MokeWISE Program Scope of Work:
Project 7b: Raise Lower Bear Feasibility Study

April 2015

Problem Statement and MokeWISE Stakeholder Interests

Water purveyors in Amador County and northern Calaveras County are concerned with short-term water supply reliability in conditions of drought and/or potential curtailments by the State Water Resources Control Board. These water purveyors are also concerned with long-term water supply reliability for existing rights and contracts in the face of drought and climate change. Finally, these water purveyors seek to assure a reliable future water supply that will accommodate growth, including under conditions of drought and climate change.

Water agencies have an interest in protecting their water rights, licenses and facility operations in order to assure water supply reliability for their customers and to continue to meet downstream obligations. Raise Lower Bear Reservoir project was identified as a portfolio component in EBMUDs Water Supply Management Program 2040. Some water agencies interest in the project would be to participate as a part of a broad coalition of interested parties seeking water supply and/or environmental benefit from the project.

Environmental stakeholders in the MokeWISE process are concerned that unnecessary or poorly planned water development may occur that will have harmful environmental, social, economic and recreational impacts, particularly related to aquatic resources. They are concerned that premature water development may create a structural and financial imbalance between water infrastructure and other infrastructure (including transportation and land-use), incentivizing regional development to pay for water infrastructure. They are concerned that the project may enable development that is inconsistent with good land use planning. They are concerned that surface storage development may create precedent for a new dam building era in California in place of more environmentally appropriate approaches to water supply and water use. Environmental stakeholders are also concerned that uncertainty over future water supply may cause water purveyors to oppose long-term river protection, including Wild & Scenic designation for portions of the upper Mokelumne River.

Some non-governmental organizations see the need for the upcountry water agencies to practice transparent decisionmaking processes, and to complete long-range financial planning, with appropriate ratepayer involvement, prior to engaging in capital intensive construction projects. These organizations are interested in seeing that project benefits are equitably reaped, and the burdens equitably distributed.

The Raise Lower Bear Feasibility Study will conduct a study to assess the feasibility of raising Lower Bear Reservoir to:

- Meet short-term and long-term water supply reliability as well as and long-term water supply needs of Amador County and northern Calaveras County, and

- Protect Mokelumne River-related environmental, social and recreational values and resources consistent with the intent of the MokeWISE project, interested stakeholder

concerns, and current laws and regulations at the time of project funding.

- Protect the public's right to managed access the Mokelumne River and its tributaries for fishing, recreation, commerce and other public benefits.

The study will 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 and operating the enlarged reservoir to protect the Mokelumne River and its resources consistent with the existing licenses, permits, legal agreements, legal decisions, and operating regimes that currently protect the river's water quality, cultural and historical resources, recreational uses, scenic values. In addition to modifications to the dam itself, the study will evaluate construction of an updated intake structure and spillway, and relocation of adjacent roads and existing recreation facilities. This feasibility study will be a continuation of previous studies and serve to address previously unanswered questions and unresolved issues.

Background Information

The Mokelumne River watershed lies on the western slope of the Sierra Nevada in Alpine, Amador, Calaveras, and San Joaquin counties. Snowmelt from parts of Alpine, Amador, and Calaveras counties contribute to the Mokelumne River runoff. The river's primary tributaries are the North, Middle, and South Forks of the Mokelumne River, with the North Fork draining close to 85% of the Mokelumne River watershed. Flows in the North Fork and some of the significant tributaries are regulated by a series of Pacific Gas & Electric (PG&E) reservoirs located directly upstream of East Bay Municipal Utility District's (EBMUD's) Pardee Reservoir. Snowmelt enters the upper reaches of the Mokelumne River and its tributaries, which then flow into the reservoirs owned by PG&E. Those on-stream reservoirs release flows back into the streams and the river, which progress downstream ultimately reaching Pardee Reservoir (EBMUD, 2012). A significant amount of water is also routed around the North Fork below Salt Springs Dam through a diversion and flume system. The FERC license for PG&E's Project 137 includes streamflows based on a multi-stakeholder settlement agreement. They mimic the natural hydrograph of the river and have been adjusted since the license was issued in 2000, in accordance with a stakeholder-supported adaptive management program, in part to protect sensitive biological resources in the North Fork below Salt Springs Dam and the Bear River confluence.

Lower Bear Reservoir is located approximately 35 miles northeast of the city of Jackson at an elevation of about 5,800 feet above sea level. Originally constructed in 1952 with a usable capacity of 52,025 acre-feet, the reservoir is part of Pacific Gas and Electric's Mokelumne River Hydroelectric Project, Federal Energy Regulatory Commission (FERC) project #137. The reservoir provides storage for hydroelectric operations, recreation, and public water

supplies, and its banks are home to a Boy Scout camp and other recreational facilities. In 1978, Amador County Water Agency (now Amador Water Agency) entered into an agreement with PG&E to store up to a maximum of 1,600 acre-feet of water in the Lower Bear reservoir to provide for a firm supply of water in association with its water right application on the Mokelumne River for the AWA's Central Amador Water Project.

Federal agencies have found sections of the North Fork and main stem Mokelumne River downstream of the project to be eligible for designation as a National Wild and Scenic River and they were included in state Wild and Scenic legislation proposed in 2014. Both designations require protecting the river's free-flowing condition and natural character as well as specific, named extraordinary (or "outstandingly remarkable") values. Federal Wild and Scenic studies have named those values as high water quality, scenic beauty, and cultural, and historic. State legislation proposed in 2014 added recreational values because of the number, popularity, long history, quality, and diversity of recreational activities on the river.

Project Information

Project Description

The Raise Lower Bear Feasibility Study will assess the feasibility of raising the existing Lower Bear dam to meet or assist in meeting both short-term and long-term water supply reliability needs and also to meet or assist in meeting long-term water supply needs for Amador County and possibly northern Calaveras County in a way that protects environmental, social, and recreational uses consistent with the intent of the MokeWISE project and environmental stakeholders' concerns. This protection includes operating the enlarged reservoir to protect the Mokelumne River and its resources consistent with the existing licenses, permits, legal agreements, legal decisions, and operating regimes that currently protect the river's water quality, cultural and historical resources, recreational uses, and scenic values.

The study will evaluate the adequacy of current water supplies to meet short-term needs in Amador and northern Calaveras counties. The study will also evaluate specific water supply needs in Amador and northern Calaveras counties that may not be met in the long-term under a series of clearly defined conditions, including various demand and development scenarios, drought and climate change.

The study will 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. The study will provide the height, or possible heights, of the dam; the associated capacity of the reservoir, and the use or uses to be made of the water.

The study will evaluate the feasibility of operating an enlarged Lower Bear River Reservoir consistent with existing uses, licenses, operating goals and norms adopted by the PG&E Ecological Resources Committee for implementation of the Project 137 FERC license, and permits. These uses include PG&E hydropower operations and licenses consistent with current practice and the related settlement agreement, existing water supply contracts between PG&E and Amador Water Agency, existing operational requirements on PG&E to meet downstream water supply needs consistent with the Lodi Decrees, the 1958 agreements between EBMUD and Amador and Calaveras counties, and EBMUD's water supply operations, both for its own customers and for downstream users.

The study will evaluate contractual agreements and/or water rights that are presently available, whether and how they could be modified to meet project purposes, and what new contractual agreements and/or water rights would additionally be needed to meet the target needs. The study will evaluate additional relevant legal issues associated with enlarging Lower Bear River Reservoir. These will include, but not be limited to: consistency with the state and federal Endangered Species Acts, National Forest Management Act, Eldorado National Forest Land and Resource Management Plan, Lodi Decrees, and the county of origin statutes of the California Water Code.

The study will conduct a hydrologic assessment to identify operational alternatives and will use an updated MOCASIM model to simulate those alternatives. Among those alternatives, modeling will evaluate the relative benefits to operations in the event that county of origin filings can be used by Amador and/or Calaveras counties.

The study will evaluate institutional obstacles and opportunities to providing the additional use of Lower Bear Reservoir.

The study will evaluate potential impacts and benefits to the Mokelumne River, including impacts if any on streamflows and the long-term benefit of additional avoided water development. The study will also evaluate the potential for environmental benefits, including but not limited to additional environmental and recreational flow releases for dry years and critically dry years, potential temperature enhancements, recreational site improvements, and others yet to be determined.

The study will evaluate any new infrastructure or infrastructure modifications outside the immediate project area that would be necessary for the project to serve the needs of the target areas.

The study will assess the feasibility of relocating existing recreational areas and transportation infrastructure, and the potential impacts of losing those recreation areas and transportation facilities.

The study will include an economic evaluation of the short-term and long-term costs of the project, including the costs of developing agreements and any needed water rights or water

right modifications, condemnation or long-term lease of surrounding PG&E lands and conservation easements, loss of hydropower revenues if any, costs of any needed infrastructure, and range of costs per acre-foot of water that might be delivered under various short-term and long-term conditions.

The study will clarify the operational parameters that will protect instream resources, including wildlife and fish, and evaluate the potential for impacts to existing uses and users (including hydropower, recreation, cultural uses, and water supply).

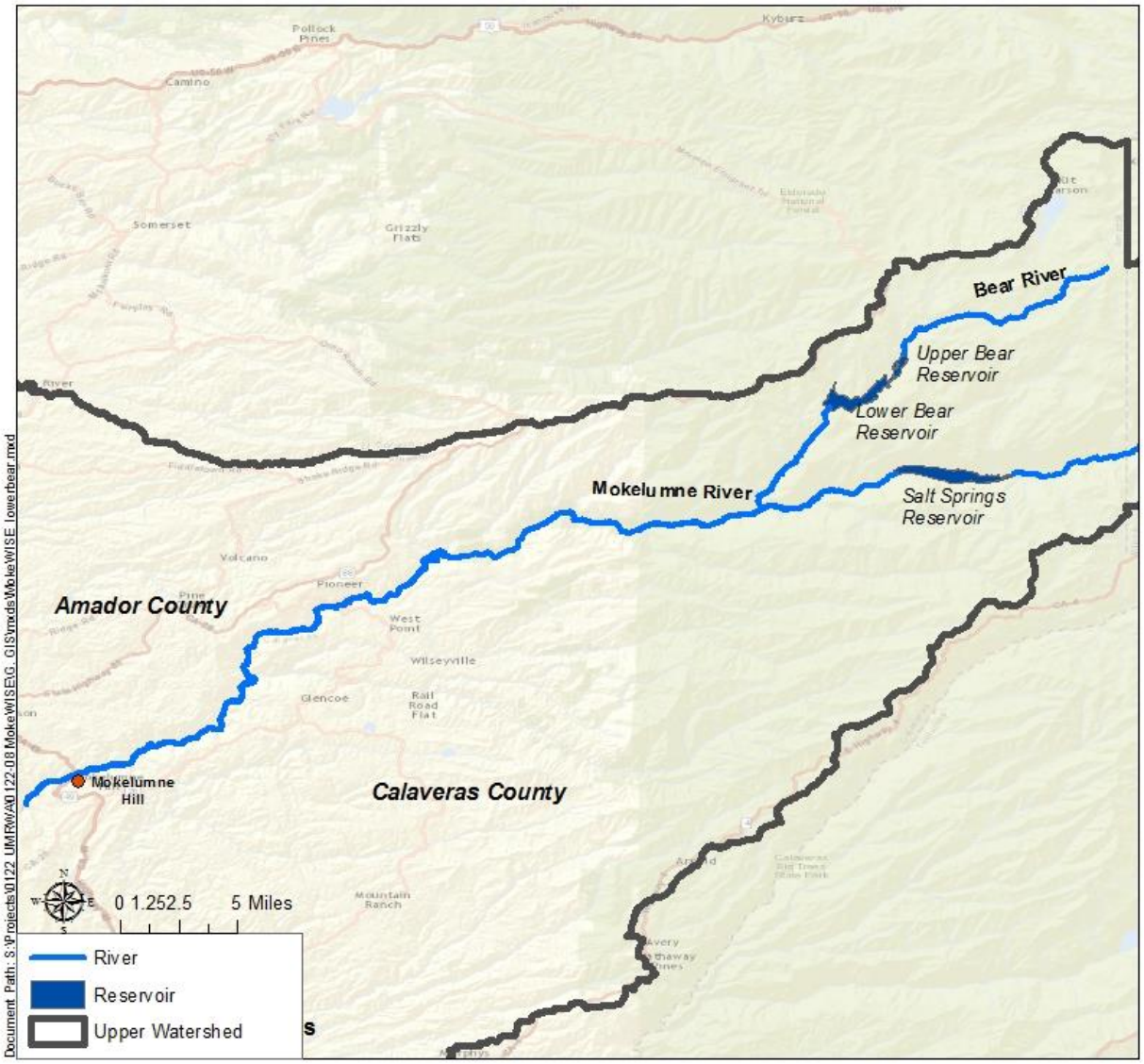
The study will include a consultation process with interested and concerned stakeholders during all phases.

A more detailed Environmental Impact Report and Environmental Impact Statement would be required prior to implementing a project.

Project Location

This study would include the areas located within Amador and Calaveras counties as shown in **Figure 1**.

Figure 1: Location of Bear River and Lower Bear Reservoir



Project Sponsor

AWA, Jackson Valley Irrigation District (JVID), CCWD, and Calaveras Public Utility District (CPUD) are the lead sponsors of this project. No co-sponsors have been identified.

Scope of Work

Task 1. Regional Reliability Needs Assessment

Subtask 1.1 Establish Level of Service Objectives

In order to properly assess current and future reliability needs, level of service (LOS) objectives for future reliability must be established. Working with local water agencies in Amador and Calaveras Counties and interested stakeholders, LOS objectives will be developed that articulate the acceptable frequency, duration, and extent of water supply outages resulting from inadequate storage capacity. These LOS objectives will establish a quantitative benchmark for assessing potential climate change impacts on reliability and articulating a potential need for improved reliability in the future.

Subtask 1.2 Regional Reliability Needs Assessment

This task will include assessing projected future supply reliability for Amador and Calaveras Counties. The reliability assessment will compare projected future supplies and a range of demands in the region, developed in coordination with stakeholders, to quantify projected future supply shortfalls under a range of hydrologic and population change conditions and establish a range of future supply needs. Needs and water demand will be based on widely accepted demographic data including, but not limited to the CA Department of Finance population projections for Amador County; reasonable projections for future water use based on increased levels of conservation, reuse, and efficiency; and a reasonable assessment of the water agencies' financial and technical capacity to expand delivery systems outside their current service areas if doing so is factored into the demand projection.

The study will identify the sources of the water supply, the nature and amount of the proposed water uses, and the locations and the descriptions of any diversions and the storage facilities. The study will present current and reliable data on the "population to be served" and its future water requirements if water is to be used for municipal purposes. The study will map and identify the land to be irrigated, its acreage, and its irrigation needs, if the project is seeking water for agricultural use.

In coordination with stakeholders, three climate change scenarios will be developed to reflect minimal, moderate, and severe climate change impacts. Each scenario will include specific assumptions related to future changes in mean temperatures and precipitation patterns in the Upper Mokelumne River watershed. The existing WARMF model of the Upper Mokelumne River watershed, or another model agreed upon by the stakeholder group, will be used to project the impact of changing temperature and precipitation patterns on supply reliability in the watershed. Supply availability will be overlaid with projected demand patterns to identify any projected changes in the timing, extent, and / or severity of projected outages. These projections will be compared to the LOS objectives developed in Task 1.1 to determine

whether or not additional reliability is needed in future years to meet stated LOS objectives. If additional reliability is needed, the analysis will indicate the magnitude and conditions under which reliability improvement is needed.

Based on the results of this analysis, potential measures needed to secure future supply reliability will be identified. This will include a determination of the degree to which additional above- or below-ground storage could mitigate potential climate change impacts on water supplies and / or environmental resources, and will assist in determining the magnitude of additional storage capacity needed to mitigate potential future reliability impacts.

Task 2. Model Updates

This task involves working with PG&E and EBMUD to understand and document current operational parameters. This information has been previously documented and is reflected in the operating logic incorporated in the MOCASIM model of the upper watershed. Following discussions with PG&E and EBMUD staff, model logic will be reviewed and confirmed, or updated if necessary based on new information.

Task 3. Alternatives Development

Subtask 3.1 Alternatives Development

This task includes inspecting and assessing a variety of project alternatives in order to identify operational constraints and opportunities associated with raising Lower Bear Reservoir. Alternatives may include raising Lower Bear Reservoir by several different heights. Each alternative will be designed to carry out the purposes of the project, including its environmental, economic and social goals, consistent with the operations described in the project description.

In order to develop potential alternatives for raising Lower Bear, relevant existing mapping, design drawings, and engineering reports will be gathered and reviewed. Existing site and reservoir drainage, overflow and outfall facilities, water transmission piping, valving, reservoir operation, existing site access, and easements will also be compiled and reviewed. Each potential alternative will be assessed for the following considerations:

- Operational scenarios to optimize operations for a range of beneficial uses, including fish, wildlife, recreation, and consumptive use.
- Potential benefits and / or impacts on fish, wildlife, recreation, cultural and consumptive uses of the river and surrounding lands
- Projected cost and cost of delivered water per acre foot
- Ability to meet LOS objectives for water reliability

- Range of potential beneficial uses and degree to which they enhance existing beneficial uses of the reservoir, Mokelumne River or water
- Degree to which the alternative could lead to imbalances

Subtask 3.2 Operational Issues

For each alternative, the steps to implementation will be discussed along with critical triggers. This task will include reviewing and defining anticipated operational parameters for the alternatives developed in Subtask 2.1. Reservoir operational considerations including timing and duration of filling cycles related to available supply, demands and conveyance capacity, and water quality will be assessed. An assessment will also be performed to gain an understanding of the nature and magnitude of the hydrologic changes that may affect the Mokelumne River, and how those changes may affect the project.

Subtask 3.3 Impacts and Constraints

For each alternative defined in Subtask 2.1, an impacts and constraints analysis will be performed. Benefits, impacts, and constraints on river flows, domestic water supply, technical, political, cultural, environmental (including both species-related and geomorphic), economic, legal, and recreation will be defined. Any mitigation efforts that could minimize impacts will be noted.

The study will identify the challenges associated with trying to mitigate the potential impacts to threatened, endangered, and sensitive species and management indicator species including but not limited to goshawk, American marten, and pacific fisher; given the incomplete nature of habitat mitigation networks both on the Eldorado National Forest and region-wide.

The study includes consultation with local land use agencies to identify feasible means of reducing impacts of development associated with new water customers anticipated to be served with water resulting from this project. Results of these consultations with any recommendations shall be published in the study.

The study will identify the compatibility of securing a Wild and Scenic Designation for the Mokelumne River in conjunction with the reservoir expansion. After the study, but before the utilities make further legal commitments, financial commitments, funding applications, or permit applications associated with reservoir expansion, the utilities will indicate their position regarding a Wild and Scenic Designation in conjunction with a dam raise.

Subtask 3.4 Economic Analysis

Conceptual opinions of probable construction and operation costs will be prepared for each alternative to identify budget-level cost for constructing facilities needed to develop the project. This subtask will conduct an economic evaluation of the short-term and long-term

costs of the alternatives, including costs associated with developing agreements, modifying water rights, loss of hydropower revenue, and constructing needed infrastructure. For each alternative, a cost per acre-foot of water delivered will be estimated.

The study shall identify prudent methods for district-wide long-term financial planning for capital expenditures, operations, and maintenance. The study will report on the willingness of the water utilities to participate in that planning prior to making further financial commitments associated with a dam raise.

The study shall identify one or more ways in which the water supply will be shared; and one or more ways the capital, operations, and maintenance costs of the project will be shared. Following the study, but before the utilities make further legal commitments, financial commitments, funding applications, or permit applications associated with a dam raise, the utilities will identify water supply and cost sharing options acceptable to the utilities.

Subtask 3.5 Technical Feasibility

This task will provide a summary of the technical analyses for each alternative and provide clear information for determining the technical feasibility of each. Each summary will provide an overall project plan and timeline including interrelationships between steps, key decision points, and system operations. Funding strategies and criteria will be identified in the summary to maximize the potential for state and federal opportunities, including interrelationships between steps, key decision points, and system operations. Funding strategies and criteria will be identified in the summary to maximize the potential for state and federal opportunities.

Task 4. Alternatives Analysis

The results of the assessment will be reviewed to determine which potential alternative, if any, meets the purposes of the project, including its water supply, environmental, social and economic goals, within the operation scheme detailed in the project description.

An extensive alternatives analysis process will be documented in order to determine the most optimal alternative. The alternatives analysis will consider, at a minimum:

- Operational constraints
- Projected cost of construction and delivered water
- Ability of the involved agencies to finance and construct the project, with potential sources of funding and local share analysis
- Effects on fish and wildlife
- Effects on recreation and other river uses, including cultural uses
- Effects on consumptive use

- Land use impacts, including the growth-inducing impact of providing additional water to areas that are not fully mitigating the environmental impacts of growth and development

The assessment will be completed under the direction of a stakeholder group comprised of interested former members of the Mokelumne Collaborative Group (MCG) as well as other interested stakeholders.

Task 5. Legal Analysis

This task will conduct a legal analysis of what new contracts and/or water rights might be needed to use existing storage to short-term and long-term water supply needs in the target areas. It will evaluate consistency with existing permits and licenses and analyze how conflicts (if any) between current and required legal constructs could be resolved. It will also evaluate what contractual or permit terms could be reasonably included that would protect environmental and recreational values.

This task will also evaluate additional specific legal issues related to the project that affect its feasibility. These include: achieving consistency with the Eldorado National Forest Land and Resource Management Plan and the National Forest Management Act (NFMA); the potential adverse effects on goshawk habitat in a national forest that has not yet implemented its goshawk management requirements under NFMA; effects on the viability of other sensitive species under NFMA (foothill yellow-legged frog, American marten, Pacific fisher); effects to listed and candidate species under the state and federal Endangered Species Acts; conformity of the project with the Forest Service's visual quality objectives for the area (LRMP/NFMA); the legal implications of incidental take of endangered species under the Endangered Species Act; legal issues regarding condemnation of surrounding lands and conservation easements; and the likelihood of achieving the agreement of all signatories to the Project 137 Settlement Agreement and the U.S. Forest Service to any modifications to facilities or operations that may be necessary for reservoir enlargement; and the likelihood of securing PG&E approval to expand the reservoir.

Task 6. Agency Coordination and Stakeholder Engagement

The study will proceed in collaboration with a targeted stakeholder group including former members of the MCG and other interested stakeholders. Key stakeholder concerns and interests will be identified at the outset of the study, such that the assessment may answer these questions and / or address these issues.

Coordination meetings will be held with water agencies, PG&E, environmental interests, recreation interests, and state and federal agencies.

The study shall identify ongoing means of providing timely information and meaningful opportunities to participate for ratepayers and other interested parties. The study will report on the willingness of the water utilities to provide such a process.

Budget

Based on the level of information, extent of investigation, modeling, legal feasibility, and high degree of involvement and coordination required, this study will cost approximately $750,000.

References

Amador Water Agency. 2011. *Urban Water Management Plan*. September 2011. Available at: http://www.water.ca.gov/urbanwatermanagement/2010uwmps/Amador%20Water%20Agency/UWMP%20Final%20Report%20092911.pdf

David C. Willer, PE Consultant in Water and Power. 1991, revised 2005. *Bear River Water Supply Alternatives for Amador Water Agency and Calaveras County Water District.*

East Bay Municipal Utility District. 2012. *Water Supply Management Program 2040 Plan*. April 2012.

RW Beck and Associates. 1994. *Enlarged Lower Bear River Reservoir Water Yield Study*.