A-30: Enhance or maintain the water supply for the beneficial use in ag practices | ○ | The concept does not include elements that would increase agricultural water supply. |
| C-31: Foster long-term regional relationships and avoid unnecessary conflict and litigation | ● | The concept would require coordination between a number of entities, which could include non-governmental organizations, private landowners, and water agencies. This coordination would contribute to fostering long-term regional relationships and help to avoid unnecessary conflict and litigation. |
| C-32: Promote broadly-supported outcomes that benefit a wide range of interests | ● | The concept would restore riparian habitat and increase recreational and angling opportunities. These outcomes are supported by a wide range of interests within the watershed. |
| C-33: Promote broadly-supported outcomes that benefit a wide range of interests (least controversial projects) | ● | The concept has passed the preliminary four screening criteria, including the beneficial and compatible screens. |
| C-34: Promote broadly-supported outcomes that benefit a wide range of interests (agreements that reduce conflict) | ○ | The concept would not directly address any current watershed conflicts. |
| C-35: Develop a program consistent with all existing licenses, permits, and agreements affecting the River | ● | As a condition of implementation, the concept would be consistent with all existing licenses, permits, and agreements affecting the Mokelumne River. As such, the concept would not |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| | | interfere with any entity exercising a water right. |
| C-36: Develop a program consistent with all existing licenses, permits, and agreements affecting the River (CEQA/NEPA) | ● | As a condition of implementation, the concept would be required to adhere to all applicable regulatory requirements, including applicable CEQA/NEPA regulations documentation, etc. |
| CA-37: Avoid basing decisions on incomplete or inaccurate information | ● | The concept involves supporting restoration activities noted in the Lower Mokelumne Watershed Stewardship Plan. Implementation of any aspects of the plan would require a planning phase that would collect and analyze data that is considered, at the time, to be the most complete and accurate. |
| CA-38: Avoid demand for new or larger on-stream dams | ● | The concept would not result in construction of a new or larger on-stream dam. |
| CA-39: Avoid harmful impacts to fisheries and other wildlife | ● | The concept would not create harmful impacts to fisheries and other wildlife. |
| CA-40: Avoid conversion of agricultural lands to developed uses | ● | The concept does not include elements that would convert agricultural lands to developed uses. |
| CA-41: Avoid shifting environmental impacts from one area to another | ● | The concept does not include elements that would shift environmental impacts from one area to another. |
| CA-42: No diminishment of the benefits of existing in-stream flow | ● | The concept does not include elements that would alter existing in-stream flows. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| CA-43: Avoid closing the process to the public | ● | As a condition of planning and implementation, the concept would include public involvement to the extent appropriate. |
| CA-44: Avoid dependency on potentially unreliable supply | ● | The concept does not include elements that would facilitate downstream users becoming dependent on an unreliable supply. |
| CA-45: Minimize adverse socio-economic and public health and safety impacts | ● | The concept does not include elements that would create adverse socio-economic and public health and safety impacts. |
| CA-46: Avoid end use harm | ● | The concept does not allocate water in ways that create end use harm. |
| CA-47: Avoid violating procedural or substantive laws | ● | As a condition of implementation, the concept would be required to complete relevant CEQA/NEPA analysis prior to implementation. |
| CA-48: Avoid interregional inequity | ● | Implementation of the concept would not create interregional inequity, either in realized benefits or in costs. |

# 1g: Mokelumne Water Quality, Soil Erosion, and Sedimentation Restoration

## Amador Water Agency

### Overview

**Sponsor(s):** Amador Water Agency (AWA)

**Concept type:** Planning

**Estimated Costs:** $400,000 (capital)

**Funding Source(s):** Watershed Restoration Grant, USFS rehabilitation funds for Power Fire, funds from Benefiting Users of Mokelumne Water

**Concept location:** Upstream of Pardee Reservoir

The purpose of this concept is to eliminate man-caused water pollution and adverse impacts on aquatic resources from sediment by eliminating point sources of gully erosion. The concept would develop a three-phase program in the Mokelumne Watershed upstream of Pardee Reservoir. Gullies from road and trail drainage (open & closed for use) and any other "unnatural" eroding surfaces that deliver significant amounts of sediment to streams will be the primary targets for this program because they can be the biggest contributors to water quality degradation and adverse impacts on river aquatic resources. The program would consist of three phases: 1) inventory areas of soil erosion in coordination with land owners, 2) set priorities, and develop an action plan, and 3) seek partners and funding for projects. The USFS Amador District Ranger is currently developing a study and restoration projects in the 2004 Power Fire burn area, which affected 17,000 acres within the upper Mokelumne watershed. This concept would be coordinated with that, as well as with the Amador Calaveras Consensus Group which is currently engaged in this work with the USFS.

### Assessment

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| ● ***Fully addressed*** | ◗ ***Partially addressed*** | ○ ***Not addressed*** |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| WS-1: Promote demand-side management strategies | ○ | As an implementation plan, the concept does not have elements that promote demand-side management strategies. Implementation of the project described in the concept would also not have elements that would promote demand-side management strategies. |
| WS-2: Increase supply reliability | ○ | As an implementation plan, the concept would not increase supply reliability. Implementation of the project described in the concept would also not increase supply reliability. |
| WS-3: Increase amount of stored water | ◗ | The concept itself does not include elements that would increase the amount of stored water. However, if implemented, less erosion, sedimentation and surface run-off could decrease the amount of sedimentation occurring in reservoirs. Storage in Tiger Creek Afterbay has been reduced by 76% since it was built in 1931; remaining capacity is anticipated ot be lost in the next 25 years (Moke Watershed Avoided Cost Analysis: Why Sierra Fuel Treatments Make Economic Sense). |
| WS-4: Promote smart, responsible development | ○ | Neither the concept nor its implementation would promote smart, responsible development. |
| WS-5: Reduce reliance on groundwater for irrigation | ○ | Neither the concept nor its implementation would reduce reliance on groundwater for irrigation |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| WS-6: Promote a long-term groundwater balance | ◗ | The concept itself does not promote a long-term groundwater balance. However, if implemented, groundwater supplies would likely increase due to greater infiltration rates as erosion slows. |
| WS-7: Maximize water resource availability for all beneficial uses | ◗ | As an implementation plan, the concept itself does not address maximizing water resource availability for all beneficial uses. However, restoration and control of erosion and sedimentation would provide optimum use of storage facilities. If implemented, peak flood flows would decrease and run-off would be less turbid, which is beneficial for water agencies and downstream communities that experience flooding. |
| WS-8: Decrease the need to import water | ◗ | The concept itself would not decrease the need to import water. However, if implemented, the concept could increase storage on the Mokelumne, which could decrease the need to import water. |
| WD-9: Review and understand existing agency demand estimates | ○ | The concept does not include reviewing and understanding existing agency demand estimates. Implementation of the project described in the concept would also not review existing agency demand estimates. |
| WD-10: Identify water demand issues for timely consideration by the water agencies during their UWMP update | ○ | The concept does not include identifying water demand issues for consideration in the upcoming UWMP update. Implementation of the project described in the concept would also not identify water demand issues. |

| ***Objective*** | ● ◗ O | ***Justification*** |
|---|---|---|
| WQ-11: Protect and improve surface and groundwater quality | ◗ | As an implementation plan, the concept would not protect and improve surface and groundwater quality. However, if implemented, the project would likely improve surface and groundwater quality by reducing pollutants and turbidity sourced by roads, trails and other development that enter the system via erosion. |
| WQ-12: Match delivered water quality use | O | As an implementation plan, the concept itself would not involve treating water, nor does it involve delivering treated water. If implemented, the concept would also not match delivered water quality to use. |
| WQ-13: Use water purification technology as a tool to maximize beneficial uses | O | As an implementation plan, the concept does not use water purification technology as a tool to maximize beneficial uses. Implementation of the project as described in the concept would also not use purification technology as a tool to maximize beneficial uses. |
| R-14: Increase access for water-based recreation | O | As an implementation plan, the concept itself does not include elements that would increase access to the Mokelumne River from Highway 12 to the headwaters. Implementation of the project as described in the concept would also not increase access. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| R-15: Increase angling and other recreational opportunities (increase spawning habitat, etc.) | ◗ | As an implementation plan, the concept itself would not increase spawning habitat. However, if the project as described in the concept were implemented, habitat would likely benefit. Management of soil erosion and sediment deposition within aquatic habitats is an important element in defining the quality and suitability of aquatic habitat, particularly for salmonid spawning and juvenile rearing, but also for other aquatic resources, including macroinvertebrate and insect production within various parts of the watershed. Soil erosion as a result of road crossings, local land use, fire, and other factors has been identified as an important factor affecting habitat quality and suitability within a watershed. |
| R-16: Increase angling and other recreational opportunities (stock hatchery-raised fish) | ○ | As an implementation plan, the concept does not involve stocking hatchery-raised trout in designated areas on the upper Mokelumne, nor does it involve designating and managing wild trout sections. Implementation of the project described in the concept would also not stock hatchery-raised trout. |
| R-17: Increase angling and other recreational opportunities (reintroduce salmon in upper Moke) | ○ | As an implementation plan, the concept itself does not include reintroducing salmon into the upper Mokelumne. Implementation of the project described in the concept would also not reintroduce salmon into the upper Mokelumne. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| R-18: Increase angling and other recreational opportunities (increase opportunities) | ◗ | The concept itself does not address increasing recreational or angling opportunities. However, if implemented, the project would likely reduce sedimentation, which could improve fish counts and lead to more angling opportunities. Less erosion would improve geomorphic functions which could include an increase in baseflows leading to better water quality and geomorphic functionality, which may improve fish habitat and riparian corridor health. These outcomes would increase angling and other recreational opportunities. |
| WR-19: Resolve existing water rights conflicts in the watershed | ○ | The concept is not focused on resolving existing water rights protests to achieve a common understanding of the application of relevant water rights law in the watershed. Implementation of the project described in the concept would also not resolve existing water rights conflicts. |
| F-20: Enhance flood protection and management | ◗ | The concept itself does not address flood protection or management. However, as a result of reduced sedimentation and sheet flow runoff and higher infiltration rates, peak flood flows and sedimentation transport rates during flood events would decrease. Implementing the project described in the concept would enhance flood protection for residents and businesses within the watershed by helping to slow and attenuate floodwaters. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| D-21: Use sound, agreed-upon data to evaluate program alternatives (hydrology dataset) | ○ | As an implementation plan, the concept itself does not involve producing an agreed-upon hydrology dataset and Water Availability Analysis separate from that which was produced as part of the MokeWISE program. Implementation of the project described in the concept would also not produce a hydrology dataset or Water Availability Analysis. |
| D-22: Use sound, agreed-upon data to evaluate program alternatives (describe in sufficient detail) | ◗ | Because the concept is not well-defined enough to complete a quantitative assessment, a qualitative assessment was performed. However, the purpose of this concept is to assess feasibility and collect sound, agreed-upon data prior to implementation of the concept. |
| D-23: Promote the contribution of sound scientific data to current body of knowledge | ● | The concept would contribute data to the current body of knowledge by collecting and reporting program information, including how and where erosion and sedimentation is occurring, restoration methods, erosion and sedimentation control and prevention, and the relationship between storage and erosion. |
| O-24: Increase investment in forest management | ◗ | The concept does not directly address increasing investment in forest management. However, if implemented, the concept could lead to additional investments in forest management as a result to improvements to riparian and fluvial health. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| O-25: Maximize socio-economic, cultural, recreational, public health, and public safety benefits with a particular emphasis on disadvantaged communities (DACs) | ◗ | As an implementation plan, the concept would not directly contribute to socio-economic, cultural, recreational, public health and public safety benefits of a DAC. If implemented, the project described in the concept could maximize these benefits, particularly if the areas identified in the implementation plan are located within a DAC. |
| O-26: Achieve equity | ◗ | As an implementation plan, the concept would not directly achieve equity. However, the benefits realized from restoration activities would not be limited to a narrow group; rather, project benefits would be spread across regions, cultures, incomes, and time. |
| E-27: Protect and enhance natural environment (enhance natural envt) | ◗ | As an implementation plan, the concept itself would not protect and enhance the natural environment. Implementation of the project as described in the concept would protect and enhance the natural environment by restoring eroded lands, leading to a healthier watershed for aquatic wildlife such as fish and frogs and promoting increased stability in more sensitive habitats. In addition, increased bank stability would promote vegetation diversity and flood events would have a less dramatic disruption in the area. |
| E-28: Protect and enhance natural environment (wild & scenic designation) | ○ | The concept does not incorporate or seek a wild and scenic designation. If implemented, the project as described in the concept would also not incorporate or seek a wild and scenic designation. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| E-29: Protect and restore fisheries | ◗ | The concept itself does not directly address fisheries. However, a reduction in sedimentation and turbidity could potentially improve substrate habitat for spawning fish and invertebrates that utilize interstitial spaces in the channel bed, as well as improve spring and summer fish growth rates. Reduce fine-grained sedimentation reduces redd (fish nest) scour, with the associated loss of incubating eggs. |
| A-30: Enhance or maintain the water supply for the beneficial use in ag practices | ○ | The concept does not include elements that would increase agricultural water supply. Implementation of the concept would also not enhance or maintain agricultural water supply. |
| C-31: Foster long-term regional relationships and avoid unnecessary conflict and litigation | ● | One purpose of the concept is to seek partners for the project (which may include private landowners and the USFS Amador District Ranger), which would foster long-term regional relationships. The implementation plan helps avoid unnecessary conflict and litigation by identifying and attempting to resolve these issues early on. |
| C-32: Promote broadly-supported outcomes that benefit a wide range of interests | ● | Implementation of the concept would lead to improved water quality, greater ecological diversity and reduced flooding hazards. These outcomes are supported by a wide range of stakeholders. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| C-33: Promote broadly-supported outcomes that benefit a wide range of interests (least controversial projects) | ◗ | The concept has passed the preliminary four screening criteria, including the beneficial and compatible screens. The project described in the concept would also need to undergo these screenings to determine if it was the least controversial project. |
| C-34: Promote broadly-supported outcomes that benefit a wide range of interests (agreements that reduce conflict) | ○ | The concept would not directly address any current watershed conflicts. Soil restoration activities would also not address this objective. |
| C-35: Develop a program consistent with all existing licenses, permits, and agreements affecting the River | ● | As a condition of implementation, the concept would be consistent with all existing licenses, permits, and agreements affecting the Mokelumne River. This would also be required of the project described in the concept if it were to be implemented. |
| C-36: Develop a program consistent with all existing licenses, permits, and agreements affecting the River (CEQA/NEPA) | ● | As a condition of implementation, the concept would be required to adhere to all applicable regulatory requirements, including applicable CEQA/NEPA regulations documentation, etc. This would also be required of the project described in the concept if it were to be implemented. |
| CA-37: Avoid basing decisions on incomplete or inaccurate information | ● | Prior to implementation, the concept would undergo a planning phase that would collect and analyze data that is considered, at the time, to be the most complete and accurate. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| CA-38: Avoid demand for new or larger on-stream dams | ● | The concept will not result in construction of a new or larger on-stream dam. If the project as described in the concept is implemented, there would also not be demand for new or larger on-stream dams. |
| CA-39: Avoid harmful impacts to fisheries and other wildlife | ● | The concept would not create harmful impacts to fisheries and other wildlife. On the contrary, the implementation of the project described in the concept would likely increase water quality, which would benefit fish and other wildlife. |
| CA-40: Avoid conversion of agricultural lands to developed uses | ● | The concept would not convert agricultural lands to developed uses. Implementation of the project described in the concept would also not convert agricultural lands. |
| CA-41: Avoid shifting environmental impacts from one area to another | ● | The concept would not shift environmental impacts from one area to another. Implementation of the project described in the concept would also not shift environmental impacts. |
| CA-42: No diminishment of the benefits of existing in-stream flow | ● | The concept does not include elements that would alter existing in-stream flows. Implementation of the project described in the concept would also not diminish the benefits of existing in-stream flow. |
| CA-43: Avoid closing the process to the public | ● | As a condition of planning and implementation, the concept would include public involvement to the extent appropriate. This also applies to any restoration activities. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| CA-44: Avoid dependency on potentially unreliable supply | ● | The concept does not include elements that would facilitate downstream users becoming dependent on an unreliable supply. This also applies to implementation of the project described in the concept. |
| CA-45: Minimize adverse socio-economic and public health and safety impacts | ● | The concept does not include elements that would create adverse socio-economic and public health and safety impacts. Implementation of the project described in the concept would provide public health and safety benefits by upgrading the treatment process from a sand filter to a membrane filtration process. |
| CA-46: Avoid end use harm | ● | The concept does not allocate water in ways that create end use harm. This also applies to implementation of the project described in the concept. |
| CA-47: Avoid violating procedural or substantive laws | ● | As a condition of implementation, the concept would be required to complete relevant CEQA/NEPA analysis prior to implementation. This also applies to any restoration activities. |
| CA-48: Avoid interregional inequity | ● | Implementation of the concept would not create interregional inequity, either in realized benefits or in costs. This also applies to any restoration activities. |

# 2a: Municipal Recycled Wastewater Recharge Program

## City of Lodi

### Overview

**Sponsor(s):** City of Lodi

**Concept type:** Planning and implementation

**Estimated Costs:** unknown

**Funding Source(s):** State grants, City of Lodi Utility Rates, Regional Groundwater Extraction Fee

**Concept location:** San Joaquin County, west of Davis Road, south of SR 12 and north of Eight Mile Road

The concept involves using treated, disinfected wastewater to recharge, either direct or in-lieu, Valley groundwater aquifers. Based on findings from the MokeWISE Water Availability Analysis, the City currently treats 7,095 AFY of wastewater. Of this, 1,642 AFY is used as recycled water. Assuming the 3,700 AFY agricultural reuse project is implemented, the City of Lodi could currently treat and reuse roughly 1,700 AFY of wastewater. This number will grow to 3,050 AFY in the future, accounting for population growth. The concept includes developing a feasibility study to identify nearby areas potentially feasible for recharge and document potential downstream impacts of diverting wastewater. Uses including consumptive use and seawater intrusion barriers will be considered. After the feasibility study is published, study recommendations will be implemented.

### Assessment

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| ● ***Fully addressed*** | ◗ ***Partially addressed*** | ○ ***Not addressed*** |
| WS-1: Promote demand-side management strategies | ○ | The concept does not have elements that promote demand-side management strategies. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| WS-2: Increase supply reliability | ● | The concept would increase supply reliability by reusing treated wastewater, which would likely offset Mokelumne River water and groundwater that is currently used by the City of Lodi. As a supply, recycled water is more reliable than Mokelumne River water and groundwater. Because of this, the City of Lodi and its customers could become more resilient against changes in the Mokelumne River system and changes in groundwater levels. |
| WS-3: Increase amount of stored water | ● | The purpose of the concept is to use treated recycled water to recharge the groundwater basin, which would increase the amount of stored water. |
| WS-4: Promote smart, responsible development | ○ | While the concept does not prohibit or preclude smart, responsible development, it does not directly promote it. |
| WS-5: Reduce reliance on groundwater for irrigation | ○ | The concept would not reduce reliance on groundwater for irrigation, as the purpose of the concept is to recharge the groundwater basin and does not offset groundwater use for irrigation. |
| WS-6: Promote a long-term groundwater balance | ● | The purpose of the concept is to recharge the groundwater basin, which would help promote a long-term groundwater balance. |
| WS-7: Maximize water resource availability for all beneficial uses | ● | The concept would maximize water resource availability for all beneficial uses by reusing treated wastewater for either consumptive uses or as a seawater intrusion barrier (use as a seawater intrusion barrier would help protect current supplies). |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| WS-8: Decrease the need to import water | ○ | The City does not currently import water, as its supply portfolio is groundwater and Mokelumne River water. As such, the concept would not decrease the need to import water. |
| WD-9: Review and understand existing agency demand estimates | ○ | The concept does not include reviewing and understanding existing agency demand estimates. |
| WD-10: Identify water demand issues for timely consideration by the water agencies during their UWMP update | ○ | The concept does not include identifying water demand issues for consideration in the upcoming UWMP update. |
| WQ-11: Protect and improve surface and groundwater quality | ● | The concept would protect and improve groundwater quality by increasing the amount of stored water, which would help dilute pollutants in the groundwater. If the recycled water is used as a seawater intrusion barrier, it would protect groundwater quality. |
| WQ-12: Match delivered water quality use | ○ | While the concept involves treating water, it does not involve increasing the level of treatment for use in groundwater recharge. Additionally, the concept does not involve delivering treated water, aside from continuing to pump groundwater. |
| WQ-13: Use water purification technology as a tool to maximize beneficial uses | ● | The concept would treat wastewater to be used for recharge, which maximizes beneficial use of the wastewater. |
| R-14: Increase access for water-based recreation | ○ | The concept does not include elements that would increase access to the Mokelumne River from Highway 12 to the headwaters. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| R-15: Increase angling and other recreational opportunities (increase spawning habitat, etc.) | ○ | The concept would not contribute to increasing spawning habitat, designating sections of the river for hatchery and wild species, or designating environmental flows. |
| R-16: Increase angling and other recreational opportunities (stock hatchery-raised fish) | ○ | The concept does not involve stocking hatchery-raised trout in designated areas on the upper Mokelumne, nor does it involve designating and managing wild trout sections. |
| R-17: Increase angling and other recreational opportunities (reintroduce salmon in upper Moke) | ○ | The concept does not include reintroducing salmon into the upper Mokelumne. |
| R-18: Increase angling and other recreational opportunities (increase opportunities) | ○ | While the concept would decrease the likelihood of fish entrainment by removing an unscreened diversion, the extent to which this would increase angling opportunities is likely negligible. |
| WR-19: Resolve existing water rights conflicts in the watershed | ○ | The concept is not focused on resolving existing water rights protests to achieve a common understanding of the application of relevant water rights law in the watershed. |
| F-20: Enhance flood protection and management | ○ | The concept does not include elements that would enhance flood protection and/or flood management, nor would the concept enhance ecosystem function in a way that would provide flood protection. |
| D-21: Use sound, agreed-upon data to evaluate program alternatives (hydrology dataset) | ○ | The concept does not involve producing an agreed-upon hydrology dataset and Water Availability Analysis separate from that which was produced as part of the MokeWISE program. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| D-22: Use sound, agreed-upon data to evaluate program alternatives (describe in sufficient detail) | ◗ | The concept has some quantitative information available, including an estimated amount of water available for groundwater recharge. |
| D-23: Promote the contribution of sound scientific data to current body of knowledge | ● | The concept would contribute data to the current body of knowledge by collecting and reporting program information, including information on groundwater recharge and recovery and water quality. |
| O-24: Increase investment in forest management | ○ | The concept does not include elements that would promote forest management, nor would it help reduce the economic impact of wildfires and other natural disasters. |
| O-25: Maximize socio-economic, cultural, recreational, public health, and public safety benefits with a particular emphasis on disadvantaged communities (DACs) | ● | The concept would be located in the San Joaquin Valley and would serve the City of Lodi. Portions of the City and a number of areas within the Valley are DACs and would benefit from this concept. |
| O-26: Achieve equity | ● | The benefits realized from implementing the concept would not be limited to a narrow group; rather, project benefits would be spread across regions, cultures, incomes, and time. |
| E-27: Protect and enhance natural environment (enhance natural envt) | ○ | The concept does not incorporate elements that would protect and enhance the natural environment. |
| E-28: Protect and enhance natural environment (wild & scenic designation) | ○ | The concept does not incorporate or seek a wild and scenic designation. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| E-29: Protect and restore fisheries | ○ | While the concept could reduce the use of Mokelumne River water, this amount would be negligible and likely not help to protect and restore fisheries. |
| A-30: Enhance or maintain the water supply for the beneficial use in ag practices | ● | The concept maintains and provides a more reliable water supply for agricultural uses by using recycled water instead of Mokelumne River water and groundwater. |
| C-31: Foster long-term regional relationships and avoid unnecessary conflict and litigation | ● | The concept would help foster regional relationships by requiring long-term coordination between the City and other entities participating in groundwater recharge within the Valley. |
| C-32: Promote broadly-supported outcomes that benefit a wide range of interests | ● | The concept would protect supplies for agricultural users and contribute to groundwater recharge. These outcomes are supported by a wide range of interests within the watershed, including farmers, water agencies, and non-governmental organizations. |
| C-33: Promote broadly-supported outcomes that benefit a wide range of interests (least controversial projects) | ● | The concept has passed the preliminary four screening criteria, including the beneficial and compatible screens. |
| C-34: Promote broadly-supported outcomes that benefit a wide range of interests (agreements that reduce conflict) | ○ | The concept would serve recycled water for irrigation and groundwater recharge; its implementation would not directly address any current watershed conflicts. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| C-35: Develop a program consistent with all existing licenses, permits, and agreements affecting the River | ● | As a condition of implementation, the concept would be consistent with all existing licenses, permits, and agreements affecting the Mokelumne River. As such, the concept would not interfere with any entity exercising a water right. |
| C-36: Develop a program consistent with all existing licenses, permits, and agreements affecting the River (CEQA/NEPA) | ● | As a condition of implementation, the concept would be required to adhere to all applicable regulatory requirements, including applicable CEQA/NEPA regulations documentation, etc. |
| CA-37: Avoid basing decisions on incomplete or inaccurate information | ● | Prior to implementation, the concept would undergo a planning phase that would collect and analyze data that is considered, at the time, to be the most complete and accurate. |
| CA-38: Avoid demand for new or larger on-stream dams | ● | The concept would not result in construction of a new or larger on-stream dam. |
| CA-39: Avoid harmful impacts to fisheries and other wildlife | ● | The concept would not create harmful impacts to fisheries and other wildlife. |
| CA-40: Avoid conversion of agricultural lands to developed uses | ● | The concept does not include elements that would convert agricultural lands to developed uses. |
| CA-41: Avoid shifting environmental impacts from one area to another | ● | The concept does not include elements that would shift environmental impacts from one area to another. |
| CA-42: No diminishment of the benefits of existing in-stream flow | ● | The concept does not include elements that would alter existing in-stream flows. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| CA-43: Avoid closing the process to the public | ● | As a condition of planning and implementation, the concept would include public involvement to the extent appropriate. |
| CA-44: Avoid dependency on potentially unreliable supply | ● | The concept does not include elements that would facilitate downstream users becoming dependent on an unreliable supply. On the contrary, the concept increases the reliability of a supply. |
| CA-45: Minimize adverse socio-economic and public health and safety impacts | ● | Use of recycled water mandates protections of public health and safety. As a condition of implementation, the concept would be required to follow regulations mandating health and safety impacts. Additionally, the concept does not include elements that would create adverse socio-economic impacts. |
| CA-46: Avoid end use harm | ● | The concept does not allocate water in ways that create end use harm. |
| CA-47: Avoid violating procedural or substantive laws | ● | As a condition of implementation, the concept would be required to complete relevant CEQA/NEPA analysis prior to implementation. |
| CA-48: Avoid interregional inequity | ● | Implementation of the concept would not create interregional inequity, either in realized benefits or in costs. |

# 2b: Constellation Winery Wastewater Reuse

## Constellation Winery; GBA, NSJWCD

### Overview

**Sponsor(s):** Constellation Winery; Groundwater Basin Authority, North San Joaquin Water Conservation District

**Concept type:** Planning and implementation

**Estimated Costs:** unknown

**Funding Source(s):** unknown

**Concept location:** NSJWCD's fourth diversion point on the Mokelumne River

Currently, Constellation Winery has an unscreened diversion point on the Mokelumne River and riparian rights. This concept involves moving their diversion point to North San Joaquin Water Conservation District's (NSJWCD's) fourth diversion point, which is a state-of-the-art facility with a fish screen. The project would divert surface water from the combined diversion and blend it with wastewater from Constellation Winery (treated wastewater is currently being used to irrigate forage crops, but is high in potassium). This blended water would be used for irrigation and recharge (percolation ponds), depending on the year type. In wet years, between 2,000 and 4,000 acre-feet per year (AFY) will be available for the project. In these wet years, 50% (likely 1,000 to 2,000 AFY) would be used for irrigation, and the remaining 50% would be used for recharge. In dry years, 1,000 to 2,000 AFY would be available for the project. In these dry years, all water would be used for irrigation.

### Assessment

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| ● ***Fully addressed*** | ◗ ***Partially addressed*** | ○ ***Not addressed*** |
| WS-1: Promote demand-side management strategies | ○ | The concept does not have elements that promote demand-side management strategies. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| WS-2: Increase supply reliability | ● | The concept would extend the use of Mokelumne River water by blending it with recycled water. This blending would increase the number of irrigated acres and recharge potential of the Mokelumne River water. The concept would increase supply reliability for NSJWCD by increasing the use of recycled water. In wet years, use of NSJWCD's Mokelumne water would be extended by blending it with recycled water. In dry years, NSJWCD would have access to Mokelumne River water through Constellation's water right; the District would be able to use the blended water for irrigation, when previously, groundwater would have been used. As a supply, recycled water is more reliable and available to NSJWCD in more hydrologic year types than Mokelumne River water. Because of this, NSJWCD and its customers could become more resilient in dry years when Mokelumne River under NSJWCD's water right is likely unavailable. |
| WS-3: Increase amount of stored water | ○ | The concept would not increase the amount of stored water. |
| WS-4: Promote smart, responsible development | ○ | While the concept does not prohibit or preclude smart, responsible development, it does not directly promote it. |
| WS-5: Reduce reliance on groundwater for irrigation | ● | Because NSJWCD's surface water rights are junior and are often unavailable in dry years, groundwater is a large portion of their supply portfolio. The concept would help reduce reliance on groundwater by 1,000 to 2,000 AFY by irrigating with recycled water instead of groundwater. |
| WS-6: Promote a long-term groundwater balance | ● | The concept would help promote a long-term groundwater balance by offsetting groundwater use by using recycled water for irrigation instead of groundwater. Between 1,000 and 2,000 AFY of groundwater would be offset. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| WS-7: Maximize water resource availability for all beneficial uses | ● | The concept will allocate water to both agricultural users and to groundwater recharge by blending Mokelumne River supply with treated wastewater, maximizing water availability for multiple beneficial uses. |
| WS-8: Decrease the need to import water | ○ | The concept would offset use of groundwater supplies, not the use of imported water. |
| WD-9: Review and understand existing agency demand estimates | ○ | The concept does not include reviewing and understanding existing agency demand estimates. |
| WD-10: Identify water demand issues for timely consideration by the water agencies during their UWMP update | ○ | The concept does not include identifying water demand issues for consideration in the upcoming UWMP update. |
| WQ-11: Protect and improve surface and groundwater quality | ◗ | The concept would protect and improve groundwater quality because more groundwater would be left in the basin, which dilutes the concentrations of constituents. However, because the amount of groundwater that would be offset is small (1,000 to 2,000 AFY), this benefit would be minimal. |
| WQ-12: Match delivered water quality use | ● | Currently, Mokelumne River water and groundwater are used for irrigation in the concept area (treated wastewater is used to irrigate forage crops). The concept would match delivered water quality to use by blending treated wastewater with Mokelumne River water to use for grape and other crop irrigation. |
| WQ-13: Use water purification technology as a tool to maximize beneficial uses | ● | The purpose of the concept is to reuse treated wastewater created by Constellation Winery, which uses water treatment technology to maximize beneficial uses, including irrigation and groundwater recharge. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| R-14: Increase access for water-based recreation | ○ | The concept does not include elements that would increase access to the Mokelumne River from Highway 12 to the headwaters. |
| R-15: Increase angling and other recreational opportunities (increase spawning habitat, etc.) | ○ | The concept would not contribute to increasing spawning habitat, designating sections of the river for hatchery and wild species, or designating environmental flows. |
| R-16: Increase angling and other recreational opportunities (stock hatchery-raised fish) | ○ | The concept does not involve stocking hatchery-raised trout in designated areas on the upper Mokelumne, nor does it involve designating and managing wild trout sections. |
| R-17: Increase angling and other recreational opportunities (reintroduce salmon in upper Moke) | ○ | The concept does not include reintroducing salmon into the upper Mokelumne. |
| R-18: Increase angling and other recreational opportunities (increase opportunities) | ○ | While the concept would decrease the likelihood of fish entrainment by removing an unscreened diversion, the extent to which this would increase angling opportunities is likely negligible. |
| WR-19: Resolve existing water rights conflicts in the watershed | ○ | The concept is not focused on resolving existing water rights protests to achieve a common understanding of the application of relevant water rights law in the watershed. |
| F-20: Enhance flood protection and management | ○ | The concept does not include elements that would enhance flood protection and/or flood management, nor would the concept enhance ecosystem function in a way that would provide flood protection. |
| D-21: Use sound, agreed-upon data to evaluate program alternatives (hydrology dataset) | ○ | The concept does not involve producing an agreed-upon hydrology dataset and Water Availability Analysis separate from that which was produced as part of the MokeWISE program. |

| ***Objective*** | ● ◗ O | ***Justification*** |
|---|---|---|
| D-22: Use sound, agreed-upon data to evaluate program alternatives (describe in sufficient detail) | ◗ | The concept has some quantitative information available, including an estimated amount of water available for groundwater recharge and irrigation. |
| D-23: Promote the contribution of sound scientific data to current body of knowledge | ● | The concept would contribute data to the current body of knowledge by collecting and reporting program information, including information on groundwater recharge and recovery, crop yield, and water quality. |
| O-24: Increase investment in forest management | O | The concept does not include elements that would promote forest management, nor would it help reduce the economic impact of wildfires and other natural disasters. |
| O-25: Maximize socio-economic, cultural, recreational, public health, and public safety benefits with a particular emphasis on disadvantaged communities (DACs) | O | The concept is not located within a DAC and would not directly contribute to socio-economic, cultural, recreational, public health, and public safety benefits of a DAC. |
| O-26: Achieve equity | ● | The benefits realized from implementing the concept, including removing of an unscreened diversion and increasing supply reliability for NSJWCD, would not be limited to a narrow group; rather, project benefits would be spread across regions, cultures, incomes, and time. |
| E-27: Protect and enhance natural environment (enhance natural envt) | ● | One outcome of the concept is the removal of an unscreened diversion from the Mokelumne River. This would protect and enhance the natural environment by decreasing the likelihood that fish would become entrained by the unscreened diversion. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| E-28: Protect and enhance natural environment (wild & scenic designation) | ○ | The concept does not incorporate or seek a wild and scenic designation. |
| E-29: Protect and restore fisheries | ● | NSJWCD's fourth diversion is a state of the art diversion facility with a fish screen. The diversion used by Constellation Winery does not have a fish screen. The concept would move Constellation Winery's diversion point to NSJWCD's fourth diversion point and abandon their current diversion. Because of this, an unscreened diversion would be removed from the River, which reduces the likelihood of fish becoming entrained in unscreened diversions. |
| A-30: Enhance or maintain the water supply for the beneficial use in ag practices | ● | The concept maintains and provides water supply for agricultural uses by blending recycled water with Mokelumne River water, which allows NSJWCD access to Mokelumne River water even in dry years when Mokelumen River water under the District's water right may not be available to the District. Additionally, using blended recycled water during dry years offsets groundwater use, as NSJWCD relies on groundwater for irrigation in dry years. |
| C-31: Foster long-term regional relationships and avoid unnecessary conflict and litigation | ● | The concept would help foster regional relationships by requiring long-term coordination between NSJWCD, agricultural water users, and Constellation Winery. |
| C-32: Promote broadly-supported outcomes that benefit a wide range of interests | ● | The concept would provide resiliency for agricultural water users, contribute to groundwater recharge, and remove an unscreened diversion from the Mokelumne River. These outcomes are supported by a wide range of interests within the watershed, including farmers, water agencies, and non-governmental organizations. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| C-33: Promote broadly-supported outcomes that benefit a wide range of interests (least controversial projects) | ● | The concept has passed the preliminary four screening criteria, including the beneficial and compatible screens. |
| C-34: Promote broadly-supported outcomes that benefit a wide range of interests (agreements that reduce conflict) | ○ | The concept would serve recycled water for irrigation and recharge groundwater; its implementation would not directly address any current watershed conflicts. |
| C-35: Develop a program consistent with all existing licenses, permits, and agreements affecting the River | ● | As a condition of implementation, the concept would be consistent with all existing licenses, permits, and agreements affecting the Mokelumne River. As such, the concept would not interfere with any entity exercising a water right. |
| C-36: Develop a program consistent with all existing licenses, permits, and agreements affecting the River (CEQA/NEPA) | ● | As a condition of implementation, the concept would be required to adhere to all applicable regulatory requirements, including applicable CEQA/NEPA regulations documentation, etc. |
| CA-37: Avoid basing decisions on incomplete or inaccurate information | ● | Prior to implementation, the concept would undergo a planning phase that would collect and analyze data that is considered, at the time, to be the most complete and accurate. |
| CA-38: Avoid demand for new or larger on-stream dams | ● | The concept would not result in construction of a new or larger on-stream dam. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| CA-39: Avoid harmful impacts to fisheries and other wildlife | ● | The concept would not create harmful impacts to fisheries and other wildlife. On the contrary, an outcome of the concept is an abandoned unscreened diversion point on the Mokelumne River, which would reduce the likelihood of fish entrainment and benefit fish and other wildlife. |
| CA-40: Avoid conversion of agricultural lands to developed uses | ● | The concept does not include elements that would convert agricultural lands to developed uses. |
| CA-41: Avoid shifting environmental impacts from one area to another | ● | The concept does not include elements that would shift environmental impacts from one area to another. |
| CA-42: No diminishment of the benefits of existing in-stream flow | ◗ | Changing a point of diversion could alter in-stream flows. However, due to the small amount of diverted water that would be moved to the new diversion point, diminishment of current in-stream benefits would likely be low. |
| CA-43: Avoid closing the process to the public | ● | As a condition of planning and implementation, the concept would include public involvement to the extent appropriate. |
| CA-44: Avoid dependency on potentially unreliable supply | ● | The concept does not include elements that would facilitate downstream users becoming dependent on an unreliable supply. On the contrary, the concept increases the reliability of a supply. |
| CA-45: Minimize adverse socio-economic and public health and safety impacts | ● | Use of recycled water mandates protections of public health and safety. As a condition of implementation, the concept would be required to follow regulations mandating health and safety impacts. Additionally, the concept does not include elements that would create adverse socio-economic impacts. |
| CA-46: Avoid end use harm | ● | The concept does not allocate water in ways that would create end use harm. |

| ***Objective*** | ● | ◗ | ○ | ***Justification*** |
|---|---|---|---|---|
| CA-47: Avoid violating procedural or substantive laws | | ● | | As a condition of implementation, the concept would be required to complete relevant CEQA/NEPA analysis prior to implementation. |
| CA-48: Avoid interregional inequity | | ● | | Implementation of the concept would not create interregional inequity, either in realized benefits or in costs. |

# 2c: Amador County Regional Reuse

## Amador Water Agency; JVID

### Overview

**Sponsor(s):** Amador Water Agency; Jackson Valley Irrigation District (JVID)

**Concept type:** Implementation

**Estimated Costs:** $118,612 per year , two sites (O&M)

**Funding Source(s):** WRCB Revolving Fund, Water Recycling Grant Programs, USDA Rural Utilities, US Bureau of Reclamation, IRWM

**Concept location:** Near the cities of Jackson and Sutter Creek

The concept involves implementing aspects of the Amador County Regional Approach for Reuse Study. There are three alternatives identified in the Reuse Study: (1) a regional recycled water tertiary plant located in the City of Sutter Creek, (2) a regional recycled water tertiary plant located in the City of Jackson, and (3) upgrade the recycled water treatment plant located in the City of Jackson to serve local users and construct a recycled water treatment plant located in the City of Sutter Creek to serve users located in Sutter Creek, Amador City, Martell, and the Gold Rush Ranch Development. The Study recommends implementation of Alternative 3, the decentralized system. The Amador County Regional Reuse project would involve developing a refinement study that would further define pipeline alignments, storage sites, pump station layouts, and required upgrades to existing WWTPs. The project would also provide engineering cost estimates, enough information for preparation of an environmental review, and refined information for continued public meetings.

### Assessment

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| ● ***Fully addressed*** | ◗ ***Partially addressed*** | ○ ***Not addressed*** |
| WS-1: Promote demand-side management strategies | ○ | The concept does not have elements that promote demand-side management strategies. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| WS-2: Increase supply reliability | ● | The concept would increase supply reliability by 400 AFY by reusing treated wastewater, which would offset Mokelumne River water use. As a supply, recycled water is more reliable than Mokelumne River water, as it is not tied to hydrologic year type, but rather population. Because of this, AWA could become more resilient against changes in the Mokelumne River system. |
| WS-3: Increase amount of stored water | ○ | The concept would not increase the amount of stored water. |
| WS-4: Promote smart, responsible development | ● | AWA policy requires that all new development, where feasible, will be required to utilize recycled water. This concept promotes this objective by providing a recycled water supply source. |
| WS-5: Reduce reliance on groundwater for irrigation | ○ | The concept would not reduce reliance on groundwater for irrigation, as AWA does not use groundwater. |
| WS-6: Promote a long-term groundwater balance | ○ | The concept would not promote a long-term groundwater balance. |
| WS-7: Maximize water resource availability for all beneficial uses | ● | The concept would maximize water resource availability for all beneficial uses by reusing treated wastewater and likely offsetting Mokelumne River water use. |
| WS-8: Decrease the need to import water | ○ | AWA does not currently import water. As such, the concept would not decrease the need to import water. |
| WD-9: Review and understand existing agency demand estimates | ○ | The concept does not include reviewing and understanding existing agency demand estimates. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| WD-10: Identify water demand issues for timely consideration by the water agencies during their UWMP update | ○ | The concept does not include identifying water demand issues for consideration in the upcoming UWMP update. |
| WQ-11: Protect and improve surface and groundwater quality | ○ | The concept would not protect or improve surface and/or groundwater quality. |
| WQ-12: Match delivered water quality use | ● | The concept would match delivered water quality to use by treating wastewater and reusing it for non-potable needs. This maximizes Mokelumne River water for those who need potable water. |
| WQ-13: Use water purification technology as a tool to maximize beneficial uses | ● | The concept would provide disinfected tertiary treated water, which maximizes its beneficial use. |
| R-14: Increase access for water-based recreation | ○ | The concept does not include elements that would increase access to the Mokelumne River from Highway 12 to the headwaters. |
| R-15: Increase angling and other recreational opportunities (increase spawning habitat, etc.) | ○ | The concept would not contribute to increasing spawning habitat, designating sections of the river for hatchery and wild species, or designating environmental flows. |
| R-16: Increase angling and other recreational opportunities (stock hatchery-raised fish) | ○ | The concept does not involve stocking hatchery-raised trout in designated areas on the upper Mokelumne, nor does it involve designating and managing wild trout sections. |
| R-17: Increase angling and other recreational opportunities (reintroduce salmon in upper Moke) | ○ | The concept does not include reintroducing salmon into the upper Mokelumne. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| R-18: Increase angling and other recreational opportunities (increase opportunities) | ○ | The concept would not increase angling and other recreational opportunities. |
| WR-19: Resolve existing water rights conflicts in the watershed | ○ | The concept is not focused on resolving existing water rights protests to achieve a common understanding of the application of relevant water rights law in the watershed. |
| F-20: Enhance flood protection and management | ○ | The concept does not include elements that would enhance flood protection and/or flood management, nor would the concept enhance ecosystem function in a way that would provide flood protection. |
| D-21: Use sound, agreed-upon data to evaluate program alternatives (hydrology dataset) | ○ | The concept does not involve producing an agreed-upon hydrology dataset and Water Availability Analysis separate from that which was produced as part of the MokeWISE program. |
| D-22: Use sound, agreed-upon data to evaluate program alternatives (describe in sufficient detail) | ◗ | The concept has some quantitative information available, including an estimated amount of water that would be available for treatment and reuse. |
| D-23: Promote the contribution of sound scientific data to current body of knowledge | ● | The concept would contribute data to the current body of knowledge by collecting and reporting program information, including information on treatment, water quality, and end uses. |
| O-24: Increase investment in forest management | ○ | The concept does not include elements that would promote forest management, nor would it help reduce the economic impact of wildfires and other natural disasters. |

| ***Objective*** | ● ◗ O | ***Justification*** |
|---|---|---|
| O-25: Maximize socio-economic, cultural, recreational, public health, and public safety benefits with a particular emphasis on disadvantaged communities (DACs) | ● | The concept would maximize socio-economic and public health and safety benefits by serving recycled water to AWA customers in Sutter Creek, which is a DAC. |
| O-26: Achieve equity | ● | The benefits realized from implementing the concept would not be limited to a narrow group; rather, project benefits would be spread across regions, cultures, incomes, and time. |
| E-27: Protect and enhance natural environment (enhance natural envt) | ● | The concept would provide recycled water for 158 acres of oak mitigation preserve, 1 acre of viewpoint, and 6 acres for the historic tailing wheels park. Supplying water to these end uses help protect the natural environment. |
| E-28: Protect and enhance natural environment (wild & scenic designation) | O | The concept does not incorporate or seek a wild and scenic designation. |
| E-29: Protect and restore fisheries | O | While the concept could reduce the use of Mokelumne River water by up to 400 AFY. The less water diverted from the river channel, the better for the geomorphic and ecological health of the ecosystem. However, this amount is negligible and won't have a significant benefit on fisheries. |
| A-30: Enhance or maintain the water supply for the beneficial use in ag practices | ◗ | The concept is focused on municipal sites initially; however, future expansion for agricultural sites (primarily vineyards) is being considered. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| C-31: Foster long-term regional relationships and avoid unnecessary conflict and litigation | ● | The concept would help foster regional relationships by requiring long-term coordination between varying entities within Amador County, including AWA, state government, and non-governmental agencies. |
| C-32: Promote broadly-supported outcomes that benefit a wide range of interests | ● | The concept would provide resiliency for AWA customers and likely offset Mokelumne River use. These outcomes are supported by a wide range of interests within the watershed, including water agencies and non-governmental organizations. |
| C-33: Promote broadly-supported outcomes that benefit a wide range of interests (least controversial projects) | ● | The concept has passed the preliminary four screening criteria, including the beneficial and compatible screens. |
| C-34: Promote broadly-supported outcomes that benefit a wide range of interests (agreements that reduce conflict) | ○ | The concept would serve recycled water to AWA customers; its implementation would not directly address any current watershed conflicts. |
| C-35: Develop a program consistent with all existing licenses, permits, and agreements affecting the River | ● | As a condition of implementation, the concept would be consistent with all existing licenses, permits, and agreements affecting the Mokelumne River. As such, the concept would not interfere with any entity exercising a water right. |
| C-36: Develop a program consistent with all existing licenses, permits, and agreements affecting the River (CEQA/NEPA) | ● | As a condition of implementation, the concept would be required to adhere to all applicable regulatory requirements, including applicable CEQA/NEPA regulations documentation, etc. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| CA-37: Avoid basing decisions on incomplete or inaccurate information | ● | Prior to implementation, the concept would undergo a planning phase that would collect and analyze data that is considered, at the time, to be the most complete and accurate. |
| CA-38: Avoid demand for new or larger on-stream dams | ● | The concept would not result in construction of a new or larger on-stream dam. |
| CA-39: Avoid harmful impacts to fisheries and other wildlife | ● | The concept would not create harmful impacts to fisheries and other wildlife. |
| CA-40: Avoid conversion of agricultural lands to developed uses | ● | The concept does not include elements that would convert agricultural lands to developed uses. |
| CA-41: Avoid shifting environmental impacts from one area to another | ● | The concept does not include elements that would shift environmental impacts from one area to another. |
| CA-42: No diminishment of the benefits of existing in-stream flow | ● | The concept does not include elements that would alter existing in-stream flows. |
| CA-43: Avoid closing the process to the public | ● | As a condition of planning and implementation, the concept would include public involvement to the extent appropriate. |
| CA-44: Avoid dependency on potentially unreliable supply | ● | The concept does not include elements that would facilitate downstream users becoming dependent on an unreliable supply. On the contrary, the concept increases the reliability of a supply. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| CA-45: Minimize adverse socio-economic and public health and safety impacts | ● | Use of recycled water mandates protections of public health and safety. As a condition of implementation, the concept would be required to follow regulations mandating health and safety impacts. Additionally, the concept does not include elements that would create adverse socio-economic impacts. |
| CA-46: Avoid end use harm | ● | The concept does not allocate water in ways that would create end use harm. |
| CA-47: Avoid violating procedural or substantive laws | ● | As a condition of implementation, the concept would be required to complete relevant CEQA/NEPA analysis prior to implementation. |
| CA-48: Avoid interregional inequity | ● | Implementation of the concept would not create interregional inequity, either in realized benefits or in costs. |

# 3a: Solar-Powered Desalination Study

*No identified sponsor*

## Overview

**Sponsor(s):** none

**Concept type:** Planning and implementation

**Estimated Costs:** uknown

**Funding Source(s):** uknown

**Concept location:** near the Delta

The concept would assess the feasibility of a solar-powered desalination facility. Based on the results of the study, the concept would also involve developing a solar-powered desalination project, which may include identifying partners for a cost-sharing program. This desalination facility would clean brackish water from the Delta, agricultural drainage water, or from groundwater using solar troughs. The solar panels would create enough heat to separate the salt and water through evaporation. The remaining salt solidifies and can be removed and used in other industries as building materials, metals, or fertilizers. Some systems have a 93% recovery rate and use about 1/5 of the energy used by traditional desalination plants. Cost per acre-foot is cited around $450, but may be greater depending on the location and scale of implementation.

## Assessment

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| WS-1: Promote demand-side management strategies | ○ | The concept does not have elements that promote demand-side management strategies. |
| WS-2: Increase supply reliability | ● | The concept would increase supply reliability by diversifying supply portfolios and treating water which is currently of too poor a quality to be beneficially used. |
| WS-3: Increase amount of stored water | ○ | The concept would not increase the amount of stored water. |
| WS-4: Promote smart, responsible development | ○ | While the concept does not prohibit or preclude smart, responsible development, it does not directly promote it. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| WS-5: Reduce reliance on groundwater for irrigation | ◗ | The concept could potentially reduce reliance on groundwater for irrigation, assuming the desalinated water was delivered to and used by agricultural users that currently use groundwater. |
| WS-6: Promote a long-term groundwater balance | ◗ | If the source water is Delta water, the concept would not promote a long-term groundwater balance. If the source water is brackish groundwater, the concept could promote a long-term groundwater balance if the desalinated water was used for recharge or salt water intrusion barriers. However, if the desalinated groundwater was used for consumptive use, the concept would not promote a long-term groundwater balance, as it would likely encourage additional groundwater pumping. |
| WS-7: Maximize water resource availability for all beneficial uses | ● | The concept would maximize water resource availability for all beneficial uses by diversifying supply portfolios and by treating and using water that is currently unavailable for use due to quality issues. |
| WS-8: Decrease the need to import water | ○ | The concept would not decrease the need to import water. |
| WD-9: Review and understand existing agency demand estimates | ○ | The concept does not include reviewing and understanding existing agency demand estimates. |
| WD-10: Identify water demand issues for timely consideration by the water agencies during their UWMP update | ○ | The concept does not include identifying water demand issues for consideration in the upcoming UWMP update. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| WQ-11: Protect and improve surface and groundwater quality | ◗ | The concept could potentially protect and improve surface and groundwater quality if the project used agricultural drainage water for its source. Agricultural drainage water can affect groundwater and surface water quality. Additionally, if the concept used groundwater and either recharged the groundwater basin or used the desalinated water as a saltwater intrusion barrier, the concept could also protect and improve groundwater quality. |
| WQ-12: Match delivered water quality use | ● | The concept would match delivered water quality to use by treating water which is currently too brackish to be put to beneficial use. |
| WQ-13: Use water purification technology as a tool to maximize beneficial uses | ● | The concept uses water purification technology to maximize beneficial uses by desalinating brackish water for use. |
| R-14: Increase access for water-based recreation | ○ | The concept does not include elements that would increase access to the Mokelumne River from Highway 12 to the headwaters. |
| R-15: Increase angling and other recreational opportunities (increase spawning habitat, etc.) | ○ | Desalinization is not a cost-effective method for increasing instream flows for fishery habitat enhancement. |
| R-16: Increase angling and other recreational opportunities (stock hatchery-raised fish) | ○ | The concept does not involve stocking hatchery-raised trout in designated areas on the upper Mokelumne, nor does it involve designating and managing wild trout sections. |
| R-17: Increase angling and other recreational opportunities (reintroduce salmon in upper Moke) | ○ | The concept does not include reintroducing salmon into the upper Mokelumne. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| R-18: Increase angling and other recreational opportunities (increase opportunities) | ○ | The concept would not increase angling and other recreational opportunities. |
| WR-19: Resolve existing water rights conflicts in the watershed | ○ | The concept is not focused on resolving existing water rights protests to achieve a common understanding of the application of relevant water rights law in the watershed. |
| F-20: Enhance flood protection and management | ○ | The concept does not include elements that would enhance flood protection and/or flood management, nor would the concept enhance ecosystem function in a way that would provide flood protection. |
| D-21: Use sound, agreed-upon data to evaluate program alternatives (hydrology dataset) | ● | The concept would require the use of an agreed-upon hydrology dataset and/or Water Availability Analysis. |
| D-22: Use sound, agreed-upon data to evaluate program alternatives (describe in sufficient detail) | ○ | Because the concept is not well-defined enough to complete a quantitative assessment, a qualitative assessment was performed. |
| D-23: Promote the contribution of sound scientific data to current body of knowledge | ● | The concept would contribute data to the current body of knowledge by collecting and reporting program information, including water quality information, cost, yield, and other information that would help determine the success of the program. |
| O-24: Increase investment in forest management | ○ | The concept does not include elements that would promote forest management, nor would it help reduce the economic impact of wildfires and other natural disasters. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| O-25: Maximize socio-economic, cultural, recreational, public health, and public safety benefits with a particular emphasis on disadvantaged communities (DACs) | ◗ | The project location is not yet well-defined. However, if the desalinated water is delivered to disadvantaged communities, the concept would maximize water supply benefits for that DAC. |
| O-26: Achieve equity | ● | The benefits realized from implementing the concept would not be limited to a narrow group; rather, concept benefits would likely be spread across regions, cultures, incomes, and time. |
| E-27: Protect and enhance natural environment (enhance natural envt) | ◗ | There are potential indirect opportunities where conjunctive operations with a desalinization facility could reduce demands on surface water supplies that could then subsequently be used for fishery habitat purposes. However, the magnitude and feasibility of such conjunctive use programs and their cost-effectiveness is not known at this time. |
| E-28: Protect and enhance natural environment (wild & scenic designation) | ○ | The concept does not incorporate or seek a wild and scenic designation. |
| E-29: Protect and restore fisheries | ○ | The concept does not include elements that would protect and restore fisheries. |
| A-30: Enhance or maintain the water supply for the beneficial use in ag practices | ● | The concept would enhance or maintain water supply for agricultural uses. Desalinated water could be used for agricultural water supply, or for recharge and/or saltwater intrusion. All of these end uses would enhance or maintain agricultural water supply. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| C-31: Foster long-term regional relationships and avoid unnecessary conflict and litigation | ● | The concept would likely require coordination between a number of entities (including non-governmental organizations, water agencies, and state government) that would contribute to fostering long-term regional relationships and help to avoid unnecessary conflict and litigation. |
| C-32: Promote broadly-supported outcomes that benefit a wide range of interests | ● | Implementation of the concept could reduce Mokelumne River use, diversify supply portfolios, and/or recharge groundwater and provide a saltwater intrusion barrier. These outcomes are supported by a wide range of interests within the watershed. |
| C-33: Promote broadly-supported outcomes that benefit a wide range of interests (least controversial projects) | ● | The concept has passed the preliminary four screening criteria, including the beneficial and compatible screens. |
| C-34: Promote broadly-supported outcomes that benefit a wide range of interests (agreements that reduce conflict) | ◗ | Treating agricultural runoff water could reduce conflict by improving surface and groundwater quality. Additionally, conflict could be reduced if the desalinated water is used for groundwater recharge and/or as a saltwater intrusion barrier. |
| C-35: Develop a program consistent with all existing licenses, permits, and agreements affecting the River | ● | As a condition of implementation, the concept would be consistent with all existing licenses, permits, and agreements affecting the Mokelumne River. As such, the concept would not interfere with any entity exercising a water right. |
| C-36: Develop a program consistent with all existing licenses, permits, and agreements affecting the River (CEQA/NEPA) | ● | As a condition of implementation, the concept would be required to adhere to all applicable regulatory requirements, including applicable CEQA/NEPA regulations documentation, etc. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| CA-37: Avoid basing decisions on incomplete or inaccurate information | ● | Prior to implementation, the concept would undergo a planning phase that would collect and analyze data that is considered, at the time, to be the most complete and accurate. |
| CA-38: Avoid demand for new or larger on-stream dams | ● | The concept would not result in construction of a new or larger on-stream dam. |
| CA-39: Avoid harmful impacts to fisheries and other wildlife | ◗ | The concept could result in harmful impacts to fisheries and wildlife, particularly in the Delta. The desalinization plant would need to be carefully constructed and placed to prevent destruction of natural land use, and to minimize harm to wildlife. |
| CA-40: Avoid conversion of agricultural lands to developed uses | ◗ | The concept would require the construction of a desalination plant. To meet this objective, construction of the plant would need to avoid converting agricultural lands (this is particularly the case in the Delta where agriculture is concentrated and where source water could be agricultural drainage water). |
| CA-41: Avoid shifting environmental impacts from one area to another | ◗ | The concept would likely reduce the use of Mokelumne River water but, if the source water were Delta supply, the concept could increase diversions from the Delta. This could shift environmental impacts from the Mokelumne River to the Delta. If the source water were agricultural drainage water, there would be no shift in environmental impacts. |
| CA-42: No diminishment of the benefits of existing in-stream flow | ● | The concept does not include elements that would alter existing Mokelumne River in-stream flows. |
| CA-43: Avoid closing the process to the public | ● | As a condition of planning and implementation, the concept would include public involvement to the extent appropriate. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| CA-44: Avoid dependency on potentially unreliable supply | ◗ | Agricultural drainage water and Delta supply can be unreliable. Agricultural drainage water is assumed to be decreasing due to agricultural efficiencies and Delta supply can be unavailable in certain year types and in certain times of the year. Depending on the end use and the size of the desalination plant, there may be a risk of creating dependency on a potentially unreliable supply. |
| CA-45: Minimize adverse socio-economic and public health and safety impacts | ● | Use of desalinated water mandates protections of public health and safety. As a condition of implementation, the concept would be required to follow regulations mandating health and safety impacts. Cost distribution would need to be considered to minimize adverse socio-economic impacts. |
| CA-46: Avoid end use harm | ● | The concept does not allocate water in ways that create end use harm. |
| CA-47: Avoid violating procedural or substantive laws | ● | As a condition of implementation, the concept would be required to complete relevant CEQA/NEPA analysis prior to implementation. |
| CA-48: Avoid interregional inequity | ● | Implementation of the concept would not create interregional inequity, either in realized benefits or in costs. |

# 4a: Groundwater Banking within the Eastern San Joaquin Groundwater Basin

## Groundwater Basin Authority, Calaveras County Water District, North San Joaquin Water Conservation District; CPUD

### Overview

**Sponsor(s):** Groundwater Basin Authority (GBA), Calaveras County Water District (CCWD), North San Joaquin Water Conservation District (NSJWCD); Calaveras Public Utilities District (CPUD)

**Concept type:** Planning

**Estimated Costs:** unknown

**Funding Source(s):** unknown

**Concept location:** Eastern San Joaquin Groundwater Basin, including portions of Calaveras County

The concept would identify opportunities for direct and in-lieu banking with a variety of sources including Mokelumne River, stormwater, agricultural runoff, etc. Recharge methods could include gravity infiltration and groundwater injection. Land that is currently used for farming may be considered for the sole and express purpose of groundwater banking and recharge subject to SJC Development Title 9-1080 (as applicable) with voluntary participation and fair compensation of the landowners for either seasonal or long-term projects. Geographic scope includes the Eastern San Joaquin Groundwater Basin, including portions of Calaveras County. The study would include evaluation of the proposed beneficial uses of the project and clarifying operational parameters. It would also identify impacts, and constraints in the following areas: river flows, domestic water supply, technical, political, environmental (including both species-related and geomorphic), economic, legal, and recreation – recognizing that a more detailed Environmental Impact Report would be required prior to implementing a project. The study will include consultation with members of the MokeWISE MCG.

### Assessment

| *Objective* | ● ◗ ○ | *Justification* |
|---|---|---|

● ***Fully addressed*** ◗ ***Partially addressed*** ○ ***Not addressed***

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| WS-1: Promote demand-side management strategies | ○ | As a feasibility study, the concept does not have elements that promote demand-side management strategies. Implementation of the project described in the concept would also not have elements that would promote demand-side management strategies. |
| WS-2: Increase supply reliability | ◗ | As a feasibility study, the concept itself would not increase supply reliability. However, if groundwater banking projects were implemented, supply reliability would be increased by storing water for use in drier years when other supplies may become unavailable. |
| WS-3: Increase amount of stored water | ◗ | As a feasibility study, the concept itself would not increase stored water. However, if groundwater banking projects were implemented, the amount of water stored in the groundwater basin would increase. |
| WS-4: Promote smart, responsible development | ◗ | As a feasibility study, the concept itself would not increase supply reliability. However, groundwater banking projects would promote smart, responsible development by increasing the amount of stored water that would be available for use during drier years. |
| WS-5: Reduce reliance on groundwater for irrigation | ○ | As a feasibility study, the concept itself would not reduce reliance on groundwater. Implementation of groundwater banking projects would also not reduce reliance on groundwater for irrigation; their implementation would increase groundwater supply that could be used for irrigation. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| WS-6: Promote a long-term groundwater balance | ◗ | As a feasibility study, the concept itself would not promote a long-term groundwater balance. However, groundwater banking projects would promote a long-term groundwater balance by banking water in wetter years to increase groundwater levels; this water would then be used during drier years when other supplies are unavailable. |
| WS-7: Maximize water resource availability for all beneficial uses | ◗ | As a feasibility study, the concept itself would not maximize water resource availability for all beneficial uses. However, groundwater banking projects would maximize water resource availability for all beneficial uses by increasing the amount of stored water that could be used for beneficial uses in drier years. |
| WS-8: Decrease the need to import water | ◗ | As a feasibility study, the concept itself would not decrease the need to import water. However, groundwater banking projects could decrease the need to import water in drier years, as banked water would be used in lieu of imported water during drier years. |
| WD-9: Review and understand existing agency demand estimates | ○ | The concept does not include reviewing and understanding existing agency demand estimates. Groundwater banking projects would also not review existing agency demand estimates. |
| WD-10: Identify water demand issues for timely consideration by the water agencies during their UWMP update | ○ | The concept does not include identifying water demand issues for consideration in the upcoming UWMP update. Implementing groundwater banking projects would also not identify water demand issues. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| WQ-11: Protect and improve surface and groundwater quality | ◗ | As a feasibility study, the concept itself would not protect or improve surface and/or groundwater quality. Groundwater banking projects would protect and improve groundwater quality by increasing the amount of stored groundwater, which would help dilute pollutants. However, depending on the location and timing of diversions from the Mokelumne, surface water quality may suffer. |
| WQ-12: Match delivered water quality use | ○ | As a feasibility study, the concept itself would not involve treating water, nor does it involve delivering treated water. The objective would also not be met if groundwater banking projects were implemented. |
| WQ-13: Use water purification technology as a tool to maximize beneficial uses | ○ | As a feasibility study, the concept itself would not use water purification technology as a tool to maximize beneficial uses. The objective would also not be met if groundwater banking projects were implemented. |
| R-14: Increase access for water-based recreation | ○ | As a feasibility study, the concept itself does not include elements that would increase access to the Mokelumne River from Highway 12 to the headwaters. Implementation of groundwater banking projects would also not increase access. |
| R-15: Increase angling and other recreational opportunities (increase spawning habitat, etc.) | ○ | The concept would not contribute to increasing spawning habitat, designating sections of the river for hatchery and wild species, or designating environmental flows. Implementation of t groundwater banking projects would also not meet this objective. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| R-16: Increase angling and other recreational opportunities (stock hatchery-raised fish) | ○ | As a feasibility study, the concept does not involve stocking hatchery-raised trout in designated areas on the upper Mokelumne, nor does it involve designating and managing wild trout sections. Implementation of groundwater banking projects would also not stock hatchery-raised trout. |
| R-17: Increase angling and other recreational opportunities (reintroduce salmon in upper Moke) | ○ | As a feasibility study, the concept itself does not include reintroducing salmon into the upper Mokelumne. Implementation of groundwater banking projects would also not reintroduce salmon into the upper Mokelumne. |
| R-18: Increase angling and other recreational opportunities (increase opportunities) | ○ | As a feasibility study, the concept itself would not increase angling, harvesting, or other recreational opportunities. Implementation of groundwater banking projects would also not increase opportunities. |
| WR-19: Resolve existing water rights conflicts in the watershed | ○ | The concept is not focused on resolving existing water rights protests to achieve a common understanding of the application of relevant water rights law in the watershed. Implementation of groundwater banking projects would also not resolve existing water rights conflicts. |
| F-20: Enhance flood protection and management | ◗ | As a feasibility study, the concept would not enhance flood protection and/or flood management, nor would the concept enhance ecosystem function in a way that would provide flood protection. However, implementation of groundwater banking projects could enhance flood protection by banking flows which could cause flooding. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| D-21: Use sound, agreed-upon data to evaluate program alternatives (hydrology dataset) | ● | As a feasibility study, the concept would require the use of an agreed-upon hydrology dataset and Water Availability Analysis. |
| D-22: Use sound, agreed-upon data to evaluate program alternatives (describe in sufficient detail) | ◗ | Because the concept is not well-defined enough to complete a quantitative assessment, a qualitative assessment was performed. However, the purpose of this concept is to assess feasibility and collect sound, agreed-upon data prior to implementation of the concept. |
| D-23: Promote the contribution of sound scientific data to current body of knowledge | ● | The concept would contribute scientific data to the current body of knowledge by completing a feasibility study and developing information about potential locations and recharge methods for groundwater banking in the Eastern San Joaquin Groundwater Basin. |
| O-24: Increase investment in forest management | ○ | The concept does not include elements that would promote forest management, nor would it help reduce the economic impact of wildfires and other natural disasters. Groundwater banking would also not increase investment in forest management. |
| O-25: Maximize socio-economic, cultural, recreational, public health, and public safety benefits with a particular emphasis on disadvantaged communities (DACs) | ◗ | As a feasibility study, the concept would not maximize socio-economic, cultural, recreational, public health, and public safety benefits. If implemented, groundwater banking projects would maximize these benefits because DACs overlay the basin. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| O-26: Achieve equity | ◗ | As a feasibility study, the concept would not directly achieve equity. However, if groundwater banking projects were implemented, the benefits realized would not be limited to a narrow group; rather, project benefits would be spread across all of the ESJ Groundwater Basin, spanning regions, cultures, incomes, and time. |
| E-27: Protect and enhance natural environment (enhance natural envt) | ○ | The concept itself would not enhance the natural environment. In coupled groundwater-surface water systems, improvement in the overall health of one of the systems would contribute to improved health in the other. Fewer river diversions would allow unallocated waters to stay in the river and perform geomorphic functions, though the benefit would likely be small and incremental at best. |
| E-28: Protect and enhance natural environment (wild & scenic designation) | ○ | The concept does not incorporate or seek a wild and scenic designation. If implemented, groundwater banking projects would also not incorporate or seek a wild and scenic designation. |
| E-29: Protect and restore fisheries | ○ | As a feasibility study, the concept will not protect and restore fisheries. There would also be no benefit to fisheries if implemented groundwater banking projects diverted water from the Mokelumne River. |
| A-30: Enhance or maintain the water supply for the beneficial use in ag practices | ◗ | As a feasibility study, the concept would not enhance or maintain water supply for beneficial use in agricultural practices. Implementing groundwater banking projects would enhance water supply for agricultural practices as there is significant agriculture overlying the Eastern San Joaquin Groundwater Basin. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| C-31: Foster long-term regional relationships and avoid unnecessary conflict and litigation | ● | The purpose of the concept is to assess the feasibility of groundwater banking projects in the Eastern San Joaquin Groundwater Basin. This helps avoid unnecessary conflict and litigation by identifying and attempting to resolve issues early on. |
| C-32: Promote broadly-supported outcomes that benefit a wide range of interests | ◗ | As a feasibility study, the concept would not directly promote broadly-supported outcomes that benefit a wide range of interests. However, implementing groundwater banking projects would increase the amount of stored water during wetter years, which could then be used in lieu of Mokelumne River water during drier years. This outcome is broadly supported by a wide range of interests. |
| C-33: Promote broadly-supported outcomes that benefit a wide range of interests (least controversial projects) | ◗ | The concept has passed the preliminary four screening criteria, including the beneficial and compatible screens. The project described in the concept would also need to undergo these screenings to determine if it was the least controversial project. |
| C-34: Promote broadly-supported outcomes that benefit a wide range of interests (agreements that reduce conflict) | ○ | As a feasibility study, the concept would not result in agreements that reduce conflicts. Implementation of the project described in the concept would also not reduce conflict in the watershed. |
| C-35: Develop a program consistent with all existing licenses, permits, and agreements affecting the River | ● | As a condition of implementation, the concept would be consistent with all existing licenses, permits, and agreements affecting the Mokelumne River. This would also be required of the project described in the concept if it were to be implemented. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| C-36: Develop a program consistent with all existing licenses, permits, and agreements affecting the River (CEQA/NEPA) | ● | As a condition of implementation, the concept would be required to adhere to all applicable regulatory requirements, including applicable CEQA/NEPA regulations documentation, etc. This would also be required of the project described in the concept if it were to be implemented. |
| CA-37: Avoid basing decisions on incomplete or inaccurate information | ● | The purpose of this concept is to study the feasibility of implementing groundwater banking projects in the Eastern San Joaquin Groundwater Basin; as such, the nature of the concept will help avoid basing decisions on incomplete or inaccurate information. |
| CA-38: Avoid demand for new or larger on-stream dams | ● | The concept will not result in construction of a new or larger on-stream dam. There would also not be demand for new or larger on-stream dams if groundwater banking projects were implemented. |
| CA-39: Avoid harmful impacts to fisheries and other wildlife | ◗ | The concept would not create harmful impacts to fisheries and other wildlife. Groundwater banking projects, if diverting Mokelumne River water for banking, could potentially harm fisheries and other wildlife by reducing in-stream flows; mitigation measures could be included to limit these impacts. |
| CA-40: Avoid conversion of agricultural lands to developed uses | ◗ | The concept would not convert agricultural lands to developed uses. Implementing groundwater banking projects could potentially convert agricultural lands; this could be mitigated through compensation and coordination with willing agricultural landowners. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| CA-41: Avoid shifting environmental impacts from one area to another | ● | The concept would not shift environmental impacts from one area to another. Implementation of groundwater banking projects would also not shift environmental impacts. |
| CA-42: No diminishment of the benefits of existing in-stream flow | ◗ | The concept does not include elements that would alter existing in-stream flows. Groundwater banking projects could potentially reduce in-stream flows by diverting Mokelumne River water for banking; mitigation measures could be included to limit the impacts of reduced flows. |
| CA-43: Avoid closing the process to the public | ● | As a condition of planning and implementation, the concept would include public involvement to the extent appropriate. This also applies to implementation of groundwater banking projects. |
| CA-44: Avoid dependency on potentially unreliable supply | ● | The concept does not include elements that would facilitate downstream users becoming dependent on an unreliable supply. Groundwater banking projects would bolster supply reliability by storing water for use in drier years. |
| CA-45: Minimize adverse socio-economic and public health and safety impacts | ● | As a feasibility study, this concept does not have adverse socio-economic and public health and safety impacts. Groundwater banking projects would minimize these impacts by increasing water quality through more stored water and reducing the likelihood of water shortages in drier years. |
| CA-46: Avoid end use harm | ● | The concept does not allocate water in ways that create end use harm. This also applies to implementation of groundwater banking projects. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| CA-47: Avoid violating procedural or substantive laws | ● | As a condition of implementation, the concept would be required to complete relevant CEQA/NEPA analysis prior to implementation. This would also be required if the project described in the concept were implemented. |
| CA-48: Avoid interregional inequity | ◗ | Implementation of the concept would not create interregional inequity, either in realized benefits or in costs. Depending on the location of diversions on the Mokelumne River, groundwater banking projects could potentially have interregional inequity. |

# 4b: Amador and Calaveras Counties Hydrologic Assessment

## Amador Water Agency, Calaveras County Water District; JVID

### Overview

**Sponsor(s):** Amador Water Agency (AWA), Calaveras County Water District (CCWD); Jackson Valley Irrigation District (JVID)

**Concept type:** Planning

**Estimated Costs:** unknown

**Funding Source(s):** IRWM Program

**Concept location:** Amador and Calaveras counties

Assess the potential for groundwater banking in Amador and Calaveras counties. This could include assessing structure of fractured rock aquifers and age of water, in addition to mapping of sandy soils as a means to inform potential project areas. The study would include evaluation of the proposed beneficial uses of the project and clarifying operational parameters. It would also identify impacts, and constraints in the following areas: river flows, domestic water supply, technical, political, environmental (including both species-related and geomorphic), economic, legal, and recreation – recognizing that a more detailed Environmental Impact Report would be required prior to implementing a project. The study will include consultation with members of the MokeWISE MCG.

### Assessment

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| ● ***Fully addressed*** | ◗ ***Partially addressed*** | ○ ***Not addressed*** |
| WS-1: Promote demand-side management strategies | ○ | As a feasibility study, the concept does not have elements that promote demand-side management strategies. Implementation of the project described in the concept would also not have elements that would promote demand-side management strategies. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| WS-2: Increase supply reliability | ◗ | As a feasibility study, the concept would not increase supply reliability. However, implementation of the project described in the concept would increase supply reliability by diversifying supply options and, depending on use patterns, potentially providing a dry year supply. |
| WS-3: Increase amount of stored water | ◗ | As a feasibility study, the concept would not increase the amount of stored water. However, implementation of the project described in the concept would increase the amount of stored water by banking water in the ground. |
| WS-4: Promote smart, responsible development | ○ | While the concept does not prohibit or preclude smart, responsible development, it does not directly promote it. |
| WS-5: Reduce reliance on groundwater for irrigation | ○ | The concept would not reduce reliance on groundwater for irrigation. Implementation of the project as described in the concept would also not reduce reliance on groundwater. |
| WS-6: Promote a long-term groundwater balance | ◗ | As a feasibility study, the concept itself would not promote a long-term groundwater balance. However, implementation of the project described in the concept could promote a long-term groundwater balance by recharging the groundwater. |
| WS-7: Maximize water resource availability for all beneficial uses | ◗ | As a feasibility study, the concept itself would not maximize water resource availability for all beneficial uses. However, implementation of the project as described in the concept would likely maximize water resource availability for all beneficial uses by recharging the groundwater basin and maximizing storage. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| WS-8: Decrease the need to import water | ○ | As a feasibility study, the concept itself would not decrease the need to import water. If implemented, the project described in the concept would offset use of Mokelumne River supplies, not the use of imported water. |
| WD-9: Review and understand existing agency demand estimates | ○ | The concept does not include reviewing and understanding existing agency demand estimates. Implementation of the project described in the concept would also not review existing agency demand estimates. |
| WD-10: Identify water demand issues for timely consideration by the water agencies during their UWMP update | ○ | The concept does not include identifying water demand issues for consideration in the upcoming UWMP update. Implementation of the project described in the concept would also not identify water demand issues. |
| WQ-11: Protect and improve surface and groundwater quality | ◗ | As a feasibility study, the concept itself would not protect and improve surface and/or groundwater quality. Implementation of the project described in the concept could protect and improve groundwater quality by recharging the groundwater basin and diluting constituents. |
| WQ-12: Match delivered water quality use | ○ | As a feasibility study, the concept itself would not involve treating water, nor does it involve delivering treated water. Implementation of the project described in the concept would also not meet this objective. |
| WQ-13: Use water purification technology as a tool to maximize beneficial uses | ○ | As a feasibility study, the concept itself would not use water purification technology as a tool to maximize beneficial uses. Implementation of the project described in the concept would also not meet this objective. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| R-14: Increase access for water-based recreation | ○ | As a feasibility study, the concept itself does not include elements that would increase access to the Mokelumne River from Highway 12 to the headwaters. Implementation of the project as described in the concept would also not increase access. |
| R-15: Increase angling and other recreational opportunities (increase spawning habitat, etc.) | ○ | The concept itself does not include elements that would increase spawning habitat. Additionally, the application of groundwater banking does not appear to be a cost effective method for improving fishery habitat. |
| R-16: Increase angling and other recreational opportunities (stock hatchery-raised fish) | ○ | As a feasibility study, the concept does not involve stocking hatchery-raised trout in designated areas on the upper Mokelumne, nor does it involve designating and managing wild trout sections. Implementation of the project described in the concept would also not stock hatchery-raised trout. |
| R-17: Increase angling and other recreational opportunities (reintroduce salmon in upper Moke) | ○ | As a feasibility study, the concept itself does not include reintroducing salmon into the upper Mokelumne. Implementation of the project described in the concept would also not reintroduce salmon into the upper Mokelumne. |
| R-18: Increase angling and other recreational opportunities (increase opportunities) | ○ | As a feasibility study, the concept itself would not increase angling, harvesting, or other recreational opportunities. Implementation of the project described in the concept would also not increase opportunities. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| WR-19: Resolve existing water rights conflicts in the watershed | ○ | The concept is not focused on resolving existing water rights protests to achieve a common understanding of the application of relevant water rights law in the watershed. Implementation of the project described in the concept would also not resolve existing water rights conflicts. |
| F-20: Enhance flood protection and management | ○ | The concept does not include elements that would enhance flood protection and/or flood management, nor would the concept enhance ecosystem function in a way that would provide flood protection. Implementation of the project described in the concept would also not provide flood protection or management. |
| D-21: Use sound, agreed-upon data to evaluate program alternatives (hydrology dataset) | ● | As a feasibility study, the concept would require the use of an agreed-upon hydrology dataset and/or Water Availability Analysis. |
| D-22: Use sound, agreed-upon data to evaluate program alternatives (describe in sufficient detail) | ○ | Because the concept is not well-defined enough to complete a quantitative assessment, a qualitative assessment was performed. |
| D-23: Promote the contribution of sound scientific data to current body of knowledge | ● | The concept would contribute data to the current body of knowledge by completing a feasibility study and developing information about the groundwater in the upper watershed. |
| O-24: Increase investment in forest management | ○ | The concept does not include elements that would promote forest management, nor would it help reduce the economic impact of wildfires and other natural disasters. Implementation of the project described in the concept would also not increase investment in forest management. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| O-25: Maximize socio-economic, cultural, recreational, public health, and public safety benefits with a particular emphasis on disadvantaged communities (DACs) | ◗ | As a feasibility study, the concept would not maximize socio-economic, cultural, recreational, public health, and public safety benefits. If implemented, the project as described in the concept would maximize these benefits because CCWD, AWA, and JVID serve DACs. |
| O-26: Achieve equity | ◗ | As a feasibility study, the concept would not directly achieve equity. However, if the project described in the concept were implemented, the benefits realized from the project would not be limited to a narrow group; rather, project benefits would be spread across all of AWA's, CCWD's, and JVID's service area, spanning regions, cultures, incomes, and time. |
| E-27: Protect and enhance natural environment (enhance natural envt) | ○ | The concept itself would not enhance the natural environment. In coupled groundwater-surface water systems, improvement in the overall health of one of the systems would contribute to improved health in the other. Fewer river diversions would allow unallocated waters to stay in the river and perform geomorphic functions, though the benefit would likely be small and incremental at best. |
| E-28: Protect and enhance natural environment (wild & scenic designation) | ○ | The concept does not incorporate or seek a wild and scenic designation. If implemented, the project as described in the concept would also not incorporate or seek a wild and scenic designation. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| E-29: Protect and restore fisheries | ○ | As a feasibility study, the concept will not protect and restore fisheries. While implementation of the project described in the concept would likely reduce Mokelumne River use, the benefit to fisheries would likely be small and incremental. |
| A-30: Enhance or maintain the water supply for the beneficial use in ag practices | ◗ | As a feasibility study, the concept would not enhance or maintain water supply for beneficial use in agricultural practices. Implementing the project described in the concept would enhance water supply for agricultural practices because AWA, CCWD, and JVID serves agricultural users within its service area. |
| C-31: Foster long-term regional relationships and avoid unnecessary conflict and litigation | ● | The purpose of the concept is to assess the feasibility of groundwater banking in the upper watershed. This helps avoid unnecessary conflict and litigation by identifying and attempting to resolve these issues early on. |
| C-32: Promote broadly-supported outcomes that benefit a wide range of interests | ● | As a feasibility study, the concept would not directly promote broadly-supported outcomes that benefit a wide range of interests. However, the project described in the concept would likely promote broadly-supported outcomes. Implementation of the project described in the concept would diversify supplies, serve DACs, and leave more water in the Mokelumne. These outcomes are broadly supported by a wide range of interests. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| C-33: Promote broadly-supported outcomes that benefit a wide range of interests (least controversial projects) | ◗ | The concept has passed the preliminary four screening criteria, including the beneficial and compatible screens. The project described in the concept would also need to undergo these screenings to determine if it was the least controversial project. |
| C-34: Promote broadly-supported outcomes that benefit a wide range of interests (agreements that reduce conflict) | ○ | As a feasibility study, the concept would not result in agreements that reduce conflicts. Implementation of the project described in the concept would also not reduce conflict in the watershed. |
| C-35: Develop a program consistent with all existing licenses, permits, and agreements affecting the River | ● | As a condition of implementation, the concept would be consistent with all existing licenses, permits, and agreements affecting the Mokelumne River. This would also be required of the project described in the concept if it were to be implemented. |
| C-36: Develop a program consistent with all existing licenses, permits, and agreements affecting the River (CEQA/NEPA) | ● | As a condition of implementation, the concept would be required to adhere to all applicable regulatory requirements, including applicable CEQA/NEPA regulations documentation, etc. This would also be required of the project described in the concept if it were to be implemented. |
| CA-37: Avoid basing decisions on incomplete or inaccurate information | ● | The purpose of this concept is to study the feasibility of groundwater banking in the upper watershed; as such, the nature of the concept will help avoid basing decisions on incomplete or inaccurate information. |
| CA-38: Avoid demand for new or larger on-stream dams | ● | The concept will not result in construction of a new or larger on-stream dam. If the project as described in the concept is implemented, there would also not be demand for new or larger on-stream dams. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| CA-39: Avoid harmful impacts to fisheries and other wildlife | ● | The concept would not create harmful impacts to fisheries and other wildlife. Implementation of the project described in the concept would also not harm fisheries and other wildlife. |
| CA-40: Avoid conversion of agricultural lands to developed uses | ● | The concept would not convert agricultural lands to developed uses. Implementation of the project described in the concept would also not convert agricultural lands. |
| CA-41: Avoid shifting environmental impacts from one area to another | ● | The concept would not shift environmental impacts from one area to another. Implementation of the project described in the concept would also not shift environmental impacts. |
| CA-42: No diminishment of the benefits of existing in-stream flow | ● | The concept does not include elements that would alter existing in-stream flows. Implementation of the project described in the concept would also not diminish the benefits of existing in-stream flow. |
| CA-43: Avoid closing the process to the public | ● | As a condition of planning and implementation, the concept would include public involvement to the extent appropriate. This also applies to implementation of the project described in the concept. |
| CA-44: Avoid dependency on potentially unreliable supply | ◗ | The concept does not include elements that would facilitate downstream users becoming dependent on an unreliable supply. Groundwater banking and use could potentially create dependence on a potentially unreliable supply; sustainable extraction rates would need to be identified to avoid this. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| CA-45: Minimize adverse socio-economic and public health and safety impacts | ● | As a feasibility study, this concept does not have adverse socio-economic and public health and safety impacts. Implementation of the project described in the concept would also not create adverse socio-economic and public health and safety impacts. |
| CA-46: Avoid end use harm | ● | The concept does not allocate water in ways that create end use harm. This also applies to implementation of the project described in the concept. |
| CA-47: Avoid violating procedural or substantive laws | ● | As a condition of implementation, the concept would be required to complete relevant CEQA/NEPA analysis prior to implementation. This would also be required if the project described in the concept were implemented. |
| CA-48: Avoid interregional inequity | ● | Implementation of the concept would not create interregional inequity, either in realized benefits or in costs. This also holds if the project described in the concept were to be implemented. |

# 4c: San Joaquin County Groundwater Banking and Exchange

## Groundwater Basin Authority, East Bay Municipal Utility District; WID

### Overview

This concept is seen as a regional effort whereby one or more partner agencies could obtain a new water right and/or modify an existing water right to enable surface water to be diverted from the Mokelumne River and banked in the Eastern San Joaquin Groundwater Basin for later use by one or more of the partners (and further to improve overdrafted groundwater conditions in the Eastern San Joaquin Groundwater Basin). This concept builds upon the recent Demonstration Project efforts between San Joaquin County (SJC), a GBA member agency, and EBMUD.

**Sponsor(s):** Groundwater Basin Authority (GBA), East Bay Municipal Utility District (EBMUD); Woodbridge Irrigation District (WID)

**Concept type:** Implementation

**Estimated Costs:** $40,000,000 - $100,000,000

**Funding Source(s):** Water agency capital investments, state/federal grants, loans

**Concept location:** Eastern San Joaquin Groundwater Basin, including portions of Calaveras County

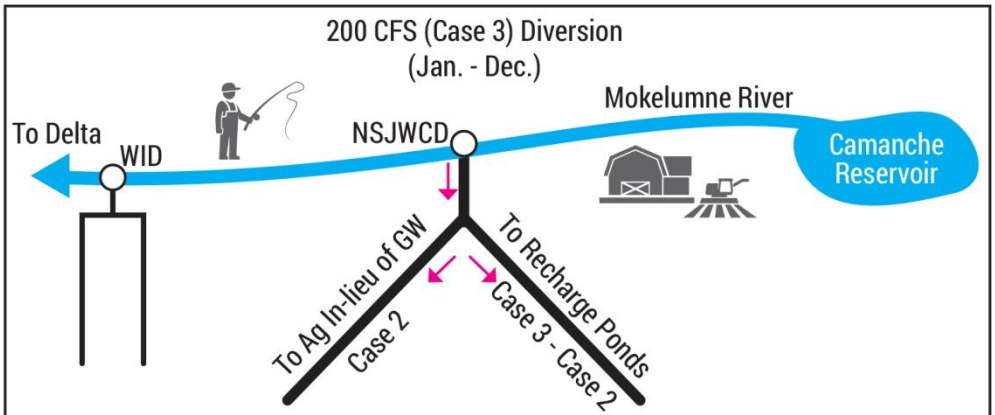
Under one scenario, a portion of the Mokelumne River supply would be conveyed through existing and/or new facilities for storage and regional use in the Basin. Various in-lieu and direct recharge projects could be used to recharge water in wet years for extraction in dry years. Recharge could be via recharge basins or direct injection.

While the first stage of a project would rely primarily on EBMUD's facilities for conveyance, some new facilities are possibly required such as an Intertie with EBMUD's Mokelumne Aqueduct, a new pipeline and pump station that directs water from the aqueducts to the recharge site, and any required facilities to provide treatment as needed prior to injection and or following extraction. Other means and measures could also be used to deliver water to a proposed banking site, such as use of existing NSJWCD Mokelumne River intakes and upgraded distribution systems.

Water stored in the Basin would be extracted for use via wells installed within project areas. The quantity extracted could be divided by the partner agencies (upcountry agencies could receive their share via an in-lieu exchange with EBMUD). Groundwater could be sent to the EBMUD service area via connection(s) to EBMUD's Mokelumne Aqueducts. A portion of the quantity stored would remain in the ground to meet SJC's share requirements.

Modeling conducted assumed two cases, as outlined below in Figure 1. The first case assumed diversions from March through October and the second case assumed diversions in all months except July. Both cases assumed a maximum diversion of 200 cfs. The assessment below includes results from Case 2 and Case 4 (Case 3 minus Case 2). Both cases would temporarily store water in Camanche that is available during the diversion window when EBMUDs demands are fully met. This water would be carried over on a seasonal basis, but could be released within the diversion window for use. It is assumed that this water would count towards EBMUDs storage requirements per the Camanche permit.

**Figure 1: Two Modeled Scenarios for Concept 4c***




| Month | CFS In-Lieu | Month | CFS Recharge |
|---|---|---|---|
| January | 0 | Jan | 200 |
| February | 0 | Feb | 200 |
| March | 50 | March | 150 |
| April | 100 | April | 100 |
| May | 120 | May | 80 |
| June | 180 | June | 20 |
| July | 200 | July | 0 |
| August | 180 | August | 20 |
| September | 120 | September | 80 |
| October | 50 | October | 150 |
| November | 0 | November | 200 |
| December | 0 | December | 200 |

* Initially, three cases were proposed and modeled. After viewing results, the Modeling Workgroup decided to drop the first case. The third case assumed a 200 cfs diversion in all months. The Workgroup decided to reconfigure the third case so that it reflected the difference in diversion between the second case and the third case (200 cfs in all months). These two cases are reflected in the above graphic.

## Assessment

| *Objective* | ● ◗ ○ | *Justification* |
|---|---|---|
| ● *Fully addressed* | ◗ *Partially addressed* | ○ *Not addressed* |
| WS-1: Promote demand-side management strategies | ○ | The concept would not have elements that would promote demand-side management strategies. |
| WS-2: Increase supply reliability | ● | The concept would increase supply reliability by storing water for use in drier years when other supplies may become unavailable. The concept would divert water from March through October with a peak diversion of 200 cubic feet per second (cfs) in July. All or a portion of this diverted water could be stored for use in drier years. Unallocated water below Camanche is unchanged between the 2040 baseline case and the case that includes concept implementation. |
| WS-3: Increase amount of stored water | ● | The purpose of the concept is to increase the amount of stored water by banking water in the groundwater basin. The concept would divert water from March through October with a peak diversion of 200 cfs in July. All or a portion of this diverted water could be stored for use in drier years. Unallocated water below Camanche is unchanged between the 2040 baseline case and the case that includes concept implementation. |
| WS-4: Promote smart, responsible development | ● | The concept would promote smart, responsible development by implementing a program that would encourage more responsible use of the groundwater basin and result in increased groundwater levels. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| WS-5: Reduce reliance on groundwater for irrigation | ○ | The concept would not reduce reliance on groundwater for irrigation; implementation of the concept would increase the groundwater supply that could be used for irrigation. |
| WS-6: Promote a long-term groundwater balance | ● | The concept would promote a long-term groundwater balance by banking water. The concept would divert water from March through October with a peak diversion of 200 cfs in July. All or a portion of this diverted water could be used to recharge the groundwater basin. |
| WS-7: Maximize water resource availability for all beneficial uses | ● | The concept would maximize water resource availability for all beneficial uses by increasing the amount of stored water that could be beneficially used in drier years. The concept would divert water from March through October with a peak diversion of 200 cfs in July. All or a portion of this diverted water could be stored for use in drier years. Unallocated water below Camanche is unchanged between the 2040 baseline case and the case that includes concept implementation. |
| WS-8: Decrease the need to import water | ● | The concept would decrease the need to import water in drier years, as banked water would be used in lieu of imported water during drier years. It is unknown at this time the reduction in imported water, but it is assumed that some portion of the stored water used during dry years would be in lieu of importing water. |
| WD-9: Review and understand existing agency demand estimates | ○ | The concept does not include reviewing and understanding existing agency demand estimates. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| WD-10: Identify water demand issues for timely consideration by the water agencies during their UWMP update | ○ | The concept does not include identifying water demand issues for consideration in the upcoming UWMP update. |
| WQ-11: Protect and improve surface and groundwater quality | ◗ | The concept would increase stored water. Leaving some of the diverted water in the groundwater basin protects and improves groundwater quality by helping dilute pollutants in the groundwater. However, surface water quality may suffer, as modeling indicates that under the 2040 baseline condition, in-stream flows to the Delta average 323.1 TAFY. Implementing the concept as configured in Case 2 would decrease this average flow by 23.1 TAFY to 300 TAFY (Table 1). Implementing the concept as configured in Case 4 (Case 3 – Case 2) would decrease this average flow by 23.3 TAFY to 299.7 TAFY (Table 2). Having decreased flow could harm water quality. |
| WQ-12: Match delivered water quality use | ○ | The concept does not involve treating water, nor does it involve delivering treated water. |
| WQ-13: Use water purification technology as a tool to maximize beneficial uses | ○ | The concept does not include water purification elements. |
| R-14: Increase access for water-based recreation | ○ | The concept does not include elements that would increase access to the Mokelumne River from Highway 12 to the headwaters. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| R-15: Increase angling and other recreational opportunities (increase spawning habitat, etc.) | ○ | The concept would not contribute to increasing spawning habitat, designating sections of the river for hatchery and wild species, nor designating environmental flows. |
| R-16: Increase angling and other recreational opportunities (stock hatchery-raised fish) | ○ | The concept does not involve stocking hatchery-raised trout in designated areas on the upper Mokelumne, nor does it involve designating and managing wild trout sections. |
| R-17: Increase angling and other recreational opportunities (reintroduce salmon in upper Moke) | ○ | The concept does not include reintroducing salmon into the upper Mokelumne. |
| R-18: Increase angling and other recreational opportunities (increase opportunities) | ○ | The concept would not increase angling, harvesting, or other recreational opportunities. |
| WR-19: Resolve existing water rights conflicts in the watershed | ○ | The concept is not focused on resolving existing water rights protests to achieve a common understanding of the application of relevant water rights law in the watershed. |
| F-20: Enhance flood protection and management | ◗ | The concept could enhance flood protection by banking flows which could cause flooding. The concept would divert water from March through October with a peak diversion of 200 cfs in July. While flooding is uncommon during this period, there may be some flood flows in March or October that could be diverted. However, unallocated water below Camanche is unchanged between the 2040 baseline case and the case that includes concept implementation. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| D-21: Use sound, agreed-upon data to evaluate program alternatives (hydrology dataset) | ● | The concept would require the use of an agreed-upon hydrology dataset and/or Water Availability Analysis. |
| D-22: Use sound, agreed-upon data to evaluate program alternatives (describe in sufficient detail) | ● | The concept is well-defined enough to complete a quantitative assessment. |
| D-23: Promote the contribution of sound scientific data to current body of knowledge | ● | The concept would contribute scientific data to the current body of knowledge by being an example of an inter-regional groundwater banking program that would help provide water in dry years to a number of users and recharge the groundwater basin. Information collected could include amount of groundwater banked and changes in groundwater levels. |
| O-24: Increase investment in forest management | ○ | The concept does not include elements that would promote forest management, nor would it help reduce the economic impact of wildfires and other natural disasters. |
| O-25: Maximize socio-economic, cultural, recreational, public health, and public safety benefits with a particular emphasis on disadvantaged communities (DACs) | ● | The concept would maximize socio-economic and public health and safety impacts by providing water in dry years to DACs served by the partner agencies. It is assumed that some portion of the water extracted during dry years would be delivered to DACs. Additionally, any DACs with private wells would benefit from the increased groundwater quality in all years due to the increased groundwater levels and pollutant dilution. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| O-26: Achieve equity | ● | The benefits realized by this concept would not be limited to a narrow group; rather, project benefits would be spread across all partner agencies, spanning regions, cultures, incomes, and time. |
| E-27: Protect and enhance natural environment (enhance natural envt) | ○ | In coupled groundwater-surface water systems, improvement in the overall health of one of the systems would contribute to improved health in the other. Fewer river diversions would allow unallocated waters to stay in the river and perform geomorphic functions, though the benefit would likely be small and incremental at best. |
| E-28: Protect and enhance natural environment (wild & scenic designation) | ○ | The concept does not incorporate or seek a wild and scenic designation. |
| E-29: Protect and restore fisheries | ○ | The concept would not benefit fisheries, as water diverted from the Mokelumne River would not provide any benefit to instream flow for fisheries or other aquatic resources. |
| A-30: Enhance or maintain the water supply for the beneficial use in ag practices | ● | The concept would enhance and maintain water supply for agricultural uses by increasing groundwater levels and storing water for use in dry years. The concept would divert water from March through October with a peak diversion of 200 cfs in July. All or a portion of this water would be used for agricultural purposes, including irrigation and groundwater recharge. |
| C-31: Foster long-term regional relationships and avoid unnecessary conflict and litigation | ● | The concept would help foster regional relationships by requiring long-term coordination between the GBA, EBMUD, and other partner agencies. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| C-32: Promote broadly-supported outcomes that benefit a wide range of interests | ● | The concept would provide dry year resiliency for water users and contribute to groundwater recharge. These outcomes are supported by a wide range of interests within the watershed, including farmers, water agencies, non-governmental organizations, and state/federal agencies. |
| C-33: Promote broadly-supported outcomes that benefit a wide range of interests (least controversial projects) | ● | The concept has passed the preliminary four screening criteria, including the beneficial and compatible screens. |
| C-34: Promote broadly-supported outcomes that benefit a wide range of interests (agreements that reduce conflict) | ● | The concept would result in an agreement that would help recharge the groundwater basin, while also providing dry year supplies. This agreement would reduce conflict surrounding allocation of supply in dry years. |
| C-35: Develop a program consistent with all existing licenses, permits, and agreements affecting the River | ● | As a condition of implementation, the concept would be consistent with all existing licenses, permits, and agreements affecting the Mokelumne River. |
| C-36: Develop a program consistent with all existing licenses, permits, and agreements affecting the River (CEQA/NEPA) | ● | As a condition of implementation, the concept would be required to adhere to all applicable regulatory requirements, including applicable CEQA/NEPA regulations documentation, etc. |
| CA-37: Avoid basing decisions on incomplete or inaccurate information | ● | Prior to implementation, the concept would undergo a planning phase that would collect and analyze data that is considered, at the time, to be the most complete and accurate. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| CA-38: Avoid demand for new or larger on-stream dams | ● | The concept would not result in construction of a new or larger on-stream dam. |
| CA-39: Avoid harmful impacts to fisheries and other wildlife | ○ | The concept would likely harm fisheries and other wildlife by reducing in-stream flows in the Mokelumne River. Based on modeling, under the 2040 baseline condition, in-stream flows to the Delta average 323.1 TAFY. Implementing the concept as configured in Case 2 would decrease this average flow by 23.1 TAFY to 300 TAFY (Table 1). Implementing the concept as configured in Case 4 (Case 3 – Case 2) would decrease this average flow by 23.3 TAFY to 299.7 TAFY (Table 2). Mitigation measures could be included to limit impacts associated with decreased river flow. |
| CA-40: Avoid conversion of agricultural lands to developed uses | ◗ | The concept could potentially convert agricultural lands depending on the location of the recharge areas; this could be mitigated through compensation and coordination with willing agricultural landowners. |
| CA-41: Avoid shifting environmental impacts from one area to another | ● | The concept does not include elements that would shift environmental impacts from one area to another. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| CA-42: No diminishment of the benefits of existing in-stream flow | ○ | The concept would reduce in-stream flows by diverting Mokelumne River water for banking. Based on modeling, under the 2040 baseline condition, in-stream flows to the Delta average 323.1 TAFY. Implementing the concept as configured in Case 2 would decrease this average flow by 23.1 TAFY to 300 TAFY (Table 1). Implementing the concept as configured in Case 4 (Case 3 – Case 2) would decrease this average flow by 23.3 TAFY to 299.7 TAFY (Table 2). However, operational parameters could be included that could create more reliable flows at times that are key for lifestages of aquatic species. |
| CA-43: Avoid closing the process to the public | ● | As a condition of planning and implementation, the concept would include public involvement to the extent appropriate. |
| CA-44: Avoid dependency on potentially unreliable supply | ● | The concept would bolster supply reliability by storing water for use in drier years. |
| CA-45: Minimize adverse socio-economic and public health and safety impacts | ● | The concept would minimize these impacts by increasing water quality through more stored water and providing a reliable supply in drier years. |
| CA-46: Avoid end use harm | ● | The concept does not allocate water in ways that would create end use harm. |
| CA-47: Avoid violating procedural or substantive laws | ● | As a condition of implementation, the concept would be required to complete relevant CEQA/NEPA analysis prior to implementation. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| CA-48: Avoid interregional inequity | ● | The proposed diversion location is in the lower watershed near NSJWCD. Benefits of the concept are also largely realized in the lower watershed. As such, there would be no interregional inequity. |

**Table 1: Difference in Mokelumne Flow to Delta between 2040 Baseline Case and Case Implementing Case 2 of SJC Groundwater Banking (in TAF)**

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1953** | 0.00 | 0.00 | 0.00 | 0.00 | -14.76 | -21.42 | -16.55 | -16.55 | -14.28 | 57.21 | 0.00 | 0.00 | -26.34 |
| **1954** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1955** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1956** | 0.01 | 0.00 | -3.07 | -0.17 | -7.37 | -10.70 | -24.60 | -22.14 | -14.28 | 30.12 | 0.00 | 0.01 | -52.19 |
| **1957** | 0.00 | 0.00 | 0.00 | 0.00 | -7.99 | -7.73 | -3.99 | -3.99 | -4.19 | 19.31 | 0.00 | 0.00 | -8.59 |
| **1958** | 0.01 | 0.00 | -3.07 | -5.94 | -7.37 | -10.70 | -24.60 | -22.14 | -14.28 | 30.11 | 0.00 | 0.01 | -57.97 |
| **1959** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1960** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1961** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1962** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1963** | 0.01 | 0.00 | 0.01 | 0.00 | -7.37 | -10.70 | -24.60 | -22.14 | -14.28 | 30.13 | 0.00 | 0.01 | -48.93 |
| **1964** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1965** | 0.01 | 0.01 | 0.01 | -5.94 | -7.37 | -15.09 | -24.60 | -22.14 | -14.28 | 34.32 | 0.01 | 0.01 | -55.05 |
| **1966** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1967** | 0.01 | 0.00 | -3.07 | -5.94 | -7.37 | -12.21 | -24.60 | -22.14 | -14.28 | 31.71 | 0.00 | 0.01 | -57.88 |
| **1968** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1969** | 0.01 | 0.00 | -3.07 | -5.94 | -7.37 | -10.70 | -24.60 | -22.14 | -14.28 | 30.12 | 0.00 | 0.01 | -57.96 |
| **1970** | 0.01 | 0.01 | -3.06 | 0.01 | -14.76 | -18.28 | -9.45 | -9.66 | -9.77 | 43.78 | 0.01 | 0.01 | -21.13 |
| **1971** | 0.00 | 0.00 | -3.07 | 0.00 | -14.76 | -21.42 | -20.26 | -20.26 | -14.28 | 64.50 | 0.00 | 0.00 | -29.56 |
| **1972** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1973** | 0.01 | 0.01 | -3.07 | 0.00 | -14.61 | -7.30 | -23.23 | -22.14 | -14.28 | 44.56 | 0.01 | 0.01 | -40.04 |
| **1974** | 0.01 | 0.01 | -3.07 | -5.94 | -7.37 | -14.17 | -24.60 | -22.14 | -14.28 | 33.48 | 0.01 | 0.01 | -58.05 |
| **1975** | 0.00 | 0.00 | 0.00 | 0.00 | -14.76 | -20.06 | -24.60 | -22.14 | -14.28 | 46.39 | 0.00 | 0.00 | -49.44 |
| **1976** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1977** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1978** | 0.00 | 0.00 | 0.00 | 0.00 | -11.82 | -11.44 | -5.91 | -6.12 | -6.35 | 28.53 | 0.00 | 0.00 | -13.11 |
| **1979** | 0.00 | 0.00 | -3.07 | 0.00 | -14.76 | -20.12 | -19.47 | -19.47 | -14.28 | 61.81 | 0.00 | 0.00 | -29.36 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1980** | 0.01 | 0.01 | -3.06 | 0.00 | -7.36 | -17.78 | -24.60 | -22.14 | -14.28 | 36.98 | 0.01 | 0.01 | -52.20 |
| **1981** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1982** | 0.00 | 0.00 | -3.07 | -5.95 | -7.38 | -18.42 | -24.60 | -22.14 | -14.28 | 37.62 | 0.00 | 0.00 | -58.21 |
| **1983** | 0.00 | 0.00 | -3.07 | -5.95 | -7.38 | -10.71 | -24.60 | -22.14 | -14.28 | 30.21 | 0.00 | 0.00 | -57.91 |
| **1984** | 0.00 | 0.00 | -3.07 | 0.00 | -14.76 | -21.42 | -24.11 | -22.14 | -14.28 | 59.26 | 0.00 | 0.00 | -40.52 |
| **1985** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1986** | 0.01 | 0.01 | -3.07 | -5.94 | -7.37 | -13.01 | -24.60 | -22.14 | -14.28 | 32.40 | 0.01 | 0.01 | -57.99 |
| **1987** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1988** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1989** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1990** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1991** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1992** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1993** | 0.00 | 0.00 | 0.00 | 0.00 | -14.76 | -21.42 | -24.60 | -22.14 | -14.28 | 47.69 | 0.00 | 0.00 | -49.50 |
| **1994** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1995** | 0.00 | 0.01 | -3.07 | -5.94 | -7.37 | -10.70 | -22.51 | -22.14 | -14.28 | 28.00 | 0.00 | 0.01 | -57.99 |
| **1996** | 0.01 | 0.01 | -3.07 | -5.94 | -7.37 | -13.44 | -22.91 | -22.14 | -14.28 | 43.21 | 0.01 | 0.01 | -45.89 |
| **1997** | 0.01 | 0.01 | -3.06 | 0.00 | -13.65 | -13.21 | -6.82 | -7.04 | -7.23 | 33.11 | 0.01 | 0.01 | -17.87 |
| **1998** | 0.00 | 0.00 | -3.07 | -5.95 | -7.37 | -10.71 | -24.60 | -22.14 | -14.28 | 30.24 | 0.00 | 0.00 | -57.85 |
| **1999** | 0.00 | 0.00 | -3.07 | 0.00 | -14.76 | -3.37 | -24.60 | -22.14 | -14.28 | 30.10 | 0.00 | 0.00 | -52.09 |
| **2000** | 0.00 | 0.00 | -3.07 | 0.00 | -14.76 | -21.42 | -12.25 | -12.25 | -12.18 | 53.69 | 0.00 | 0.00 | -22.24 |
| **2001** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **2002** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **2003** | 0.00 | 0.00 | 0.00 | 0.00 | -5.76 | -5.58 | -2.88 | -2.88 | -3.12 | 13.92 | 0.00 | 0.00 | -6.30 |
| **2004** | 0.00 | 0.00 | -3.07 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -3.07 |
| **2005** | 0.01 | 0.00 | -3.07 | -5.94 | -7.37 | -10.70 | -24.60 | -22.14 | -14.28 | 30.16 | 0.00 | 0.01 | -57.92 |
| **2006** | 0.01 | 0.00 | -3.07 | -5.94 | -7.37 | -10.70 | -24.60 | -22.14 | -14.28 | 30.17 | 0.00 | 0.00 | -57.91 |
| **2007** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **2008** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **2009** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **2010** | 0.00 | 0.00 | 0.00 | 0.00 | -14.76 | -21.42 | -22.73 | -22.14 | -14.28 | 57.91 | 0.00 | 0.00 | -37.41 |
| | | | | | | | | | | | | | |
| **Ave** | 0.00 | 0.00 | -1.22 | -1.34 | -5.51 | -7.52 | -10.88 | -10.09 | -6.89 | 20.36 | 0.00 | 0.00 | -23.08 |
| **Max** | 0.01 | 0.01 | -3.07 | -5.94 | -7.37 | -10.71 | -24.60 | -22.14 | -14.28 | 62.58 | 0.00 | 0.00 | -57.91 |
| **Min** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.03 | 0.00 | 0.00 | 0.00 | 0.00 |

**Table 2: Difference in Mokelumne Flow to Delta between 2040 Baseline Case and Case Implementing Case 4 (Case 3 - Case 2) of SJC Groundwater Banking (in TAF)**

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1953** | -12.3 | 0.0 | 0.0 | 0.0 | -9.8 | -2.4 | 0.0 | -2.5 | -9.5 | 11.9 | 0.0 | 0.0 | -24.6 |
| **1954** | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **1955** | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -12.3 | -12.3 |
| **1956** | -12.3 | -11.5 | -5.6 | -0.2 | -4.9 | -1.2 | 0.0 | -2.5 | -9.5 | 6.0 | 0.0 | 0.0 | -41.7 |
| **1957** | 0.0 | 0.0 | 0.0 | 0.0 | -8.0 | -2.4 | 0.0 | -2.5 | -4.2 | 10.1 | 0.0 | 0.0 | -6.9 |
| **1958** | 0.0 | -11.1 | -9.2 | -5.9 | -4.9 | -1.2 | 0.0 | -2.5 | -9.5 | 6.0 | 0.0 | 0.0 | -38.4 |
| **1959** | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **1960** | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **1961** | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **1962** | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **1963** | 0.0 | -11.1 | 0.0 | 0.0 | -4.9 | -1.2 | 0.0 | -2.5 | -9.5 | 6.0 | -11.9 | 0.0 | -35.1 |
| **1964** | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -12.3 | -12.3 |
| **1965** | -12.3 | -11.1 | 0.0 | -5.9 | -4.9 | -2.4 | 0.0 | -2.5 | -9.5 | 7.1 | -11.9 | -1.3 | -54.7 |
| **1966** | -1.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -1.3 |
| **1967** | -4.4 | -11.1 | -9.2 | -5.9 | -4.9 | -2.4 | 0.0 | -2.5 | -9.5 | 7.1 | 0.0 | 0.0 | -42.8 |
| **1968** | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **1969** | -12.3 | -11.1 | -9.2 | -5.9 | -4.9 | -1.2 | 0.0 | -2.5 | -9.5 | 6.0 | 0.0 | -6.9 | -57.6 |
| **1970** | -12.3 | -11.1 | -9.2 | 0.0 | -9.8 | -2.4 | 0.0 | -2.5 | -9.5 | 11.9 | -11.9 | -12.3 | -69.1 |
| **1971** | -12.3 | -11.1 | -9.2 | 0.0 | -9.8 | -2.4 | 0.0 | -2.5 | -9.5 | 11.9 | -3.4 | -5.9 | -54.2 |
| **1972** | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **1973** | -12.3 | -11.1 | -9.2 | 0.0 | -9.8 | -0.1 | 0.0 | -2.5 | -9.5 | 9.6 | -11.9 | -12.3 | -69.1 |
| **1974** | -12.3 | 0.0 | -9.2 | -5.9 | -4.9 | -2.4 | 0.0 | -2.5 | -9.5 | 7.1 | 0.0 | 0.0 | -39.6 |
| **1975** | 0.0 | 0.0 | 0.0 | 0.0 | -9.8 | -2.4 | 0.0 | -2.5 | -9.5 | 11.9 | -3.1 | 0.0 | -15.4 |
| **1976** | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **1977** | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **1978** | 0.0 | 0.0 | 0.0 | 0.0 | -9.8 | -2.4 | 0.0 | -2.5 | -6.3 | 12.8 | 0.0 | 0.0 | -8.3 |
| **1979** | 0.0 | 0.0 | -9.2 | 0.0 | -9.8 | -2.4 | 0.0 | -2.5 | -9.5 | 12.0 | 0.0 | 0.0 | -21.4 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1980** | -12.3 | -11.5 | -9.2 | 0.0 | -4.9 | -2.4 | 0.0 | -2.5 | -9.5 | 7.1 | 0.0 | 0.0 | -45.2 |
| **1981** | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -12.3 | -12.3 |
| **1982** | -12.3 | -11.1 | -9.2 | -6.0 | -4.9 | -2.4 | 0.0 | -2.5 | -9.5 | 7.1 | -11.9 | -12.3 | -74.9 |
| **1983** | -12.3 | -11.1 | -9.2 | -6.0 | -4.9 | -1.2 | 0.0 | -2.5 | -9.5 | 6.0 | -11.9 | -12.3 | -74.9 |
| **1984** | -12.3 | -11.5 | -6.8 | 0.0 | -9.8 | -2.4 | 0.0 | -2.5 | -9.5 | 11.9 | -11.9 | 0.0 | -54.8 |
| **1985** | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **1986** | 0.0 | -11.1 | -9.2 | -5.9 | -4.9 | -2.4 | 0.0 | -2.5 | -9.5 | 7.1 | 0.0 | 0.0 | -38.4 |
| **1987** | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **1988** | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **1989** | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **1990** | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **1991** | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **1992** | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **1993** | 0.0 | 0.0 | 0.0 | 0.0 | -9.8 | -2.4 | 0.0 | -2.5 | -9.5 | 11.9 | 0.0 | 0.0 | -12.3 |
| **1994** | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **1995** | 0.0 | -11.1 | -9.2 | -5.9 | -4.9 | -1.2 | 0.0 | -2.5 | -9.5 | 6.0 | 0.0 | 0.0 | -38.4 |
| **1996** | 0.0 | -11.5 | -9.2 | -5.9 | -4.9 | -2.4 | 0.0 | -2.5 | -9.5 | 7.1 | -11.9 | -12.3 | -63.0 |
| **1997** | -12.3 | -11.1 | -9.2 | 0.0 | -9.8 | -2.4 | 0.0 | -2.5 | -7.2 | 13.7 | -8.7 | 0.0 | -49.5 |
| **1998** | -12.3 | -11.1 | -9.2 | -5.9 | -4.9 | -1.2 | 0.0 | -2.5 | -9.5 | 6.0 | 0.0 | 0.0 | -50.7 |
| **1999** | -12.3 | -11.1 | -9.2 | 0.0 | -9.8 | 3.7 | 0.0 | -2.5 | -9.5 | 6.0 | 0.0 | 0.0 | -44.8 |
| **2000** | 0.0 | -11.5 | -9.2 | 0.0 | -9.8 | -2.4 | 0.0 | -2.5 | -9.5 | 11.9 | 0.0 | 0.0 | -33.0 |
| **2001** | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **2002** | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **2003** | 0.0 | 0.0 | 0.0 | 0.0 | -5.8 | -2.4 | 0.0 | -2.5 | -3.1 | 7.9 | 0.0 | 0.0 | -5.8 |
| **2004** | 0.0 | 0.0 | -9.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | -9.0 |
| **2005** | 0.0 | -11.1 | -9.2 | -5.9 | -4.9 | -1.2 | 0.0 | -2.5 | -9.5 | 6.0 | 0.0 | -12.3 | -50.7 |
| **2006** | -12.3 | -11.1 | -9.2 | -5.9 | -4.9 | -1.2 | 0.0 | -2.5 | -9.5 | 6.0 | -1.2 | -2.0 | -53.8 |
| **2007** | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **2008** | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **2009** | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **2010** | 0.0 | 0.0 | 0.0 | 0.0 | -9.8 | -2.4 | 0.0 | -2.5 | -9.5 | 11.9 | -11.9 | -12.3 | -36.5 |
| | | | | | | | | | | | | | |
| **Ave** | -3.5 | -4.2 | -3.5 | -1.3 | -3.8 | -0.9 | 0.0 | -1.3 | -4.8 | 4.7 | -2.1 | -2.4 | -23.3 |
| **Max** | -12.3 | -11.1 | -9.2 | -5.9 | -4.9 | -1.2 | 0.0 | -2.5 | -9.5 | 10.8 | -11.9 | -12.3 | -74.9 |
| **Min** | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

# 4d: NSJWCD Infrastructure Improvements

## North San Joaquin Water Conservation District

### Overview

The concept would improve the infrastructure to increase reliable surface water delivery to the North San Joaquin Water Conservation District so the District can utilize existing water rights and its agricultural customers can reduce reliance on groundwater sources. The largest of these projects includes rebuilding the southern pump station and southern distribution system, and rebuilding the northern distribution system.

**Sponsor(s):** North San Joaquin Water Conservation District (NSJWCD)

**Concept type:** Implementation

**Estimated Costs:** unknown

**Funding Source(s):** unknown

**Concept location:** NSJWCD service area

### Assessment

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| ● ***Fully addressed*** | ◗ ***Partially addressed*** | ○ ***Not addressed*** |
| WS-1: Promote demand-side management strategies | ○ | The concept does not have elements that promote demand-side management strategies. |
| WS-2: Increase supply reliability | ● | The concept would increase supply reliability for NSJWCD by approximately 17,000 AFY by sizing infrastructure that allows NSJWCD to divert Mokelumne River water, pursuant to its current water rights. This water would help the District deliver water to its customers during years when it is available. |
| WS-3: Increase amount of stored water | ○ | The concept does not include elements that would increase the amount of stored water. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| WS-4: Promote smart, responsible development | ● | The concept promotes smart, responsible development by using Mokelumne River water in wetter years, thereby recharging the groundwater basin, which can be used in lieu of Mokelumne River water in drier years. |
| WS-5: Reduce reliance on groundwater for irrigation | ● | The concept would reduce reliance on groundwater for irrigation by approximately 17,000 AFY in years when NSJWCD has access to Mokelumne River water, as many users within the NSJWCD service area currently use groundwater to meet irrigation needs. Increasing surface water use would offset groundwater use. |
| WS-6: Promote a long-term groundwater balance | ● | The concept would promote a long-term groundwater balance by reducing the use of groundwater by approximately 17,000 AFY in years when NSJWCD has access to Mokelumne River water, thereby leaving this water in the basin and allowing the basin to recharge. |
| WS-7: Maximize water resource availability for all beneficial uses | ● | The concept would maximize water resource availability for all beneficial uses by approximately 17,000 AFY by using Mokelumne River water in lieu of groundwater during years when Mokelumne River water is available to the District. |
| WS-8: Decrease the need to import water | ○ | NSJWCD does not import water from outside of the watershed. Implementation of the concept would not decrease the need to import water. |
| WD-9: Review and understand existing agency demand estimates | ○ | The concept does not include reviewing and understanding existing agency demand estimates. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| WD-10: Identify water demand issues for timely consideration by the water agencies during their UWMP update | ○ | The concept does not include identifying water demand issues for consideration in the upcoming UWMP update. |
| WQ-11: Protect and improve surface and groundwater quality | ◗ | The concept would protect groundwater quality by leaving approximately 17,000 AFY of water in the basin that would dilute pollutants (in years when Mokelumne River water is available to NSJWCD). However, Mokelumne River diversions would increase by roughly 17,000 AFY in wetter years when Mokelumne River water is available to NSJWCD. Because these diversions would occur in high flow years, it is likely that Mokelumne River quality would not be significantly impacted. However, the magnitude of this impact is not currently known. |
| WQ-12: Match delivered water quality use | ○ | The concept does not involve treating water, nor does it involve delivering treated water. |
| WQ-13: Use water purification technology as a tool to maximize beneficial uses | ○ | The concept does not include water purification elements. |
| R-14: Increase access for water-based recreation | ○ | The concept does not include elements that would increase access to the Mokelumne River from Highway 12 to the headwaters. |
| R-15: Increase angling and other recreational opportunities (increase spawning habitat, etc.) | ○ | The concept would not contribute to increasing spawning habitat, designating sections of the river for hatchery and wild species, nor designating environmental flows. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| R-16: Increase angling and other recreational opportunities (stock hatchery-raised fish) | ○ | The concept does not involve stocking hatchery-raised trout in designated areas on the upper Mokelumne, nor does it involve designating and managing wild trout sections. |
| R-17: Increase angling and other recreational opportunities (reintroduce salmon in upper Moke) | ○ | The concept does not include reintroducing salmon into the upper Mokelumne. |
| R-18: Increase angling and other recreational opportunities (increase opportunities) | ○ | The concept would not increase angling, harvesting, or other recreational opportunities. |
| WR-19: Resolve existing water rights conflicts in the watershed | ● | By developing infrastructure that allows NSJWCD to utilize its existing water rights, the concept would resolve existing water rights conflicts surrounding NSJWCDs rights. |
| F-20: Enhance flood protection and management | ○ | The concept does not include elements that would enhance flood protection and/or flood management, nor would the concept enhance ecosystem function in a way that would provide flood protection. |
| D-21: Use sound, agreed-upon data to evaluate program alternatives (hydrology dataset) | ○ | The concept does not involve producing an agreed-upon hydrology dataset and Water Availability Analysis separate from that which was produced as part of the MokeWISE program. |
| D-22: Use sound, agreed-upon data to evaluate program alternatives (describe in sufficient detail) | ● | The concept is well-defined enough to complete a quantitative assessment. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| D-23: Promote the contribution of sound scientific data to current body of knowledge | ○ | The concept involves increasing diversions from the Mokelumne River and would not contribute scientific data to the current body of knowledge. |
| O-24: Increase investment in forest management | ○ | The concept does not include elements that would promote forest management, nor would it help reduce the economic impact of wildfires and other natural disasters. Raising Lower Bear would also not increase investment in forest management. |
| O-25: Maximize socio-economic, cultural, recreational, public health, and public safety benefits with a particular emphasis on disadvantaged communities (DACs) | ● | The concept would maximize benefits for DACs, as NSJWCD serves areas of Lodi that are classified as DACs. The concept would provide increased supply reliability for these DACs. |
| O-26: Achieve equity | ● | The benefits realized from implementing the concept would not be limited to a narrow group; rather, concept benefits would likely be spread across cultures, incomes, and time. |
| E-27: Protect and enhance natural environment (enhance natural envt) | ○ | The concept would decrease groundwater pumping by 17,000 AFY in wetter years, which would enhance groundwater reserves that could be used in drier years when Mokelumne River water is unavailable to NSJWCD. However, higher efficiency in pumping stations will likely not affect geomorphic conditions in the river corridor. If pipelines are constructed in place of aqueducts, then evaporation, leakage and seepage rates would diminish, thereby potentially requiring fewer AF of diversions for the same volumetric delivery. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| E-28: Protect and enhance natural environment (wild & scenic designation) | ○ | The concept does not incorporate or seek a wild and scenic designation. |
| E-29: Protect and restore fisheries | ○ | The concept does not include elements that would protect and restore fisheries and would not provide benefit to instream flows. |
| A-30: Enhance or maintain the water supply for the beneficial use in ag practices | ● | By increasing supply reliability for agricultural users, the concept would enhance and maintain the water supply for beneficial use in agricultural practices. |
| C-31: Foster long-term regional relationships and avoid unnecessary conflict and litigation | ○ | While the concept does not prohibit or preclude fostering long-term regional relationships and avoiding unnecessary conflict and litigation, it does not directly address it. Implementation of the concept would not require coordination between a number of different agencies; NSJWCD is the only agency that would be involved in the implementation of the concept. |
| C-32: Promote broadly-supported outcomes that benefit a wide range of interests | ◗ | The concept would reduce groundwater pumping by 17,000 AFY during wetter years, which would help the groundwater basin recharge and stabilize. However, diversions from the Mokelumne River would increase by 17,000 AFY. These outcomes would benefit NSJWCD and other groundwater users, while potentially creating negative environmental impacts. |
| C-33: Promote broadly-supported outcomes that benefit a wide range of interests (least controversial projects) | ● | The concept has passed the preliminary four screening criteria, including the beneficial and compatible screens. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| C-34: Promote broadly-supported outcomes that benefit a wide range of interests (agreements that reduce conflict) | ○ | Implementation of the concept would not directly address any current watershed conflicts. |
| C-35: Develop a program consistent with all existing licenses, permits, and agreements affecting the River | ● | As a condition of implementation, the concept would be consistent with all existing licenses, permits, and agreements affecting the Mokelumne River. As such, the concept would not interfere with any entity exercising a water right. |
| C-36: Develop a program consistent with all existing licenses, permits, and agreements affecting the River (CEQA/NEPA) | ● | As a condition of implementation, the concept would be required to adhere to all applicable regulatory requirements, including applicable CEQA/NEPA regulations documentation, etc. |
| CA-37: Avoid basing decisions on incomplete or inaccurate information | ● | Prior to implementation, the concept would undergo a planning phase that would collect and analyze data that is considered, at the time, to be the most complete and accurate. |
| CA-38: Avoid demand for new or larger on-stream dams | ● | The concept would not result in construction of a new or larger on-stream dam. |
| CA-39: Avoid harmful impacts to fisheries and other wildlife | ○ | The concept would increase diversions from the Mokelumne by 17,000 AFY in wetter years, which could harm fisheries and other wildlife. Mitigation measures could be added to reduce this impact. |
| CA-40: Avoid conversion of agricultural lands to developed uses | ● | The concept does not include elements that would convert agricultural lands to developed uses. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| CA-41: Avoid shifting environmental impacts from one area to another | ● | The concept does not include elements that would shift environmental impacts from one area to another. |
| CA-42: No diminishment of the benefits of existing in-stream flow | ○ | The concept would increase Mokelumne diversions by 17,000 AFY in wetter years when Mokelumne River water is available to NSJWCD. This reduction in flows would reduce the benefits of existing in-stream flows. Mitigation measures could be included to reduce this impact. |
| CA-43: Avoid closing the process to the public | ● | As a condition of planning and implementation, the concept would include public involvement to the extent appropriate. |
| CA-44: Avoid dependency on potentially unreliable supply | ◗ | The concept would increase the use of Mokelumne River water by 17,000 AFY in lieu of groundwater during wetter years. This would help balance the groundwater basin, allowing it to recharge in wetter years; this source could then be used in drier years when Mokelumne River water is unavailable to NSJWCD. While increasing the use of Mokelumne River water would increase dependency on a potentially unreliable supply, the recharge resulting from forgoing groundwater would be available to NSJWCD when Mokelumne River water is unavailable. |
| CA-45: Minimize adverse socio-economic and public health and safety impacts | ◗ | The concept would likely increase water quality delivered to NSJWCD by using Mokelumne River water in wetter years and recharged groundwater in drier years. This would increase public health and safety benefits. However, costs would need to be considered to minimize adverse socio-economic impacts to ratepayers associated with constructing the infrastructure. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| CA-46: Avoid end use harm | ● | The concept does not allocate water in ways that would create end use harm. |
| CA-47: Avoid violating procedural or substantive laws | ● | As a condition of implementation, the concept would be required to complete relevant CEQA/NEPA analysis prior to implementation. |
| CA-48: Avoid interregional inequity | ● | Implementation of the concept would not create interregional inequity, either in realized benefits or in costs. |

# 5a: Regional Urban Water Conservation Program

## Upper Mokelumne River Watershed Authority, Groundwater Basin Authority, City of Lodi

### Overview

**Sponsor(s):** Upper Mokelumne River Watershed Authority (UMRWA), Groundwater Basin Authority (GBA), City of Lodi

**Concept type:** Implementation

**Estimated Costs:** $80,000

**Funding Source(s):** unspecified grants and local jurisdiction operating funds

**Concept location:** Amador County, Calaveras County and San Joaquin Groundwater Banking Authority. (There will be spill over outside the MokeWISE area.)

The concept would reduce demand by 109 AFY through implementation of efficient urban water use practices. This program includes submitting a regional conservation plan for funding. The funding received would then be distributed among agencies to fund their individual plans. Plan elements may include initiating a pilot program with funding available to encourage residents to replace existing water reliant landscaping and utilize landscaping BMP's to reduce runoff and improve water quality; increasing irrigation efficiency; metering and billing based on water use; leak detection; rainwater capture; stormwater capture; education and outreach regarding lawn and landscape watering needs.

### Assessment

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| ● ***Fully addressed*** | ◗ ***Partially addressed*** | ○ ***Not addressed*** |
| WS-1: Promote demand-side management strategies | ● | The concept would promote demand-side management strategies by implementing conservation measures that would reduce urban demand for water by 109 AFY. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| WS-2: Increase supply reliability | ● | The concept would increase supply reliability by decreasing the urban demand for water by 109 AFY. This increases reliability by decreasing the amount of time that urban (and other) Mokelumne River and groundwater users would experience water shortages. Based on modeling, this concept would increase the average amount of unallocated water below Camanche. Under baseline 2040 conditions, average unallocated flow is projected to be 230.0 thousand acre-feet per year (TAFY). The concept would increase that amount to 230.1 TAFY, an increase of 0.1 TAFY or 100 AFY (Table 1). |
| WS-3: Increase amount of stored water | ◗ | The concept could increase the amount of stored water by conserving groundwater or water that would otherwise be left in surface storage. This assumes that the conserved water would remain in these places of storage and not be re-allocated for another use. |
| WS-4: Promote smart, responsible development | ● | The concept promotes smart, responsible development by encouraging water users to decrease use, thereby decreasing gallons per capita per day. This would help accommodate a growing population. |
| WS-5: Reduce reliance on groundwater for irrigation | ● | The concept would reduce reliance on groundwater for irrigation by reducing the amount of water used for irrigation. |
| WS-6: Promote a long-term groundwater balance | ◗ | The concept could promote a long-term groundwater balance by reducing the amount of water that would be otherwise be pumped for use. This assumes that the groundwater that would otherwise be pumped would remain in the groundwater basin and not be used by another entity. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| WS-7: Maximize water resource availability for all beneficial uses | ● | The concept would maximize water resource availability for all beneficial uses by conserving 109 AFY of water, which could be made available for other beneficial uses, including groundwater recharge, environmental flows, or consumptive use. Based on modeling, this concept would increase the average amount of unallocated water below Camanche. Under baseline 2040 conditions, average unallocated flow is projected to be 230 TAFY. The concept would increase that amount to 230.1 TAFY, an increase of 0.1 TAFY or 100 AFY (Table 1). |
| WS-8: Decrease the need to import water | ◗ | The concept conserves water which could potentially decrease the need to import water if the water being conserved would otherwise have been imported. |
| WD-9: Review and understand existing agency demand estimates | ○ | The concept does not include reviewing and understanding existing agency demand estimates. |
| WD-10: Identify water demand issues for timely consideration by the water agencies during their UWMP update | ○ | The concept does not include identifying water demand issues for consideration in the upcoming UWMP update. |
| WQ-11: Protect and improve surface and groundwater quality | ◗ | The concept could potentially increase surface and groundwater quality, assuming that the 109 AFY of conserved water would remain in the basin or Mokelumne River. If the conserved water were re-allocated, there would be no benefit. |
| WQ-12: Match delivered water quality use | ○ | The concept does not involve treating water, nor does it involve delivering treated water. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| WQ-13: Use water purification technology as a tool to maximize beneficial uses | ○ | The concept does not include water purification elements. |
| R-14: Increase access for water-based recreation | ○ | The concept does not include elements that would increase access to the Mokelumne River from Highway 12 to the headwaters. |
| R-15: Increase angling and other recreational opportunities (increase spawning habitat, etc.) | ○ | Based on modeling, the concept does not significantly alter the average in-stream flow in such a way as to increase the spawning habitat benefit. Under baseline 2040 conditions, average inflow to the Delta is projected to be 323.1 TAFY, while the concept would marginally increase that inflow to 323.2 TAFY; an increase of 0.1 TAFY or 100 AFY (Table 2). |
| R-16: Increase angling and other recreational opportunities (stock hatchery-raised fish) | ○ | The concept does not involve stocking hatchery-raised trout in designated areas on the upper Mokelumne, nor does it involve designating and managing wild trout sections. |
| R-17: Increase angling and other recreational opportunities (reintroduce salmon in upper Moke) | ○ | The concept does not include reintroducing salmon into the upper Mokelumne. |
| R-18: Increase angling and other recreational opportunities (increase opportunities) | ○ | The concept would not increase angling, harvesting, or other recreational opportunities. |
| WR-19: Resolve existing water rights conflicts in the watershed | ○ | The concept is not focused on resolving existing water rights protests to achieve a common understanding of the application of relevant water rights law in the watershed. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| F-20: Enhance flood protection and management | ○ | The concept does not include elements that would enhance flood protection and/or flood management, nor would the concept enhance ecosystem function in a way that would provide flood protection. |
| D-21: Use sound, agreed-upon data to evaluate program alternatives (hydrology dataset) | ○ | The concept does not involve producing an agreed-upon hydrology dataset and Water Availability Analysis separate from that which was produced as part of the MokeWISE program. |
| D-22: Use sound, agreed-upon data to evaluate program alternatives (describe in sufficient detail) | ● | The concept is well-defined enough to complete a quantitative assessment. Modeling with MOCASIM has been performed. |
| D-23: Promote the contribution of sound scientific data to current body of knowledge | ● | The concept would contribute scientific data to the current body of knowledge by collecting and reporting program information, including BMPs implemented and level of conservation achieved. |
| O-24: Increase investment in forest management | ○ | The concept does not include elements that would promote forest management, nor would it help reduce the economic impact of wildfires and other natural disasters. |
| O-25: Maximize socio-economic, cultural, recreational, public health, and public safety benefits with a particular emphasis on disadvantaged communities (DACs) | ● | The concept would maximize benefits for DACs by encouraging conservation, which would lower water bills for customers in DACs. These benefits would be realized within urban DAC's in Amador, Calaveras, and San Joaquin counties. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| O-26: Achieve equity | ● | The benefits realized from implementing the concept would not be limited to a narrow group; rather, project benefits would be spread across regions, cultures, incomes, and time. |
| E-27: Protect and enhance natural environment (enhance natural envt) | ○ | Based on modeling, the concept does not significantly alter the average in-stream flow in such a way as to enhance the natural environment. Under baseline 2040 conditions, average inflow to the Delta is projected to be 323.1 TAFY, while the concept would marginally increase that inflow to 323.2 TAFY This slight increase of 0.1 TAFY or 100 AF in flow would not likely provide a significant geomorphic or habitat benefit (Table 2). |
| E-28: Protect and enhance natural environment (wild & scenic designation) | ○ | The concept does not incorporate or seek a wild and scenic designation. |
| E-29: Protect and restore fisheries | ◗ | Based on modeling, the concept does not significantly alter the average in-stream flow in such a way as to restore fisheries. Under baseline 2040 conditions, average inflow to the Delta is projected to be 323.1 TAFY, while the concept would marginally increase that inflow to 323.2 TAFY; an increase of 0.1 TAFY or 100 AFY (Table 2). However, this concept could protect fisheries by conserving water which would otherwise be diverted for use. Assuming this forgone water was left in the river and not allocated elsewhere, this water could provide instream flow augmentation and/or fishery habitat protection. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| A-30: Enhance or maintain the water supply for the beneficial use in ag practices | ○ | The concept would not enhance or maintain water supply for agricultural uses. |
| C-31: Foster long-term regional relationships and avoid unnecessary conflict and litigation | ● | The concept would help foster regional relationships by requiring long-term coordination between water agencies, state/federal agencies, private water users, and non-governmental organizations. |
| C-32: Promote broadly-supported outcomes that benefit a wide range of interests | ● | The concept would reduce demands and conserve water. These outcomes are supported by a wide range of interests within the watershed, including water agencies and non-governmental organizations. |
| C-33: Promote broadly-supported outcomes that benefit a wide range of interests (least controversial projects) | ● | The concept has passed the preliminary four screening criteria, including the beneficial and compatible screens. |
| C-34: Promote broadly-supported outcomes that benefit a wide range of interests (agreements that reduce conflict) | ○ | The concept would conserve water; its implementation would not directly address any current watershed conflicts. |
| C-35: Develop a program consistent with all existing licenses, permits, and agreements affecting the River | ● | As a condition of implementation, the concept would be consistent with all existing licenses, permits, and agreements affecting the Mokelumne River. As such, the concept would not interfere with any entity exercising a water right. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| C-36: Develop a program consistent with all existing licenses, permits, and agreements affecting the River (CEQA/NEPA) | ● | As a condition of implementation, the concept would be required to adhere to all applicable regulatory requirements, including applicable CEQA/NEPA regulations documentation, etc. |
| CA-37: Avoid basing decisions on incomplete or inaccurate information | ● | Prior to implementation, the concept would undergo a planning phase that would collect and analyze data that is considered, at the time, to be the most complete and accurate. |
| CA-38: Avoid demand for new or larger on-stream dams | ● | The concept would not result in construction of a new or larger on-stream dam. |
| CA-39: Avoid harmful impacts to fisheries and other wildlife | ● | The concept would not create harmful impacts to fisheries and other wildlife. |
| CA-40: Avoid conversion of agricultural lands to developed uses | ● | The concept does not include elements that would convert agricultural lands to developed uses. |
| CA-41: Avoid shifting environmental impacts from one area to another | ● | The concept does not include elements that would shift environmental impacts from one area to another. |
| CA-42: No diminishment of the benefits of existing in-stream flow | ● | The concept does not include elements that would decrease existing in-stream flows. On the contrary, the concept could potentially increase flows by leaving more water in the River. |
| CA-43: Avoid closing the process to the public | ● | As a condition of planning and implementation, the concept would include public involvement to the extent appropriate. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| CA-44: Avoid dependency on potentially unreliable supply | ● | The concept does not include elements that would facilitate downstream users becoming dependent on an unreliable supply. On the contrary, the concept decreases dependency on water supplies which could be potentially unreliable. |
| CA-45: Minimize adverse socio-economic and public health and safety impacts | ◗ | Conserving water would not create any adverse public health and safety impacts. Depending on the levels of conservation, socio-economic impacts could be seen among water agencies whose revenue can heavily rely on supplied water. If water use decreases, revenues will also decrease, thereby causing adverse socio-economic impacts. Mitigation measures can be implemented to safeguard against these impacts. |
| CA-46: Avoid end use harm | ● | The concept does not allocate water in ways that would create end use harm. |
| CA-47: Avoid violating procedural or substantive laws | ● | As a condition of implementation, the concept would be required to complete relevant CEQA/NEPA analysis prior to implementation. |
| CA-48: Avoid interregional inequity | ● | Implementation of the concept would not create interregional inequity, either in realized benefits or in costs. |

**Table 1: Difference in Unallocated Flow between 2040 Baseline Case and Case Implementing Urban Conservation (TAF)**

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1953** | 0.01 | 0.00 | 0.00 | 0.00 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.00 | 0.00 | 0.00 | 0.09 |
| **1954** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1955** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.22 | 0.22 |
| **1956** | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.09 |
| **1957** | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.04 |
| **1958** | 0.00 | 0.03 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.10 |
| **1959** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1960** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1961** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1962** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1963** | 0.00 | 4.73 | 0.00 | 0.00 | 4.71 | 0.05 | 0.05 | 0.05 | 0.05 | 0.00 | 0.01 | 0.00 | 9.66 |
| **1964** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -9.41 | -9.41 |
| **1965** | 0.01 | 0.01 | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.01 | 0.01 | 0.10 |
| **1966** | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 |
| **1967** | 0.11 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.18 |
| **1968** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1969** | 0.13 | 0.01 | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.01 | 0.21 |
| **1970** | 0.01 | 0.01 | 0.01 | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.01 | 0.01 | 0.10 |
| **1971** | 0.01 | 0.01 | 0.01 | 0.00 | 0.02 | 0.01 | 0.02 | 0.02 | 0.01 | 0.00 | 0.01 | 0.01 | 0.11 |
| **1972** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1973** | 0.11 | 0.01 | 0.01 | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.01 | 0.01 | 0.20 |
| **1974** | 0.01 | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.09 |
| **1975** | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.00 | 0.01 | 0.00 | 0.12 |
| **1976** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1977** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1978** | 0.00 | 0.00 | 0.00 | 0.00 | 0.06 | 0.06 | 0.06 | 0.06 | 0.06 | 0.00 | 0.00 | 0.00 | 0.28 |
| **1979** | 0.00 | 0.02 | 0.02 | 0.00 | 0.02 | 0.01 | 0.02 | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 | 0.11 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1980** | 0.02 | 0.01 | 0.01 | 0.00 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.10 |
| **1981** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.12 | 0.12 |
| **1982** | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.01 | 0.01 | 0.11 |
| **1983** | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.01 | 0.01 | 0.11 |
| **1984** | 0.01 | 0.01 | 0.01 | 0.00 | 0.02 | 0.01 | 0.02 | 0.02 | 0.01 | 0.00 | 0.01 | 0.00 | 0.10 |
| **1985** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1986** | 0.00 | 0.13 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.20 |
| **1987** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1988** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1989** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1990** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1991** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1992** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1993** | 0.00 | 0.00 | 0.00 | 0.00 | 0.11 | 0.10 | 0.11 | 0.11 | 0.10 | 0.00 | 0.00 | 0.00 | 0.52 |
| **1994** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1995** | 0.00 | 0.12 | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.19 |
| **1996** | 0.00 | 0.03 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.01 | 0.01 | 0.12 |
| **1997** | 0.01 | 0.01 | 0.01 | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.01 | 0.00 | 0.10 |
| **1998** | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.10 |
| **1999** | 0.02 | 0.01 | 0.01 | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.10 |
| **2000** | 0.00 | 0.03 | 0.01 | 0.00 | 0.02 | 0.01 | 0.02 | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 | 0.11 |
| **2001** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **2002** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **2003** | 0.00 | 0.00 | 0.00 | 0.00 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.00 | 0.00 | 0.00 | 0.13 |
| **2004** | 0.00 | 0.00 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.03 |
| **2005** | 0.00 | 0.10 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.01 | 0.19 |
| **2006** | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.01 | 0.01 | 0.10 |
| **2007** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **2008** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **2009** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **2010** | 0.00 | 0.00 | 0.00 | 0.00 | 0.08 | 0.07 | 0.08 | 0.08 | 0.07 | 0.00 | 0.01 | 0.01 | 0.39 |
| | | | | | | | | | | | | | |
| **Ave** | 0.01 | 0.09 | 0.00 | 0.00 | 0.09 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | -0.15 | 0.09 |
| **Max** | 0.01 | 0.13 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.01 | -9.41 | 0.11 |
| **Min** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

**Table 2: Difference in Mokelumne Flow to Delta between 2040 Baseline Case and Case Implementing Urban Conservation (TAF)**

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1953** | 0.01 | 0.00 | 0.00 | 0.00 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.00 | 0.00 | 0.00 | 0.09 |
| **1954** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1955** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.22 | 0.22 |
| **1956** | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.08 |
| **1957** | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.04 |
| **1958** | 0.00 | 0.03 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.10 |
| **1959** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1960** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1961** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 5.71 | 5.17 | 4.51 | 15.39 |
| **1962** | 4.78 | 4.72 | 3.83 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -4.61 | -4.46 | -4.61 | -0.35 |
| **1963** | -4.58 | 0.59 | -4.58 | 0.00 | 4.71 | 0.05 | 0.05 | 0.05 | 0.05 | 0.03 | 0.03 | 0.03 | -3.55 |
| **1964** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -9.41 | -9.41 |
| **1965** | 0.01 | 0.01 | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.01 | 0.01 | 0.10 |
| **1966** | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 |
| **1967** | 0.11 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.17 |
| **1968** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1969** | 0.13 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.01 | 0.21 |
| **1970** | 0.01 | 0.01 | 0.01 | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.01 | 0.01 | 0.10 |
| **1971** | 0.01 | 0.01 | 0.01 | 0.00 | 0.02 | 0.01 | 0.02 | 0.02 | 0.01 | 0.00 | 0.01 | 0.01 | 0.11 |
| **1972** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1973** | 0.11 | 0.00 | 0.00 | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.01 | 0.01 | 0.19 |
| **1974** | 0.01 | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.08 |
| **1975** | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 | 0.00 | 0.01 | 0.00 | 0.12 |
| **1976** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1977** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1978** | 0.00 | 0.00 | 0.00 | 0.00 | 0.06 | 0.06 | 0.06 | 0.06 | 0.06 | 0.00 | 0.00 | 0.00 | 0.28 |
| **1979** | 0.00 | 0.02 | 0.02 | 0.00 | 0.02 | 0.01 | 0.02 | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 | 0.11 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1980** | 0.02 | 0.01 | 0.01 | 0.00 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.10 |
| **1981** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.12 | 0.12 |
| **1982** | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.01 | 0.01 | 0.11 |
| **1983** | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.01 | 0.01 | 0.11 |
| **1984** | 0.01 | 0.01 | 0.01 | 0.00 | 0.02 | 0.01 | 0.02 | 0.02 | 0.01 | 0.00 | 0.01 | 0.00 | 0.10 |
| **1985** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1986** | 0.00 | 0.13 | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.18 |
| **1987** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1988** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1989** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1990** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1991** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1992** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1993** | 0.00 | 0.00 | 0.00 | 0.00 | 0.11 | 0.10 | 0.11 | 0.11 | 0.10 | 0.00 | 0.00 | 0.00 | 0.52 |
| **1994** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1995** | 0.00 | 0.12 | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.18 |
| **1996** | 0.00 | 0.03 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.01 | 0.01 | 0.11 |
| **1997** | 0.01 | 0.01 | 0.01 | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.01 | 0.00 | 0.09 |
| **1998** | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.09 |
| **1999** | 0.02 | 0.01 | 0.01 | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.10 |
| **2000** | 0.00 | 0.03 | 0.01 | 0.00 | 0.02 | 0.01 | 0.02 | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 | 0.11 |
| **2001** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **2002** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **2003** | 0.00 | 0.00 | 0.00 | 0.00 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | -0.01 | 0.00 | 0.00 | 0.12 |
| **2004** | 0.00 | 0.00 | 0.03 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.03 |
| **2005** | 0.00 | 0.10 | 0.00 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.00 | 0.01 | 0.18 |
| **2006** | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.01 | 0.01 | 0.10 |
| **2007** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **2008** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **2009** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **2010** | 0.00 | 0.00 | 0.00 | 0.00 | 0.08 | 0.07 | 0.08 | 0.08 | 0.07 | 0.00 | 0.01 | 0.01 | 0.39 |
| | | | | | | | | | | | | | |
| **Ave** | 0.01 | 0.10 | -0.01 | 0.00 | 0.09 | 0.01 | 0.01 | 0.01 | 0.01 | 0.02 | 0.01 | -0.16 | 0.12 |
| **Max** | 0.01 | 0.13 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.01 | -9.41 | 0.11 |
| **Min** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

# 5b: Regional Agriculture Conservation Program

## San Joaquin County Resource Conservation District; JVID

### Overview

The concept will develop a program to increase agricultural irrigation efficiency. This program would work with growers and agencies to test and evaluate agricultural management practices for irrigation water management efficiency. Due to implementation of these practices, 2,262 AFY of water would be conserved.

**Sponsor(s):** San Joaquin County Resource Conservation District (SJCRCD); Jackson Valley Irrigation District (JVID)

**Concept type:** Implementation

**Estimated Costs:** $100,00

**Funding Source(s):** USDA NRCS CIG Grants, DWR Ag Water Use Efficiency grants, Department of Conservation, the water boards (state and regional),Water Agencies, Irrigation Districts.

**Concept location:** Amador, Calaveras, and San Joaquin counties. 38.173 -121.167 (USDA NRCS Plant Materials Center as study/demonstration site)

### Assessment

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| ● ***Fully addressed*** | ◗ ***Partially addressed*** | ○ ***Not addressed*** |
| WS-1: Promote demand-side management strategies | ● | The concept would promote demand-side management strategies by evaluating conservation measures that would reduce the demand for agricultural irrigation and conserving 2,262 AFY of water. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| WS-2: Increase supply reliability | ● | The concept would increase supply reliability by decreasing the agricultural demand for water by 2,262 AFY. This increases reliability by decreasing the amount of time that agricultural (and other) Mokelumne River and groundwater users would experience water shortages. Based on modeling, this concept would increase the average amount of unallocated water below Camanche. Under baseline 2040 conditions, average unallocated flow below Camanche is projected to be 230.0 thousand acre-feet per year (TAFY). The concept would increase that amount to 231 TAFY, an increase of 1 TAFY (Table 1). This assumes that the water conserved would have been diverted from the Mokelumne River; if groundwater is conserved, the change in unallocated flows would be less than 1 TAFY. |
| WS-3: Increase amount of stored water | ◗ | The concept could increase the amount of stored water by conserving groundwater or water that would otherwise be left in surface storage. This assumes that the conserved water would remain in these places of storage and not be re-allocated for another use. |
| WS-4: Promote smart, responsible development | ● | The concept promotes smart, responsible development by encouraging water users to decrease use, thereby decreasing water used per acre. This would help accommodate a growing population and increase agricultural land use efficiency. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| WS-5: Reduce reliance on groundwater for irrigation | ● | Many agricultural users in the upper and lower watershed rely on groundwater for irrigation. The concept would reduce reliance on groundwater for irrigation by reducing the amount of water used for agricultural irrigation by roughly 2,262 AFY. |
| WS-6: Promote a long-term groundwater balance | ◗ | The concept could promote a long-term groundwater balance by reducing the amount of water that would be otherwise be pumped for use (roughly 2,262 AFY). This assumes that the groundwater that would otherwise be pumped would remain in the groundwater basin and not be reallocated. |
| WS-7: Maximize water resource availability for all beneficial uses | ● | The concept would maximize water resource availability for all beneficial uses by conserving 2,262 AFY of water, which could be made available for other beneficial uses, including groundwater recharge, environmental flows, or consumptive use. Based on modeling, this concept would increase the average amount of unallocated water below Camanche. Under baseline 2040 conditions, average unallocated flow below Camanche is projected to be 230.0 TAFY. The concept would increase that amount to 231 TAFY, an increase of 1 TAFY (Table 1). This assumes that the water conserved would have been diverted from the Mokelumne River; if groundwater is conserved, the change in unallocated flows would be less than 1 TAFY. |
| WS-8: Decrease the need to import water | ◗ | The concept conserves water which could potentially decrease the need to import water if the water being conserved would otherwise have been imported. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| WD-9: Review and understand existing agency demand estimates | ○ | The concept does not include reviewing and understanding existing agency demand estimates. |
| WD-10: Identify water demand issues for timely consideration by the water agencies during their UWMP update | ○ | The concept does not include identifying water demand issues for consideration in the upcoming UWMP update. |
| WQ-11: Protect and improve surface and groundwater quality | ◗ | The concept could potentially increase surface and groundwater quality, assuming that the 2,262 AFY of conserved water would remain in the basin or Mokelumne River. If the conserved water were re-allocated, there would be no benefit. |
| WQ-12: Match delivered water quality use | ○ | The concept does not involve treating water, nor does it involve delivering treated water. |
| WQ-13: Use water purification technology as a tool to maximize beneficial uses | ○ | The concept does not include water purification elements. |
| R-14: Increase access for water-based recreation | ○ | The concept does not include elements that would increase access to the Mokelumne River from Highway 12 to the headwaters. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| R-15: Increase angling and other recreational opportunities (increase spawning habitat, etc.) | ○ | The concept could increase available surface water supplies for other beneficial uses, which could be used for instream flow augmentation and fishery habitat enhancement. Based on modeling, under baseline 2040 conditions, average inflow to the Delta is projected to be 323.1 TAFY. The concept would increase this flow to 324.5 TAFY, an increase of 1.4 TAFY (Table 2). However, this assumes that the water conserved would have been diverted from the Mokelumne River; if groundwater is conserved, the change in flow would be less than 1.4 TAFY. Because many agricultural users rely on groundwater for irrigation, agricultural conservation would likely lead to more groundwater recharge than it would biogeomorphic benefits that would increase spawning habitat. |
| R-16: Increase angling and other recreational opportunities (stock hatchery-raised fish) | ○ | The concept does not involve stocking hatchery-raised trout in designated areas on the upper Mokelumne, nor does it involve designating and managing wild trout sections. |
| R-17: Increase angling and other recreational opportunities (reintroduce salmon in upper Moke) | ○ | The concept does not include reintroducing salmon into the upper Mokelumne. |
| R-18: Increase angling and other recreational opportunities (increase opportunities) | ○ | The concept would not increase angling, harvesting, or other recreational opportunities. |
| WR-19: Resolve existing water rights conflicts in the watershed | ○ | The concept is not focused on resolving existing water rights protests to achieve a common understanding of the application of relevant water rights law in the watershed. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| F-20: Enhance flood protection and management | ○ | The concept does not include elements that would enhance flood protection and/or flood management, nor would the concept enhance ecosystem function in a way that would provide flood protection. |
| D-21: Use sound, agreed-upon data to evaluate program alternatives (hydrology dataset) | ○ | The concept does not involve producing an agreed-upon hydrology dataset and Water Availability Analysis separate from that which was produced as part of the MokeWISE program. |
| D-22: Use sound, agreed-upon data to evaluate program alternatives (describe in sufficient detail) | ● | The concept is well-defined enough to complete a quantitative assessment. Modeling with MOCASIM has been performed. |
| D-23: Promote the contribution of sound scientific data to current body of knowledge | ● | The concept would contribute scientific data to the current body of knowledge by collecting and reporting program information, including BMPs implemented and level of conservation achieved. |
| O-24: Increase investment in forest management | ○ | The concept does not include elements that would promote forest management, nor would it help reduce the economic impact of wildfires and other natural disasters. |
| O-25: Maximize socio-economic, cultural, recreational, public health, and public safety benefits with a particular emphasis on disadvantaged communities (DACs) | ● | The concept would maximize benefits for agricultural users, some of which are in DACs. Encouraging conservation by these users would maximize socio-economic benefits for these users by helping lower water bills. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| O-26: Achieve equity | ● | The benefits realized from implementing the concept would not be limited to a narrow group; rather, project benefits would be spread across regions, cultures, incomes, and time. |
| E-27: Protect and enhance natural environment (enhance natural envt) | ● | Since agricultural irrigation uses a big portion of available water supply, significant increases in efficiencies could reduce surface water diversions and GW pumping throughout the watershed. Based on modeling, the concept would increase in-stream flows. Under baseline 2040 conditions, average inflow to the Delta is projected to be 323.1 TAFY. The concept would increase this flow to 324.5 TAFY, an increase of 1.4 TAFY (Table 2). However, this assumes that the water conserved would have been diverted from the Mokelumne River; if groundwater is conserved, the change in flow would be less than 1.4 TAFY. |
| E-28: Protect and enhance natural environment (wild & scenic designation) | ○ | The concept does not incorporate or seek a wild and scenic designation. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| E-29: Protect and restore fisheries | ◗ | Many agricultural users in the upper and lower watershed rely on groundwater for irrigation. Based on modeling, under baseline 2040 conditions, average inflow to the Delta is projected to be 323.1 TAFY. The concept would increase this flow to 324.5 TAFY, an increase of 1.4 TAFY (Table 2). However, this assumes that the water conserved would have been diverted from the Mokelumne River; if groundwater is conserved, the change in flow would be less than 1.4 TAFY. While the concept would reduce reliance on both groundwater and surface water, it is likely that more groundwater would be conserved than would surface water. Based on the supply conserved, this could concept potentially protect and restore fisheries by conserving Mokelumne River water. |
| A-30: Enhance or maintain the water supply for the beneficial use in ag practices | ● | By increasing supply reliability for agricultural users, the concept would enhance and maintain the water supply for beneficial use in agricultural practices. |
| C-31: Foster long-term regional relationships and avoid unnecessary conflict and litigation | ● | The concept would help foster regional relationships by requiring long-term coordination between water agencies, state/federal agencies, farmers, and non-governmental organizations. |
| C-32: Promote broadly-supported outcomes that benefit a wide range of interests | ● | The concept would reduce demands and conserve water. These outcomes are supported by a wide range of interests within the watershed, including water agencies and non-governmental organizations. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| C-33: Promote broadly-supported outcomes that benefit a wide range of interests (least controversial projects) | ● | The concept has passed the preliminary four screening criteria, including the beneficial and compatible screens. |
| C-34: Promote broadly-supported outcomes that benefit a wide range of interests (agreements that reduce conflict) | ○ | The concept would conserve water; its implementation would not directly address any current watershed conflicts. |
| C-35: Develop a program consistent with all existing licenses, permits, and agreements affecting the River | ● | As a condition of implementation, the concept would be consistent with all existing licenses, permits, and agreements affecting the Mokelumne River. As such, the concept would not interfere with any entity exercising a water right. |
| C-36: Develop a program consistent with all existing licenses, permits, and agreements affecting the River (CEQA/NEPA) | ● | As a condition of implementation, the concept would be required to adhere to all applicable regulatory requirements, including applicable CEQA/NEPA regulations documentation, etc. |
| CA-37: Avoid basing decisions on incomplete or inaccurate information | ● | Prior to implementation, the concept would undergo a planning phase that would collect and analyze data that is considered, at the time, to be the most complete and accurate. |
| CA-38: Avoid demand for new or larger on-stream dams | ● | The concept would not result in construction of a new or larger on-stream dam. |
| CA-39: Avoid harmful impacts to fisheries and other wildlife | ● | The concept would not create harmful impacts to fisheries and other wildlife. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| CA-40: Avoid conversion of agricultural lands to developed uses | ● | The concept does not include elements that would convert agricultural lands to developed uses. |
| CA-41: Avoid shifting environmental impacts from one area to another | ● | The concept does not include elements that would shift environmental impacts from one area to another. |
| CA-42: No diminishment of the benefits of existing in-stream flow | ● | The concept does not include elements that would decrease existing in-stream flows. On the contrary, the concept could potentially increase flows by leaving more water in the River. |
| CA-43: Avoid closing the process to the public | ● | As a condition of planning and implementation, the concept would include public involvement to the extent appropriate. |
| CA-44: Avoid dependency on potentially unreliable supply | ● | The concept does not include elements that would facilitate downstream users becoming dependent on an unreliable supply. On the contrary, the concept decreases dependency on water supplies which could be potentially unreliable. |
| CA-45: Minimize adverse socio-economic and public health and safety impacts | ● | Conserving water would not create any adverse public health and safety impacts. Depending on the amount of water agency delivered conserved, socio-economic impacts could be seen among water agencies whose revenue can heavily rely on supplied water. However, due to the large amount of groundwater and privately diverted Mokelumne River water used for agriculture, these impacts are likely low. |
| CA-46: Avoid end use harm | ● | The concept does not allocate water in ways that would create end use harm. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| CA-47: Avoid violating procedural or substantive laws | ● | As a condition of implementation, the concept would be required to complete relevant CEQA/NEPA analysis prior to implementation. |
| CA-48: Avoid interregional inequity | ● | Implementation of the concept would not create interregional inequity, either in realized benefits or in costs. |

**Table 1: Difference in Unallocated Flow between 2040 Baseline Case and Case Implementing Agricultural Conservation**

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1953** | -0.01 | 0.00 | 0.00 | 0.00 | -0.39 | -0.38 | -0.39 | -0.39 | -0.38 | 0.00 | 0.00 | 0.00 | -1.93 |
| **1954** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1955** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -3.18 | -3.18 |
| **1956** | -0.01 | -0.01 | -0.01 | -0.09 | -0.27 | -0.38 | -0.38 | -0.38 | -0.37 | 0.00 | 0.00 | 0.00 | -1.92 |
| **1957** | 0.00 | 0.00 | 0.00 | 0.00 | -0.14 | -0.13 | -0.14 | -0.14 | -0.13 | 0.00 | 0.00 | 0.00 | -0.68 |
| **1958** | 0.00 | -0.05 | -0.01 | -0.09 | -0.27 | -0.38 | -0.38 | -0.38 | -0.37 | 0.00 | 0.00 | 0.00 | -1.95 |
| **1959** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1960** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1961** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1962** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1963** | 0.00 | 11.10 | 0.00 | 0.00 | -0.62 | -0.51 | -0.51 | -0.51 | -0.49 | 0.00 | -0.02 | 0.00 | 8.45 |
| **1964** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -1.62 | -1.62 |
| **1965** | -0.01 | -0.01 | 0.00 | -0.03 | -0.27 | -0.37 | -0.39 | -0.39 | -0.37 | 0.00 | -0.02 | -0.01 | -1.87 |
| **1966** | -0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.01 |
| **1967** | -1.61 | -0.01 | -0.01 | -0.08 | -0.26 | -0.36 | -0.37 | -0.37 | -0.36 | 0.00 | 0.00 | 0.00 | -3.43 |
| **1968** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1969** | -1.66 | -0.01 | -0.01 | -0.08 | -0.26 | -0.36 | -0.37 | -0.37 | -0.35 | 0.00 | 0.00 | -0.03 | -3.49 |
| **1970** | -0.01 | -0.01 | -0.01 | 0.00 | -0.37 | -0.35 | -0.37 | -0.37 | -0.35 | 0.00 | -0.02 | -0.01 | -1.87 |
| **1971** | -0.01 | -0.01 | -0.01 | 0.00 | -0.38 | -0.37 | -0.38 | -0.38 | -0.37 | 0.00 | -0.02 | -0.01 | -1.96 |
| **1972** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1973** | -1.63 | -0.01 | -0.01 | 0.00 | -0.36 | -0.35 | -0.36 | -0.36 | -0.35 | 0.00 | -0.02 | -0.01 | -3.47 |
| **1974** | -0.01 | 0.00 | -0.02 | -0.01 | -0.27 | -0.37 | -0.39 | -0.39 | -0.37 | 0.00 | 0.00 | 0.00 | -1.84 |
| **1975** | 0.00 | 0.00 | 0.00 | 0.00 | -0.40 | -0.38 | -0.40 | -0.40 | -0.38 | 0.00 | -0.02 | 0.00 | -1.98 |
| **1976** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1977** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1978** | 0.00 | 0.00 | 0.00 | 0.00 | -0.80 | -0.77 | -0.80 | -0.80 | -0.77 | 0.00 | 0.00 | 0.00 | -3.93 |
| **1979** | 0.00 | -0.04 | -0.02 | 0.00 | -0.38 | -0.37 | -0.38 | -0.38 | -0.37 | 0.00 | 0.00 | 0.00 | -1.96 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1980** | -0.04 | -0.01 | -0.01 | 0.00 | -0.37 | -0.37 | -0.39 | -0.39 | -0.37 | 0.00 | 0.00 | 0.00 | -1.95 |
| **1981** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -1.64 | -1.64 |
| **1982** | -0.01 | -0.01 | -0.02 | -0.10 | -0.28 | -0.38 | -0.39 | -0.39 | -0.38 | 0.00 | -0.02 | -0.01 | -1.97 |
| **1983** | -0.01 | -0.01 | -0.01 | -0.10 | -0.28 | -0.38 | -0.38 | -0.38 | -0.37 | 0.00 | -0.02 | -0.01 | -1.96 |
| **1984** | -0.01 | -0.01 | -0.01 | 0.00 | -0.37 | -0.36 | -0.37 | -0.37 | -0.36 | 0.00 | -0.02 | 0.00 | -1.87 |
| **1985** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1986** | 0.00 | -1.65 | -0.01 | -0.08 | -0.25 | -0.36 | -0.37 | -0.37 | -0.36 | 0.00 | 0.00 | 0.00 | -3.44 |
| **1987** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1988** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1989** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1990** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1991** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1992** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1993** | 0.00 | 0.00 | 0.00 | 0.00 | 1.01 | 0.98 | 1.01 | 1.01 | 0.98 | 0.00 | 0.00 | 0.00 | 4.98 |
| **1994** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1995** | 0.00 | -1.06 | -0.01 | -0.08 | -0.26 | -0.37 | -0.37 | -0.37 | -0.36 | 0.00 | 0.00 | 0.00 | -2.88 |
| **1996** | 0.00 | -0.05 | -0.01 | -0.09 | -0.27 | -0.37 | -0.38 | -0.38 | -0.37 | 0.00 | -0.02 | -0.01 | -1.98 |
| **1997** | -0.01 | -0.01 | -0.01 | 0.00 | -0.38 | -0.37 | -0.38 | -0.38 | -0.37 | 0.00 | -0.02 | 0.00 | -1.94 |
| **1998** | -0.03 | -0.01 | -0.01 | -0.09 | -0.27 | -0.38 | -0.38 | -0.38 | -0.37 | 0.00 | 0.00 | 0.00 | -1.94 |
| **1999** | -0.04 | -0.01 | -0.01 | 0.00 | -0.38 | -0.37 | -0.38 | -0.38 | -0.37 | 0.00 | 0.00 | 0.00 | -1.95 |
| **2000** | 0.00 | -0.05 | -0.01 | 0.00 | -0.38 | -0.37 | -0.38 | -0.38 | -0.37 | 0.00 | 0.00 | 0.00 | -1.96 |
| **2001** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **2002** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **2003** | 0.00 | 0.00 | 0.00 | 0.00 | -0.39 | -0.38 | -0.39 | -0.39 | -0.38 | 0.00 | 0.00 | 0.00 | -1.95 |
| **2004** | 0.00 | 0.00 | -0.07 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.07 |
| **2005** | 0.00 | -1.61 | -0.01 | -0.01 | -0.26 | -0.36 | -0.36 | -0.36 | -0.35 | 0.00 | 0.00 | -0.03 | -3.37 |
| **2006** | -0.01 | -0.01 | -0.01 | -0.09 | -0.27 | -0.38 | -0.38 | -0.38 | -0.37 | 0.00 | -0.02 | -0.01 | -1.95 |
| **2007** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **2008** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **2009** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **2010** | 0.00 | 0.00 | 0.00 | 0.00 | -1.16 | -1.13 | -1.16 | -1.16 | -1.13 | 0.00 | -0.02 | -0.01 | -5.77 |
| | | | | | | | | | | | | | |
| **Ave** | -0.09 | 0.11 | -0.01 | -0.02 | -0.17 | -0.19 | -0.20 | -0.20 | -0.19 | 0.00 | 0.00 | -0.11 | -1.07 |
| **Max** | -0.01 | -1.65 | -0.01 | -0.09 | -0.26 | -0.38 | -0.38 | -0.38 | -0.37 | 0.00 | -0.02 | -1.62 | -1.96 |
| **Min** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

**Table 2: Difference in Mokelumne Flow to Delta between 2040 Baseline Case and Case Implementing Agricultural Conservation**

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1953** | -0.01 | 0.00 | -0.01 | 0.00 | -0.39 | -0.38 | -0.39 | -0.39 | -0.38 | -0.12 | 0.00 | 0.00 | -2.06 |
| **1954** | 0.00 | 0.00 | -0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.10 | 0.00 | 0.00 | -0.11 |
| **1955** | 0.00 | 0.00 | -0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.10 | 0.00 | -3.18 | -3.29 |
| **1956** | -0.01 | -0.01 | -0.02 | -0.09 | -0.27 | -0.38 | -0.38 | -0.38 | -0.37 | -0.12 | 0.00 | 0.00 | -2.04 |
| **1957** | 0.00 | 0.00 | -0.01 | 0.00 | -0.14 | -0.13 | -0.14 | -0.14 | -0.13 | -0.03 | 0.00 | 0.00 | -0.72 |
| **1958** | 0.00 | -0.05 | -0.02 | -0.09 | -0.27 | -0.38 | -0.38 | -0.38 | -0.37 | -0.12 | 0.00 | 0.00 | -2.07 |
| **1959** | 0.00 | 0.00 | -0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.10 | 0.00 | 0.00 | -0.11 |
| **1960** | 0.00 | 0.00 | -0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.10 | 0.00 | 0.00 | -0.11 |
| **1961** | 0.00 | 0.00 | -0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.01 |
| **1962** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.10 | 0.00 | 0.00 | -0.10 |
| **1963** | -0.10 | 11.02 | -0.12 | 0.00 | -0.62 | -0.51 | -0.51 | -0.51 | -0.49 | -0.20 | -0.10 | -0.10 | 7.76 |
| **1964** | 0.00 | 0.00 | -0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.10 | 0.00 | -1.62 | -1.73 |
| **1965** | -0.01 | -0.01 | -0.01 | -0.11 | -0.27 | -0.37 | -0.39 | -0.39 | -0.37 | -0.12 | -0.01 | -0.01 | -2.07 |
| **1966** | -0.01 | 0.00 | -0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.10 | 0.00 | 0.00 | -0.12 |
| **1967** | -1.60 | 0.00 | -0.01 | -0.08 | -0.26 | -0.36 | -0.37 | -0.37 | -0.36 | -0.10 | 0.01 | 0.02 | -3.47 |
| **1968** | 0.00 | 0.00 | -0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.10 | 0.00 | 0.00 | -0.11 |
| **1969** | -1.64 | 0.00 | -0.01 | -0.08 | -0.26 | -0.36 | -0.37 | -0.37 | -0.35 | -0.10 | 0.01 | -0.01 | -3.54 |
| **1970** | -0.01 | -0.01 | -0.02 | -0.08 | -0.37 | -0.35 | -0.37 | -0.37 | -0.35 | -0.12 | -0.01 | -0.01 | -2.07 |
| **1971** | -0.01 | -0.01 | -0.02 | 0.00 | -0.38 | -0.37 | -0.38 | -0.38 | -0.37 | -0.12 | -0.02 | -0.01 | -2.09 |
| **1972** | 0.00 | 0.00 | -0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.10 | 0.00 | 0.00 | -0.11 |
| **1973** | -1.61 | 0.00 | -0.01 | 0.00 | -0.36 | -0.35 | -0.36 | -0.36 | -0.35 | -0.10 | 0.00 | 0.00 | -3.51 |
| **1974** | -0.01 | 0.00 | -0.03 | -0.09 | -0.27 | -0.37 | -0.39 | -0.39 | -0.37 | -0.12 | 0.00 | 0.00 | -2.04 |
| **1975** | 0.00 | 0.00 | -0.01 | 0.00 | -0.40 | -0.38 | -0.40 | -0.40 | -0.38 | -0.12 | -0.02 | 0.00 | -2.10 |
| **1976** | 0.00 | 0.00 | -0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.04 | 0.00 | 0.00 | -0.05 |
| **1977** | 0.00 | 0.00 | -0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.01 |
| **1978** | 0.00 | 0.00 | 0.00 | -0.08 | -0.80 | -0.77 | -0.80 | -0.80 | -0.77 | -0.12 | 0.00 | 0.00 | -4.13 |
| **1979** | 0.00 | -0.04 | -0.04 | 0.00 | -0.38 | -0.37 | -0.38 | -0.38 | -0.37 | -0.12 | 0.00 | 0.00 | -2.09 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1980** | -0.04 | -0.01 | -0.02 | 0.00 | -0.37 | -0.37 | -0.39 | -0.39 | -0.37 | -0.12 | 0.00 | 0.00 | -2.07 |
| **1981** | 0.00 | 0.00 | -0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.10 | 0.00 | -1.64 | -1.74 |
| **1982** | -0.01 | -0.01 | -0.02 | -0.10 | -0.28 | -0.38 | -0.39 | -0.39 | -0.38 | -0.12 | -0.02 | -0.01 | -2.09 |
| **1983** | -0.01 | -0.01 | -0.02 | -0.10 | -0.28 | -0.38 | -0.38 | -0.38 | -0.37 | -0.12 | -0.02 | -0.01 | -2.09 |
| **1984** | -0.01 | -0.01 | -0.02 | -0.08 | -0.37 | -0.36 | -0.37 | -0.37 | -0.36 | -0.12 | -0.02 | 0.00 | -2.08 |
| **1985** | 0.00 | 0.00 | -0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.10 | 0.00 | 0.00 | -0.11 |
| **1986** | 0.02 | -1.64 | -0.01 | -0.08 | -0.25 | -0.36 | -0.37 | -0.37 | -0.36 | -0.10 | 0.01 | 0.02 | -3.48 |
| **1987** | 0.00 | 0.00 | -0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.04 | 0.00 | 0.00 | -0.05 |
| **1988** | 0.00 | 0.00 | -0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.01 |
| **1989** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.10 | 0.00 | 0.00 | -0.10 |
| **1990** | 0.00 | 0.00 | -0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.04 | 0.00 | 0.00 | -0.05 |
| **1991** | 0.00 | 0.00 | -0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.01 |
| **1992** | 0.00 | 0.00 | 0.00 | -4.46 | -7.81 | 0.00 | 0.00 | 0.00 | -0.30 | 0.00 | 0.00 | 0.00 | -12.57 |
| **1993** | 0.00 | 0.00 | 0.00 | -0.08 | 1.01 | 0.98 | 1.01 | 1.01 | 0.98 | -0.12 | 0.00 | 0.00 | 4.78 |
| **1994** | 0.00 | 0.00 | -0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.04 | 0.00 | 0.00 | -0.05 |
| **1995** | 0.00 | -1.05 | -0.01 | -0.08 | -0.26 | -0.37 | -0.37 | -0.37 | -0.36 | -0.11 | 0.01 | 0.01 | -2.96 |
| **1996** | 0.00 | -0.05 | -0.02 | -0.09 | -0.27 | -0.37 | -0.38 | -0.38 | -0.37 | -0.11 | -0.01 | -0.01 | -2.09 |
| **1997** | -0.01 | -0.01 | -0.02 | 0.00 | -0.38 | -0.37 | -0.38 | -0.38 | -0.37 | -0.12 | -0.01 | 0.00 | -2.05 |
| **1998** | -0.02 | -0.01 | -0.02 | -0.09 | -0.27 | -0.38 | -0.38 | -0.38 | -0.37 | -0.12 | 0.00 | 0.00 | -2.05 |
| **1999** | -0.04 | -0.01 | -0.02 | 0.00 | -0.38 | -0.37 | -0.38 | -0.38 | -0.37 | -0.12 | 0.00 | 0.00 | -2.07 |
| **2000** | 0.00 | -0.05 | -0.02 | 0.00 | -0.38 | -0.37 | -0.38 | -0.38 | -0.37 | -0.12 | 0.00 | 0.00 | -2.09 |
| **2001** | 0.00 | 0.00 | -0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.10 | 0.00 | 0.00 | -0.11 |
| **2002** | 0.00 | 0.00 | -0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.10 | 0.00 | 0.00 | -0.11 |
| **2003** | 0.00 | 0.00 | -0.01 | 0.00 | -0.39 | -0.38 | -0.39 | -0.39 | -0.38 | 0.08 | 0.00 | 0.00 | -1.88 |
| **2004** | 0.00 | 0.00 | -0.08 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.10 | 0.00 | 0.00 | -0.17 |
| **2005** | 0.02 | -1.60 | -0.01 | -0.08 | -0.26 | -0.36 | -0.36 | -0.36 | -0.35 | -0.10 | 0.01 | -0.01 | -3.46 |
| **2006** | -0.01 | -0.01 | -0.02 | -0.09 | -0.27 | -0.38 | -0.38 | -0.38 | -0.37 | -0.12 | -0.01 | -0.01 | -2.07 |
| **2007** | 0.00 | 0.00 | -0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.10 | 0.00 | 0.00 | -0.11 |
| **2008** | 0.00 | 0.00 | -0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.04 | 0.00 | 0.00 | -0.05 |
| **2009** | 0.00 | 0.00 | -0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.10 | 0.00 | 0.00 | -0.11 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **2010** | 0.00 | 0.00 | -0.01 | 0.00 | -1.16 | -1.13 | -1.16 | -1.16 | -1.13 | -0.12 | -0.02 | -0.01 | -5.90 |
| | | | | | | | | | | | | | |
| **Ave** | -0.09 | 0.11 | -0.02 | -0.10 | -0.31 | -0.19 | -0.20 | -0.20 | -0.20 | -0.09 | 0.00 | -0.11 | -1.40 |
| **Max** | -0.01 | -1.64 | -0.02 | -0.09 | -0.26 | -0.38 | -0.38 | -0.38 | -0.37 | -0.10 | -0.02 | -1.62 | -2.09 |
| **Min** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -12.57 |

# 6a: Mokelumne Floodplain Management Plan – Camanche to Below Woodbridge Dam

## San Joaquin County Resource Conservation District

### Overview

In coordination with the Lower Mokelumne Watershed Stewardship Plan, work with willing landowners to create set back levees, re-configure side channels, and/or increase riparian buffer areas in the Mokelumne River from Camanche to Woodbridge Dam to maximize available habitat for salmonids and (in some cases) restore some floodplain function and promote groundwater storage.

**Sponsor(s):** San Joaquin County Resource Conservation District (SJCRCD)

**Concept type:** Implementation

**Estimated Costs:** Dependent on restoration contractor. Average is ~$8,000/acre for invasive/non-invasive species removal (Capital)

**Funding Source(s):** USFWS Partners for Fish and Wildlife Program, Anadramous Fish Restoration Program, USDA NRCS, NOAA Fisheries, DWR (Floodplain Corridor Protection Program), CA Fish and Wildlife, Department of Conservation

**Concept location:** Lower Mokelumne Watershed (from Camanche to Woodbride Dam)

### Assessment

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| ● ***Fully addressed*** | ◗ ***Partially addressed*** | ○ ***Not addressed*** |
| WS-1: Promote demand-side management strategies | ○ | The concept does not have elements that promote demand-side management strategies. |
| WS-2: Increase supply reliability | ○ | The concept would not address and/or increase supply reliability. |
| WS-3: Increase amount of stored water | ● | The concept would increase the amount of stored water by restoring floodplain function, which promotes groundwater storage. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| WS-4: Promote smart, responsible development | ● | The concept promotes smart, responsible development by encouraging set-back levees, reconfiguring side channels, and increasing riparian buffer areas, all of which help attenuate flood flows and can help mitigate flooding in developed areas. |
| WS-5: Reduce reliance on groundwater for irrigation | ○ | The concept would not reduce reliance on groundwater for irrigation. |
| WS-6: Promote a long-term groundwater balance | ● | The concept would promote a long-term groundwater balance by restoring floodplain function, which promotes groundwater storage. |
| WS-7: Maximize water resource availability for all beneficial uses | ● | The concept would maximize water resource availability for all beneficial uses by mobilizing flood flows in such a way as to provide geomorphic, habitat, flood management, and groundwater recharge benefits. |
| WS-8: Decrease the need to import water | ○ | The concept would not result in a substantial decrease in the need to import water. |
| WD-9: Review and understand existing agency demand estimates | ○ | The concept does not include reviewing and understanding existing agency demand estimates. |
| WD-10: Identify water demand issues for timely consideration by the water agencies during their UWMP update | ○ | The concept does not include identifying water demand issues for consideration in the upcoming UWMP update. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| WQ-11: Protect and improve surface and groundwater quality | ◗ | The concept could protect or improve groundwater quality by recharging the groundwater basin and diluting groundwater constituents; however the extent and magnitude of this benefit is unknown at this time. |
| WQ-12: Match delivered water quality use | ○ | The concept does not involve treating water, nor does it involve delivering treated water. |
| WQ-13: Use water purification technology as a tool to maximize beneficial uses | ○ | The concept does not include water purification elements. |
| R-14: Increase access for water-based recreation | ○ | The concept does not include elements that would increase access to the Mokelumne River from Highway 12 to the headwaters. |
| R-15: Increase angling and other recreational opportunities (increase spawning habitat, etc.) | ◗ | Available scientific information is demonstrating biological benefits for juvenile rearing salmonids and other aquatic resources associated with levee setbacks, seasonally inundated floodplain, and improved riparian vegetation. However, the locations where restoration activities would occur and the aerial extent of restoration activities will determine the overall success of the program. The opportunity certainly exists to provide major habitat benefit through such restoration activities if they were implemented over a large landscape of the lower river. |
| R-16: Increase angling and other recreational opportunities (stock hatchery-raised fish) | ○ | The concept does not involve stocking hatchery-raised trout in designated areas on the upper Mokelumne, nor does it involve designating and managing wild trout sections. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| R-17: Increase angling and other recreational opportunities (reintroduce salmon in upper Moke) | ○ | The concept does not include reintroducing salmon into the upper Mokelumne. |
| R-18: Increase angling and other recreational opportunities (increase opportunities) | ◗ | The concept could increase angling and other recreational opportunities by providing habitat that promotes juvenile salmonid growth rates and survival, both of which contribute to increased recreational opportunities. However, the locations where restoration activities would occur and the aerial extent of restoration activities will determine the overall success of the program. |
| WR-19: Resolve existing water rights conflicts in the watershed | ○ | The concept is not focused on resolving existing water rights protests to achieve a common understanding of the application of relevant water rights law in the watershed. |
| F-20: Enhance flood protection and management | ● | The concept enhances flood management and protection by attenuating flows through set-back levees, re-configured side channels, and increased riparian buffer zones. These outcomes provide enhanced flood protection to developed areas in the Lower Mokelumne. |
| D-21: Use sound, agreed-upon data to evaluate program alternatives (hydrology dataset) | ○ | The concept does not involve producing an agreed-upon hydrology dataset and Water Availability Analysis separate from that which was produced as part of the MokeWISE program. |
| D-22: Use sound, agreed-upon data to evaluate program alternatives (describe in sufficient detail) | ○ | Because the concept is not well-defined enough to complete a quantitative assessment, a qualitative assessment was performed. |

| ***Objective*** | ● ◗ O | ***Justification*** |
|---|---|---|
| D-23: Promote the contribution of sound scientific data to current body of knowledge | ● | The concept would contribute data to the current body of knowledge by collecting and reporting program information, including information on groundwater recharge, flood attenuation, and riparian habitat. |
| O-24: Increase investment in forest management | O | The concept does not include elements that would promote forest management, nor would it help reduce the economic impact of wildfires and other natural disasters. |
| O-25: Maximize socio-economic, cultural, recreational, public health, and public safety benefits with a particular emphasis on disadvantaged communities (DACs) | ● | The concept is located along the river, and flood benefits would be seen in Lodi and Stockton, both of which have areas that the classified as DACs. |
| O-26: Achieve equity | ● | The benefits realized from implementing the concept would not be limited to a narrow group; rather, project benefits would be spread across the lower Mokelumne region, spanning cultures, incomes, and time. |
| E-27: Protect and enhance natural environment (enhance natural envt) | ● | Restoration that involves connectivity to floodplains, side channels, and an increase in riparian corridor width and length would provide multiple biogeomorphic beneficial uses to the aquatic ecosystem. Benefits include: sediment deposition on floodplains, increased connectivity during high flows would provide for increased refugia, increased productivity on the floodplains which can yield larger juvenile fish, shading which improves water temperature, additional opportunities for streamwood to enter the active channel and provide structure, food and dissolved organic carbon to the system. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| E-28: Protect and enhance natural environment (wild & scenic designation) | ○ | The concept does not incorporate or seek a wild and scenic designation. |
| E-29: Protect and restore fisheries | ● | The concept would likely protect and restore fisheries by providing juvenile salmonid habitat and shading which can improve water temperature. The locations where restoration activities would occur and the aerial extent of restoration activities will determine the overall success of the program. |
| A-30: Enhance or maintain the water supply for the beneficial use in ag practices | ○ | The concept does not include elements that would increase agricultural water supply. |
| C-31: Foster long-term regional relationships and avoid unnecessary conflict and litigation | ● | The concept would require coordination between a number of entities, which could include non-governmental organizations, state/federal agencies, and private landowners. This coordination would contribute to fostering long-term regional relationships and help to avoid unnecessary conflict and litigation. |
| C-32: Promote broadly-supported outcomes that benefit a wide range of interests | ● | The concept would restore riparian habitat, re-engage floodplains, and reduce flooding in developed areas. These outcomes are supported by a wide range of interests within the watershed. |
| C-33: Promote broadly-supported outcomes that benefit a wide range of interests (least controversial projects) | ● | The concept has passed the preliminary four screening criteria, including the beneficial and compatible screens. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| C-34: Promote broadly-supported outcomes that benefit a wide range of interests (agreements that reduce conflict) | ○ | The concept would not directly address any current watershed conflicts. |
| C-35: Develop a program consistent with all existing licenses, permits, and agreements affecting the River | ● | As a condition of implementation, the concept would be consistent with all existing licenses, permits, and agreements affecting the Mokelumne River. As such, the concept would not interfere with any entity exercising a water right. |
| C-36: Develop a program consistent with all existing licenses, permits, and agreements affecting the River (CEQA/NEPA) | ● | As a condition of implementation, the concept would be required to adhere to all applicable regulatory requirements, including applicable CEQA/NEPA regulations documentation, etc. |
| CA-37: Avoid basing decisions on incomplete or inaccurate information | ● | Prior to implementation, the concept would undergo a planning phase that would collect and analyze data that is considered, at the time, to be the most complete and accurate. |
| CA-38: Avoid demand for new or larger on-stream dams | ● | The concept would not result in construction of a new or larger on-stream dam. |
| CA-39: Avoid harmful impacts to fisheries and other wildlife | ● | The concept would not create harmful impacts to fisheries and other wildlife. |
| CA-40: Avoid conversion of agricultural lands to developed uses | ● | The concept does not include elements that would convert agricultural lands to developed uses. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| CA-41: Avoid shifting environmental impacts from one area to another | ● | The concept does not include elements that would shift environmental impacts from one area to another. |
| CA-42: No diminishment of the benefits of existing in-stream flow | ● | The concept does not include elements that would alter existing in-stream flows. |
| CA-43: Avoid closing the process to the public | ● | As a condition of planning and implementation, the concept would include public involvement to the extent appropriate. |
| CA-44: Avoid dependency on potentially unreliable supply | ● | The concept does not include elements that would facilitate downstream users becoming dependent on an unreliable supply. |
| CA-45: Minimize adverse socio-economic and public health and safety impacts | ● | The concept does not include elements that would create adverse socio-economic and public health and safety impacts. |
| CA-46: Avoid end use harm | ● | The concept does not allocate water in ways that create end use harm. |
| CA-47: Avoid violating procedural or substantive laws | ● | As a condition of implementation, the concept would be required to complete relevant CEQA/NEPA analysis prior to implementation. |
| CA-48: Avoid interregional inequity | ● | Implementation of the concept would not create interregional inequity, either in realized benefits or in costs. |

# 7a: PG&E Storage Recovery

## Amador Water Agency, Calaveras County Water District

### Overview

**Sponsor(s):** Amador Water Agency (AWA), Calaveras County Water District (CCWD)

**Concept type:** Planning

**Estimated Costs:** unknown

**Funding Source(s):** unknown

**Concept location:** PG&E reservoirs in the Mokelumne system

Evaluate the feasibility of removing silt and sediment from behind PG&E dams. The study would include evaluation of the proposed beneficial uses of the project and clarifying operational parameters. It would also identify impacts, and constraints in the following areas: river flows, domestic water supply, technical, political, environmental (including both species-related and geomorphic), economic, legal, and recreation – recognizing that a more detailed Environmental Impact Report would be required prior to implementing a project. The study will include consultation with members of the MokeWISE MCG.

### Assessment

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| ● ***Fully addressed*** | ◗ ***Partially addressed*** | ○ ***Not addressed*** |
| WS-1: Promote demand-side management strategies | ○ | As a feasibility study, the concept would not promote demand-side management strategies. Implementation of the project described in the concept would also not meet this objective. |
| WS-2: Increase supply reliability | ◗ | As a feasibility study, the concept would not increase supply reliability. However, if the project described in the concept were implemented, supply reliability would be increased by the amount of additional storage gained by desilting. |
| WS-3: Increase amount of stored water | ◗ | As a feasibility study, the concept would not increase the amount of stored water. However, stored water would be increased if sediment and silt were removed from behind PG&E dams. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| WS-4: Promote smart, responsible development | ○ | As a feasibility study, the concept itself would not promote smart, responsible development. And if implemented, while the concept does not prohibit or preclude smart, responsible development, it does not directly promote it. |
| WS-5: Reduce reliance on groundwater for irrigation | ◗ | As a feasibility study, the concept itself would not reduce reliance on groundwater. Implementation of the plan could potentially reduce groundwater for irrigation, assuming that the additional stored water is used for irrigation. |
| WS-6: Promote a long-term groundwater balance | ◗ | As a feasibility study, the concept itself would not promote a long-term groundwater balance. Implementation of the plan could potentially reduce groundwater for irrigation, assuming that the additional stored water is used for irrigation. |
| WS-7: Maximize water resource availability for all beneficial uses | ◗ | The concept itself would not maximize water resource availability for all beneficial uses. Removal of silt and sedimentation from behind dams would maximize water resource availability by capturing additional water during wet periods and increasing storage. |
| WS-8: Decrease the need to import water | ◗ | The concept itself would not decrease the need to import water. However, the need for imported water could be decreased with the use of added storage to capture additional water during wet periods. |
| WD-9: Review and understand existing agency demand estimates | ○ | The concept does not include reviewing and understanding existing agency demand estimates. Implementation of the project described in the concept would also not review existing agency demand estimates. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| WD-10: Identify water demand issues for timely consideration by the water agencies during their UWMP update | ○ | The concept does not include identifying water demand issues for consideration in the upcoming UWMP update. Implementation of the project described in the concept would also not identify water demand issues. |
| WQ-11: Protect and improve surface and groundwater quality | ○ | As a feasibility study, the concept itself would not protect or improve surface and/or groundwater quality. Implementation of the project described in the concept would also not meet this objective. Dredging of toxic elements could present a fatal flaw to the concept's implementation and should be addressed in the feasibility study. |
| WQ-12: Match delivered water quality use | ○ | The concept itself would not involve treating water, nor does it involve delivering treated water. Desilting would also not involve treating water, nor would it involve delivering treated water. |
| WQ-13: Use water purification technology as a tool to maximize beneficial uses | ○ | As a feasibility study, the concept itself would not use water purification technology as a tool to maximize beneficial uses. Desilting would also not include water purification elements. |
| R-14: Increase access for water-based recreation | ○ | As a feasibility study, the concept itself does not include elements that would increase access to the Mokelumne River from Highway 12 to the headwaters. Desilting would also not include these elements. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| R-15: Increase angling and other recreational opportunities (increase spawning habitat, etc.) | ○ | As a feasibility study, the concept itself would not increase spawning habitat. Sediment removal would have very little direct benefit to aquatic habitat resources within the watershed. Sediment removal from existing impoundments would reduce the risk of sediment resuspension during high flow periods, reduce suspended sediment loading and sediment deposition in habitats downstream of the reservoirs, thereby improving the quality and availability of habitat for salmonids and other aquatic resources. Increasing the reservoir storage volume by sediment removal would also create additional opportunities to further trap suspended sediments and bedload transport in the upper part of the watershed. Given the size of the PG&E facilities, and sediment trapping that would occur downstream in Pardee and Camanche reservoirs, desilting PG&E reservoirs is expected to provide relatively little benefit for habitat enhancement within the lower Mokelumne River downstream of Camanche dam. |
| R-16: Increase angling and other recreational opportunities (stock hatchery-raised fish) | ○ | The concept does not involve stocking hatchery-raised trout in designated areas on the upper Mokelumne, nor does it involve designating and managing wild trout sections. Desilting would also not meet this objective. |
| R-17: Increase angling and other recreational opportunities (reintroduce salmon in upper Moke) | ○ | The concept does not include reintroducing salmon into the upper Mokelumne. Desilting would also not meet this objective. |
| R-18: Increase angling and other recreational opportunities (increase opportunities) | ○ | As a feasibility study, the concept would not increase angling and other recreational opportunities. Desilting would also not meet this objective. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| WR-19: Resolve existing water rights conflicts in the watershed | ○ | The concept is not focused on resolving existing water rights protests to achieve a common understanding of the application of relevant water rights law in the watershed. This objective would also not be achieved if restoration were implemented. |
| F-20: Enhance flood protection and management | ◗ | As a feasibility study, the concept would not enhance flood protection and management. If implemented, desilting could enhance flood protection by increasing the amount of storage available for catching flood flows. |
| D-21: Use sound, agreed-upon data to evaluate program alternatives (hydrology dataset) | ● | As a feasibility study, the concept would require the use of an agreed-upon hydrology dataset and/or Water Availability Analysis. |
| D-22: Use sound, agreed-upon data to evaluate program alternatives (describe in sufficient detail) | ◗ | Because the concept is not well-defined enough to complete a quantitative assessment, a qualitative assessment was performed. However, the purpose of this concept is to assess feasibility and collect sound, agreed-upon data prior to implementation of the concept. |
| D-23: Promote the contribution of sound scientific data to current body of knowledge | ● | The concept would contribute scientific data to the current body of knowledge by completing a feasibility study and developing information about the cost of desilting dams and the potential environmental and water supply benefits. |
| O-24: Increase investment in forest management | ○ | The concept does not include elements that would promote forest management, nor would it help reduce the economic impact of wildfires and other natural disasters. Implementation of the project described in the concept would also not increase investment in forest management. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| O-25: Maximize socio-economic, cultural, recreational, public health, and public safety benefits with a particular emphasis on disadvantaged communities (DACs) | ○ | As a feasibility study, the concept would not meet this objective. Additionally, desilting activities would not be located within a DAC and would not directly contribute to socio-economic, cultural, recreational, public health, and public safety benefits of a DAC. |
| O-26: Achieve equity | ◗ | As a feasibility study, the concept would not directly achieve equity. However, the benefits realized from desilting activities would not be limited to a narrow group; rather, project benefits would be spread across water agency customers, spanning regions, cultures, incomes, and time. |
| E-27: Protect and enhance natural environment (enhance natural envt) | ◗ | As a feasibility study, the concept would not enhance the natural environment. However, sediment removal from reservoirs could be beneficial, especially if the larger size fractions of these sediments could be repurposed to provide augmentation to locations within the river corridor. Benefits may need to be assessed based on presence/absence of mercury, and the relative risks of removal/disposal or methylation if left in place. Mercury and other trace metal risks are thought to be generally lower in the Upper Moke than in other Sierran watersheds. |
| E-28: Protect and enhance natural environment (wild & scenic designation) | ○ | The concept does not incorporate or seek a wild and scenic designation. Restoration activities would also not meet this objective. |
| E-29: Protect and restore fisheries | ○ | As a feasibility study, the concept itself would not protect and restore fisheries. Desilting reservoirs would also not protect and restore fisheries downstream of Camanche. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| A-30: Enhance or maintain the water supply for the beneficial use in ag practices | ◗ | As a feasibility study, the concept would not enhance or maintain water supply for beneficial use in agricultural practices. Implementing the project described in the concept could enhance water supply for agricultural practices by potentially providing water to AWAs, CCWDs, JVIDs, and CPUDs agricultural customers. |
| C-31: Foster long-term regional relationships and avoid unnecessary conflict and litigation | ● | The purpose of the concept is to assess the feasibility of desilting PG&E reservoirs. This helps avoid unnecessary conflict and litigation by identifying and attempting to resolve issues early on. Coordination between water agencies, PG&E, non-governmental organizations, and state/federal agencies would be required. |
| C-32: Promote broadly-supported outcomes that benefit a wide range of interests | ◗ | As a feasibility study, the concept would not directly promote broadly-supported outcomes that benefit a wide range of interests. However, the project described in the concept would likely promote broadly-supported outcomes. Desilting would increase the amount of stored water, reduce the need for additional on-stream storage, and increase recreation. These outcomes are broadly supported by a wide range of interests. |
| C-33: Promote broadly-supported outcomes that benefit a wide range of interests (least controversial projects) | ◗ | The concept has passed the preliminary four screening criteria, including the beneficial and compatible screens. The project described in the concept would also need to undergo these screenings to determine if it was the least controversial project. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| C-34: Promote broadly-supported outcomes that benefit a wide range of interests (agreements that reduce conflict) | ◗ | As a feasibility study, the concept would not result in agreements that reduce conflicts. Desilting PG&E reservoirs could reduce conflicts if the implementation reduced the need for new on-stream storage. |
| C-35: Develop a program consistent with all existing licenses, permits, and agreements affecting the River | ● | As a condition of implementation, the concept would be consistent with all existing licenses, permits, and agreements affecting the Mokelumne River. This would also be required of the project described in the concept if it were to be implemented. |
| C-36: Develop a program consistent with all existing licenses, permits, and agreements affecting the River (CEQA/NEPA) | ● | As a condition of implementation, the concept would be required to adhere to all applicable regulatory requirements, including applicable CEQA/NEPA regulations documentation, etc. This would also be required of the project described in the concept if it were to be implemented. |
| CA-37: Avoid basing decisions on incomplete or inaccurate information | ● | The purpose of this concept is to study the feasibility of desilting PG&E reservoirs; as such, the nature of the concept will help avoid basing decisions on incomplete or inaccurate information. |
| CA-38: Avoid demand for new or larger on-stream dams | ● | The concept will not result in construction of a new or larger on-stream dam. If the project as described in the concept is implemented, there would also not be demand for new or larger on-stream dams. On the contrary, implementation of the project could potentially reduce the demand for new or larger on-stream dams. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| CA-39: Avoid harmful impacts to fisheries and other wildlife | ◗ | The concept would not create harmful impacts to fisheries and other wildlife. Implementation of the project described in the concept could create harmful impacts to fisheries and other wildlife by capturing more water and reducing downstream flows; mitigation measures could be implemented to maintain these current benefits. |
| CA-40: Avoid conversion of agricultural lands to developed uses | ● | The concept would not convert agricultural lands to developed uses. Implementation of the project described in the concept would also not convert agricultural lands. |
| CA-41: Avoid shifting environmental impacts from one area to another | ● | The concept would not shift environmental impacts from one area to another. Implementation of the project described in the concept would also not shift environmental impacts. |
| CA-42: No diminishment of the benefits of existing in-stream flow | ◗ | The concept does not include elements that would alter existing in-stream flows. Implementation of the project described in the concept would reduce existing in-stream flows by capturing more water. It is unclear at this time if the benefits of current in-stream flow would be diminished; mitigation measures could be implemented to maintain these current benefits. |
| CA-43: Avoid closing the process to the public | ● | As a condition of planning and implementation, the concept would include public involvement to the extent appropriate. This also applies to implementation of the project described in the concept. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| CA-44: Avoid dependency on potentially unreliable supply | ◗ | The concept does not include elements that would facilitate downstream users becoming dependent on an unreliable supply. Making additional storage available by desilting could create dependency on this supply, which is more unreliable than other forms of supply, as it is susceptible to re-silting and hydrologic year type. |
| CA-45: Minimize adverse socio-economic and public health and safety impacts | ● | As a feasibility study, this concept does not have adverse socio-economic and public health and safety impacts. Implementation of the project described in the concept would provide public health and safety benefits by upgrading the treatment process from a sand filter to a membrane filtration process. |
| CA-46: Avoid end use harm | ◗ | The concept does not allocate water in ways that create end use harm. It is not known at this time how the additional stored water would be allocated. |
| CA-47: Avoid violating procedural or substantive laws | ● | As a condition of implementation, the concept would be required to complete relevant CEQA/NEPA analysis prior to implementation. This would also be required if the project described in the concept were implemented. |
| CA-48: Avoid interregional inequity | ● | Implementation of the concept would not create interregional inequity, either in realized benefits or in costs. This also holds if the project described in the concept were to be implemented. |

# 7b: Raise Lower Bear Reservoir Feasibility Update and Preliminary Engineering

## Amador Water Agency, Jackson Valley Irrigation District, Calaveras County Water District, Calaveras Public Utilities District

### Overview

**Sponsor(s):** Amador Water Agency (AWA), Calaveras County Water District (CCWD), Jackson Valley Irrigation District (JVID), Calaveras Public Utility District (CPUD)

**Concept type:** Planning

**Estimated Costs:** $500,000

**Funding Source(s):** unknown

**Concept location:** Lower Bear Reservoir, Amador County

Evaluate the feasibility of enlarging Lower Bear Reservoir by raising the existing dam (embankment) by up to 32 feet to increase surface water storage capacity within the upper Mokelumne River watershed. This feasibility study would be a continuation of previous studies and serve to address previously unanswered questions and unresolved issues. The study would include evaluation of the proposed beneficial uses of the project and clarifying operational parameters. It would also identify benefits, impacts, and constraints in the following areas: technical, political, environmental (including both species-related and geomorphic), economic, legal, and recreation – recognizing that a more detailed Environmental Impact Report would be required prior to implementing a project. The study will include consultation with members of the MokeWISE MCG. Previous studies performed on behalf of Amador Water Agency suggest that Lower Bear Reservoir would provide 18,300 acre-feet of additional yield (Willard, 2005). In addition to modifications to the dam itself, other facilities that would need to be constructed include an updated intake structure and spillway. Also note that the project would require the relocation of adjacent roads and existing recreation facilities.

Modeling work performed in MOCASIM assumed five demand structures for Amador Water Agency, including an additional 5,000; 6,000; 7,000; 8,000; 9,000; and 10,000 AFY of demand. This additional demand was added onto AWA's projected 2040 demand. These additional demands were distributed over the year based on AWA's current yearly demand distribution. Modeling assumed a 2015 water right priority.

## Assessment

| *Objective* | ● ◗ ○ | *Justification* |
|---|---|---|
| ● *Fully addressed* | ◗ *Partially addressed* | ○ *Not addressed* |
| WS-1: Promote demand-side management strategies | ○ | As a feasibility study, the concept does not have elements that promote demand-side management strategies. Implementation of the project described in the concept would also not have elements that would promote demand-side management strategies. |
| WS-2: Increase supply reliability | ◗ | As a feasibility study, the concept would not increase supply reliability. If Lower Bear was raised by 32 feet, modeling shows that the firm yield would be between 2,000 AFY and 3,000 AFY (Table 1). While this concept would increase supply reliability for AWA and other partner agencies, this concept would decrease the average amount of unallocated water below Camanche. Under baseline 2040 conditions, average unallocated flow is projected to be 230.0 thousand acre-feet per year (TAFY). The concept would decrease that amount by between 5.7 TAFY and 8.2 TAFY, depending on the demand scenario. Under a 5,000 AFY demand, this would result in average unallocated flow of 224.3 TAFY; in a 10,000 AFY demand scenario, average unallocated flow would be 221.7 TAFY (Table 1). |
| WS-3: Increase amount of stored water | ◗ | As a feasibility study, the concept itself would not increase the amount of stored water. If Lower Bear was raised by 32 feet, the amount of stored water would be increased by up to 30 TAF of surface storage. A portion of the additional demand placed on the reservoir storage (5,000 – 10,000 AFY) could be moved to groundwater storage. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| WS-4: Promote smart, responsible development | ◗ | As a feasibility study, the concept itself would promote smart, responsible development by studying the dam raise prior to implementing the project. If implemented, the project could meet this objective by implementing operational parameters that promote smart responsible development. |
| WS-5: Reduce reliance on groundwater for irrigation | ◗ | The concept itself would not reduce reliance on groundwater for irrigation. However, if Lower Bear were raised up to 32 feet for an additional 30 thousand acre-feet (TAF) of storage, a portion of the demand on that stored water (5,000 – 10,000 AFY) could be used in lieu of groundwater. This concept would decrease the average amount of unallocated water below Camanche. Under baseline 2040 conditions, average unallocated flow is projected to be 230.0 thousand acre-feet per year (TAFY). The concept would decrease that amount by between 5.7 TAFY and 8.2 TAFY, depending on the demand scenario. Under a 5,000 AFY demand, this would result in average unallocated flow of 224.3 TAFY; in a 10,000 AFY demand scenario, average unallocated flow would be 221.7 TAFY (Table 1). Thus, reliance on groundwater could be reduced between 5.7 TAFY and 8.2 TAFY. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| WS-6: Promote a long-term groundwater balance | ◗ | The concept itself would not promote a long-term groundwater balance. However, if Lower Bear were raised 32 feet for an additional 30 TAF of storage, a portion of the demand on that stored water (5,000 – 10,000 AFY) could be used in lieu of groundwater. Under baseline 2040 conditions, average unallocated flow is projected to be 230.0 thousand acre-feet per year (TAFY). The concept would decrease that amount by between 5.7 TAFY and 8.2 TAFY, depending on the demand scenario. Thus, between 5.7 TAFY and 8.2 TAFY could be left in the groundwater basin, which would promote a long-term groundwater balance. |
| WS-7: Maximize water resource availability for all beneficial uses | ◗ | As a feasibility study, the concept would not maximize water resource availability. However, if the project were implemented, the raised reservoir would store an additional 30 TAF. The demand on this additional stored water (5,000 – 10,000 AFY) could be put to a variety of beneficial uses, including consumptive, groundwater recharge, and environmental. |
| WS-8: Decrease the need to import water | ◗ | The concept itself would not decrease the need to import water. However, the need for imported water in San Joaquin County could be decreased with the use of added storage to capture additional water during wet periods, assuming the concept included County partners (or was combined into a groundwater banking project). |
| WD-9: Review and understand existing agency demand estimates | ○ | The concept does not include reviewing and understanding existing agency demand estimates. Implementation of the project described in the concept would also not review existing agency demand estimates. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| WD-10: Identify water demand issues for timely consideration by the water agencies during their UWMP update | ○ | The concept does not include identifying water demand issues for consideration in the upcoming UWMP update. Implementation of the project described in the concept would also not identify water demand issues. |
| WQ-11: Protect and improve surface and groundwater quality | ◗ | As a feasibility study, the concept itself would not protect or improve surface and/or groundwater quality. However, the feasibility study will include analysis on the improvements associated with encapsulating exposed rocks on the dam face, which could be a source of elevated copper levels noted during spring snowmelt. Based on the feasibility study results, raising Lower Bear could include a component that reduces copper levels. The amount of copper reduction potentially feasible will be determined during the feasibility study and is unknown at this time. |
| WQ-12: Match delivered water quality use | ○ | The concept itself would not involve treating water, nor does it involve delivering treated water. Raising Lower Bear would also not involve treating water, nor would it involve delivering treated water. |
| WQ-13: Use water purification technology as a tool to maximize beneficial uses | ○ | As a feasibility study, the concept itself would not use water purification technology as a tool to maximize beneficial uses. Raising Lower Bear would also not include water purification elements. |
| R-14: Increase access for water-based recreation | ○ | As a feasibility study, the concept itself does not include elements that would increase access to the Mokelumne River from Highway 12 to the headwaters. Raising Lower Bear would also not include these elements. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| R-15: Increase angling and other recreational opportunities (increase spawning habitat, etc.) | ○ | As a feasibility study, the concept itself would not increase spawning habitat. Raising the elevation of Lower Bear Reservoir could provide opportunities for releases downstream that could benefit the cold water pool in Camanche and Pardee reservoirs as well as enhance instream flows for salmonids within the watershed immediately downstream of Lower Bear Reservoir as well as further downstream in the lower Mokelumne River. The overall benefits of increasing reservoir storage, however, on fishery habitat are considered to be moderately low. |
| R-16: Increase angling and other recreational opportunities (stock hatchery-raised fish) | ○ | The concept does not involve stocking hatchery-raised trout in designated areas on the upper Mokelumne, nor does it involve designating and managing wild trout sections. Raising Lower Bear would also not meet this objective. |
| R-17: Increase angling and other recreational opportunities (reintroduce salmon in upper Moke) | ○ | The concept does not include reintroducing salmon into the upper Mokelumne. Implementing the project described in the concept would also not meet this objective. |
| R-18: Increase angling and other recreational opportunities (increase opportunities) | ◗ | As a feasibility study, the concept would not increase angling and other recreational opportunities. If implemented, raising Lower Bear could potentially increase angling and recreational opportunities by increasing the surface area of the reservoir. However, the increase in these benefits is likely small. |
| WR-19: Resolve existing water rights conflicts in the watershed | ◗ | The concept could help address/clarify AWA's and CCWD's water rights. Additionally, raising Lower Bear could potentially be integrated with other projects (like a groundwater banking project) if it is structured that way. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| F-20: Enhance flood protection and management | ◗ | As a feasibility study, the concept would not enhance flood protection and management. If implemented, the 30 TAF of additional storage would enhance flood protection by capturing flood flows. This concept would decrease the average amount of unallocated water below Camanche. Under baseline 2040 conditions, average unallocated flow is projected to be 230.0 thousand acre-feet per year (TAFY). The concept would decrease that amount by between 5.7 TAFY and 8.2 TAFY, depending on the demand scenario. Under a 5,000 AFY demand, this would result in average unallocated flow of 224.3 TAFY; in a 10,000 AFY demand scenario, average unallocated flow would be 221.7 TAFY (Table 1). |
| D-21: Use sound, agreed-upon data to evaluate program alternatives (hydrology dataset) | ● | As a feasibility study, the concept would require the use of an agreed-upon hydrology dataset and/or Water Availability Analysis. |
| D-22: Use sound, agreed-upon data to evaluate program alternatives (describe in sufficient detail) | ● | The concept is well-defined enough to complete a quantitative assessment. Modeling with MOCASIM has been performed. Additionally, the purpose of this concept is to assess feasibility and collect sound, agreed-upon data prior to implementation of the concept. |
| D-23: Promote the contribution of sound scientific data to current body of knowledge | ● | The concept would contribute scientific data to the current body of knowledge by completing a feasibility study and addressing questions that have been unanswered by previous Lower Bear studies. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| O-24: Increase investment in forest management | ○ | The concept does not include elements that would promote forest management, nor would it help reduce the economic impact of wildfires and other natural disasters. Raising Lower Bear would also not increase investment in forest management. |
| O-25: Maximize socio-economic, cultural, recreational, public health, and public safety benefits with a particular emphasis on disadvantaged communities (DACs) | ◗ | As a feasibility study, the concept would not meet this objective. Raising Lower Bear would maximize these benefits for a DAC, as AWA, CCWD, JVID, and CPUD all serve DACs. Additional storage for these agencies would benefit the DACs that these agencies serve. |
| O-26: Achieve equity | ◗ | As a feasibility study, the concept would not directly achieve equity. However, the benefits realized from additional storage would not be limited to a narrow group; rather, project benefits would be spread across water agency customers, spanning regions, cultures, incomes, and time. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| E-27: Protect and enhance natural environment (enhance natural envt) | ○ | The concept itself would not enhance the natural environment. Raising Lower Bear would capture additional peak flows, which would reduce the ability of flood hydrographs from doing "natural" geomorphic work even more so than current regulated conditions. Processes that need peak flows include sediment transport, rejuvenation of channel bed and bank substrates, and floodplain inundation. This concept would decrease the average amount of Mokelumne flow to the Delta. Under baseline 2040 conditions, average unallocated flow is projected to be 323.1 thousand acre-feet per year (TAFY). The concept would decrease that amount by between 4.6 TAFY and 7.1 TAFY, depending on the demand scenario. Under a 5,000 AFY demand, this would result in average unallocated flow of 318.5 TAFY; in a 10,000 AFY demand scenario, average flow to the Delta would be 315.9 TAFY (Table 2). |
| E-28: Protect and enhance natural environment (wild & scenic designation) | ○ | The concept does not incorporate or seek a wild and scenic designation. Raising Lower Bear would also not meet this objective. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| E-29: Protect and restore fisheries | ◗ | As a feasibility study, the concept would not protect and restore fisheries. Raising Lower Bear Reservoir could potentially provide opportunities for releases downstream that could benefit the coldwater pool in Camanche and Pardee reservoirs as well as enhance instream flows for salmonids within the watershed immediately downstream of Lower Bear Reservoir as well as further downstream in the lower Mokelumne River. The overall benefits of increasing reservoir storage, however, on fishery habitat are considered to be moderately low. This concept would decrease the average amount of Mokelumne flow to the Delta. Under baseline 2040 conditions, average unallocated flow is projected to be 323.1 thousand acre-feet per year (TAFY). The concept would decrease that amount by between 4.6 TAFY and 7.1 TAFY, depending on the demand scenario. Under a 5,000 AFY demand, this would result in average unallocated flow of 318.5 TAFY; in a 10,000 AFY demand scenario, average flow to the Delta would be 315.9 TAFY (Table 2). |
| A-30: Enhance or maintain the water supply for the beneficial use in ag practices | ◗ | As a feasibility study, the concept would not enhance or maintain water supply for beneficial use in agricultural practices. However, the additional water stored by a raised Lower Bear (30 TAF) would likely enhance water supply for agricultural uses, as AWA, JVID, CPUD, and CCWD all serve agricultural customers. Demand placed on the additional storage (5,000 – 10,000 AFY) could serve agricultural uses. Additionally, if a lower watershed water agency partnered on this project, water supply for agricultural customers in the lower watershed would also be enhanced by this additional storage. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| C-31: Foster long-term regional relationships and avoid unnecessary conflict and litigation | ● | The purpose of the concept is to assess the feasibility of raising Lower Bear. This helps avoid unnecessary conflict and litigation by identifying and attempting to resolve issues early on. Coordination between water agencies, non-governmental organizations, and state/federal agencies would be required. |
| C-32: Promote broadly-supported outcomes that benefit a wide range of interests | ◗ | As a feasibility study, the concept would directly promote broadly-supported outcomes that benefit a wide range of interests by studying aspects of raising Lower Bear that has yet been previously studied. However, raising Lower Bear would not likely promote broadly-supported outcomes, as there are a number of watershed stakeholders who fundamentally disagree with expanded on-stream storage. |
| C-33: Promote broadly-supported outcomes that benefit a wide range of interests (least controversial projects) | ◗ | The concept has passed the preliminary four screening criteria, including the beneficial and compatible screens. The project described in the concept would also need to undergo these screenings to determine if it was the least controversial project. |
| C-34: Promote broadly-supported outcomes that benefit a wide range of interests (agreements that reduce conflict) | ○ | As a feasibility study, the concept would not result in agreements that reduce conflicts. Raising Lower Bear would also not likely result in agreements that reduce conflict, as there are a number of watershed stakeholders who fundamentally disagree with expanded on-stream storage. |
| C-35: Develop a program consistent with all existing licenses, permits, and agreements affecting the River | ● | As a condition of implementation, the concept would be consistent with all existing licenses, permits, and agreements affecting the Mokelumne River. This would also be required of the project described in the concept if it were to be implemented. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| C-36: Develop a program consistent with all existing licenses, permits, and agreements affecting the River (CEQA/NEPA) | ● | As a condition of implementation, the concept would be required to adhere to all applicable regulatory requirements, including applicable CEQA/NEPA regulations documentation, etc. This would also be required of the project if Lower Bear were raised. |
| CA-37: Avoid basing decisions on incomplete or inaccurate information | ● | The purpose of this concept is to study the feasibility of raising Lower Bear Reservoir; as such, the nature of the concept will help avoid basing decisions on incomplete or inaccurate information. |
| CA-38: Avoid demand for new or larger on-stream dams | ◗ | The concept itself would not result in the construction of a new or larger on-stream dam. However, raising Lower Bear would result in a larger on-stream dam; as such, this objective would not be met. |
| CA-39: Avoid harmful impacts to fisheries and other wildlife | ◗ | The concept would not create harmful impacts to fisheries and other wildlife. Raising Lower Bear would provide a small increase in water storage capability and opportunities for releases downstream that could benefit the coldwater pool in Camanche and Pardee reservoirs as well as enhance instream flows for salmonids within the watershed immediately downstream of Lower Bear Reservoir as well as further downstream in the lower Mokelumne River. The overall benefits of increasing reservoir storage, however, on fishery habitat are considered to be moderately low. Mitigation measures could be implemented to minimize these impacts. |
| CA-40: Avoid conversion of agricultural lands to developed uses | ● | The concept would not convert agricultural lands to developed uses. Implementation of the project described in the concept would also not convert agricultural lands. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| CA-41: Avoid shifting environmental impacts from one area to another | ● | The concept would not shift environmental impacts from one area to another. Implementation of the project described in the concept would also not shift environmental impacts. |
| CA-42: No diminishment of the benefits of existing in-stream flow | ◗ | The concept does not include elements that would alter existing in-stream flows. Raising Lower Bear would reduce existing in-stream flows by capturing more water. It is unclear at this time if the benefits of current in-stream flow would be diminished; mitigation measures could be implemented to maintain these current benefits. |
| CA-43: Avoid closing the process to the public | ● | As a condition of planning and implementation, the concept would include public involvement to the extent appropriate. This also applies to implementation of the project described in the concept. |
| CA-44: Avoid dependency on potentially unreliable supply | ◗ | The concept does not include elements that would facilitate downstream users becoming dependent on an unreliable supply. Raising Lower Bear could create additional dependency on the Mokelumne River, which is susceptible to hydrologic year types can be unreliable in drier years. |
| CA-45: Minimize adverse socio-economic and public health and safety impacts | ◗ | As a feasibility study, this concept does not have adverse socio-economic and public health and safety impacts. Raising Lower Bear would not have adverse health and safety impacts. However, raising the reservoir could potentially have some adverse socio-economic impacts; more information on potential cost and yield is needed to determine the magnitude of these impacts. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| CA-46: Avoid end use harm | ◗ | The concept does not allocate water in ways that create end use harm. It is not known at this time how the additional stored water would be allocated. |
| CA-47: Avoid violating procedural or substantive laws | ● | As a condition of implementation, the concept would be required to complete relevant CEQA/NEPA analysis prior to implementation. This would also be required if the project described in the concept were implemented. |
| CA-48: Avoid interregional inequity | ◗ | Implementation of the concept would not create interregional inequity, either in realized benefits or in costs. Raising Lower Bear could potentially have interregional inequity, particularly in environmental costs. |

**Table 1: Concept 7b: Enlarged Lower Bear**
**Percent of the Year Demand is Met or Exceeded**

| | Annual Demand in TAF | | | | | |
|---|---|---|---|---|---|---|
| % Exc | 5 | 6 | 7 | 8 | 9 | 10 |
| 100% | 2.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 98% | 3.1 | 2.7 | 0.4 | 0.2 | 0.0 | 0.0 |
| 96% | 3.4 | 3.6 | 3.5 | 1.6 | 0.0 | 0.0 |
| 94% | 3.8 | 3.8 | 4.5 | 2.3 | 0.5 | 0.0 |
| 92% | 4.6 | 4.1 | 4.7 | 3.1 | 1.5 | 0.1 |
| 90% | 5.0 | 4.7 | 4.8 | 4.5 | 2.0 | 1.2 |
| 88% | 5.0 | 5.8 | 5.0 | 5.2 | 5.0 | 3.8 |
| 86% | 5.0 | 6.0 | 5.0 | 5.3 | 5.6 | 4.5 |
| 84% | 5.0 | 6.0 | 5.2 | 5.4 | 5.7 | 4.7 |
| 82% | 5.0 | 6.0 | 5.9 | 5.6 | 5.9 | 5.2 |
| 80% | 5.0 | 6.0 | 7.0 | 5.8 | 6.0 | 5.9 |
| 78% | 5.0 | 6.0 | 7.0 | 6.4 | 6.1 | 6.2 |
| 76% | 5.0 | 6.0 | 7.0 | 7.6 | 6.2 | 6.3 |
| 74% | 5.0 | 6.0 | 7.0 | 8.0 | 6.5 | 6.4 |
| 72% | 5.0 | 6.0 | 7.0 | 8.0 | 6.8 | 6.5 |
| 70% | 5.0 | 6.0 | 7.0 | 8.0 | 7.3 | 6.6 |
| 68% | 5.0 | 6.0 | 7.0 | 8.0 | 7.6 | 6.7 |
| 66% | 5.0 | 6.0 | 7.0 | 8.0 | 8.0 | 6.8 |
| 64% | 5.0 | 6.0 | 7.0 | 8.0 | 8.3 | 6.8 |
| 62% | 5.0 | 6.0 | 7.0 | 8.0 | 8.8 | 7.2 |
| 60% | 5.0 | 6.0 | 7.0 | 8.0 | 9.0 | 7.8 |
| 58% | 5.0 | 6.0 | 7.0 | 8.0 | 9.0 | 8.6 |
| 56% | 5.0 | 6.0 | 7.0 | 8.0 | 9.0 | 9.0 |
| 54% | 5.0 | 6.0 | 7.0 | 8.0 | 9.0 | 9.3 |
| 52% | 5.0 | 6.0 | 7.0 | 8.0 | 9.0 | 9.6 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 50% | 5.0 | 6.0 | 7.0 | 8.0 | 9.0 | 10.0 |
| 48% | 5.0 | 6.0 | 7.0 | 8.0 | 9.0 | 10.0 |
| 46% | 5.0 | 6.0 | 7.0 | 8.0 | 9.0 | 10.0 |
| 44% | 5.0 | 6.0 | 7.0 | 8.0 | 9.0 | 10.0 |
| 42% | 5.0 | 6.0 | 7.0 | 8.0 | 9.0 | 10.0 |
| 40% | 5.0 | 6.0 | 7.0 | 8.0 | 9.0 | 10.0 |
| 38% | 5.0 | 6.0 | 7.0 | 8.0 | 9.0 | 10.0 |
| 36% | 5.0 | 6.0 | 7.0 | 8.0 | 9.0 | 10.0 |
| 34% | 5.0 | 6.0 | 7.0 | 8.0 | 9.0 | 10.0 |
| 32% | 5.0 | 6.0 | 7.0 | 8.0 | 9.0 | 10.0 |
| 30% | 5.0 | 6.0 | 7.0 | 8.0 | 9.0 | 10.0 |
| 28% | 5.0 | 6.0 | 7.0 | 8.0 | 9.0 | 10.0 |
| 26% | 5.0 | 6.0 | 7.0 | 8.0 | 9.0 | 10.0 |
| 24% | 5.0 | 6.0 | 7.0 | 8.0 | 9.0 | 10.0 |
| 22% | 5.0 | 6.0 | 7.0 | 8.0 | 9.0 | 10.0 |
| 20% | 5.0 | 6.0 | 7.0 | 8.0 | 9.0 | 10.0 |
| 18% | 5.0 | 6.0 | 7.0 | 8.0 | 9.0 | 10.0 |
| 16% | 5.0 | 6.0 | 7.0 | 8.0 | 9.0 | 10.0 |
| 14% | 5.0 | 6.0 | 7.0 | 8.0 | 9.0 | 10.0 |
| 12% | 5.0 | 6.0 | 7.0 | 8.0 | 9.0 | 10.0 |
| 10% | 5.0 | 6.0 | 7.0 | 8.0 | 9.0 | 10.0 |
| 8% | 5.0 | 6.0 | 7.0 | 8.0 | 9.0 | 10.0 |
| 6% | 5.0 | 6.0 | 7.0 | 8.0 | 9.0 | 10.0 |
| 4% | 5.0 | 6.0 | 7.0 | 8.0 | 9.0 | 10.0 |
| 2% | 5.0 | 6.0 | 7.0 | 8.0 | 9.0 | 10.0 |

**Table 2: Difference in Unallocated Flow below Camanche between 2040 Baseline Case and Raising Lower Bear under 5,000 AF Demand (TAF)**

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1953** | -0.92 | 0.00 | 0.00 | 0.00 | 0.02 | -16.01 | -0.21 | 0.02 | 0.02 | 0.00 | 0.00 | 0.00 | -17.08 |
| **1954** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1955** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 59.58 | 59.58 |
| **1956** | -31.81 | -6.62 | -2.28 | 7.92 | 5.66 | -1.97 | 1.20 | 1.29 | 1.25 | 0.00 | 0.00 | 0.00 | -25.36 |
| **1957** | 0.00 | 0.00 | 0.00 | 0.00 | -2.87 | 1.00 | 1.55 | 1.55 | 1.50 | 0.00 | 0.00 | 0.00 | 2.72 |
| **1958** | 0.00 | -12.48 | 2.23 | 2.77 | -16.00 | 2.20 | 2.29 | 2.50 | 2.42 | 0.00 | 0.00 | 0.00 | -14.06 |
| **1959** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1960** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1961** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1962** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1963** | 0.00 | 5.78 | 0.00 | 0.00 | -21.06 | 0.60 | 1.10 | 1.10 | 1.07 | 0.00 | 0.19 | 0.00 | -11.22 |
| **1964** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -21.49 | -21.49 |
| **1965** | -23.29 | -0.46 | 0.00 | 17.82 | 14.76 | -3.22 | 1.06 | 1.22 | 1.18 | 0.00 | -2.69 | 2.17 | 8.54 |
| **1966** | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.60 |
| **1967** | -4.43 | 3.30 | -7.51 | -0.82 | 19.56 | -10.08 | -5.20 | -2.49 | -2.41 | 0.00 | 0.00 | 0.00 | -10.07 |
| **1968** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1969** | -10.47 | -1.23 | 2.08 | -3.78 | -14.72 | 12.34 | -0.35 | -0.03 | -0.03 | 0.00 | 0.00 | 0.27 | -15.92 |
| **1970** | -8.79 | -2.72 | -5.76 | 0.00 | 3.99 | 0.19 | 4.45 | 4.45 | 4.31 | 0.00 | -2.69 | 1.22 | -1.35 |
| **1971** | -0.11 | 0.13 | -0.27 | 0.00 | 0.34 | -4.80 | 0.28 | 0.34 | 0.33 | 0.00 | 1.85 | 0.09 | -1.83 |
| **1972** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1973** | -5.49 | -0.15 | 2.16 | 0.00 | -3.79 | -4.76 | 0.20 | 0.20 | 0.20 | 0.00 | -2.00 | -2.70 | -16.13 |
| **1974** | -1.83 | 0.00 | -1.06 | 4.46 | -7.90 | 1.93 | 1.67 | 1.69 | 1.63 | 0.00 | 0.00 | 0.00 | 0.58 |
| **1975** | 0.00 | 0.00 | 0.00 | 0.00 | -1.70 | -6.81 | -1.91 | -1.70 | -1.64 | 0.00 | 1.09 | 0.00 | -12.66 |
| **1976** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1977** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1978** | 0.00 | 0.00 | 0.00 | 0.00 | 1.60 | -5.72 | 1.37 | 1.60 | 1.54 | 0.00 | 0.00 | 0.00 | 0.39 |
| **1979** | 0.00 | 0.00 | -3.67 | 0.00 | -5.26 | -3.78 | 1.08 | 1.08 | 1.05 | 0.00 | 0.00 | 0.00 | -9.50 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1980** | -11.17 | -9.17 | -5.83 | 14.12 | 11.75 | -1.77 | 1.72 | 2.37 | 2.29 | 0.00 | 0.00 | 0.00 | 4.32 |
| **1981** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -11.40 | -11.40 |
| **1982** | -6.57 | -12.23 | -19.83 | 29.39 | 4.50 | 0.60 | 0.79 | 1.14 | 1.10 | 0.00 | -5.01 | -13.20 | -19.33 |
| **1983** | -5.72 | -14.20 | -21.41 | 3.13 | 30.49 | 17.40 | 0.77 | 1.35 | 1.37 | 0.00 | -14.93 | -16.69 | -18.42 |
| **1984** | -10.86 | -4.42 | -2.18 | 0.00 | 8.31 | 9.16 | 9.99 | 9.99 | 9.66 | 0.00 | -3.42 | 0.57 | 26.81 |
| **1985** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1986** | 0.00 | -12.91 | -17.49 | 12.43 | 1.65 | 5.66 | 1.71 | 1.71 | 1.65 | 0.00 | 0.00 | 0.00 | -5.60 |
| **1987** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1988** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1989** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1990** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1991** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1992** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1993** | 0.00 | 0.00 | 0.00 | 0.00 | -7.38 | -7.28 | -3.95 | -3.76 | -3.64 | 0.00 | 0.00 | 0.00 | -25.99 |
| **1994** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1995** | 0.00 | -8.61 | -16.41 | -5.07 | 7.00 | -16.98 | 0.04 | 2.55 | 2.50 | 0.00 | 0.00 | 0.00 | -34.98 |
| **1996** | 0.00 | -6.08 | -14.80 | -1.21 | 13.61 | 5.14 | 3.10 | 3.10 | 3.00 | 0.00 | -8.32 | -9.92 | -12.40 |
| **1997** | -3.86 | -13.40 | -5.93 | 0.00 | 6.30 | 7.23 | 7.56 | 7.56 | 7.32 | 0.00 | -1.31 | 0.00 | 11.47 |
| **1998** | 0.24 | -1.10 | -3.88 | 3.95 | 9.66 | -14.48 | -0.67 | -0.02 | -0.02 | 0.00 | 0.00 | 0.00 | -6.33 |
| **1999** | -0.23 | -7.67 | -10.14 | 0.00 | -0.29 | 13.01 | -0.24 | 0.40 | 0.39 | 0.00 | 0.00 | 0.00 | -4.77 |
| **2000** | 0.00 | -4.88 | -4.16 | 0.00 | -2.21 | 1.67 | 2.25 | 2.25 | 2.17 | 0.00 | 0.00 | 0.00 | -2.91 |
| **2001** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **2002** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **2003** | 0.00 | 0.00 | 0.00 | 0.00 | -2.88 | -2.79 | -0.46 | -0.46 | -0.45 | 0.00 | 0.00 | 0.00 | -7.05 |
| **2004** | 0.00 | 0.00 | -8.96 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -8.96 |
| **2005** | 0.00 | -11.72 | -9.87 | -4.00 | -22.82 | 18.17 | 2.64 | 2.99 | 2.90 | 0.00 | 0.00 | -13.40 | -35.11 |
| **2006** | -4.77 | -9.08 | -28.07 | -24.06 | 50.38 | 10.07 | 3.12 | 3.20 | 3.10 | 0.00 | -0.53 | -1.96 | 1.40 |
| **2007** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **2008** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **2009** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **2010** | 0.00 | 0.00 | 0.00 | 0.00 | -9.70 | -21.99 | -9.76 | -9.70 | -9.39 | 0.00 | -7.56 | -27.54 | -95.64 |
| | | | | | | | | | | | | | |
| **Ave** | -2.23 | -2.24 | -3.16 | 0.98 | 1.22 | -0.28 | 0.47 | 0.65 | 0.63 | 0.00 | -0.78 | -0.94 | -5.67 |
| **Max** | -3.86 | -12.91 | -21.41 | -3.00 | 26.06 | 17.40 | 0.77 | 1.35 | 1.37 | 0.00 | -14.93 | -21.49 | -18.42 |
| **Min** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

**Table 2: Difference in in Unallocated Flow below Camanche between 2040 Baseline Case and Raising Lower Bear under 10,000 AF Demand (TAF)**

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1953** | -0.92 | 0.00 | 0.00 | 0.00 | 0.02 | -16.01 | -0.39 | 0.02 | 0.02 | 0.00 | 0.00 | 0.00 | -17.27 |
| **1954** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1955** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 59.58 | 59.58 |
| **1956** | -31.81 | -6.62 | -2.28 | 7.92 | 5.50 | -4.60 | 1.13 | 1.29 | 1.25 | 0.00 | 0.00 | 0.00 | -28.22 |
| **1957** | 0.00 | 0.00 | 0.00 | 0.00 | -3.99 | -2.68 | 1.55 | 1.55 | 1.50 | 0.00 | 0.00 | 0.00 | -2.08 |
| **1958** | 0.00 | -12.48 | 2.23 | 2.77 | -20.06 | 1.23 | 2.09 | 2.50 | 2.42 | 0.00 | 0.00 | 0.00 | -19.29 |
| **1959** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1960** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1961** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1962** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1963** | 0.00 | 5.78 | 0.00 | 0.00 | -21.27 | -5.65 | 1.10 | 1.10 | 1.07 | 0.00 | 0.19 | 0.00 | -17.67 |
| **1964** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -21.49 | -21.49 |
| **1965** | -23.29 | -0.46 | 0.00 | 17.82 | 14.73 | -5.84 | 0.92 | 1.22 | 1.18 | 0.00 | -2.69 | 2.17 | 5.75 |
| **1966** | 0.60 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.60 |
| **1967** | -4.43 | 3.30 | -7.51 | -0.82 | 19.56 | -10.40 | -9.77 | -2.49 | -2.41 | 0.00 | 0.00 | 0.00 | -14.95 |
| **1968** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1969** | -10.47 | -1.23 | 2.08 | -3.78 | -16.65 | 3.93 | -0.65 | -0.03 | -0.03 | 0.00 | 0.00 | 0.27 | -26.57 |
| **1970** | -8.79 | -2.72 | -5.76 | 0.00 | 3.90 | -0.25 | 4.45 | 4.45 | 4.31 | 0.00 | -2.69 | 1.22 | -1.88 |
| **1971** | -0.11 | 0.13 | -0.27 | 0.00 | 0.34 | -6.49 | 0.22 | 0.34 | 0.33 | 0.00 | 1.85 | 0.09 | -3.58 |
| **1972** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1973** | -5.49 | -0.15 | 2.16 | 0.00 | -3.85 | -5.01 | 0.20 | 0.20 | 0.20 | 0.00 | -2.00 | -2.70 | -16.45 |
| **1974** | -1.83 | 0.00 | -1.06 | 4.46 | -7.96 | -1.03 | 1.65 | 1.69 | 1.63 | 0.00 | 0.00 | 0.00 | -2.46 |
| **1975** | 0.00 | 0.00 | 0.00 | 0.00 | -1.70 | -23.91 | -2.11 | -1.70 | -1.64 | 0.00 | 1.09 | 0.00 | -29.97 |
| **1976** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1977** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1978** | 0.00 | 0.00 | 0.00 | 0.00 | 1.60 | -5.72 | 1.14 | 1.60 | 1.54 | 0.00 | 0.00 | 0.00 | 0.16 |
| **1979** | 0.00 | 0.00 | -3.67 | 0.00 | -5.31 | -4.03 | 1.08 | 1.08 | 1.05 | 0.00 | 0.00 | 0.00 | -9.80 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1980** | -11.17 | -9.17 | -5.83 | 14.12 | 11.69 | -2.87 | 0.03 | 2.37 | 2.29 | 0.00 | 0.00 | 0.00 | 1.47 |
| **1981** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -11.40 | -11.40 |
| **1982** | -6.57 | -12.23 | -23.22 | 9.99 | 4.01 | 0.10 | 0.49 | 1.14 | 1.10 | 0.00 | -5.01 | -13.20 | -43.41 |
| **1983** | -5.72 | -14.20 | -21.41 | 3.13 | 26.29 | 16.90 | 0.13 | 1.29 | 1.37 | 0.00 | -14.93 | -18.69 | -25.82 |
| **1984** | -11.18 | -4.42 | -2.18 | 0.00 | 6.63 | 8.66 | 9.99 | 9.99 | 9.66 | 0.00 | -3.42 | 0.57 | 24.32 |
| **1985** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1986** | 0.00 | -12.91 | -25.87 | 11.49 | 1.16 | 5.16 | 1.71 | 1.71 | 1.65 | 0.00 | 0.00 | 0.00 | -15.90 |
| **1987** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1988** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1989** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1990** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1991** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1992** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1993** | 0.00 | 0.00 | 0.00 | 0.00 | -7.52 | -7.78 | -4.13 | -3.76 | -3.64 | 0.00 | 0.00 | 0.00 | -26.82 |
| **1994** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1995** | 0.00 | -8.61 | -16.41 | -5.07 | 6.84 | -17.48 | -0.60 | 2.53 | 2.50 | 0.00 | 0.00 | 0.00 | -36.30 |
| **1996** | 0.00 | -6.08 | -14.80 | -1.21 | 9.74 | 4.89 | 3.10 | 3.10 | 3.00 | 0.00 | -8.32 | -9.92 | -16.52 |
| **1997** | -7.13 | -13.69 | -5.93 | 0.00 | 5.04 | 7.15 | 7.56 | 7.56 | 7.32 | 0.00 | -1.31 | 0.00 | 6.56 |
| **1998** | 0.24 | -1.10 | -3.88 | 3.95 | 9.66 | -19.98 | -1.31 | -0.02 | -0.02 | 0.00 | 0.00 | 0.00 | -12.47 |
| **1999** | -0.23 | -7.67 | -10.14 | 0.00 | -0.79 | 8.99 | -0.35 | 0.40 | 0.39 | 0.00 | 0.00 | 0.00 | -9.40 |
| **2000** | 0.00 | -4.88 | -4.16 | 0.00 | -4.18 | 1.30 | 2.25 | 2.25 | 2.17 | 0.00 | 0.00 | 0.00 | -5.26 |
| **2001** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **2002** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **2003** | 0.00 | 0.00 | 0.00 | 0.00 | -2.88 | -2.79 | -0.46 | -0.46 | -0.45 | 0.00 | 0.00 | 0.00 | -7.05 |
| **2004** | 0.00 | 0.00 | -8.96 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -8.96 |
| **2005** | 0.00 | -11.72 | -9.87 | -4.00 | -22.84 | 12.15 | 2.44 | 2.99 | 2.90 | 0.00 | 0.00 | -13.40 | -41.34 |
| **2006** | -4.77 | -9.08 | -30.86 | -29.58 | 49.89 | 9.57 | 3.03 | 3.20 | 3.10 | 0.00 | -0.53 | -1.96 | -7.99 |
| **2007** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **2008** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **2009** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **2010** | 0.00 | 0.00 | 0.00 | 0.00 | -9.70 | -21.99 | -9.82 | -9.70 | -9.39 | 0.00 | -7.56 | -27.54 | -95.70 |
| | | | | | | | | | | | | | |
| **Ave** | -2.29 | -2.25 | -3.41 | 0.54 | 0.83 | -1.46 | 0.29 | 0.64 | 0.63 | 0.00 | -0.78 | -0.97 | -8.23 |
| **Max** | -7.13 | -12.91 | -21.41 | -22.41 | 21.85 | 16.90 | 0.13 | 1.29 | 1.37 | 0.00 | -14.93 | -21.49 | -25.82 |
| **Min** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

**Table 3: Difference in Mokelumne Flow to Delta between 2040 Baseline Case and Raising Lower Bear under 5,000 AF Demand (TAF)**

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1953** | -0.94 | 0.00 | 0.00 | 0.00 | 0.02 | -16.01 | -0.21 | 0.02 | 0.02 | 7.50 | 0.00 | 0.00 | -9.60 |
| **1954** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 4.61 | 4.46 | 4.61 | 13.69 |
| **1955** | 4.61 | 4.17 | 4.61 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 59.23 | 72.62 |
| **1956** | -34.66 | -6.50 | -2.12 | 8.14 | 2.89 | -3.03 | 1.20 | 1.29 | 1.25 | 15.17 | 0.12 | 0.15 | -16.10 |
| **1957** | 0.00 | 0.00 | 0.00 | 0.00 | -2.87 | 1.00 | 1.55 | 1.55 | 1.50 | 2.62 | 0.00 | 0.00 | 5.34 |
| **1958** | 0.22 | -22.38 | -0.33 | 4.91 | -22.03 | 2.31 | 2.29 | 2.50 | 2.42 | 8.58 | 0.18 | 0.22 | -21.10 |
| **1959** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1960** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.84 | 1.79 | 1.84 | 5.47 |
| **1961** | 1.84 | 1.67 | 1.84 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 5.36 |
| **1962** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -4.61 | -4.46 | -4.61 | -13.69 |
| **1963** | -4.43 | -2.58 | -4.41 | 0.00 | -19.53 | -3.65 | 1.10 | 1.10 | 1.07 | 12.63 | -0.82 | 0.19 | -19.31 |
| **1964** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -26.66 | -26.66 |
| **1965** | -21.54 | -0.50 | -0.04 | 20.35 | 9.94 | -3.22 | 1.06 | 1.22 | 1.18 | 1.94 | -6.16 | -0.40 | 3.84 |
| **1966** | 0.32 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.32 |
| **1967** | -2.87 | 2.41 | -8.11 | -1.39 | 22.07 | -10.08 | -5.20 | -2.49 | -2.41 | 2.39 | 0.04 | 0.05 | -5.59 |
| **1968** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 10.55 | 0.00 | 10.55 |
| **1969** | -12.09 | -9.16 | -2.11 | -4.00 | -15.37 | 12.63 | -0.35 | -0.03 | -0.03 | 3.06 | 0.22 | -1.29 | -28.52 |
| **1970** | -8.90 | -2.75 | -5.76 | -0.01 | 3.99 | 0.19 | 4.45 | 4.45 | 4.31 | 16.78 | -14.12 | -1.41 | 1.21 |
| **1971** | -0.76 | 0.98 | -2.85 | 0.00 | 0.34 | -4.80 | 0.28 | 0.34 | 0.33 | 5.77 | 2.78 | 1.60 | 4.01 |
| **1972** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1973** | -12.64 | -1.76 | 2.29 | 0.00 | -3.79 | -2.87 | 0.20 | 0.20 | 0.20 | 14.24 | -10.72 | -5.86 | -20.50 |
| **1974** | -3.50 | -0.01 | -3.06 | 3.86 | -3.83 | 2.24 | 1.67 | 1.69 | 1.63 | -0.01 | -0.01 | -0.01 | 0.67 |
| **1975** | 0.00 | 0.00 | 0.00 | 0.00 | -1.70 | -6.81 | -1.91 | -1.70 | -1.64 | 0.00 | -3.13 | 0.00 | -16.89 |
| **1976** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1977** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1978** | 0.00 | 0.00 | 0.00 | 0.00 | 1.60 | -5.72 | 1.37 | 1.60 | 1.54 | 4.07 | 0.00 | 0.00 | 4.46 |
| **1979** | 0.00 | 3.21 | -10.03 | 0.00 | -5.26 | -3.78 | 1.08 | 1.08 | 1.05 | 13.75 | 0.00 | 0.00 | 1.09 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1980** | -22.65 | -9.13 | -5.78 | 14.28 | 12.15 | -1.77 | 1.72 | 2.37 | 2.29 | 2.08 | 0.03 | 0.04 | -4.35 |
| **1981** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 6.56 | 6.56 |
| **1982** | -17.42 | -13.88 | -23.22 | 21.84 | 4.50 | 0.60 | 0.79 | 1.14 | 1.10 | 10.72 | -6.92 | -13.20 | -33.96 |
| **1983** | -5.72 | -14.20 | -21.41 | 3.13 | 21.55 | 17.40 | 0.77 | 1.35 | 1.37 | 0.79 | -15.08 | -17.33 | -27.36 |
| **1984** | -10.68 | -4.42 | -2.18 | 0.00 | 8.31 | 9.16 | 9.99 | 9.99 | 9.66 | 5.40 | -5.00 | 0.00 | 30.24 |
| **1985** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1986** | -0.01 | -10.91 | -22.59 | 11.91 | 1.68 | 12.09 | 1.71 | 1.71 | 1.65 | 4.51 | -0.01 | -0.01 | 1.71 |
| **1987** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1988** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1989** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1990** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1991** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1992** | 0.00 | 0.00 | 0.00 | 4.46 | 7.81 | 0.00 | 0.00 | 0.00 | 0.30 | 0.00 | 0.00 | 0.00 | 12.57 |
| **1993** | 0.00 | 0.00 | 0.00 | 0.00 | -7.38 | -7.28 | -3.95 | -3.76 | -3.64 | 0.00 | 0.00 | 0.00 | -25.99 |
| **1994** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1995** | 0.00 | -16.70 | -16.09 | -4.75 | 7.35 | -16.62 | 0.04 | 2.55 | 2.50 | 8.58 | 0.27 | 0.33 | -32.53 |
| **1996** | 0.10 | -7.26 | -14.69 | -1.19 | 8.28 | 14.18 | 3.10 | 3.10 | 3.00 | 10.38 | -12.72 | -16.63 | -10.36 |
| **1997** | -12.69 | -13.30 | -5.98 | 0.00 | 6.75 | 7.23 | 7.56 | 7.56 | 7.32 | 7.88 | -6.04 | -0.05 | 6.25 |
| **1998** | -0.65 | -2.57 | 0.53 | 8.71 | 10.72 | -14.48 | -0.67 | -0.02 | -0.02 | -0.01 | -0.01 | -0.01 | 1.51 |
| **1999** | -8.24 | -0.94 | 6.92 | 6.72 | -0.29 | -2.73 | -0.24 | 0.40 | 0.39 | -0.01 | -0.02 | -0.02 | 1.92 |
| **2000** | 0.00 | -18.38 | -6.11 | 0.00 | -2.21 | 1.67 | 2.25 | 2.25 | 2.17 | 9.85 | 0.00 | 0.00 | -8.50 |
| **2001** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **2002** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **2003** | 0.00 | 0.00 | 0.00 | 0.00 | -2.88 | -2.79 | -0.46 | -0.46 | -0.45 | 0.21 | 0.00 | 0.00 | -6.84 |
| **2004** | 0.00 | 0.00 | -8.96 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -8.96 |
| **2005** | 0.35 | -3.74 | -11.98 | -3.60 | -21.99 | 3.24 | 2.64 | 2.99 | 2.90 | 4.40 | 0.28 | -12.09 | -36.60 |
| **2006** | -6.28 | -9.93 | -30.93 | -24.24 | 50.43 | 10.13 | 3.12 | 3.20 | 3.10 | 6.00 | -0.42 | -1.97 | 2.21 |
| **2007** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **2008** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.84 | 1.79 | 1.84 | 5.47 |
| **2009** | 1.84 | 1.67 | 1.84 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 5.36 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **2010** | 0.00 | 0.00 | 0.00 | 0.00 | -9.70 | -21.99 | -9.76 | -9.70 | -9.39 | 0.00 | -7.93 | -26.03 | -94.51 |
| | | | | | | | | | | | | | |
| **Ave** | -3.06 | -2.71 | -3.29 | 1.19 | 1.06 | -0.58 | 0.47 | 0.65 | 0.63 | 3.15 | -1.23 | -0.88 | -4.58 |
| **Max** | -12.69 | -10.91 | -21.41 | -10.55 | 17.11 | 17.40 | 0.77 | 1.35 | 1.37 | 14.46 | -15.08 | -26.00 | -27.36 |
| **Min** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 12.57 |

**Table 4: Difference in Mokelumne Flow to Delta between 2040 Baseline Case and Raising Lower Bear under 10,000 AF Demand (TAF)**

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1953** | -0.94 | 0.00 | 0.00 | 0.00 | 0.02 | -16.01 | -0.39 | 0.02 | 0.02 | 7.47 | 0.00 | 0.00 | -9.81 |
| **1954** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 4.61 | 4.46 | 4.61 | 13.69 |
| **1955** | 4.61 | 4.17 | 4.61 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 52.30 | 65.69 |
| **1956** | -31.65 | -6.53 | -2.16 | 8.10 | 5.69 | -4.39 | 1.13 | 1.29 | 1.25 | 15.00 | 0.09 | 0.12 | -12.07 |
| **1957** | 0.00 | 0.00 | 0.00 | 0.00 | -3.99 | -2.68 | 1.55 | 1.55 | 1.50 | 3.70 | 0.00 | 0.00 | 1.62 |
| **1958** | 0.28 | -23.52 | -0.27 | 4.98 | -22.06 | -2.57 | 2.09 | 2.50 | 2.42 | 8.82 | 0.22 | 0.28 | -26.83 |
| **1959** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1960** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.84 | 1.79 | 1.84 | 5.47 |
| **1961** | 1.84 | 1.67 | 1.84 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 5.36 |
| **1962** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -4.61 | -4.46 | -4.61 | -13.69 |
| **1963** | -4.38 | -4.94 | -4.36 | 0.00 | -20.70 | -5.35 | 1.10 | 1.10 | 1.07 | 12.84 | -0.79 | 0.24 | -24.16 |
| **1964** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -27.67 | -27.67 |
| **1965** | -21.52 | -0.48 | -0.03 | 20.37 | 10.62 | -5.84 | 0.92 | 1.22 | 1.18 | 2.64 | -6.34 | -0.50 | 2.24 |
| **1966** | 0.28 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.28 |
| **1967** | -2.61 | 2.44 | -8.08 | -1.36 | 22.11 | -10.40 | -9.77 | -2.49 | -2.41 | 3.55 | 0.07 | 0.09 | -8.86 |
| **1968** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1969** | -13.26 | -1.01 | 0.00 | -3.72 | -16.57 | 4.16 | -0.65 | -0.03 | -0.03 | 2.97 | 0.22 | -1.32 | -29.24 |
| **1970** | -8.90 | -2.75 | -5.76 | 0.00 | 3.90 | -0.25 | 4.45 | 4.45 | 4.31 | 15.35 | -13.35 | -0.84 | 0.61 |
| **1971** | -0.63 | 0.99 | -2.85 | 0.00 | 0.34 | -6.49 | 0.22 | 0.34 | 0.33 | 5.13 | 3.12 | 1.72 | 2.23 |
| **1972** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1973** | -13.98 | -0.13 | 2.21 | 0.00 | -3.85 | -5.01 | 0.20 | 0.20 | 0.20 | 3.82 | -3.19 | -3.70 | -23.24 |
| **1974** | -2.39 | 0.00 | -1.75 | 4.25 | -8.03 | 2.74 | 1.65 | 1.69 | 1.63 | 0.00 | 0.00 | 0.00 | -0.21 |
| **1975** | 0.00 | 0.00 | 0.00 | 0.00 | -1.70 | -23.91 | -2.11 | -1.70 | -1.64 | 0.00 | -2.35 | 0.00 | -33.40 |
| **1976** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1977** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1978** | 0.00 | 0.00 | 0.00 | 0.00 | 1.60 | -5.72 | 1.14 | 1.60 | 1.54 | 2.35 | 0.00 | 0.00 | 2.50 |
| **1979** | 0.00 | 0.00 | -6.11 | 0.00 | -5.31 | -4.03 | 1.08 | 1.08 | 1.05 | 7.74 | 0.00 | 0.00 | -4.50 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1980** | -16.40 | -9.16 | -5.83 | 14.24 | 11.60 | -2.87 | 0.03 | 2.37 | 2.29 | 3.68 | 0.00 | 0.00 | -0.05 |
| **1981** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -16.93 | -16.93 |
| **1982** | -6.57 | -12.23 | -23.22 | 9.99 | 4.01 | 0.10 | 0.49 | 1.14 | 1.10 | 10.73 | -6.93 | -13.20 | -34.60 |
| **1983** | -5.72 | -14.20 | -21.41 | 3.13 | 17.34 | 16.90 | 0.13 | 1.29 | 1.37 | 0.79 | -15.08 | -19.33 | -34.77 |
| **1984** | -10.82 | -4.42 | -2.18 | 0.00 | 6.63 | 8.66 | 9.99 | 9.99 | 9.66 | 5.69 | -5.00 | 0.00 | 28.21 |
| **1985** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1986** | 0.07 | -11.00 | -25.79 | 6.19 | 1.30 | 11.89 | 1.71 | 1.71 | 1.65 | 4.88 | 0.06 | 0.07 | -7.27 |
| **1987** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1988** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1989** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1990** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1991** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1992** | 0.00 | 0.00 | 0.00 | 4.46 | 7.81 | 0.00 | 0.00 | 0.00 | 0.30 | 0.00 | 0.00 | 0.00 | 12.57 |
| **1993** | 0.00 | 0.00 | 0.00 | 0.00 | -7.52 | -7.78 | -4.13 | -3.76 | -3.64 | 0.00 | 0.00 | 0.00 | -26.82 |
| **1994** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **1995** | 0.00 | -15.19 | -16.09 | -4.75 | 7.20 | -17.12 | -0.60 | 2.53 | 2.50 | 8.58 | 0.26 | 0.33 | -32.35 |
| **1996** | 0.14 | -7.24 | -14.65 | -1.15 | 4.45 | 13.97 | 3.10 | 3.10 | 3.00 | 10.53 | -12.69 | -16.59 | -14.04 |
| **1997** | -15.91 | -13.41 | -5.94 | 0.00 | 5.57 | 7.15 | 7.56 | 7.56 | 7.32 | 8.11 | -6.00 | -0.01 | 2.00 |
| **1998** | -0.60 | -2.53 | 0.59 | 8.77 | 10.79 | -19.98 | -1.31 | -0.02 | -0.02 | 0.04 | 0.04 | 0.05 | -4.20 |
| **1999** | -7.81 | -0.91 | 6.96 | 6.69 | -0.79 | -6.76 | -0.35 | 0.40 | 0.39 | 0.02 | 0.02 | 0.02 | -2.13 |
| **2000** | 0.00 | -18.01 | -6.11 | 0.00 | -4.18 | 1.30 | 2.25 | 2.25 | 2.17 | 9.98 | 0.00 | 0.00 | -10.36 |
| **2001** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **2002** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **2003** | 0.00 | 0.00 | 0.00 | 0.00 | -2.88 | -2.79 | -0.46 | -0.46 | -0.45 | 0.21 | 0.00 | 0.00 | -6.84 |
| **2004** | 0.00 | 0.00 | -8.96 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -8.96 |
| **2005** | 0.40 | -11.55 | -19.53 | -3.54 | -22.52 | 13.11 | 2.44 | 2.99 | 2.90 | 5.02 | 0.33 | -11.95 | -41.90 |
| **2006** | -6.20 | -9.87 | -30.86 | -32.44 | 50.04 | 9.75 | 3.03 | 3.20 | 3.10 | 6.35 | -0.35 | -1.88 | -6.13 |
| **2007** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **2008** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **2009** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **2010** | 0.00 | 0.00 | 0.00 | 0.00 | -9.70 | -21.99 | -9.82 | -9.70 | -9.39 | 1.10 | -8.13 | -27.40 | -95.04 |
| | | | | | | | | | | | | | |
| **Ave** | -2.80 | -2.76 | -3.37 | 0.76 | 0.71 | -1.42 | 0.29 | 0.64 | 0.63 | 2.91 | -1.28 | -1.45 | -7.13 |
| **Max** | -15.91 | -11.00 | -21.41 | -22.41 | 12.91 | 16.90 | 0.13 | 1.29 | 1.37 | 13.04 | -15.08 | -27.67 | -34.77 |
| **Min** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 12.57 |

# 7c: Surface Storage Regional Assessment

## Upper Mokelumne River Watershed Authority

### Overview

**Sponsor(s):** Upper Mokelumne River Watershed Authority (UMRWA)

**Concept type:** Planning

**Estimated Costs:** $200,000 (capital)

**Funding Source(s):** unspecified grant

**Concept location:** Amador and Calaveras counties

Conduct a regional assessment to evaluate the feasibility of the constructing additional surface storage – including both on-stream and off-stream storage opportunities – in Amador and Calaveras Counties. The study would include discussions on location, technical feasibility, political feasibility, environmental feasibility, economic feasibility, and legal feasibility. The study would include evaluation of the proposed beneficial uses of the project and clarifying operational parameters. It would also identify impacts, and constraints in the following areas: river flows, domestic water supply, technical, political, environmental (including both species-related and geomorphic), economic, legal, and recreation – recognizing that a more detailed Environmental Impact Report would be required prior to implementing a project. The study will include consultation with members of the MokeWISE MCG.

### Assessment

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| ● ***Fully addressed*** | ◗ ***Partially addressed*** | ○ ***Not addressed*** |
| WS-1: Promote demand-side management strategies | ○ | As a feasibility study, the concept does not have elements that promote demand-side management strategies. Implementation of the project described in the concept would also not have elements that would promote demand-side management strategies. |
| WS-2: Increase supply reliability | ◗ | As a feasibility study, the concept itself would not increase supply reliability. However, if the project as described in the concept were implemented, supply reliability would be increased by increasing the amount of stored water. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| WS-3: Increase amount of stored water | ◗ | As a feasibility study, the concept itself would not increase the amount of stored water. However, the purpose of the project as described in the concept is to increase the amount of stored water. As such, implementation of the project would result in an increased amount of stored water. |
| WS-4: Promote smart, responsible development | ○ | As a feasibility study, the concept itself would not promote smart, responsible development. And if implemented, while the concept does not prohibit or preclude smart, responsible development, it does not directly promote it. |
| WS-5: Reduce reliance on groundwater for irrigation | ◗ | The concept itself would not reduce reliance on groundwater for irrigation. However, if the project were implemented, more surface water would be stored which could be used to offset the use of groundwater for irrigation. |
| WS-6: Promote a long-term groundwater balance | ◗ | The concept itself would not promote a long-term groundwater balance. However, if the project were implemented, it could potentially promote a long-term groundwater balance by using surface water for irrigation instead of groundwater, thereby leaving more groundwater in the basin. |
| WS-7: Maximize water resource availability for all beneficial uses | ◗ | As a feasibility study, the concept would not maximize water resource availability. However, if the project were implemented, additional surface storage would capture additional water, which could be put to a variety of beneficial uses, including consumptive, groundwater recharge, and environmental. |
| WS-8: Decrease the need to import water | ◗ | The concept itself would not decrease the need to import water. However, the need for imported water could be decreased with the use of added storage to capture additional water during wet periods. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| WD-9: Review and understand existing agency demand estimates | ○ | The concept does not include reviewing and understanding existing agency demand estimates. Implementation of the project described in the concept would also not review existing agency demand estimates. |
| WD-10: Identify water demand issues for timely consideration by the water agencies during their UWMP update | ○ | The concept does not include identifying water demand issues for consideration in the upcoming UWMP update. Implementation of the project described in the concept would also not identify water demand issues. |
| WQ-11: Protect and improve surface and groundwater quality | ○ | As a feasibility study, the concept itself would not protect or improve surface and/or groundwater quality. Implementation of the project described in the concept would also not meet this objective. |
| WQ-12: Match delivered water quality use | ○ | The concept itself would not involve treating water, nor does it involve delivering treated water. Additional surface storage would also not involve treating water, nor would it involve delivering treated water. |
| WQ-13: Use water purification technology as a tool to maximize beneficial uses | ○ | As a feasibility study, the concept itself would not use water purification technology as a tool to maximize beneficial uses. Implementing the project described in the concept would also not include water purification elements. |
| R-14: Increase access for water-based recreation | ◗ | As a feasibility study, the concept itself does not include elements that would increase access to the Mokelumne River from Highway 12 to the headwaters. Access to the Mokelumne River could be increased if additional on-river storage were built from Highway 12 to the headwaters. |

| ***Objective*** | ● ◗ O | ***Justification*** |
|---|---|---|
| R-15: Increase angling and other recreational opportunities (increase spawning habitat, etc.) | O | As a feasibility study, the concept itself would not increase spawning habitat. On-stream dam and reservoir construction would create a discontinuity in the river channel network. Such discontinuities are seldom a positive benefit for the river ecosystem, as sediment, water, aquatic, and riparian processes are fundamentally disrupted. Off-stream storage avoids the discontinuity aspect. |
| R-16: Increase angling and other recreational opportunities (stock hatchery-raised fish) | O | The concept does not involve stocking hatchery-raised trout in designated areas on the upper Mokelumne, nor does it involve designating and managing wild trout sections. Increased storage would also not meet this objective. |
| R-17: Increase angling and other recreational opportunities (reintroduce salmon in upper Moke) | O | The concept does not include reintroducing salmon into the upper Mokelumne. Implementing the project described in the concept would also not meet this objective. |
| R-18: Increase angling and other recreational opportunities (increase opportunities) | ◗ | As a feasibility study, the concept would not increase angling and other recreational opportunities. If implemented, additional storage could potentially increase angling and recreational opportunities by providing access to the additional storage, which could be used for angling and other recreating. However, the increase in these benefits is likely small. |
| WR-19: Resolve existing water rights conflicts in the watershed | ◗ | The purpose of the concept is to assess, among other things, legal feasibility. This could include discussion on water rights, including how they could apply to the project. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| F-20: Enhance flood protection and management | ◗ | As a feasibility study, the concept would not enhance flood protection and management. If implemented, additional storage would enhance flood protection by capturing flood flows. The magnitude of these benefits will differ depending on the size and location of the storage. |
| D-21: Use sound, agreed-upon data to evaluate program alternatives (hydrology dataset) | ● | As a feasibility study, the concept would require the use of an agreed-upon hydrology dataset and/or Water Availability Analysis. |
| D-22: Use sound, agreed-upon data to evaluate program alternatives (describe in sufficient detail) | ◗ | Because the concept is not well-defined enough to complete a quantitative assessment, a qualitative assessment was performed. However, the purpose of this concept is to assess feasibility and collect sound, agreed-upon data prior to implementation of the concept. |
| D-23: Promote the contribution of sound scientific data to current body of knowledge | ● | The concept would contribute scientific data to the current body of knowledge by completing a feasibility study and developing information about potential locations and costs associated with implementing additional storage in Amador and Calaveras counties. |
| O-24: Increase investment in forest management | ○ | The concept does not include elements that would promote forest management, nor would it help reduce the economic impact of wildfires and other natural disasters. Implementation of the project described in the concept would also not increase investment in forest management. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| O-25: Maximize socio-economic, cultural, recreational, public health, and public safety benefits with a particular emphasis on disadvantaged communities (DACs) | ◗ | As a feasibility study, the concept would not meet this objective. Additional storage would maximize these benefits for a DAC, as AWA, CCWD, JVID, and CPUD all serve DACs. Additional storage for these agencies would benefit the DACs that these agencies serve. |
| O-26: Achieve equity | ◗ | As a feasibility study, the concept would not directly achieve equity. However, the benefits realized from additional storage would not be limited to a narrow group; rather, project benefits would be spread across water agency customers, spanning regions, cultures, incomes, and time. |
| E-27: Protect and enhance natural environment (enhance natural envt) | ○ | The concept itself would not enhance the natural environment. Removal of additional flows from the watershed and any local river reaches may generally result in a negative geomorphic effect to the channel and the aquatic ecosystem, as lower flows become less able to perform the geomorphic work and maintenance needed in the channel. Mitigation elements that provide benefits, perhaps below Camanche Dam to enhance anadromous fish habitat, could offset potential geomorphic impacts. |
| E-28: Protect and enhance natural environment (wild & scenic designation) | ○ | The concept does not incorporate or seek a wild and scenic designation. Additional storage would also not meet this objective. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| E-29: Protect and restore fisheries | ○ | As a feasibility study, the concept itself would not protect and restore fisheries. If additional storage is implemented, the degree of fishery benefit would depend on specific information regarding the location of additional storage, the magnitude of additional storage, operational strategies, including instream flow releases, the effects of increased storage on geomorphic processes that affect fishery habitat, and other factors. |
| A-30: Enhance or maintain the water supply for the beneficial use in ag practices | ◗ | As a feasibility study, the concept would not enhance or maintain water supply for beneficial use in agricultural practices. Implementing the project described in the concept could enhance water supply for agricultural practices by potentially providing water to AWAs, CCWDs, JVIDs, and CPUDs agricultural customers. |
| C-31: Foster long-term regional relationships and avoid unnecessary conflict and litigation | ● | The purpose of the concept is to assess the feasibility of implementing additional storage in Amador and Calaveras counties. This helps avoid unnecessary conflict and litigation by identifying and attempting to resolve issues early on. Coordination between water agencies, PG&E, non-governmental organizations, and state/federal agencies would be required. |
| C-32: Promote broadly-supported outcomes that benefit a wide range of interests | ◗ | As a feasibility study, the concept would directly promote broadly-supported outcomes that benefit a wide range of interests by providing information to the region about potential storage opportunities. If additional surface storage were implemented, this objective could be met depending on the type of storage. If the storage were on-stream, this objective would not be met, as there are a number of watershed stakeholders that oppose additional on-stream storage. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| C-33: Promote broadly-supported outcomes that benefit a wide range of interests (least controversial projects) | ◗ | The concept has passed the preliminary four screening criteria, including the beneficial and compatible screens. The project described in the concept would also need to undergo these screenings to determine if it was the least controversial project. |
| C-34: Promote broadly-supported outcomes that benefit a wide range of interests (agreements that reduce conflict) | ◗ | As a feasibility study, the concept would not result in agreements that reduce conflicts. Additional on-stream storage in the upper watershed would also not likely result in agreements that reduce conflict, as there are a number of watershed stakeholders who fundamentally disagree with additional on-stream storage. However, any resulting off-stream storage or optimization of current storage could result in agreements that reduce conflict. |
| C-35: Develop a program consistent with all existing licenses, permits, and agreements affecting the River | ● | As a condition of implementation, the concept would be consistent with all existing licenses, permits, and agreements affecting the Mokelumne River. This would also be required of the project described in the concept if it were to be implemented. |
| C-36: Develop a program consistent with all existing licenses, permits, and agreements affecting the River (CEQA/NEPA) | ● | As a condition of implementation, the concept would be required to adhere to all applicable regulatory requirements, including applicable CEQA/NEPA regulations documentation, etc. This would also be required of the project described in the concept if it were to be implemented. |
| CA-37: Avoid basing decisions on incomplete or inaccurate information | ● | The purpose of this concept is to study the feasibility of additional storage in the upper watershed; as such, the nature of the concept will help avoid basing decisions on incomplete or inaccurate information. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| CA-38: Avoid demand for new or larger on-stream dams | ◗ | The concept itself would not result in the construction of a new or larger on-stream dam. However, if additional on-stream storage is implemented as a result of the concept, this objective would not be met. |
| CA-39: Avoid harmful impacts to fisheries and other wildlife | ◗ | The concept would not create harmful impacts to fisheries and other wildlife. Implementation of additional storage could potentially create harmful impacts to fisheries and other wildlife. Mitigation measures could be implemented to minimize these impacts. |
| CA-40: Avoid conversion of agricultural lands to developed uses | ● | The concept would not convert agricultural lands to developed uses. Implementation of the project described in the concept would also not convert agricultural lands. |
| CA-41: Avoid shifting environmental impacts from one area to another | ● | The concept would not shift environmental impacts from one area to another. Implementation of the project described in the concept would also not shift environmental impacts. |
| CA-42: No diminishment of the benefits of existing in-stream flow | ◗ | The concept does not include elements that would alter existing in-stream flows. Implementation of the project described in the concept would reduce existing in-stream flows by capturing more water. It is unclear at this time if the benefits of current in-stream flow would be diminished; mitigation measures could be implemented to maintain these current benefits. |
| CA-43: Avoid closing the process to the public | ● | As a condition of planning and implementation, the concept would include public involvement to the extent appropriate. This also applies to implementation of the project described in the concept. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| CA-44: Avoid dependency on potentially unreliable supply | ◗ | The concept does not include elements that would facilitate downstream users becoming dependent on an unreliable supply. Making additional storage available by desilting could create dependency on this supply, which is more unreliable than other forms of supply, as it is susceptible to re-silting and hydrologic year type. |
| CA-45: Minimize adverse socio-economic and public health and safety impacts | ◗ | As a feasibility study, this concept does not have adverse socio-economic and public health and safety impacts. Implementation of the project described in the concept could minimize health and safety impacts by providing some flood management. Cost sharing would need to be carefully considered to minimize socio-economic impacts. |
| CA-46: Avoid end use harm | ◗ | The concept does not allocate water in ways that create end use harm. It is not known at this time how the additional stored water would be allocated. |
| CA-47: Avoid violating procedural or substantive laws | ● | As a condition of implementation, the concept would be required to complete relevant CEQA/NEPA analysis prior to implementation. This would also be required if the project described in the concept were implemented. |
| CA-48: Avoid interregional inequity | ● | Implementation of the concept would not create interregional inequity, either in realized benefits or in costs. This also holds if the project described in the concept were to be implemented. |

# 7d: Re-operation of Existing Storage

## Upper Mokelumne River Watershed Authority; CSPA

### Overview

**Sponsor(s):** Upper Mokelumne River Watershed Authority (UMRWA); California Sportfishing Protection Alliance (CSPA)

**Concept type:** Planning

**Estimated Costs:** $300,000 (capital)

**Funding Source(s):** unspecified grant and agency in-kind

**Concept location:** PG&E reservoirs on the upper Mokelumne

Conduct a study to assess the feasibility of re-operating existing storage to store water for consumptive use in addition to hydropower. The study would include a discussion on legal, environmental, political, economic, and technical feasibility, as well as address the issue of flood control capabilities. The study would include evaluation of the proposed beneficial uses of the project and clarifying operational parameters. It would also identify impacts, and constraints in the following areas: river flows, domestic water supply, technical, political, environmental (including both species-related and geomorphic), economic, legal, and recreation – recognizing that a more detailed Environmental Impact Report would be required prior to implementing a project. The study will include consultation with members of the MokeWISE MCG.

### Assessment

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| ● ***Fully addressed*** | ◗ ***Partially addressed*** | ○ ***Not addressed*** |
| WS-1: Promote demand-side management strategies | ○ | As a feasibility study, the concept does not have elements that promote demand-side management strategies. Implementation of the project described in the concept would also not have elements that would promote demand-side management strategies. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| WS-2: Increase supply reliability | ◗ | As a feasibility study, the concept itself would not increase supply reliability. However, if the project as described in the concept were implemented, supply reliability would be increased by increasing the amount of water that could be consumptively used. |
| WS-3: Increase amount of stored water | ◗ | As a feasibility study, the concept itself would not increase the amount of stored water. PG&E facilities are currently operated to maximize hydropower generation. If these facilities were re-operated to provide supply benefit, the dams would be increasing the amount of stored water that could be consumptively used. |
| WS-4: Promote smart, responsible development | ○ | As a feasibility study, the concept itself would not promote smart, responsible development. And if implemented, while the concept does not prohibit or preclude smart, responsible development, it does not directly promote it. |
| WS-5: Reduce reliance on groundwater for irrigation | ◗ | The concept itself would not reduce reliance on groundwater for irrigation. However, if the project were implemented, the additional water stored for consumptive use could be used in lieu of groundwater for irrigation. |
| WS-6: Promote a long-term groundwater balance | ○ | The concept itself would not promote a long-term groundwater balance. Re-operating storage would also not promote a long-term groundwater balance. |
| WS-7: Maximize water resource availability for all beneficial uses | ◗ | As a feasibility study, the concept would not maximize water resource availability. However, re-operating storage would optimize the storage, thereby maximizing water resource availability for beneficial use. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| WS-8: Decrease the need to import water | ◗ | The concept itself would not decrease the need to import water. However, re-operating storage could potentially decrease the need to import water if the additional water was delivered to users who import water and was used in lieu of imported water. |
| WD-9: Review and understand existing agency demand estimates | ○ | The concept does not include reviewing and understanding existing agency demand estimates. Implementation of the project described in the concept would also not review existing agency demand estimates. |
| WD-10: Identify water demand issues for timely consideration by the water agencies during their UWMP update | ○ | The concept does not include identifying water demand issues for consideration in the upcoming UWMP update. Implementation of the project described in the concept would also not identify water demand issues. |
| WQ-11: Protect and improve surface and groundwater quality | ○ | As a feasibility study, the concept itself would not protect or improve surface and/or groundwater quality. Implementation of the project described in the concept would also not meet this objective. |
| WQ-12: Match delivered water quality use | ○ | The concept itself would not involve treating water, nor does it involve delivering treated water. Additional surface storage would also not involve treating water, nor would it involve delivering treated water. |
| WQ-13: Use water purification technology as a tool to maximize beneficial uses | ○ | As a feasibility study, the concept itself would not use water purification technology as a tool to maximize beneficial uses. Implementing the project described in the concept would also not include water purification elements. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| R-14: Increase access for water-based recreation | ○ | As an implementation plan, the concept itself does not include elements that would increase access to the Mokelumne River from Highway 12 to the headwaters. Re-operating storage would also not include these elements. |
| R-15: Increase angling and other recreational opportunities (increase spawning habitat, etc.) | ○ | As a feasibility study, the concept itself would not increase spawning habitat. Implementing alternative operational strategies could have a benefit on resident and migratory fish, but this is likely small and incremental. |
| R-16: Increase angling and other recreational opportunities (stock hatchery-raised fish) | ○ | The concept does not involve stocking hatchery-raised trout in designated areas on the upper Mokelumne, nor does it involve designating and managing wild trout sections. Re-operating storage would also not meet this objective. |
| R-17: Increase angling and other recreational opportunities (reintroduce salmon in upper Moke) | ○ | The concept does not include reintroducing salmon into the upper Mokelumne. Implementing the project described in the concept would also not meet this objective. |
| R-18: Increase angling and other recreational opportunities (increase opportunities) | ○ | As a feasibility study, the concept would not increase angling and other recreational opportunities. If implemented, re-operating storage would not meet this objective. |
| WR-19: Resolve existing water rights conflicts in the watershed | ○ | The concept is not focused on resolving existing water rights protests to achieve a common understanding of the application of relevant water rights law in the watershed. This objective would also not be achieved if storage were re-operated. |
| F-20: Enhance flood protection and management | ◗ | As a feasibility study, the concept would not enhance flood protection and management. If implemented, re-operated storage could potentially include flood protection benefits. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| D-21: Use sound, agreed-upon data to evaluate program alternatives (hydrology dataset) | ● | As a feasibility study, the concept would require the use of an agreed-upon hydrology dataset and/or Water Availability Analysis. |
| D-22: Use sound, agreed-upon data to evaluate program alternatives (describe in sufficient detail) | ● | The concept is well-defined enough to complete a quantitative assessment. |
| D-23: Promote the contribution of sound scientific data to current body of knowledge | ● | The concept would contribute scientific data to the current body of knowledge by completing a feasibility study and developing information about potential locations, costs associated with re-operating storage, and operational scenarios. |
| O-24: Increase investment in forest management | ○ | The concept does not include elements that would promote forest management, nor would it help reduce the economic impact of wildfires and other natural disasters. Implementation of the project described in the concept would also not increase investment in forest management. |
| O-25: Maximize socio-economic, cultural, recreational, public health, and public safety benefits with a particular emphasis on disadvantaged communities (DACs) | ◗ | As a feasibility study, the concept would not meet this objective. Re-operated storage could maximize these benefits for a DAC if the additional water served a DAC. |
| O-26: Achieve equity | ◗ | As a feasibility study, the concept would not directly achieve equity. However, the benefits realized from additional storage would not be limited to a narrow group; rather, project benefits would be spread across regions, cultures, incomes, and time. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| E-27: Protect and enhance natural environment (enhance natural envt) | ○ | The concept itself would not enhance the natural environment. However, if re-operation included geomorphic goals as well as water supply goals, there is a potential to enhance the natural environment. |
| E-28: Protect and enhance natural environment (wild & scenic designation) | ○ | The concept does not incorporate or seek a wild and scenic designation. Re-operating storage would also not meet this objective. |
| E-29: Protect and restore fisheries | ○ | As a feasibility study, the concept itself would not protect and restore fisheries. If storage is re-operated, there may be an incremental benefit on resident and migratory fish, but these benefits are likely small. |
| A-30: Enhance or maintain the water supply for the beneficial use in ag practices | ◗ | As a feasibility study, the concept would not enhance or maintain water supply for beneficial use in agricultural practices. Implementing the project described in the concept could enhance agricultural water supply for partner agencies.. |
| C-31: Foster long-term regional relationships and avoid unnecessary conflict and litigation | ● | The purpose of the concept is to assess the feasibility of re-operating PG&E storage in the upper watershed. This helps avoid unnecessary conflict and litigation by identifying and attempting to resolve issues early on. Coordination between water agencies, PG&E, non-governmental organizations, and state/federal agencies would be required. |
| C-32: Promote broadly-supported outcomes that benefit a wide range of interests | ◗ | As a feasibility study, the concept would not directly promote broadly-supported outcomes that benefit a wide range of interests. If storage is re-operated to capture wildlife or geomorphic benefits in addition to water supply benefits, re-operating storage could provide broadly-supported outcomes that benefit a wide range of interests. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| C-33: Promote broadly-supported outcomes that benefit a wide range of interests (least controversial projects) | ◗ | The concept has passed the preliminary four screening criteria, including the beneficial and compatible screens. The project described in the concept would also need to undergo these screenings to determine if it was the least controversial project. |
| C-34: Promote broadly-supported outcomes that benefit a wide range of interests (agreements that reduce conflict) | ○ | As a feasibility study, the concept would not result in agreements that reduce conflicts. If storage is re-operated to capture wildlife or geomorphic benefits in addition to water supply benefits, re-operating storage could result in agreements that reduce conflict. |
| C-35: Develop a program consistent with all existing licenses, permits, and agreements affecting the River | ● | As a condition of implementation, the concept would be consistent with all existing licenses, permits, and agreements affecting the Mokelumne River. This would also be required of the project described in the concept if it were to be implemented. |
| C-36: Develop a program consistent with all existing licenses, permits, and agreements affecting the River (CEQA/NEPA) | ● | As a condition of implementation, the concept would be required to adhere to all applicable regulatory requirements, including applicable CEQA/NEPA regulations documentation, etc. This would also be required of the project described in the concept if it were to be implemented. |
| CA-37: Avoid basing decisions on incomplete or inaccurate information | ● | The purpose of this concept is to study the feasibility of re-operating storage; as such, the nature of the concept will help avoid basing decisions on incomplete or inaccurate information. |
| CA-38: Avoid demand for new or larger on-stream dams | ● | The concept will not result in construction of a new or larger on-stream dam. Re-operating storage would avoid new or larger on-stream dams. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| CA-39: Avoid harmful impacts to fisheries and other wildlife | ◗ | The concept would not create harmful impacts to fisheries and other wildlife. Re-operating storage for water supply benefit could potentially create harmful impacts to fisheries and other wildlife. Mitigation measures could be implemented to minimize these impacts. |
| CA-40: Avoid conversion of agricultural lands to developed uses | ● | The concept would not convert agricultural lands to developed uses. Implementation of the project described in the concept would also not convert agricultural lands. |
| CA-41: Avoid shifting environmental impacts from one area to another | ● | The concept would not shift environmental impacts from one area to another. Implementation of the project described in the concept would also not shift environmental impacts. |
| CA-42: No diminishment of the benefits of existing in-stream flow | ◗ | The concept does not include elements that would alter existing in-stream flows. Re-operating storage for water supply benefit would change the timing and amount of water being released. This could potentially reduce the benefits seen by existing in-stream flows; mitigation measures could be implemented to maintain these current benefits. |
| CA-43: Avoid closing the process to the public | ● | As a condition of planning and implementation, the concept would include public involvement to the extent appropriate. This also applies to implementation of the project described in the concept. |
| CA-44: Avoid dependency on potentially unreliable supply | ◗ | The concept does not include elements that would facilitate downstream users becoming dependent on an unreliable supply. Making additional supply available by re-operating could create dependency on this supply, which is more unreliable than other forms of supply, as it is susceptible to hydrologic year type. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| CA-45: Minimize adverse socio-economic and public health and safety impacts | ◗ | As a feasibility study, this concept does not have adverse socio-economic and public health and safety impacts. Re-operating storage would not have any adverse health and safety impacts. Cost sharing would need to be carefully considered to minimize socio-economic impacts. |
| CA-46: Avoid end use harm | ◗ | The concept does not allocate water in ways that create end use harm. It is not known at this time how the additional stored water would be allocated. |
| CA-47: Avoid violating procedural or substantive laws | ● | As a condition of implementation, the concept would be required to complete relevant CEQA/NEPA analysis prior to implementation. This would also be required if the project described in the concept were implemented. |
| CA-48: Avoid interregional inequity | ● | Implementation of the concept would not create interregional inequity, either in realized benefits or in costs. This also holds if the project described in the concept were to be implemented. |

# 7e: Optimization of Calaveras County Reservation

## Calaveras County Water District, Calaveras Public Utility District, Groundwater Basin Authority

### Overview

**Sponsor(s):** Calaveras County Water District (CCWD), Calaveras Public Utility District (CPUD), Groundwater Basin Authority (GBA)

**Concept type:** Planning

**Estimated Costs:** unknown

**Funding Source(s):** unknown

**Concept location:** Calaveras County

Evaluate the legal feasibility of and options for allowing CCWD/CPUD to assign all or a portion of Calaveras County's area of origin reservation on the Mokelumne. Evaluate potential beneficial uses of the water, including fish, wildlife, recreation, a drought reserve, and consumptive use. This may also include evaluating the feasibility of both new and previously proposed projects. The study would include evaluation of the proposed beneficial uses of the project and clarifying operational parameters. It would also identify impacts, and constraints in the following areas: river flows, domestic water supply, technical, political, environmental (including both species-related and geomorphic), economic, legal, and recreation – recognizing that a more detailed Environmental Impact Report would be required prior to implementing a project. The study will include consultation with members of the MokeWISE MCG.

### Assessment

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| ● ***Fully addressed*** | ◗ ***Partially addressed*** | ○ ***Not addressed*** |
| WS-1: Promote demand-side management strategies | ○ | As a feasibility study, the concept does not have elements that promote demand-side management strategies. Implementation of the project described in the concept would also not have elements that would promote demand-side management strategies. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| WS-2: Increase supply reliability | ◗ | As a feasibility study, the concept itself would not increase supply reliability. However, if the project as described in the concept were implemented, supply reliability would be increased by increasing the amount of water that could be consumptively used. The amount that could be consumptively used is assumed to be 20,000 AFY or less. |
| WS-3: Increase amount of stored water | ◗ | As a feasibility study, the concept itself would not increase the amount of stored water. If the reservation were assigned, stored water could be increased by up to 20,000 AFY. |
| WS-4: Promote smart, responsible development | ◗ | As a feasibility study, the concept itself would not promote smart, responsible development. Assigning all or a portion of the reservation would allow the County to maintain its area of origin right, while providing additional benefits to the watershed, which may include flood, water supply, or environmental benefits |
| WS-5: Reduce reliance on groundwater for irrigation | ◗ | The concept itself would not reduce reliance on groundwater for irrigation. However, if the project were implemented, the reservation could be used in-lieu of groundwater for irrigation. |
| WS-6: Promote a long-term groundwater balance | ◗ | The concept itself would not promote a long-term groundwater balance. However, if the project were implemented, the reservation could be used for groundwater recharge. |
| WS-7: Maximize water resource availability for all beneficial uses | ◗ | As a feasibility study, the concept would not maximize water resource availability. However, assigning all or a portion of the reservation for a variety of uses would maximize water resource availability for beneficial uses. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| WS-8: Decrease the need to import water | ◗ | The concept itself would not decrease the need to import water. However, the project described in the concept could potentially decrease the need to import water if the reservation water was delivered to users who import water and was used in lieu of imported water. |
| WD-9: Review and understand existing agency demand estimates | ○ | The concept does not include reviewing and understanding existing agency demand estimates. Implementation of the project described in the concept would also not review existing agency demand estimates. |
| WD-10: Identify water demand issues for timely consideration by the water agencies during their UWMP update | ○ | The concept does not include identifying water demand issues for consideration in the upcoming UWMP update. Implementation of the project described in the concept would also not identify water demand issues. |
| WQ-11: Protect and improve surface and groundwater quality | ◗ | As a feasibility study, the concept itself would not protect or improve surface and/or groundwater quality. If the reservation were assigned, surface water quality could be protected if the water remained in the River; groundwater quality could be improved if a portion of the reservation were recharged. |
| WQ-12: Match delivered water quality use | ○ | The concept itself would not involve treating water, nor does it involve delivering treated water. Assigning the reservation would also not involve treating water, nor would it involve delivering treated water. |
| WQ-13: Use water purification technology as a tool to maximize beneficial uses | ○ | As a feasibility study, the concept itself would not use water purification technology as a tool to maximize beneficial uses. Implementing the project described in the concept would also not include water purification elements. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| R-14: Increase access for water-based recreation | ○ | As an implementation plan, the concept itself does not include elements that would increase access to the Mokelumne River from Highway 12 to the headwaters. Assigning the reservation would also not include these elements. |
| R-15: Increase angling and other recreational opportunities (increase spawning habitat, etc.) | ○ | As a feasibility study, the concept itself would not increase spawning habitat. Less water in the river corridor generally translates to increased stressors for aquatic organisms that depend on a healthy ecosystem. Assigning all or a portion of the reservation is not expected to increase spawning habitat. |
| R-16: Increase angling and other recreational opportunities (stock hatchery-raised fish) | ○ | The concept does not involve stocking hatchery-raised trout in designated areas on the upper Mokelumne, nor does it involve designating and managing wild trout sections. Assigning the reservation would also not meet this objective. |
| R-17: Increase angling and other recreational opportunities (reintroduce salmon in upper Moke) | ○ | The concept does not include reintroducing salmon into the upper Mokelumne. Implementing the project described in the concept would also not meet this objective. |
| R-18: Increase angling and other recreational opportunities (increase opportunities) | ○ | As a feasibility study, the concept would not increase angling and other recreational opportunities. Assigning the reservation would not meet this objective. |
| WR-19: Resolve existing water rights conflicts in the watershed | ◗ | As a feasibility study, the concept would not resolve existing water rights conflicts in the watershed. However, if the reservation were assigned, Calaveras County would maintain its area of origin rights, while the water could be used for a variety of beneficial uses. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| F-20: Enhance flood protection and management | ○ | As a feasibility study, the concept would not enhance flood protection and management. Reassigning the reservation would not enhance flood protection and management. |
| D-21: Use sound, agreed-upon data to evaluate program alternatives (hydrology dataset) | ● | As a feasibility study, the concept would require the use of an agreed-upon hydrology dataset and/or Water Availability Analysis. |
| D-22: Use sound, agreed-upon data to evaluate program alternatives (describe in sufficient detail) | ● | The concept is well-defined enough to complete a quantitative assessment. |
| D-23: Promote the contribution of sound scientific data to current body of knowledge | ● | The concept would contribute scientific data to the current body of knowledge by completing a feasibility study and developing information about the legal feasibility of assigning the reservation and the potential beneficial end uses. |
| O-24: Increase investment in forest management | ○ | The concept does not include elements that would promote forest management, nor would it help reduce the economic impact of wildfires and other natural disasters. Implementation of the project described in the concept would also not increase investment in forest management. |
| O-25: Maximize socio-economic, cultural, recreational, public health, and public safety benefits with a particular emphasis on disadvantaged communities (DACs) | ◗ | As a feasibility study, the concept would not meet this objective. Assigning the reservation could maximize these benefits for a DAC if the water was assigned to a water district that served a DAC. |

| ***Objective*** | ● ◗ O | ***Justification*** |
|---|---|---|
| O-26: Achieve equity | ◗ | As a feasibility study, the concept would not directly achieve equity. However, the benefits realized from additional storage would not be limited to a narrow group; rather, project benefits would be spread across regions, cultures, incomes, and time. |
| E-27: Protect and enhance natural environment (enhance natural envt) | O | The concept itself would not enhance the natural environment. If the reservation were assigned, it would likely leave less water in the river corridor, which generally translates to increased stressors for aquatic organisms. Problems caused by less water generally include increased water temperatures; higher concentrations of chemicals (i.e. fertilizers) in the water columns which can disrupt aquatic life cycle; fewer to no episodic high flow events, which leads to riparian encroachment, and fewer instances of channel substrate renewal associated with robust sediment transport events. |
| E-28: Protect and enhance natural environment (wild & scenic designation) | O | The concept does not incorporate or seek a wild and scenic designation. Assigning the reservation would also not meet this objective. |
| E-29: Protect and restore fisheries | O | As a feasibility study, the concept itself would not protect and restore fisheries. If the reservation were assigned, it would likely leave less water in the river corridor, which generally translates to increased stressors for fish and other aquatic organisms. The project is not expected to protect and restore fisheries |
| A-30: Enhance or maintain the water supply for the beneficial use in ag practices | ◗ | As a feasibility study, the concept would not enhance or maintain water supply for beneficial use in agricultural practices. If a portion of the reservation is assigned for beneficial use by agriculture, then this objective would be met. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| C-31: Foster long-term regional relationships and avoid unnecessary conflict and litigation | ● | The purpose of the concept is to assess the feasibility of assigning Calaveras County's reservation. This helps avoid unnecessary conflict and litigation by identifying and attempting to resolve issues early on. Coordination between water agencies, non-governmental organizations, and state/federal agencies would be required. |
| C-32: Promote broadly-supported outcomes that benefit a wide range of interests | ◗ | As a feasibility study, the concept would not directly promote broadly-supported outcomes that benefit a wide range of interests. Assigning all or a portion of the reservation could serve a number of beneficial uses, which would be supported by a wide range of interests. |
| C-33: Promote broadly-supported outcomes that benefit a wide range of interests (least controversial projects) | ◗ | The concept has passed the preliminary four screening criteria, including the beneficial and compatible screens. The project described in the concept would also need to undergo these screenings to determine if it was the least controversial project. |
| C-34: Promote broadly-supported outcomes that benefit a wide range of interests (agreements that reduce conflict) | ◗ | As a feasibility study, the concept would not result in agreements that reduce conflict. Assigning all or a portion of the reservation would require agreements between a number of water agencies, state/federal agencies, and other participating entities. These agreements would help reduce conflict by beneficially using a supply that is not currently used, while allowing Calaveras County to maintain its area of origin water right. |
| C-35: Develop a program consistent with all existing licenses, permits, and agreements affecting the River | ● | As a condition of implementation, the concept would be consistent with all existing licenses, permits, and agreements affecting the Mokelumne River. This would also be required of the project described in the concept if it were to be implemented. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| C-36: Develop a program consistent with all existing licenses, permits, and agreements affecting the River (CEQA/NEPA) | ● | As a condition of implementation, the concept would be required to adhere to all applicable regulatory requirements, including applicable CEQA/NEPA regulations documentation, etc. This would also be required of the project described in the concept if it were to be implemented. |
| CA-37: Avoid basing decisions on incomplete or inaccurate information | ● | The purpose of this concept is to study the feasibility of assigning the reservation; as such, the nature of the concept will help avoid basing decisions on incomplete or inaccurate information. |
| CA-38: Avoid demand for new or larger on-stream dams | ● | The concept itself would not result in the construction of a new or larger on-stream dam. Implementation of the project described in the concept would also not require new or larger on-stream dams. |
| CA-39: Avoid harmful impacts to fisheries and other wildlife | ◗ | As a feasibility study, the concept would not generate harmful impacts to fisheries and other wildlife. Assigning a portion of the reservation would likely leave less water in the river corridor, which generally translates to increased stressors for aquatic organisms. Problems caused by less water generally include increased water temperatures; higher concentrations of chemicals (i.e. fertilizers) in the water columns which can disrupt aquatic life cycle; fewer to no episodic high flow events, which leads to riparian encroachment, and fewer instances of channel substrate renewal associated with robust sediment transport events. These outcomes would generate harmful impacts to fisheries and other wildlife. |
| CA-40: Avoid conversion of agricultural lands to developed uses | ● | The concept would not convert agricultural lands to developed uses. Implementation of the project described in the concept would also not convert agricultural lands. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| CA-41: Avoid shifting environmental impacts from one area to another | ● | The concept would not shift environmental impacts from one area to another. Implementation of the project described in the concept would also not shift environmental impacts. |
| CA-42: No diminishment of the benefits of existing in-stream flow | ◗ | As a feasibility study, the concept would not reduce current in-stream flows. Assigning a portion of the reservation would likely leave less water in the river corridor, which would reduce the benefits seen with existing in-stream flow. |
| CA-43: Avoid closing the process to the public | ● | As a condition of planning and implementation, the concept would include public involvement to the extent appropriate. This also applies to implementation of the project described in the concept. |
| CA-44: Avoid dependency on potentially unreliable supply | ◗ | As a feasibility study, the concept would not create dependency on a potentially unreliable supply. If the reservation were assigned to beneficial uses, those receiving the water could become dependent on the supply, which at some point, will be returned to the County when it is needed. |
| CA-45: Minimize adverse socio-economic and public health and safety impacts | ◗ | As a feasibility study, this concept does not have adverse socio-economic and public health and safety impacts. Assigning all or a portion of the reservation is not anticipated to have adverse socio-economic or public health and safety impacts. |
| CA-46: Avoid end use harm | ● | The concept does not allocate water in ways that create end use harm. The feasibility study would identify beneficial uses for the portion of the reservation that would be assigned; as such, there would be no end use harm associated with assigning the reservation. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| CA-47: Avoid violating procedural or substantive laws | ● | As a condition of implementation, the concept would be required to complete relevant CEQA/NEPA analysis prior to implementation. This would also be required if the project described in the concept were implemented. |
| CA-48: Avoid interregional inequity | ● | Implementation of the concept would not create interregional inequity, either in realized benefits or in costs. This also holds if the project described in the concept were to be implemented. |

# 8a: Jeff Davis Water Treatment Plant Replacement

## Calaveras Public Utility District

### Overview

Evaluate the feasibility of replacing the existing Jeff Davis Water Treatment Plant (WTP), a sand filter water treatment plant, with a state-of-the-art membrane filtration plant. The Jeff Davis WTP was designed in 1970 and is oversized for the current and projected District demands. The project would reduce backwash water requirements which would reduce demand for Mokelumne River supplies.

**Sponsor(s):** Calaveras Public Utility District

**Concept type:** Planning

**Estimated Costs:** unknown

**Funding Source(s):** unknown

**Concept location:** Jeff Davis Water Treatment Plant

### Assessment

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| ● ***Fully addressed*** | ◗ ***Partially addressed*** | ○ ***Not addressed*** |
| WS-1: Promote demand-side management strategies | ○ | As a feasibility study, the concept does not have elements that promote demand-side management strategies. Implementation of the project described in the concept would also not have elements that would promote demand-side management strategies. |
| WS-2: Increase supply reliability | ◗ | As a feasibility study, the concept itself would not increase supply reliability. However, if the project as described in the concept were implemented, the amount of Mokelumne River water needed for backwash water use would be reduced, which would likely increase supply reliability for both the CPUD and for downstream users. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| WS-3: Increase amount of stored water | ○ | The concept does not include elements that would store water, nor would it increase the amount of stored water. Implementation of the project described in the concept would also not have elements that would promote demand-side management strategies. |
| WS-4: Promote smart, responsible development | ◗ | As a feasibility study, the concept itself would not promote smart, responsible development. However, if the project as described in the concept were implemented, resizing the treatment plant would promote smart, responsible development by properly sizing the plant for currently projected CPUD demands. |
| WS-5: Reduce reliance on groundwater for irrigation | ○ | As a feasibility study, the concept itself would not reduce reliance on groundwater. Implementation of the project described in the concept would also not reduce reliance on groundwater for irrigation because no groundwater is currently used in the operation of the treatment plant. |
| WS-6: Promote a long-term groundwater balance | ○ | As a feasibility study, the concept itself would not promote a long-term groundwater balance. Implementation of the project described in the concept would also not promote a long-term groundwater balance because no groundwater is currently used in the operation of the treatment plant. |
| WS-7: Maximize water resource availability for all beneficial uses | ◗ | As a feasibility study, the concept itself would not maximize water resource availability for all beneficial uses. However, implementation of the project as described in the concept would likely maximize water resource availability for all beneficial uses by reducing the amount of Mokelumne River water that would be used for backwash water. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| WS-8: Decrease the need to import water | ○ | As a feasibility study, the concept itself would not decrease the need to import water. If implemented, the project described in the concept would offset use of Mokelumne River supplies, not the use of imported water. |
| WD-9: Review and understand existing agency demand estimates | ○ | The concept does not include reviewing and understanding existing agency demand estimates. Implementation of the project described in the concept would also not review existing agency demand estimates. |
| WD-10: Identify water demand issues for timely consideration by the water agencies during their UWMP update | ○ | The concept does not include identifying water demand issues for consideration in the upcoming UWMP update. Implementation of the project described in the concept would also not identify water demand issues. |
| WQ-11: Protect and improve surface and groundwater quality | ○ | As a feasibility study, the concept itself would not protect or improve surface and/or groundwater quality. Implementation of the project described in the concept could have some surface water quality benefits because less Mokelumne River water would be used for backwash water, thus leaving more water to dilute constituents and other pollutants. However, because of the relatively small amount of Mokelumne River water being left in the River, this benefit is likely to be negligible. |
| WQ-12: Match delivered water quality use | ◗ | As a feasibility study, the concept itself would not involve treating water, nor does it involve delivering treated water. If implemented, the concept would improve the alignment of water quality and use by reducing the need to use potable quality water for backwash purposes. |

| ***Objective*** | ● ◗ O | ***Justification*** |
|---|---|---|
| WQ-13: Use water purification technology as a tool to maximize beneficial uses | ◗ | As a feasibility study, the concept itself would not use water purification technology as a tool to maximize beneficial uses. However, if implemented, the project as described in the concept would maximize beneficial uses by upgrading the treatment plant and reducing backwash water requirements. These upgrades would reduce Mokelumne River use. |
| R-14: Increase access for water-based recreation | O | As a feasibility study, the concept itself does not include elements that would increase access to the Mokelumne River from Highway 12 to the headwaters. Implementation of the project as described in the concept would also not increase access. |
| R-15: Increase angling and other recreational opportunities (increase spawning habitat, etc.) | O | The concept would not contribute to increasing spawning habitat, designating sections of the river for hatchery and wild species, or designating environmental flows. Implementation of the project described in the concept would also not meet this objective. |
| R-16: Increase angling and other recreational opportunities (stock hatchery-raised fish) | O | As a feasibility study, the concept does not involve stocking hatchery-raised trout in designated areas on the upper Mokelumne, nor does it involve designating and managing wild trout sections. Implementation of the project described in the concept would also not stock hatchery-raised trout. |
| R-17: Increase angling and other recreational opportunities (reintroduce salmon in upper Moke) | O | As a feasibility study, the concept itself does not include reintroducing salmon into the upper Mokelumne. Implementation of the project described in the concept would also not reintroduce salmon into the upper Mokelumne. |
| R-18: Increase angling and other recreational opportunities (increase opportunities) | O | As a feasibility study, the concept itself would not increase angling, harvesting, or other recreational opportunities. Implementation of the project described in the concept would also not increase opportunities. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| WR-19: Resolve existing water rights conflicts in the watershed | ○ | The concept is not focused on resolving existing water rights protests to achieve a common understanding of the application of relevant water rights law in the watershed. Implementation of the project described in the concept would also not resolve existing water rights conflicts. |
| F-20: Enhance flood protection and management | ○ | The concept does not include elements that would enhance flood protection and/or flood management, nor would the concept enhance ecosystem function in a way that would provide flood protection. Implementation of the project described in the concept would also not provide flood protection or management. |
| D-21: Use sound, agreed-upon data to evaluate program alternatives (hydrology dataset) | ○ | As a feasibility study, the concept itself does not involve producing an agreed-upon hydrology dataset and Water Availability Analysis. Implementation of the project described in the concept would also not produce a hydrology dataset or Water Availability Analysis. |
| D-22: Use sound, agreed-upon data to evaluate program alternatives (describe in sufficient detail) | ◗ | Because the concept is not well-defined enough to complete a quantitative assessment, a qualitative assessment was performed. However, the purpose of this concept is to assess feasibility and collect sound, agreed-upon data prior to implementation of the concept. |
| D-23: Promote the contribution of sound scientific data to current body of knowledge | ● | The concept would contribute scientific data to the current body of knowledge by completing a feasibility study and developing information about the effects of installing a membrane filtration plant. |
| O-24: Increase investment in forest management | ○ | The concept does not include elements that would promote forest management, nor would it help reduce the economic impact of wildfires and other natural disasters. Implementation of the project described in the concept would also not increase investment in forest management. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| O-25: Maximize socio-economic, cultural, recreational, public health, and public safety benefits with a particular emphasis on disadvantaged communities (DACs) | ◗ | As a feasibility study, the concept would not maximize socio-economic, cultural, recreational, public health, and public safety benefits. If implemented, the project as described in the concept would maximize these benefits because the CPUD serves San Andreas, which is a DAC. |
| O-26: Achieve equity | ◗ | As a feasibility study, the concept would not directly achieve equity. However, if the treatment plant were upgraded, the benefits realized from this upgrade would not be limited to a narrow group; rather, project benefits would be spread across all of CPUD's service area, spanning regions, cultures, incomes, and time. |
| E-27: Protect and enhance natural environment (enhance natural envt) | ◗ | The concept itself would not enhance the natural environment. However, if the treatment plant were upgraded, the plant would use less Mokelumne River water for backwash water. Leaving more water in the River would likely enhance the natural environment of the watershed. |
| E-28: Protect and enhance natural environment (wild & scenic designation) | ○ | The concept does not incorporate or seek a wild and scenic designation. If implemented, the project as described in the concept would also not incorporate or seek a wild and scenic designation. |
| E-29: Protect and restore fisheries | ○ | As a feasibility study, the concept will not protect and restore fisheries. Additionally, modifying the existing water treatment plant backwashing process appears to have very little potential to benefit fishery resources. Although the project proposed in the concept would provide greater efficiency of water treatment plant operations and incrementally reduce water required for filter backwashing, the magnitude of the potential change in water supply is anticipated to be minimal in terms of fishery habitat enhancement. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| A-30: Enhance or maintain the water supply for the beneficial use in ag practices | ◗ | As a feasibility study, the concept would not enhance or maintain water supply for beneficial use in agricultural practices. Implementing the project described in the concept would enhance water supply for agricultural practices because CPUD serves agricultural users within its service area. |
| C-31: Foster long-term regional relationships and avoid unnecessary conflict and litigation | ● | The purpose of the concept is to assess the feasibility of upgrading the treatment plant. This helps avoid unnecessary conflict and litigation by identifying and attempting to resolve issues early on. |
| C-32: Promote broadly-supported outcomes that benefit a wide range of interests | ◗ | As a feasibility study, the concept would not directly promote broadly-supported outcomes that benefit a wide range of interests. However, the project described in the concept would likely promote broadly-supported outcomes. Implementation of the project described in the concept would increase water quality at the treatment plant, serve a DAC, and leave more water in the Mokelumne. These outcomes are broadly supported by a wide range of interests. |
| C-33: Promote broadly-supported outcomes that benefit a wide range of interests (least controversial projects) | ◗ | The concept has passed the preliminary four screening criteria, including the beneficial and compatible screens. The project described in the concept would also need to undergo these screenings to determine if it was the least controversial project. |
| C-34: Promote broadly-supported outcomes that benefit a wide range of interests (agreements that reduce conflict) | ○ | As a feasibility study, the concept would not result in agreements that reduce conflicts. Implementation of the project described in the concept would also not reduce conflict in the watershed. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| C-35: Develop a program consistent with all existing licenses, permits, and agreements affecting the River | ● | As a condition of implementation, the concept would be consistent with all existing licenses, permits, and agreements affecting the Mokelumne River. This would also be required of the project described in the concept if it were to be implemented. |
| C-36: Develop a program consistent with all existing licenses, permits, and agreements affecting the River (CEQA/NEPA) | ● | As a condition of implementation, the concept would be required to adhere to all applicable regulatory requirements, including applicable CEQA/NEPA regulations documentation, etc. This would also be required of the project described in the concept if it were to be implemented. |
| CA-37: Avoid basing decisions on incomplete or inaccurate information | ● | The purpose of this concept is to study the feasibility of upgrading the treatment plant; as such, the nature of the concept will help avoid basing decisions on incomplete or inaccurate information. |
| CA-38: Avoid demand for new or larger on-stream dams | ● | The concept will not result in construction of a new or larger on-stream dam. If the project as described in the concept is implemented, there would also not be demand for new or larger on-stream dams. |
| CA-39: Avoid harmful impacts to fisheries and other wildlife | ● | The concept would not create harmful impacts to fisheries and other wildlife. On the contrary, the implementation of the project described in the concept would leave more water in the Mokelumne, which would benefit fish and other wildlife. |
| CA-40: Avoid conversion of agricultural lands to developed uses | ● | The concept would not convert agricultural lands to developed uses. Implementation of the project described in the concept would also not convert agricultural lands. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| CA-41: Avoid shifting environmental impacts from one area to another | ● | The concept would not shift environmental impacts from one area to another. Implementation of the project described in the concept would also not shift environmental impacts. |
| CA-42: No diminishment of the benefits of existing in-stream flow | ● | The concept does not include elements that would alter existing in-stream flows. Implementation of the project described in the concept would also not diminish the benefits of existing in-stream flow. |
| CA-43: Avoid closing the process to the public | ● | As a condition of planning and implementation, the concept would include public involvement to the extent appropriate. This also applies to implementation of the project described in the concept. |
| CA-44: Avoid dependency on potentially unreliable supply | ● | The concept does not include elements that would facilitate downstream users becoming dependent on an unreliable supply. This also applies to implementation of the project described in the concept. |
| CA-45: Minimize adverse socio-economic and public health and safety impacts | ● | As a feasibility study, this concept does not have adverse socio-economic and public health and safety impacts. Implementation of the project described in the concept would provide public health and safety benefits by upgrading the treatment process from a sand filter to a membrane filtration process. |
| CA-46: Avoid end use harm | ● | The concept does not allocate water in ways that create end use harm. This also applies to implementation of the project described in the concept. |
| CA-47: Avoid violating procedural or substantive laws | ● | As a condition of implementation, the concept would be required to complete relevant CEQA/NEPA analysis prior to implementation. This would also be required if the project described in the concept were implemented. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| CA-48: Avoid interregional inequity | ● | Implementation of the concept would not create interregional inequity, either in realized benefits or in costs. This also holds if the project described in the concept were to be implemented. |

# 8b: Rehab of Transmission Main

## Calaveras Public Utility District

### Overview

**Sponsor(s):** Calaveras Public Utility District (CPUD)

**Concept type:** Planning and implementation

**Estimated Costs:** unknown

**Funding Source(s):** unspecified grant/loan

**Concept location:** Transmission main that runs from Jeff Davis Water Treatment Plant to Mokelumne Hill, Paloma and San Andreas

This concept will conduct a study to determine the benefits of replacing all or a portion of the transmission main that conveys treated water from the Jeff Davis water treatment plant (WTP) to Mokelumne Hill, Paloma, and San Andreas. The study would include assessment of areas that are reaching life expectancy, areas of water loss, and recommendations for rehabilitation. Upon completion of the study, the project would include replacing or lining the recommended areas of the current transmission main. The transmission main was installed in the 1970's and has had one large repair since that time. Replacing or lining the transmission main will increase the life expectancy, and likely improve efficiencies and reduce water loss.

### Assessment

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| ● ***Fully addressed*** | ◗ ***Partially addressed*** | ○ ***Not addressed*** |
| WS-1: Promote demand-side management strategies | ○ | The concept does not promote demand-side management strategies. |
| WS-2: Increase supply reliability | ● | The concept would increase supply reliability by replacing old, leaking transmission pipeline. Because this pipeline is reaching life expectancy, there is an increased risk of pipeline bursts which threatens supply reliability. |
| WS-3: Increase amount of stored water | ◗ | Because the concept would reduce water losses, it may result in an increase in the amount of stored water. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| WS-4: Promote smart, responsible development | ○ | While the concept does not prohibit or preclude smart, responsible development, it does not directly promote it. |
| WS-5: Reduce reliance on groundwater for irrigation | ○ | The concept would not reduce reliance on groundwater for irrigation. |
| WS-6: Promote a long-term groundwater balance | ○ | The concept would not help to promote a long-term groundwater balance. |
| WS-7: Maximize water resource availability for all beneficial uses | ● | The concept would maximize water resource availability for all beneficial uses by increasing efficiency and eliminating leaky pipes. Replacing the pipeline would reduce the amount of water diverted from the Mokelumne to offset the leaks. |
| WS-8: Decrease the need to import water | ○ | The concept would not decrease the need to import water. |
| WD-9: Review and understand existing agency demand estimates | ○ | The concept does not include reviewing and understanding existing agency demand estimates. |
| WD-10: Identify water demand issues for timely consideration by the water agencies during their UWMP update | ○ | The concept does not include identifying water demand issues for consideration in the upcoming UWMP update. |
| WQ-11: Protect and improve surface and groundwater quality | ○ | The concept would not protect or improve surface and/or groundwater quality. |
| WQ-12: Match delivered water quality use | ● | The concept would reduce water losses, thereby increasing the amount of potable water that could be delivered for potable use. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| WQ-13: Use water purification technology as a tool to maximize beneficial uses | ○ | The concept does not include water purification elements. |
| R-14: Increase access for water-based recreation | ○ | The concept does not include elements that would increase access to the Mokelumne River from Highway 12 to the headwaters. |
| R-15: Increase angling and other recreational opportunities (increase spawning habitat, etc.) | ○ | The concept would not contribute to increasing spawning habitat, designating sections of the river for hatchery and wild species, nor designating environmental flows. |
| R-16: Increase angling and other recreational opportunities (stock hatchery-raised fish) | ○ | The concept does not involve stocking hatchery-raised trout in designated areas on the upper Mokelumne, nor does it involve designating and managing wild trout sections. |
| R-17: Increase angling and other recreational opportunities (reintroduce salmon in upper Moke) | ○ | The concept does not include reintroducing salmon into the upper Mokelumne. |
| R-18: Increase angling and other recreational opportunities (increase opportunities) | ○ | The concept would not increase angling, harvesting, or other recreational opportunities. |
| WR-19: Resolve existing water rights conflicts in the watershed | ○ | The concept is not focused on resolving existing water rights protests to achieve a common understanding of the application of relevant water rights law in the watershed. |
| F-20: Enhance flood protection and management | ○ | The concept does not include elements that would enhance flood protection and/or flood management, nor would the concept enhance ecosystem function in a way that would provide flood protection. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| D-21: Use sound, agreed-upon data to evaluate program alternatives (hydrology dataset) | ○ | The concept does not involve producing an agreed-upon hydrology dataset and Water Availability Analysis. |
| D-22: Use sound, agreed-upon data to evaluate program alternatives (describe in sufficient detail) | ○ | Because the concept is not well-defined enough to complete a quantitative assessment, a qualitative assessment was performed. |
| D-23: Promote the contribution of sound scientific data to current body of knowledge | ◗ | The concept would contribute scientific data to the current body of knowledge by completing the feasibility study and including information on the amount of anticipated savings and documenting the condition of the old pipeline. However, because this information would be very site specific, there may not be wide application of the data. |
| O-24: Increase investment in forest management | ○ | The concept does not include elements that would promote forest management, nor would it help reduce the economic impact of wildfires and other natural disasters. |
| O-25: Maximize socio-economic, cultural, recreational, public health, and public safety benefits with a particular emphasis on disadvantaged communities (DACs) | ● | The concept would maximize socio-economic and public health and safety benefits by replacing a leaking transmission pipeline. These benefits would be realized within DAC's, as CPUD serves San Andreas, which is a disadvantaged community. |
| O-26: Achieve equity | ● | The benefits realized from the concept would not be limited to a narrow group; rather, project benefits would be spread across all of CPUD's service area, spanning regions, cultures, incomes, and time. |

| ***Objective*** | ● ◗ O | ***Justification*** |
|---|---|---|
| E-27: Protect and enhance natural environment (enhance natural envt) | ◗ | This project would likely not provide much in the way of geomorphic benefits to the river corridor, but could potentially be an additional factor in increased water efficiencies, which overall may provide additional waters to the river. |
| E-28: Protect and enhance natural environment (wild & scenic designation) | O | The concept does not incorporate or seek a wild and scenic designation. |
| E-29: Protect and restore fisheries | O | Reducing loss during transmission is expected to have very little direct or indirect fishery benefit. Presumably, increasing water conveyance efficiency would incrementally reduce the demand on surface waters. However, the incremental magnitude of such a reduction on the ability to provide instream flows or cold water pool management for fishery habitat is expected to be minimal. |
| A-30: Enhance or maintain the water supply for the beneficial use in ag practices | O | The concept does not include elements that would increase agricultural water supply. |
| C-31: Foster long-term regional relationships and avoid unnecessary conflict and litigation | O | While the concept does not prohibit or preclude fostering long-term regional relationships and avoiding unnecessary conflict and litigation, it does not directly address it. Implementation of the concept would not require coordination between a number of different agencies; Calaveras Public Utility District is the only agency that would be involved in the implementation of the concept. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| C-32: Promote broadly-supported outcomes that benefit a wide range of interests | ● | Implementation of the concept would reduce transmission losses, thereby increasing efficiency and reducing demand on the Mokelumne, and increase supply reliability. These outcomes are supported by a wide range of interests within the watershed. |
| C-33: Promote broadly-supported outcomes that benefit a wide range of interests (least controversial projects) | ● | The concept has passed the preliminary four screening criteria, including the beneficial and compatible screens. |
| C-34: Promote broadly-supported outcomes that benefit a wide range of interests (agreements that reduce conflict) | ○ | The concept would not directly address any current watershed conflicts. |
| C-35: Develop a program consistent with all existing licenses, permits, and agreements affecting the River | ● | As a condition of implementation, the concept would be consistent with all existing licenses, permits, and agreements affecting the Mokelumne River. |
| C-36: Develop a program consistent with all existing licenses, permits, and agreements affecting the River (CEQA/NEPA) | ● | As a condition of implementation, the concept would be required to adhere to all applicable regulatory requirements, including applicable CEQA/NEPA documentation, etc. |
| CA-37: Avoid basing decisions on incomplete or inaccurate information | ● | Prior to implementation, the concept would undergo a planning phase that would collect and analyze data that is considered, at the time, to be most complete and accurate. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| CA-38: Avoid demand for new or larger on-stream dams | ● | The concept would not result in construction of a new or larger on-stream dam. |
| CA-39: Avoid harmful impacts to fisheries and other wildlife | ● | The concept would not create harmful impacts to fisheries and other wildlife. |
| CA-40: Avoid conversion of agricultural lands to developed uses | ● | The concept does not include elements that would convert agricultural lands to developed uses. |
| CA-41: Avoid shifting environmental impacts from one area to another | ● | The concept does not include elements that would shift environmental impacts from one area to another. |
| CA-42: No diminishment of the benefits of existing in-stream flow | ● | The concept does not include elements that would alter existing in-stream flows. |
| CA-43: Avoid closing the process to the public | ● | As a condition of planning and implementation, the concept would include public involvement to the extent appropriate. |
| CA-44: Avoid dependency on potentially unreliable supply | ● | The concept does not include elements that would facilitate downstream users becoming dependent on an unreliable supply. |
| CA-45: Minimize adverse socio-economic and public health and safety impacts | ● | The concept does not include elements that would create adverse socio-economic and public health and safety impacts. |
| CA-46: Avoid end use harm | ● | The concept does not include elements that would allocate water in ways that create end use harm. |

| ***Objective*** | ● | ◗ | ○ | ***Justification*** |
|---|---|---|---|---|
| CA-47: Avoid violating procedural or substantive laws | | ● | | As a condition of implementation, the concept would be required to complete relevant CEQA/NEPA analysis prior to implementation. |
| CA-48: Avoid interregional inequity | | ● | | Implementation of the concept would not create interregional inequity, either in realized benefits or in costs. |

# 8c: Barney Way Septic System Conversion

## Calaveras County Water District

### Overview

This concept would connect existing residences along Barney Way either into the public sewer system or a new community septic vault system to improve water quality in the Mokelumne River. This project would evaluate options, and would implement the most cost-effective conversion alternative. Barney Way sits alongside the northern side of the Middle Fork of the Mokelumne off of Highway 26, downstream of Schaads Dam.

**Sponsor(s):** Calaveras County Water District

**Concept type:** Planning and implementation

**Estimated Costs:** unknown

**Funding Source(s):** unknown

**Concept location:** Barney Way (northern side of the Middle Fork of the Mokelumne River, off Highway 26, downstream of Schaads Dam)

### Assessment

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| ● ***Fully addressed*** | ◗ ***Partially addressed*** | ○ ***Not addressed*** |
| WS-1: Promote demand-side management strategies | ○ | The concept does not promote demand-side management strategies. |
| WS-2: Increase supply reliability | ○ | The concept would not address and/or increase supply reliability. |
| WS-3: Increase amount of stored water | ○ | The concept would not increase the amount of stored water. |
| WS-4: Promote smart, responsible development | ○ | While the concept does not prohibit or preclude smart, responsible development, it does not directly promote it. |
| WS-5: Reduce reliance on groundwater for irrigation | ○ | The concept would not reduce reliance on groundwater for irrigation. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| WS-6: Promote a long-term groundwater balance | ○ | The concept would not help to promote a long-term groundwater balance. |
| WS-7: Maximize water resource availability for all beneficial uses | ○ | The concept does not involve maximizing water resource availability. |
| WS-8: Decrease the need to import water | ○ | The concept would not decrease the need to import water. |
| WD-9: Review and understand existing agency demand estimates | ○ | The concept does not include reviewing and understanding existing agency demand estimates. |
| WD-10: Identify water demand issues for timely consideration by the water agencies during their UWMP update | ○ | The concept does not include identifying water demand issues for consideration in the upcoming UWMP update. |
| WQ-11: Protect and improve surface and groundwater quality | ● | Reducing the use of local septic systems through interconnection with a main wastewater treatment facility may provide some incremental water quality benefit within the local watershed. Wastewater leakage from septic systems into the local water supply, including adjacent streams and rivers, reduces the potential for contaminant and bacterial growth that improve water quality. |
| WQ-12: Match delivered water quality use | ○ | The concept does not involve treating water, nor does it involve delivering treated water. |
| WQ-13: Use water purification technology as a tool to maximize beneficial uses | ○ | The concept does not include water purification elements. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| R-14: Increase access for water-based recreation | ○ | The concept does not include elements that would increase access to the Mokelumne River from Highway 12 to the headwaters. |
| R-15: Increase angling and other recreational opportunities (increase spawning habitat, etc.) | ○ | The concept would not contribute to increasing spawning habitat, designating sections of the river for hatchery and wild species, nor designating environmental flows. |
| R-16: Increase angling and other recreational opportunities (stock hatchery-raised fish) | ○ | The concept does not involve stocking hatchery-raised trout in designated areas on the upper Mokelumne, nor does it involve designating and managing wild trout sections. |
| R-17: Increase angling and other recreational opportunities (reintroduce salmon in upper Moke) | ○ | The concept does not include reintroducing salmon into the upper Mokelumne. |
| R-18: Increase angling and other recreational opportunities (increase opportunities) | ○ | The concept would not increase angling, harvesting, or other recreational opportunities. |
| WR-19: Resolve existing water rights conflicts in the watershed | ○ | The concept is not focused on resolving existing water rights protests to achieve a common understanding of the application of relevant water rights law in the watershed. |
| F-20: Enhance flood protection and management | ○ | The concept does not include elements that would enhance flood protection and/or flood management, nor would the concept enhance ecosystem function in a way that would provide flood protection. |
| D-21: Use sound, agreed-upon data to evaluate program alternatives (hydrology dataset) | ○ | The concept does not involve producing an agreed-upon hydrology dataset and Water Availability Analysis. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| D-22: Use sound, agreed-upon data to evaluate program alternatives (describe in sufficient detail) | ○ | Because the concept is not well-defined enough to complete a quantitative assessment, a qualitative assessment was performed. |
| D-23: Promote the contribution of sound scientific data to current body of knowledge | ● | The concept would contribute data to the current body of knowledge through the planning study that would be completed prior to converting the septic systems. Collected and reported information would likely include information on water quality and socio-economic benefits. |
| O-24: Increase investment in forest management | ○ | The concept does not include elements that would promote forest management, nor would it help reduce the economic impact of wildfires and other natural disasters. |
| O-25: Maximize socio-economic, cultural, recreational, public health, and public safety benefits with a particular emphasis on disadvantaged communities (DACs) | ● | The concept would maximize socio-economic, cultural, recreational, public health, and public safety benefits by removing septic systems, which can create public health and safety impacts. Additionally, Barney Way is located in West Point, which is a DAC. |
| O-26: Achieve equity | ● | The benefits realized from implementing the concept would help achieve equity by addressing public health and safety impacts in a DAC. |
| E-27: Protect and enhance natural environment (enhance natural envt) | ◗ | Improvements in water quality, particularly those associated with sewage, are good for river ecosystem and human health environments. However, the incremental benefit of such improvement on fishery habitat is expected to be moderately low. |
| E-28: Protect and enhance natural environment (wild & scenic designation) | ○ | The concept does not incorporate or seek a wild and scenic designation. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| E-29: Protect and restore fisheries | ○ | The concept does not include elements that would protect and restore fisheries. |
| A-30: Enhance or maintain the water supply for the beneficial use in ag practices | ○ | The concept does not include elements that would increase agricultural water supply. |
| C-31: Foster long-term regional relationships and avoid unnecessary conflict and litigation | ○ | While the concept does not prohibit or preclude fostering long-term regional relationships and avoiding unnecessary conflict and litigation, it does not directly address it. Implementation of the concept would not require coordination between a number of different agencies; Calaveras County Water District is the only agency that would be involved in the implementation of the concept. |
| C-32: Promote broadly-supported outcomes that benefit a wide range of interests | ● | Implementation of the concept would increase surface and groundwater quality and engage a disadvantaged community. These outcomes are supported by a wide range of interests within the watershed. |
| C-33: Promote broadly-supported outcomes that benefit a wide range of interests (least controversial projects) | ● | The concept has passed the preliminary four screening criteria, including the beneficial and compatible screens. |
| C-34: Promote broadly-supported outcomes that benefit a wide range of interests (agreements that reduce conflict) | ○ | The concept would not directly address any current watershed conflicts. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| C-35: Develop a program consistent with all existing licenses, permits, and agreements affecting the River | ● | As a condition of implementation, the concept would be consistent with all existing licenses, permits, and agreements affecting the Mokelumne River. |
| C-36: Develop a program consistent with all existing licenses, permits, and agreements affecting the River (CEQA/NEPA) | ● | As a condition of implementation, the concept would be required to adhere to all applicable regulatory requirements, including applicable CEQA/NEPA documentation, etc. |
| CA-37: Avoid basing decisions on incomplete or inaccurate information | ● | Prior to implementation, the concept would undergo a planning phase that would collect and analyze data that is considered, at the time, to be most complete and accurate. |
| CA-38: Avoid demand for new or larger on-stream dams | ● | The concept would not result in construction of a new or larger on-stream dam. |
| CA-39: Avoid harmful impacts to fisheries and other wildlife | ● | The concept does not include elements that would generate harmful impacts to fisheries and other wildlife. On the contrary, the concept would be expected to increase water quality in the Mokelumne River by removing septic systems, which would likely have fishery and wildlife impacts. |
| CA-40: Avoid conversion of agricultural lands to developed uses | ● | The concept does not include elements that would convert agricultural lands to developed uses. |
| CA-41: Avoid shifting environmental impacts from one area to another | ● | The concept does not include elements that would shift environmental impacts from one area to another. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| CA-42: No diminishment of the benefits of existing in-stream flow | ● | The concept does not include elements that would alter existing in-stream flows. |
| CA-43: Avoid closing the process to the public | ● | As a condition of planning and implementation, the concept would include public involvement to the extent appropriate. |
| CA-44: Avoid dependency on potentially unreliable supply | ● | The concept does not include elements that would facilitate downstream users becoming dependent on an unreliable supply. |
| CA-45: Minimize adverse socio-economic and public health and safety impacts | ● | The concept does not include elements that would create adverse socio-economic and public health and safety impacts. Conversely, the concept would generate public health and safety benefits by removing septic systems from alongside the Mokelumne River. |
| CA-46: Avoid end use harm | ● | The concept does not allocate water in ways that create end use harm. |
| CA-47: Avoid violating procedural or substantive laws | ● | As a condition of implementation, the concept would be required to complete relevant CEQA/NEPA analysis prior to implementation. |
| CA-48: Avoid interregional inequity | ● | Implementation of the concept would not create interregional inequity, either in realized benefits or in costs. |

# 8d: Lake Camanche Village Recycled Water Project

## Amador Water Agency; JVID, CPUD

### Overview

The concept involves conducting a feasibility study that would assess converting from existing wastewater treatment ponds to a recycled water plant in the Camanche Village area to allow for recycled water to be used locally.

**Sponsor(s):** Amador Water Agency (AWA); Jackson Valley Irrigation District (JVID), Calaveras Public Utility District (CPUD)

**Concept type:** Planning

**Estimated Costs:** unknown

**Funding Source(s):** SWRCB, USDA Rural Utilities, IRWM Program

**Concept location:** North Shore Lake Camanche

### Assessment

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| ● ***Fully addressed*** | ◗ ***Partially addressed*** | ○ ***Not addressed*** |
| WS-1: Promote demand-side management strategies | ○ | As a feasibility study, the concept would not promote demand-side management strategies. Implementation of the project described in the concept would also not meet this objective. |
| WS-2: Increase supply reliability | ◗ | As a feasibility study, the concept would not increase supply reliability. However, if the project described in the concept were implemented, supply reliability would be increased by approximately 100 AFY by reusing treated wastewater, which would offset groundwater use. As a supply, recycled water is more reliable than groundwater, as recycled water is tied to population. Because of this, AWA could become more resilient against changes in groundwater levels and groundwater quality. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| WS-3: Increase amount of stored water | ○ | As a feasibility study, the concept would not increase the amount of stored water. Implementation of the project described in the concept would also not meet this objective. |
| WS-4: Promote smart, responsible development | ◗ | As a feasibility study, the concept itself would not promote smart, responsible development. However, if the project as described in the concept were implemented, hooking the Lake Camanche Village area to receive recycled water would promote smart, responsible development by developing resiliency. |
| WS-5: Reduce reliance on groundwater for irrigation | ◗ | The concept itself would not reduce reliance on groundwater for irrigation. However, if the project were implemented, the Lake Camanche Village area would reduce its reliance on groundwater for irrigation, since recycled water would be used for irrigation. |
| WS-6: Promote a long-term groundwater balance | ◗ | The concept itself would not promote a long-term groundwater balance. However, if the project were implemented, the Lake Camanche Village area would promote a long-term groundwater balance by using recycled water in-lieu of groundwater for irrigation. |
| WS-7: Maximize water resource availability for all beneficial uses | ◗ | As a feasibility study, the concept would not maximize water resource availability. However, if the project were implemented, the use of recycled water will maximize the limited water resources available for the area. |
| WS-8: Decrease the need to import water | ○ | As a feasibility study, the concept itself would not decrease the need to import water. If implemented, the project described in the concept would offset groundwater use, not the use of imported water. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| WD-9: Review and understand existing agency demand estimates | ○ | The concept does not include reviewing and understanding existing agency demand estimates. Implementation of the project described in the concept would also not review existing agency demand estimates. |
| WD-10: Identify water demand issues for timely consideration by the water agencies during their UWMP update | ○ | The concept does not include identifying water demand issues for consideration in the upcoming UWMP update. Implementation of the project described in the concept would also not identify water demand issues. |
| WQ-11: Protect and improve surface and groundwater quality | ○ | As a feasibility study, the concept itself would not protect or improve surface and/or groundwater quality. Implementation of the project described in the concept could have some groundwater water quality benefits because more groundwater would be left in the basin, thus leaving more water to dilute constituents and other pollutants. However, because of the relatively small amount of groundwater that will likely be offset, this benefit is likely to be negligible. |
| WQ-12: Match delivered water quality use | ◗ | As a feasibility study, the concept itself would not involve treating water, nor does it involve delivering treated water. If implemented, the project as described in the concept would improve the alignment of water quality and use by reducing the need to use potable quality water for irrigation. |
| WQ-13: Use water purification technology as a tool to maximize beneficial uses | ◗ | As a feasibility study, the concept itself would not use water purification as a tool to maximize beneficial uses. However, the project as described in the concept involves treating a portion of the water to tertiary level. This would allow for a wide range of uses for recycled water. |

| ***Objective*** | ● ◗ O | ***Justification*** |
|---|---|---|
| R-14: Increase access for water-based recreation | O | As a feasibility study, the concept itself does not include elements that would increase access to the Mokelumne River from Highway 12 to the headwaters. Implementation of the project as described in the concept would also not increase access. |
| R-15: Increase angling and other recreational opportunities (increase spawning habitat, etc.) | O | As a feasibility study, the concept would not increase spawning habitat. Additionally, it is not expected that converting an existing wastewater treatment plant process from one mode to another is expected to have virtually no benefit for fishery habitat. Although there is the potential for a small incremental improvement in overall wastewater treatment plant efficiency, the benefit to fishery habitat through increased water supply availability, instream flows, or cold water pool management is anticipated to be minimal. |
| R-16: Increase angling and other recreational opportunities (stock hatchery-raised fish) | O | As a feasibility study, the concept does not involve stocking hatchery-raised trout in designated areas on the upper Mokelumne, nor does it involve designating and managing wild trout sections. Implementation of the project described in the concept would also not stock hatchery-raised trout. |
| R-17: Increase angling and other recreational opportunities (reintroduce salmon in upper Moke) | O | As a feasibility study, the concept itself does not include reintroducing salmon into the upper Mokelumne. Implementation of the project described in the concept would also not reintroduce salmon into the upper Mokelumne. |
| R-18: Increase angling and other recreational opportunities (increase opportunities) | O | As a feasibility study, the concept itself would not increase angling, harvesting, or other recreational opportunities. Implementation of the project described in the concept would also not increase opportunities. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| WR-19: Resolve existing water rights conflicts in the watershed | ○ | The concept is not focused on resolving existing water rights protests to achieve a common understanding of the application of relevant water rights law in the watershed. Implementation of the project described in the concept would also not resolve existing water rights conflicts. |
| F-20: Enhance flood protection and management | ○ | The concept does not include elements that would enhance flood protection and/or flood management, nor would the concept enhance ecosystem function in a way that would provide flood protection. Implementation of the project described in the concept would also not provide flood protection or management. |
| D-21: Use sound, agreed-upon data to evaluate program alternatives (hydrology dataset) | ○ | As a feasibility study, the concept itself does not involve producing an agreed-upon hydrology dataset and Water Availability Analysis. Implementation of the project described in the concept would also not produce a hydrology dataset or Water Availability Analysis. |
| D-22: Use sound, agreed-upon data to evaluate program alternatives (describe in sufficient detail) | ◗ | Because the concept is not well-defined enough to complete a quantitative assessment, a qualitative assessment was performed. However, the purpose of this concept is to assess feasibility and collect sound, agreed-upon data prior to implementation of the concept. |
| D-23: Promote the contribution of sound scientific data to current body of knowledge | ● | The concept would contribute scientific data to the current body of knowledge by completing a feasibility study and developing information about the effects of switching away from wastewater ponds. |
| O-24: Increase investment in forest management | ○ | The concept does not include elements that would promote forest management, nor would it help reduce the economic impact of wildfires and other natural disasters. Implementation of the project described in the concept would also not increase investment in forest management. |

| ***Objective*** | ● ◗ O | ***Justification*** |
|---|---|---|
| O-25: Maximize socio-economic, cultural, recreational, public health, and public safety benefits with a particular emphasis on disadvantaged communities (DACs) | ◗ | As a feasibility study, the concept would not maximize socio-economic, cultural, recreational, public health, and public safety benefits. If implemented, the project as described in the concept would maximize these benefits as the Lake Camanche Village area is a DAC. Additionally, the implementation of a public wastewater system with reuse will lift a decade long moratorium on wastewater connections, provide an option to engineered on-site systems, reduce wastewater spills, and enhance the area with a reliable drought resistant water supply. |
| O-26: Achieve equity | ◗ | As a feasibility study, the concept would not directly achieve equity. However, if the project as described in the concept was implemented, the benefits realized would be spread across cultures, incomes, and time. |
| E-27: Protect and enhance natural environment (enhance natural envt) | ◗ | As a feasibility study, the concept would not protect and enhance the natural environment. However, if the project as described in the concept were implemented, improvements in water quality, particularly those associated with sewage and good for river ecosystem environments. While the project has little to no geomorphic benefits, there are environmental components to the project that are compelling. The project could eliminate failed on-site septic systems, some of which may contribute to the degradation of Lake Camanche. However, the magnitude of these benefits is unknown at this time and may be minimal. |
| E-28: Protect and enhance natural environment (wild & scenic designation) | O | The concept does not incorporate or seek a wild and scenic designation. If implemented, the project as described in the concept would also not incorporate or seek a wild and scenic designation. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| E-29: Protect and restore fisheries | ○ | As a feasibility study, the concept will not protect and restore fisheries. Additionally, modifying the existing water treatment plant backwashing process appears to have very little potential to benefit fishery resources. Although the project proposed in the concept would provide greater efficiency of water treatment plant operations and incrementally reduce water required for filter backwashing, the magnitude of the potential change in water supply is anticipated to be minimal in terms of fishery habitat enhancement. |
| A-30: Enhance or maintain the water supply for the beneficial use in ag practices | ◗ | The concept itself would not enhance or maintain water supply for agricultural users. If implemented, the project described in the concept would provide recycled water for a nearby ranch (initially about 75 AFY), which would maintain supply for agricultural uses. |
| C-31: Foster long-term regional relationships and avoid unnecessary conflict and litigation | ● | The purpose of the concept is to assess the feasibility of using recycled water in the Lake Camanche Village area. This helps avoid unnecessary conflict and litigation by identifying and attempting to resolve issues early on. Implementation of the project described in the concept would require coordination between EBMUD, JVID, Amador County Environmental Health, AWA, and residents in the Lake Camanche Village area. |
| C-32: Promote broadly-supported outcomes that benefit a wide range of interests | ◗ | As a feasibility study, the concept would not directly promote broadly-supported outcomes that benefit a wide range of interests. However, the project described in the concept would likely promote broadly-supported outcomes. Implementation of the project described in the concept would likely increase water quality in Lake Camanche and provide benefits to a DAC. These outcomes are broadly supported by a wide range of interests. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| C-33: Promote broadly-supported outcomes that benefit a wide range of interests (least controversial projects) | ◗ | The concept has passed the preliminary four screening criteria, including the beneficial and compatible screens. The project described in the concept would also need to undergo these screenings to determine if it was the least controversial project. |
| C-34: Promote broadly-supported outcomes that benefit a wide range of interests (agreements that reduce conflict) | ○ | As a feasibility study, the concept would not result in agreements that reduce conflicts. Implementation of the project described in the concept would also not reduce conflict in the watershed. |
| C-35: Develop a program consistent with all existing licenses, permits, and agreements affecting the River | ● | As a condition of implementation, the concept would be consistent with all existing licenses, permits, and agreements affecting the Mokelumne River. This would also be required of the project described in the concept if it were to be implemented. |
| C-36: Develop a program consistent with all existing licenses, permits, and agreements affecting the River (CEQA/NEPA) | ● | As a condition of implementation, the concept would be required to adhere to all applicable regulatory requirements, including applicable CEQA/NEPA regulations documentation, etc. This would also be required of the project described in the concept if it were to be implemented. |
| CA-37: Avoid basing decisions on incomplete or inaccurate information | ● | The purpose of this concept is to study the feasibility of using recycled water in the Lake Camanche Village area; as such, the nature of the concept will help avoid basing decisions on incomplete or inaccurate information. |
| CA-38: Avoid demand for new or larger on-stream dams | ● | The concept will not result in construction of a new or larger on-stream dam. If the project as described in the concept is implemented, there would also not be demand for new or larger on-stream dams. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| CA-39: Avoid harmful impacts to fisheries and other wildlife | ● | The concept would not create harmful impacts to fisheries and other wildlife. Implementation of the project as described in the concept would also avoid harmful impacts to fisheries and other wildlife. |
| CA-40: Avoid conversion of agricultural lands to developed uses | ● | The concept would not convert agricultural lands to developed uses. Implementation of the project described in the concept would also not convert agricultural lands. |
| CA-41: Avoid shifting environmental impacts from one area to another | ● | The concept would not shift environmental impacts from one area to another. Implementation of the project described in the concept would also not shift environmental impacts. |
| CA-42: No diminishment of the benefits of existing in-stream flow | ● | The concept does not include elements that would alter existing in-stream flows. Implementation of the project described in the concept would also not diminish the benefits of existing in-stream flow. |
| CA-43: Avoid closing the process to the public | ● | As a condition of planning and implementation, the concept would include public involvement to the extent appropriate. This also applies to implementation of the project described in the concept. |
| CA-44: Avoid dependency on potentially unreliable supply | ● | The concept does not include elements that would facilitate downstream users becoming dependent on an unreliable supply. This also applies to implementation of the project described in the concept. On the contrary, supply reliability is increased by using recycled water, a drought-resistant supply. |

| ***Objective*** | ● ◗ ○ | ***Justification*** |
|---|---|---|
| CA-45: Minimize adverse socio-economic and public health and safety impacts | ● | As a feasibility study, this concept does not have adverse socio-economic and public health and safety impacts. Use of recycled water mandates protections of public health and safety. As a condition of implementation, the project described in the concept would be required to follow regulations mandating health and safety impacts. Additionally, the project would provide public health and safety benefits by removing old, potentially leaky septic systems. |
| CA-46: Avoid end use harm | ● | The concept does not allocate water in ways that create end use harm. This also applies to implementation of the project described in the concept. |
| CA-47: Avoid violating procedural or substantive laws | ● | As a condition of implementation, the concept would be required to complete relevant CEQA/NEPA analysis prior to implementation. This would also be required if the project described in the concept were implemented. |
| CA-48: Avoid interregional inequity | ● | Implementation of the concept would not create interregional inequity, either in realized benefits or in costs. This also holds if the project described in the concept were to be implemented. |