Appendix A – CalSim II Modeling Assumptions, Methods, and Results

This Appendix provides information about the modeling assumptions, modeling tools, and the methods used for the SSWD Long Term Warren Act Contract Environmental Assessment (SSWD LTWAC EA) Alternatives analysis including information for the No Action Alternative simulation. The Appendix also provides model results for the Alternatives analysis.

A.1 - Modeling Methodology

To support the impact analysis of the alternatives, numerical modeling of physical variables such as river flows and water temperatures are required to evaluate changes to conditions affecting resources in the Central Valley including the Sacramento-San Joaquin Delta, with specific focus on the American River. A framework of integrated analyses including hydrologic, operations, hydrodynamics, and water quality is required to provide information of the comparative National Environmental Policy Act (NEPA) assessment of several resources, such as water supply, surface water, and aquatic resources.

The alternatives include operational changes in the coordinated operation of the Central Valley Project (CVP) and State Water Project (SWP). Both these operational changes and other external forces, such as climate and sea-level changes, influence the future conditions of reservoir storage, river flow, Delta flows, exports, water temperature, and water quality. Evaluation of these conditions is the primary focus of the physically based modeling analyses.

Changes to the historical hydrology related to the future climate are applied in the CalSim II model and combined with the assumed operations for each alternative. The CalSim II model simulates the operation of the major CVP and SWP facilities in the Central Valley and generates estimates of river flows, exports, reservoir storage, deliveries, and other parameters.

River and reservoir temperature models for the primary river systems use the CalSim II reservoir storage, reservoir releases, river flows, and meteorological conditions to estimate reservoir and river temperatures under each scenario.

The results from this suite of physically based models are used to describe the effects of each scenario considered in the EA.

A.1.1 - Analytical Tools

A brief description of the hydrologic and hydrodynamic models used in the analysis is provided below.

A.1.1.1 - CalSim II

The CalSim II planning model was used to simulate the coordinated operation of the CVP and SWP over a range of hydrologic conditions. CalSim II is a generalized reservoir-river basin simulation model that allows for specification and achievement of user-specified allocation targets or goals (Draper et al. 2004). CalSim II represents the best available planning model for the CVP and SWP system operations and has been used in previous system-wide evaluations of CVP and SWP operations (Reclamation 2008).

Inputs to CalSim II include water diversion requirements (demands), stream accretions and depletions, rim basin inflows, irrigation efficiencies, return flows, non-recoverable losses, and groundwater operations. Sacramento Valley and tributary rim basin hydrologies are developed using a process designed to adjust the historical sequence of monthly stream flows over an 82-year period (1922 to 2003) to represent a sequence of flows at a particular level of development.

Adjustments to historical water supplies are determined by imposing a defined level of land use on historical meteorological and hydrologic conditions. The resulting hydrology represents the water supply available from Central Valley streams to the CVP and SWP at that defined level of development.

CalSim II produces outputs for river flows and diversions, reservoir storage, Delta flows and exports, Delta inflow and outflow, deliveries to project and non-project users, and controls on project operations. Reclamation’s 2008 Operations Criteria and Plan Biological Assessment (2008 OCAP BA) Appendix D provides more information about CalSim II (Reclamation 2008). CalSim II output provides the basis for multiple other hydrologic, hydrodynamic, and biological models and analyses.

A.1.1.2 - Artificial Neural Network for Flow-Salinity Relationships

An artificial neural network (ANN) that mimics the flow-salinity relationships as modeled in DSM2 and transforms this information into a form usable by the CalSim II model has been developed (Sandhu et al. 1999; Seneviratne and Wu, 2007). The ANN is implemented in CalSim II to constrain the operations of the upstream reservoirs and the Delta export pumps in order to satisfy particular salinity requirements in the Delta. The current ANN predicts salinity at various locations in the Delta using the following parameters as input: Sacramento River inflow, San Joaquin River inflow, Delta Cross Channel gate position, and total exports and diversions. Sacramento River inflow includes Sacramento River flow, Yolo Bypass flow, and combined flow from the Mokelumne, Cosumnes, and Calaveras rivers (east side streams) minus North Bay Aqueduct and Vallejo exports. Total exports and diversions include SWP Banks Pumping Plant, CVP Tracy Pumping Plant, and Contra Costa Water District (CCWD) diversions including diversion to Los Vaqueros Reservoir. The ANN model approximates DSM2 model-generated salinity at the following key locations for the purpose of modeling Delta water quality standards: X2, Sacramento River at Emmaton, San Joaquin River at Jersey Point, Sacramento River at Collinsville, and Old River at Rock Slough. In addition, the ANN is capable of providing salinity estimates for Clifton Court Forebay, CCWD Alternate Intake Project, and Los Vaqueros diversion locations. A more detailed description of the ANNs and their use in the CalSim II model is provided in Wilbur and Munévar (Reclamation 2008). In addition, the California

Department of Water Resources (DWR) Modeling Support Branch website (http://baydeltaoffice.water.ca.gov/modeling/) provides ANN documentation.

A.1.1.3 - Reclamation American River Temperature Model

The Reclamation Temperature Model was used to predict the effects of operations on water temperatures in the Lower American River and Folsom reservoir. The model is a reservoir and stream temperature model, which simulates monthly reservoir and stream temperatures used for evaluating the effects of American River operations on mean monthly water temperatures in the basin based on hydrologic and climatic input data. It has been applied to past CVP and SWP system operational performance evaluations (Reclamation, 2008).

The model uses CALSIM II output to simulate mean monthly vertical temperature profiles and release temperatures for Folsom reservoir, Lake Natoma, and the American River. For more information on the Reclamation Temperature Model, see Appendix H of the Reclamation's 2008 OCAP BA (Reclamation, 2008).

A.1.2 - Climate Change and Sea-Level Rise

The analysis for the SSWD LTWAC EA follows the same approach as Reclamation's Long-Term Operation for incorporating climate and sea-level change in the modeling analysis. Detailed information on the climate change and sea-level rise modeling approach followed for this analysis can be found in Reclamation's Long-Term Operation EIS (Reclamation, 2015).

A.1.3 - Hydrology and System Operations

The hydrology of the Central Valley and coordinated operation of the CVP and SWP systems is a critical element in any assessment of changed conditions in the Central Valley and the Delta. Changes to conveyance, flow patterns, demands, regulations, or Delta configuration will influence the operations of the CVP and SWP reservoirs and export facilities. The operations of these facilities, in turn, influence Delta flows, water quality, river flows, and reservoir storage. The interaction between hydrology, operations, and regulations is not always intuitive and detailed analysis of this interaction often results in new understanding of system responses. Modeling tools are required to approximate these complex interactions under future conditions.

This section describes in detail the use of CalSim II and the methodology used to simulate hydrology and system operations for evaluating the effects of the EIS.

A.1.3.1 - CalSim II

The CalSim II planning model was used to simulate the operation of the CVP and SWP over a range of regulatory conditions. CalSim II is a generalized reservoir-river basin simulation model that allows for the achievement of user-specified allocation targets, or goals (Reclamation 2008). The current application to the Central Valley system is called CalSim II and represents the best available planning model for the CVP and SWP system operations. CalSim II includes major reservoirs in the Central Valley of the California including Trinity, Lewiston, Whiskeytown, Shasta, Keswick, Folsom, Oroville, San Luis, New Melones, and Millerton located along the Sacramento and San Joaquin rivers and their tributaries. CalSim II also includes all the major CVP and SWP facilities including Clear Creek Tunnel, Tehama Colusa Canal, Corning Canal, Jones Pumping Plant, Delta Mendota Canal, Mendota Pool, Banks Pumping Plant, California Aqueduct, South Bay Aqueduct, North Bay Aqueduct, Coastal Aqueduct and East Branch Extension. It also includes some locally managed facilities such as the Glenn Colusa Canal, Contra Costa Canal, and Los Vaqueros Reservoir.

The CalSim II simulation model uses single time-step optimization techniques to route water through a network of storage nodes and flow arcs based on a series of user-specified relative priorities for water allocation and storage. Physical capacities and specific regulatory and contractual requirements are input as linear constraints to the system operation using the water resources simulation language (WRESL). The process of routing water through the channels and storing water in reservoirs is performed by a mixed-integer linear-programming solver. For each time step, the solver maximizes the objective function to determine a solution that delivers or stores water according to the specified priorities and satisfies all system constraints. The sequence of solved linear-programming problems represents the simulation of the system over the period of analysis.

CalSim II includes an 82-year modified historical hydrology (water years 1922-2003) developed jointly by Reclamation and DWR. Water diversion requirements (demands), stream accretions and depletions, rim basin inflows, irrigation efficiencies, return flows, nonrecoverable losses, and groundwater operations are components that make up the hydrology used in CalSim II. Sacramento Valley and tributary rim basin hydrologies are developed using a process designed to adjust the historical observed sequence of monthly stream flows to represent a sequence of flows at a future level of development. Adjustments to historic water supplies are determined by imposing future level land use on historical meteorological and hydrologic conditions. The resulting hydrology represents the water supply available from Central Valley streams to the system at a future level of development. Figure 5A.A.3 shows the valley floor depletion regions, which represent the spatial resolution at which the hydrologic analysis is performed in the model.

CalSim II uses rule-based algorithms for determining deliveries to north-of-Delta and south-of-Delta CVP and SWP contractors. This delivery logic uses runoff forecast information, which incorporates uncertainty and standardized rule curves. The rule curves relate storage levels and forecasted water supplies to project delivery capability for the upcoming year. The delivery capability is then translated into CVP and SWP contractor allocations that are satisfied through coordinated reservoir-export operations.

The CalSim II model utilizes a monthly time step to route flows throughout the river-reservoir system of the Central Valley. Although monthly time steps are reasonable for long-term planning analyses of water operations, a component of the EIS conveyance and conservation strategy includes operations that are sensitive to flow variability at scales less than monthly (i.e., the operation of the Fremont Weir). Initial comparisons of monthly versus daily operations at these facilities indicated that weir spills were likely underestimated and diversion potential was likely overstated using a monthly time step. For these reasons, a monthly to daily flow disaggregation technique was included in the CalSim II model for the Fremont Weir and the Sacramento Weir. The technique applies historical daily patterns, based on the hydrology of the year, to transform the monthly volumes into daily flows. Reclamation's 2008 OCAP BA Appendix D provides more information about CalSim II (Reclamation 2008).

A.1.3.2 - Artificial Neural Network for Flow-Salinity Relationship

Determination of flow-salinity relationships in the Sacramento-San Joaquin Delta is critical to both project and ecosystem management. Operation of the SWP/CVP facilities and management of Delta flows is often dependent on Delta flow needs for salinity standards. Salinity in the Delta cannot be simulated accurately by the simple mass balance routing and coarse timestep used in CALSIM II. Likewise, the upstream reservoirs and operational constraints cannot be modeled in the DSM2 model. An Artificial Neural Network (ANN) has been developed (Reclamation 2008) that attempts to mimic the flow-salinity relationships as simulated in DSM2, but provide a rapid transformation of this information into a form usable by the CALSIM II operations model. The ANN is implemented in CALSIM II to constrain the operations of the upstream reservoirs and the Delta export pumps in order to satisfy particular salinity requirements. A more detailed description of the use of ANNs in the CALSIM II model is provided in Wilbur and Munévar (Reclamation 2008).

The ANN developed by DWR (Reclamation 2008) attempts to statistically correlate the salinity results from a particular DSM2 model run to the various peripheral flows (Delta inflows, exports and diversions), gate operations and an indicator of tidal energy. The ANN is calibrated or trained on DSM2 results that may represent historical or future conditions using a full circle analysis (Reclamation 2008). For example, a future reconfiguration of the Delta channels to improve conveyance may significantly affect the hydrodynamics of the system. The ANN would be able to represent this new configuration by being retrained on DSM2 model results that included the new configuration.

The current ANN predicts salinity at various locations in the Delta using the following parameters as input: Northern flows, San Joaquin River inflow, Delta Cross Channel gate position, total exports and diversions, Net Delta Consumptive Use, an indicator of the tidal energy and San Joaquin River at Vernalis salinity. Northern flows include Sacramento River flow, Yolo Bypass flow, and combined flow from the Mokelumne, Cosumnes, and Calaveras rivers (East Side Streams) minus North Bay Aqueduct and Vallejo exports. Total exports and diversions include State Water Project (SWP) Banks Pumping Plant, Central Valley Project

(CVP) Jones Pumping Plant, and CCWD diversions including diversions to Los Vaqueros Reservoir. A total of 148 days of values of each of these parameters is included in the correlation, representing an estimate of the length of memory of antecedent conditions in the Delta. The ANN model approximates DSM2 model-generated salinity at the following key locations for the purpose of modeling Delta water quality standards: X2, Sacramento River at Emmaton, San Joaquin River at Jersey Point, Sacramento River at Collinsville, and Old River at Rock Slough. In addition, the ANN is capable of providing salinity estimates for Clifton Court Forebay, CCWD Alternate Intake Project (AIP) and Los Vaqueros diversion locations.

The ANN may not fully capture the dynamics of the Delta under conditions other than those for which it was trained. It is possible that the ANN will exhibit errors in flow regimes beyond those for which it was trained. Therefore, a new ANN is needed for any new Delta configuration or under sea level rise conditions which may result in changed flow – salinity relationships in the Delta.

A.1.3.3 - Incorporation of Climate Change

Climate and sea level change are incorporated into the CalSim II model in two ways: changes to the input hydrology and changes to the flow-salinity relationship in the Delta due to sea-level rise. In this approach, changes in runoff and stream flow are simulated through VIC modeling under representative climate scenarios. These simulated changes in runoff are applied to the CalSim II inflows as a fractional change from the observed inflow patterns (simulated future runoff divided by historical runoff). These fraction changes are first applied for every month of the 82-year period consistent with the VIC simulated patterns. A second order correction is then applied to ensure that the annual shifts in runoff at each location are consistent with that generated from the VIC modeling. A spreadsheet tool has been prepared by Reclamation to process this information and generate adjusted inflow time series records for CalSim II. Once the changes in flows have been resolved, water year types and other hydrologic indices that govern water operations or compliance are adjusted to be consistent with the new hydrologic regime.

The effect of sea-level rise on the flow-salinity response is incorporated in the respective ANN. The following input parameters are adjusted in CalSim II to incorporate the effects of climate change:

- Inflow time series records for all major streams in the Central Valley
- Sacramento and San Joaquin valley water year types
- Runoff forecasts used for reservoir operations and allocation decisions
- Delta water temperature as used in triggering Biological Opinion Smelt criteria
- A modified ANN to reflect the flow-salinity response under 15-cm sea-level change

The CalSim II simulations do not consider future climate change adaptations that may manage the CVP and SWP system in a different manner than today to reduce climate impacts. For example, future changes in reservoir flood control reservation to better accommodate a seasonally changing hydrograph may be considered under future programs, but are not considered under the EIA Thus, the CalSim II results represent the risks to operations, water users, and the environment in the absence of dynamic adaptation for climate change.

A.1.3.4 - Output Parameters

The hydrology and system operations models produce the following key parameters on a monthly time step:

- River flows and diversions
- Reservoir storage
- Delta flows and exports
- Delta inflow and outflow
- Deliveries to project and non-project users
- Controls on project operations

Some operations have been informed by the daily variability included in the CalSim II model for the EA and, where appropriate, these results are presented. However, it should be noted that CalSim II remains a monthly model. The daily variability inputs to the CalSim II model help to better represent certain operational aspects, but the monthly results are utilized for water balance.

A.1.3.5 - Appropriate Use of CalSim II Results

CalSim II is a monthly model developed for planning level analyses. The model is run for an 82-year historical hydrologic period, at a projected level of hydrology and demands, and under an assumed framework of regulations. Therefore, the 82-year simulation does not provide information about historical conditions, but it does provide information about variability of conditions that would occur at the assumed level of hydrology and demand with the assumed operations, under the same historical hydrologic sequence. Because it is not a physically based model, CalSim II is not calibrated and cannot be used in a predictive manner. CalSim II is intended to be used in a comparative manner, which is appropriate for a NEPA analysis.

In CalSim II, operational decisions are made on a monthly basis, based on a set of predefined rules that represent the assumed regulations. The model has no capability to adjust these rules based on a sequence of hydrologic events such as a prolonged drought, or based on statistical performance criteria such as meeting a storage target in an assumed percentage of years.

Although there are certain components in the model that are downscaled to daily time step (simulated or approximated hydrology) such as an air-temperature-based trigger for a fisheries action, the results of those daily conditions are always averaged to a monthly time step (for example, a certain number of days with and without the action is calculated and the monthly result is calculated using a day-weighted average based on the total number of days in that month), and operational decisions based on those components are made on a monthly basis. Therefore, reporting sub-monthly results from CalSim II or from any other subsequent model that uses monthly CalSim results as an input is not considered an appropriate use of model results.

Appropriate use of model results is important. Despite detailed model inputs and assumptions, the CalSim II results may differ from real-time operations under stressed water supply conditions. Such model results occur due to the inability of the model to make real-time policy decisions under extreme circumstances, as the actual (human) operators must do. Therefore, these results should only be considered an indicator of stressed water supply conditions under that alternative, and should not be considered to reflect what would occur in the future. For example, reductions to senior water rights holders due to dead-pool conditions in the model can be observed in model results under certain circumstances. These reductions, in real-time operations, would be avoided by making policy decisions on other requirements in prior months. In actual future operations, as has always been the case in the past, the project operators would work in real time to satisfy legal and contractual obligations given the current conditions and hydrologic constraints. Chapter 5, Surface Water Resources and Water Supplies, of the 2015 LTO Final EIS provides appropriate interpretation and analysis of such model results (Reclamation 2015).

A.1.3.6 - Linkages to Other Models

The hydrology and system operations models generally require input assumptions relating to hydrology, demands, regulations, and flow-salinity responses. Reclamation and DWR have prepared hydrologic inputs and demand assumptions for a future (2030) level of development (future land use and development assumptions) based on historical hydroclimatic conditions. Regulations and associated operations are translated into operational requirements. The flow-salinity ANN, representing appropriate sea-level rise, is embedded into the system operations model.

As mentioned previously in this appendix, changes to the historical hydrology related to future climate are applied in the CalSim II model and combined with the assumed operations for each alternative. The CalSim II model simulates the operation of the major CVP and SWP facilities in the Central Valley and generates estimates of river flows, exports, reservoir storage, deliveries, and other parameters.

River and temperature models for the primary river systems use the CalSim II reservoir storage, reservoir releases, river flows, and meteorological conditions to estimate reservoir and river temperatures under each scenario.

A.1.3.7 - Incorporating Climate Change and Sea-Level Rise in Modeling Simulations

Incorporation of climate change in water resources planning continues to be an area of evolving science, methods, and applications. Several potential approaches exist for incorporating climate change in the resources impact analyses. Currently, there is no standardized methodology that has been adopted by either the State of California or the Federal agencies for use in impact assessments. The courts have ruled that climate change must be considered in the planning of long-term water management projects in California, but have not been prescriptive in terms of methodologies to be applied. Climate change could be addressed in a qualitative and/or quantitative manner, could focus on global climate model projections or recent observed trends, and could explore broader descriptions of observed variability by blending paleoclimate information into this understanding.

One of the recent publicly available studies that have incorporated potential climate change and sea-level rise scenarios in the modeling is the Bay Delta Conservation Plan (BDCP). At the time of incorporating climate change in EA simulations, the methodology in the BDCP Environmental Impact Report/EIS had the greatest level of detail incorporating climate change and sea-level rise scenarios for water resources planning in published documents. Therefore, for the purposes of the EA modeling simulations, BDCP methodology is used. This approach is also used in Reclamation's Long Term Operations EIS.

A.1.3.7.1 - Incorporating Climate Change

The approach uses five statistically representative climate change scenarios to characterize the central tendency, also known as Q5, and the range of the ensemble uncertainty including projections representing drier, less warming; drier, more warming; wetter, more warming; and wetter, less warming conditions than the median projection. For the purposes of the EA, Q5 climate change scenario for the period centered on 2025 is used. The Q5 scenario was derived from the central tending "consensus" of the climate projections and thus represents the median ensemble projection.

The climate change scenarios were developed from an ensemble of 112 bias-corrected, spatially downscaled GCM simulations from 16 climate models for SRES emission scenarios A2, A1B, and B1 from the CMIP3 that are part of the IPCC AR4. The future projected changes over the 30-year climatological period centered on 2025 (i.e., 2011-2040 to represent 2025 timeline) (early long-term) and 2060 (i.e., 2046-2075 to represent 2060 timeline) (late long-term) were combined with a set of historically observed temperatures and precipitation to generate climate sequences that maintain important multi-year variability not always reproduced in direct climate projections.

The modified temperature and precipitation inputs were used in the VIC hydrology model to simulate hydrologic processes on the 1/8th degree scale to produce watershed runoff (and other hydrologic variables) for the major rivers and streams in the Central Valley.

These simulated changes in runoff were applied to the CalSim II inflows as a fractional change from the observed inflow patterns (simulated future runoff divided by historical runoff). These fraction changes were first applied for every month of the 82-year period consistent with the VIC simulated patterns. A second correction was then applied to ensure that the annual shifts in runoff at each location are consistent with that generated from the VIC modeling. Once the changes in flows had been resolved, water year types and other hydrologic indices that govern water operations or compliance were adjusted to be consistent with the new hydrologic regime.

The changes in reservoir inflows, key valley floor accretions, and water year types and hydrologic indices were translated into modified input time series for the CalSim II model.

A.1.3.7.2 - Incorporation of Sea-Level Rise

For sea-level rise simulation the BDCP assumed the projected sea-level rise at the early long-term timeline (2025) would be approximately 12 to 18 cm (5 to 7 inches).

These sea-level rise estimates were consistent with those outlined in the recent USACE guidance circular for incorporating sea-level changes in civil works programs (USACE 2013). Due to the considerable uncertainty in these projections and the state of sea-level rise science, it was proposed to use the mid-range of the estimate of 15 cm (6 inches) by 2025.

For the purposes of the EA, the sea-level rise scenario for the period centered on 2025 is used (DWR et al. 2013). These changes were simulated in Bay-Delta hydrodynamics models, and their effect on the flow-salinity relationship in the Bay-Delta was incorporated into CalSim II modeling through the use of ANNs.

A.1.3.7.3 - Climate Change and Sea-Level Rise Modeling Limitations

GCMs represent different physical processes in the atmosphere, ocean, cryosphere, and land surface. GCMs are the most advanced tools currently available for simulating the response of the global climate system to increasing greenhouse gas concentrations. However, several of the important processes are either missing or inadequately represented in today’s state-of-the-art GCMs. GCMs depict the climate using a three dimensional grid over the globe at a coarse horizontal resolution. A downscaling method is generally used to produce finer spatial scale that is more meaningful in the context of local and regional impacts than the coarse-scale GCM simulations.

In this study, downscaled climate projections using the Bias-correction and Spatial Disaggregation (BCSD) method is used (http://gdo-dcp.ucllnl.org/downscaled_cmip_projections/dcpInterface.html#About).

The BCSD downscaling method is well tested and widely used, but it has some inherent limitations such as stationary assumptions used in the BCSD downscaling method (Maurer et al. 2007; Reclamation 2013) and also due to the fact that bias correction procedure employed in the BCSD downscaling method can modify climate model simulated precipitation changes (Maurer and Pierce, 2014). The downscaling method also carries some of the limitations applicable to native GCM simulations.

A median climate change scenario that was based on more than a hundred climate change projections was used for characterizing the future climate condition for the purposes of the EIS. Although projected changes in future climate contain significant uncertainty through time, several studies have shown that use of the median climate change condition is acceptable (for example, Pierce et al. 2009). The median climate change is considered appropriate for the EA because of the comparative nature of the NEPA analysis. Therefore, a sensitivity analysis using the different climate change conditions was not conducted for this study.

Projected change in stream flow is calculated using the VIC macroscale hydrologic model. The use of the VIC model is primarily intended to generate changes in inflow magnitude and timing for use in subsequent CalSim II modeling. While the model contains several sub-grid mechanisms, the coarse grid scale should be noted when considering results and analysis of local-scale phenomena. The VIC model is currently best applied for the regional-scale hydrologic analyses. There are several limitations to long-term gridded meteorology related to spatial-temporal interpolation due to limited availability of meteorological stations that provide data for interpolation. In addition, the inputs to the model do not include any transient trends in the vegetation or water management that may affect stream flows; they should only be analyzed from a "naturalized" flow change standpoint. Finally, the VIC model includes three soil zones to capture the vertical movement of soil moisture, but does not explicitly include groundwater. The exclusion of deeper groundwater is not likely a limiting factor in the upper watersheds of the Sacramento and San Joaquin river watersheds that contribute approximately 80 to 90 percent of the runoff to the Delta. However, in the valley floor, interrelation of groundwater and surface water management is considerable. Water management models such as CalSim II should be used to characterize the heavily "managed" portions of the system.

A.1.4 - Reservoir and River Temperature

A.1.4.1 - Modeling Approach

The CVP and SWP are required to operate the reservoirs and releases such that specific temperature compliance objectives are met downstream in the rivers, to protect habitat for the anadramous fish. Models are necessary to study the impacts of operational changes on the river and reservoir temperatures. Several models are available to study the impacts to the water temperatures on various river systems in the Central Valley. These models in general are capable of simulating mean monthly and mean daily downstream temperatures for long-term operational scenarios taking into consideration the selective withdrawal capabilities at the reservoirs. This section briefly describes the tools used to model the reservoir and river temperatures as part of the physical modeling.

Reclamation's HEC-5Q water temperature model was used to model temperatures in the Lower American River, Folsom Reservoir, and Nimbus Reservoir. The HEC-5Q model was updated for Reclamation's LTO EIS, and the updated HEC-5Q model of the American River was used.

A description of the updates to the model can be found in Appendix 6B of Reclamation's Long Term Operations EIS (Reclamation, 2015). The HEC-5Q model was developed using integrated HEC-5 and HEC-5Q models. The HEC-5 component of the model simulates daily reservoir and river flow operations from monthly CalSim II data that are disaggregated to daily data. The HEC-5Q component simulates mean daily reservoir and river temperatures based on the daily flow inputs and meteorological parameters specified on a 6-hour time step.

The hydrology modeling results of this project show no changes to flows or storages in the Sacramento, Trinity, or Feather River. Since there are no changes to hydrology on these river systems, reservoir and river temperature modeling was not performed on these systems and no change in temperatures was assumed.

A.1.4.2 - Simulations and Assumptions

The simulations run in the water temperature modeling are the same as for the surface water modeling: No Action Alternative and Proposed Action Alternative. The assumptions for each alternative are consistent with the assumptions for the hydrology and operations modeling.

A.1.4.3 - Input and Storage

Monthly flows simulated by the CalSim II model for an 82-year period (water years 1922 through 2003) are used as input to HEC-5Q. Temporal downscaling is performed on the CalSim II monthly average tributary flows to convert them to daily average flows for HEC-5Q input using a pre-processing tool. Table A.1.4.3-1 shows the list of CalSim II inputs used in the HEC-5Q modeling.

Table A.1.4.3-1. CalSim II Input Mapping with American River HEC-5Q Model

HEC-5Q Control Point Number	HEC-5Q Control Point Name	Input Types	CalSim II Node
590	Folsom Reservoir	Storage Inflow Outflow Diversion	S8 C300 + I8 C8 + F8 E8 + D8 + D8_ED
560	Natoma Reservoir	Storage Diversion	S9 D9 + E9 + I9
572	American River above City of Sacramento Diversion	Diversion	GS66 – I302
570	American River at City of Sacramento Diversion	Diversion	D302

A.1.4.4 - Climate Change Assumptions

When simulating alternatives with climate change, some of the inputs to the temperature models must be modified. This section presents the assumptions and approaches used for modifying meteorological and inflow temperatures in the temperature models. For the alternative simulations, climate assumptions were established around Year 2030. Therefore, to be consistent with the other water supply models, the climate input data for HEC-5Q and Reclamation Temperature Model was modified to represent approximate conditions at Year 2030.

HEC-5Q requires meteorological inputs specified in the form of equilibrium temperatures, exchange rates, shortwave radiation and wind speed. The modeling used the Q5 meterological inputs that were developed by Reclamation for their Long Term Operations Plan. Detailed descriptions of how these meterological inputs were adjusted for climate change can be found in Appendix 6B of Reclamation's Long Term Operations EIS (Reclamation, 2015).

A.2 - Modeling Simulations and Assumptions

The following model simulations were prepared as the basis for evaluating the impacts of the project at 2030 projected conditions:

- No Action Alternative
- Proposed Action Alternative

A.2.1 - No Action Alternative

The No Action Alternative is based on the No Action Alternative from Reclamation's Long Term Operations EIS (LTO NAA) modeling. Changes were made to the LTO NAA based on comments on Reclamation's Long Term Operations EIS and El Dorado Irrigation District project status. The following changes were made to the LTO NAA to develop the No Action Alternative:

- Changes to the way that El Dorado (El Dorado Irrigation District and El Dorado County Water Agency) diversions from Folsom Reservoir are represented in the model. Previous versions of the model grouped El Dorado diversions together with other diversions out of Folsom Reservoir, and routed the return flows from these diversions into the Sacramento River below the confluence with the American River. Unlike the other diversions out of Folsom Reservoir, El Dorado Diversions are routed to the El Dorado Hills Water Treatment Plant and return flows from these diversions are conveyed to the North Fork Cosumnes River. These inconsistencies were corrected and return flows from El Dorado diversions were routed to the Cosumnes River.
- Changes to Demand Service Area 70's demand time series to reflect total demand without El Dorado: DEM_DSA70_PMI, NP_DR70_IMI, and PRJ_DR70_IMI.
- Changes to the ANN and DSM routines to reflect the new representation of the Cosumnes River in the modeling schematic.
- El Dorado diversions were changed to reflect the status of their Long Term Warren Act projects. Specifically, El Dorado's P.L. 101-514 diversions were set to zero.

With the changes listed above, the No Action Alternative represents the projected Year 2030 conditions as described in Reclamation's Long Term Operations Plan EIS (Reclamation, 2015). The No Action Alternative assumptions include the existing facilities and ongoing programs that existed as of March 2012, publication date of the Notice of Intent for the LTO EIS. The No Action Alternative includes the projected climate change and sea-level rise assumptions described in section 3.3.1.3.1 (Climate Change and Sea Level Rise). Information about the facilities, regulatory standards, regulatory assumptions and operations criteria assumed in the No Action Alternative are described in detail in the Long Term Operations Plan EIS Appendix 5A (Reclamation, 2015).

A.2.1.1 - Inflows/Supplies

The CalSim II model includes the historical hydrology projected to Year 2030 under the climate change and with projected 2020 modifications for operations upstream of the rim reservoirs.

A.2.1.2 - Level of Development

CalSim II uses a hydrology that is the result of an analysis of agricultural and urban land use and population estimates. The assumptions used for Sacramento Valley land use result from aggregation of historical survey and projected data developed for the California Water Plan Update (Bulletin 160-98). Generally, land-use projections are based on Year 2020 estimates (hydrology serial number 2020D09E); however, the San Joaquin Valley hydrology reflects draft 2030 land-use assumptions developed by Reclamation. Where appropriate, Year 2020 projections of demands associated with water rights and CVP and SWP water service contracts have been included. Specifically, projections of full buildout are used to describe the American River region demands for water rights and CVP contract supplies, and California Aqueduct and the Delta Mendota Canal CVP and SWP contractor demands are set to full contract amounts.

A.2.1.3 - Demands, Water Rights, and CVP and SWP Contracts

CalSim II demand inputs are preprocessed monthly time series for a specified level of development (e.g., 2020) and according to hydrologic conditions. Demands are classified as CVP project, SWP project, local project, or non-project. CVP and SWP demands are separated into different classes based on the contract type. A description of various demands and classifications included in CalSim II is provided in the 2008 Operations Criteria and Plan (OCAP) Biological Assessment (BA) Appendix D (Reclamation 2008). The demand assumptions are not modified for changes in climate conditions. A detailed listing of CVP and SWP contract amounts and other water rights assumptions for the No Action Alternative can be found in Reclamation's Long Term Operations EIS Appendix 5A (Reclamation, 2015).

A.2.2 - Proposed Action Alternative

The Proposed Action simulation will move 29,000 AF of diversions from PCWA's American River Pumping Station (ARPS) to SSWD diversions from Folsom Reservoir at the municipal intake in years where the Folsom Unimpaired Inflow, calculated March through November (M-N

FUI) is greater than or equal to 1,600,00 AF. In this simulation, years where the M-N FUI is less than 1.6 MAF diversions will continue in the Proposed Action equal to the diversions in the No Action simulation. In the Proposed Action, in years where the M-N FUI is greater than 1.6 MAF, SSWD demands increase by 29,000 AF and PCWA diversions at ARPS decrease by 29,000 AF.

The monthly demand pattern for SSWD was developed using historical SSWD usage, with input from SSWD's Operations Manager (Arnez, 2016). Surface water from Folsom Reservoir can be used throughout SSWD's North Service Area in lieu of groundwater pumping. The monthly demand pattern for the Proposed Action Alternative is developed to meet demands in the North Service Area. Each month in the demand curve was calculated as the largest North Service Area usage in that month over the 10-year period of 2004 - 2013.

Implementation of the Proposed Action Alternative in CalSim II is done by altering the input time series for SSWD diversions at Folsom and PCWA diversions at the American River Pump Station. This is done by altering the time series inputs listed in Table A.2.2-1.

Table A.2.2-1. Time Series Inputs Modified for Proposed Action Alternative

Time Series Name	Time Series Description
DEM_D300_WR_ANN / Demand-NP-MI	The annual demand for PCWA's water rights diversions at their American River Pumping Station
DEM_D8A_WR_ANN / DEMAND-NP-MI	The annual demand for SSWD's water rights diversions out of Folsom Reservoir
PERDEM_70NRWD / DELIVERY-PATTERN	The monthly demand pattern for SSWD (formerly Northridge Water District, hence the NRWD acronym in the time series name).
PERDEM_70PCWA / DELIVERY-PATTERN	The monthly demand pattern for PCWA at the American River Pump Station.

All assumptions not specifically addressed in this section are identical to the assumptions used for the No Action Alternative.

A.2.3 – American River Demands

Table A.2.3-1. American River Annual Demand Levels (TAF)

Calsim II sub-arc	Purveyor and source	Location	No Action	Proposed Action
300	Placer County Water Agency water rights	American River Pump Station	65	36*
D8a_wr	Sacramento Suburban WD	Folsom	0	29*
D8b_pmi	City of Folsom CVP	Folsom	7	7
D8b_wr	City of Folsom water rights	Folsom	27	27
D8c_wr	Folsom Prison water rights	Folsom	5	5
D8d_wr	San Juan WD, Placer County, water rights	Folsom	25	25
D8e_wr	San Juan WD, Sac County, water rights	Folsom	33	33
D8e_pmi	San Juan WD, Sac County, CVP	Folsom	24.2	24.2
D8f_wr	El Dorado ID water rights	Folsom	17	17
D8f_pmi	El Dorado ID CVP	Folsom	7.55	7.55
D8g_wr	City of Roseville water rights	Folsom	30	30
D8g_pmi	City of Roseville CVP	Folsom	32	32
D8h_wr	Placer County Water Agency water rights	Folsom	0	0
D8h_pmi	Placer County Water Agency CVP	Folsom	35	35
D8i_pmi	EDCWA P.L. 101-514	Folsom	0	0
D9aa	SCWC/ACWC water rights	Natomas	5	5
D9ab	Cal Dept of Parks & Rec CVP	Natomas	5	5
D9b_pmi	SMUD Folsom South Canal CVP	Natomas	30	30
D9b_wr	SMUD Folsom South Canal water rights	Natomas	15	15
D302a_wr	City of Sacramento water rights	Fairbairn	230	230
D302b_wr	Arcade WD water rights	Fairbairn	0	0
D302c_wr	Carmichael WD water rights	Fairbairn	12	12
D167a_wr	City of Sacramento water rights	Freeport Pump Station	81.8	81.8
D167b_pmi	Sacramento County WA P.L. 101-514	Freeport Pump Station	10	10
D168c	EBMUD	Freeport Pump Station	35	35

* In years where the M-N FUI is greater than 1.6 MAF (as described in section A.2.2). Years drier than 1.6 MAF are identical to the No Action Alternative.

A.3 - Modeling Results

A.3.1 - Introduction

This appendix provides CalSim II and DSM2 model simulation results for alternatives evaluated for the EIS. Figures and tables are provided to illustrate and summarize the results. The different types of presentations are explained below.

Probability of Exceedance Plots. Probability of exceedance plots provide the frequency of occurrence of values of a parameter that exceed a reference value. For this appendix, the calculation of exceedance probability is done by ranking the data. For example, for the Shasta storage end of September exceedance plot, Shasta storage values at the end of September for each simulated year are sorted in ascending order. The smallest value would have a probability of exceedance of 100 percent since all other values would be greater than that value, and the largest value would have a probability of exceedance of 0 percent. All the values are plotted with probability of exceedance on the x-axis and the value of the parameter on the y-axis. Following the same example, if for one scenario, Shasta end of September of 2,000 TAF corresponds to 80 percent probability, it implies that Shasta end-of September storage is higher than 2,000 TAF in 80 percent of the years under the simulated conditions.

Monthly Pattern Plots. Monthly pattern plots provide average values for a parameter for each month of the year. The averaging may be done on a long-term basis, which means that it is being averaged over the full number of simulated years, or it may be done for a set of simulated years that have a certain year type. In this appendix, year types are determined using the Sacramento Valley 40-30-30 Index developed by the State Water Resources Control Board (SWRCB). In this appendix, for year type based averages, the year type for each simulated year is assumed to be the classification of the year under projected climate at Year 2030 conditions. This type of plot is used to obtain insight to the monthly variation of phenomena throughout the year.

Long-Term Average Summary and Year Type Based Statistics Summary Tables. These tables provide parameter values for each 10 percent increment of exceedance probability (rows) for each month (columns) as well as long-term and year-type averages (using the Sacramento Valley 40-30-30 Index developed by the SWRCB for projected climate at Year 2030) for each month. For a few parameters, such as Delta outflow, annual total or average values are added to the tables (for volume and rates, respectively).

All plots and tables were prepared to facilitate a comparison between the No Action Alternative and the Proposed Action Alternative, with climate change and sea-level rise at Year 2030.

A.3.2 - Appropriate Use of Model Results

The physical models developed and applied in the Environmental Impact Statement (EIS) analysis are generalized and simplified representations of a complex water resources system. A brief description of appropriate use of the model results to compare two scenarios or to compare against threshold values or standards is presented below.

A.3.2.1 - Absolute vs. Relative Use of the Model Results

The models are not predictive models (in how they are applied in this project), and therefore the results cannot be considered as absolute with and within a quantifiable confidence interval. The model results are only useful in a comparative analysis and can only serve as an indicator of condition (e.g., compliance with a standard) and of trends (e.g., generalized impacts).

A.3.2.2 - Appropriate Reporting Time-Step

Due to the assumptions involved in the input data sets and model logic, care must be taken to select the most appropriate time-step for the reporting of model results. Sub-monthly (e.g., weekly or daily) reporting of model results is inappropriate for all models and the results should be presented and interpreted on a monthly basis.

A.3.2.3 - Statistical Comparisons

Absolute differences computed at a point in time between model results from an alternative and a baseline to evaluate impacts is an inappropriate use of model results (e.g., computing differences between the results from a baseline and an alternative for a particular day or month and year within the period of record of simulation). Likewise computing absolute differences between an alternative (or a baseline) and a specific threshold value or standard is an inappropriate use of model results. Statistics computed based on the absolute differences at a point in time (e.g., average of monthly differences) are an inappropriate use of model results. Computing the absolute differences in this way disregards the changes in antecedent conditions between individual scenarios and distorts the evaluation of impacts of a specific action.

Reporting seasonal patterns from long-term averages and water year type averages is appropriate. Statistics computed based on long-term and water year type averages are an appropriate use of model results. Computing differences between long-term or water year type averages of model results from two scenarios are appropriate. Care should be taken to use the appropriate water year type for presenting water year type average statistics of model results (e.g., D1641 Sacramento River 40-30-30 or San Joaquin River 60-20-20 based on climate modifications). For this study, water year types are based on the projected climate and hydrology at Year 2030.

The most appropriate presentation of monthly and annual model results is in the form of probability distributions and comparisons of probability distributions (e.g., cumulative probabilities). If necessary, comparisons of model results against threshold or standard values should be limited to comparisons based on cumulative probability distributions.

A.3.3 - CalSim II Model Results

CalSim II model results are presented in the tables and figures in this section as follows:

- Trinity Storage
- Shasta Storage
- Oroville Storage
- Folsom Storage

- San Luis Storage
- New Melones Storage
- Millerton Storage
- Trinity River Flow below Lewiston
- Clear Creek Flow below Whiskeytown
- Sacramento River Flow downstream of Keswick Reservoir
- Sacramento River Flow at Bend Bridge
- Feather River Flow downstream of Thermalito
- Fremont Weir Spills
- American River Flow downstream of Nimbus
- North Fork American River Flow below American River Pump Station
- Sacramento River Flow at Freeport
- Yolo Bypass Flow
- Sacramento River Flow a Rio Vista
- Delta Cross Channel Flow
- Qwest Flow
- Delta Outflow
- Old and Middle River Flow
- Exports through Jones and Banks Pumping Plants

A.3.3.1. Trinity Storage

Figure A.3.3.1-1. Trinity Lake, End of May Storage

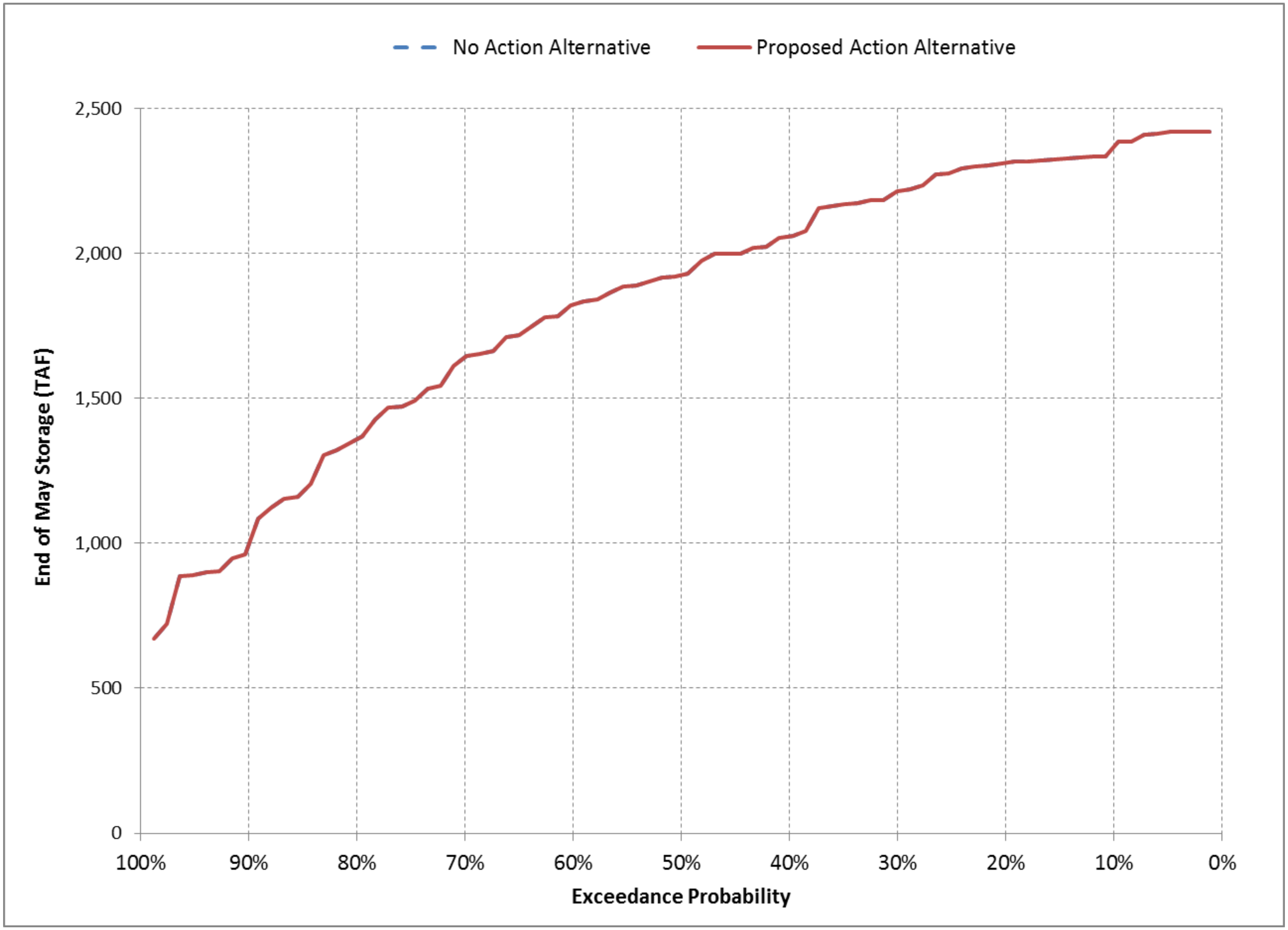


Figure A.3.3.1-2. Trinity Lake, End of September Storage

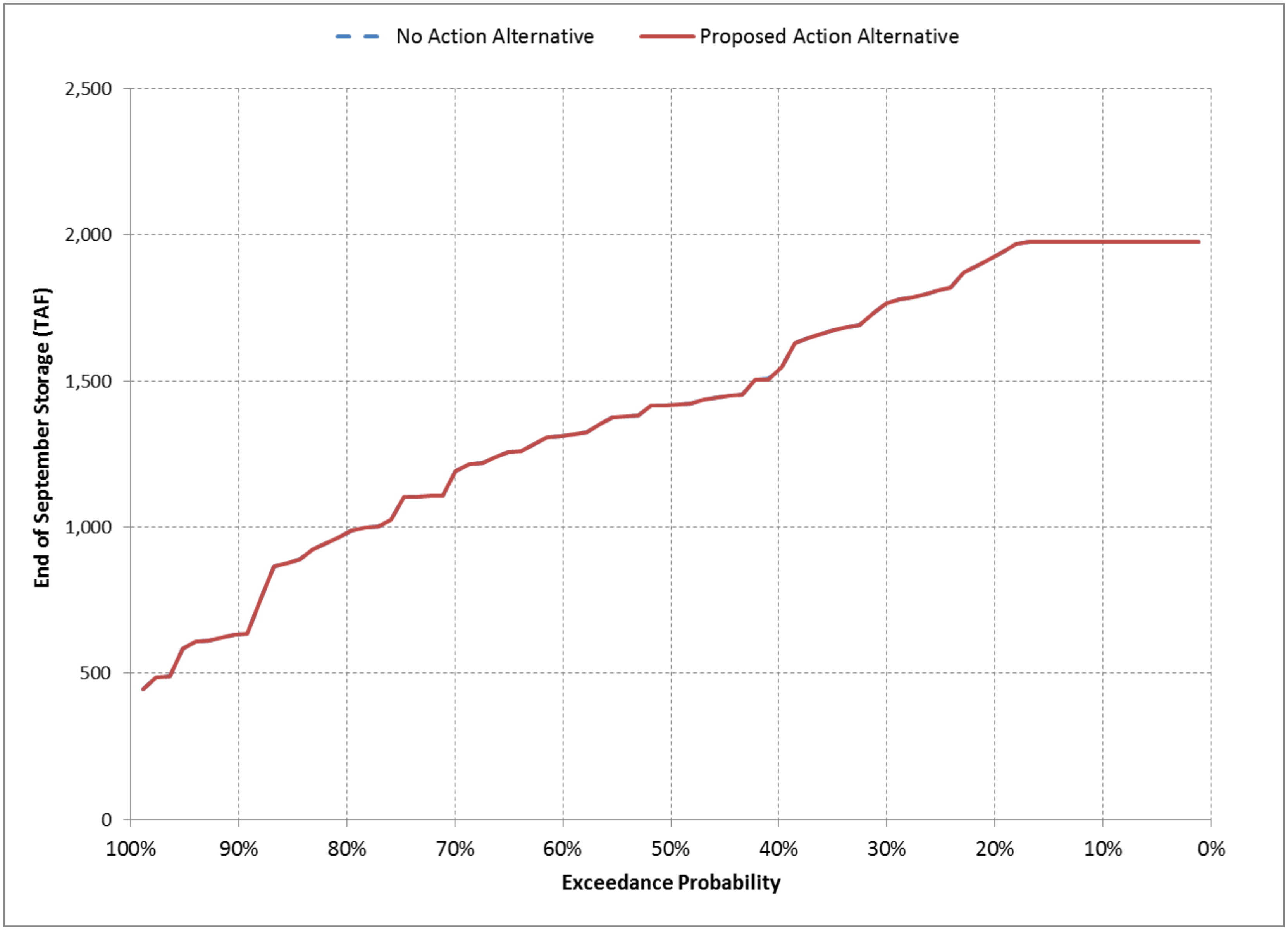


Table A.3.3.1-1. Trinity Lake, End of Month Storage

No Action Alternative

	End of Month Storage (TAF)											
Statistic	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Probability of Exceedance[a]												
10%	1,850	1,850	1,850	1,900	2,000	2,100	2,300	2,384	2,397	2,270	2,150	1,975
20%	1,850	1,837	1,850	1,900	2,000	2,100	2,272	2,318	2,304	2,216	2,098	1,942
30%	1,703	1,753	1,787	1,834	1,957	2,100	2,234	2,222	2,187	2,067	1,892	1,778
40%	1,454	1,502	1,668	1,751	1,840	2,015	2,161	2,061	2,025	1,847	1,694	1,548
50%	1,363	1,351	1,457	1,557	1,750	1,853	2,009	1,930	1,859	1,681	1,530	1,419
60%	1,265	1,274	1,327	1,374	1,527	1,672	1,868	1,835	1,731	1,578	1,425	1,316
70%	1,155	1,148	1,206	1,316	1,376	1,487	1,596	1,645	1,607	1,484	1,304	1,192
80%	958	946	984	1,036	1,130	1,247	1,384	1,369	1,305	1,149	1,055	989
90%	621	681	691	727	861	984	1,043	1,085	1,046	940	760	637
Long Term												
Full Simulation Period[b]	1,337	1,346	1,398	1,460	1,569	1,693	1,842	1,836	1,799	1,661	1,522	1,401
Water Year Types[c]												
Wet	1,529	1,558	1,655	1,763	1,925	2,062	2,239	2,273	2,250	2,121	2,000	1,845
Above Normal	1,354	1,362	1,437	1,563	1,716	1,886	2,057	2,062	2,034	1,914	1,775	1,637
Below Normal	1,274	1,281	1,301	1,359	1,433	1,529	1,703	1,687	1,646	1,511	1,369	1,266
Dry	1,304	1,308	1,334	1,349	1,430	1,560	1,697	1,646	1,579	1,414	1,255	1,149
Critical	1,024	1,001	1,009	980	1,021	1,091	1,148	1,119	1,092	958	815	741

Proposed Action Alternative

	End of Month Storage (TAF)											
Statistic	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Probability of Exceedance[a]												
10%	1,850	1,850	1,850	1,900	2,000	2,100	2,300	2,384	2,397	2,270	2,150	1,975
20%	1,850	1,837	1,850	1,900	2,000	2,100	2,272	2,318	2,304	2,216	2,098	1,942
30%	1,703	1,753	1,787	1,834	1,957	2,100	2,234	2,222	2,187	2,067	1,892	1,778
40%	1,454	1,502	1,668	1,751	1,840	2,015	2,161	2,061	2,025	1,847	1,694	1,548
50%	1,363	1,351	1,457	1,557	1,750	1,853	2,009	1,930	1,859	1,681	1,530	1,419
60%	1,264	1,274	1,327	1,374	1,527	1,672	1,868	1,835	1,731	1,578	1,425	1,316
70%	1,155	1,147	1,206	1,316	1,376	1,487	1,596	1,645	1,606	1,484	1,304	1,191
80%	958	946	984	1,036	1,130	1,247	1,384	1,369	1,305	1,149	1,055	989
90%	621	681	691	727	861	984	1,043	1,085	1,046	940	760	637
Long Term												
Full Simulation Period[b]	1,337	1,346	1,398	1,459	1,569	1,693	1,842	1,836	1,799	1,661	1,522	1,401
Water Year Types[c]												
Wet	1,529	1,558	1,655	1,763	1,925	2,062	2,239	2,273	2,250	2,121	2,000	1,845
Above Normal	1,354	1,362	1,436	1,563	1,716	1,886	2,057	2,062	2,034	1,913	1,774	1,637
Below Normal	1,274	1,281	1,300	1,359	1,432	1,529	1,703	1,687	1,645	1,511	1,369	1,266
Dry	1,304	1,308	1,334	1,349	1,430	1,560	1,697	1,646	1,579	1,414	1,255	1,149
Critical	1,024	1,001	1,009	980	1,021	1,091	1,148	1,119	1,092	958	815	741

Proposed Action Alternative minus No Action Alternative

	End of Month Storage (TAF)											
Statistic	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Probability of Exceedance[a]												
10%	0	0	0	0	0	0	0	0	0	0	0	0
20%	0	0	0	0	0	0	0	0	0	0	0	0
30%	0	0	-1	0	0	0	0	0	0	0	0	0
40%	0	0	0	0	0	0	0	0	0	0	0	0
50%	0	0	0	0	0	0	0	0	0	0	0	0
60%	-1	0	0	0	0	0	0	0	0	0	0	0
70%	0	0	0	0	0	0	0	0	-1	0	-1	-1
80%	0	0	0	0	0	0	0	0	0	0	0	0
90%	0	0	0	0	0	0	0	0	0	0	0	0
Long Term												
Full Simulation Period[b]	0	0	0	0	0	0	0	0	0	0	0	0
Water Year Types[c]												
Wet	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0
Critical	0	0	0	0	0	0	0	0	0	0	0	0

a Exceedance probability is defined as the probability a given value will be exceeded in any one year

b Based on the 82-year simulation period

c As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

A.3.3.2. Shasta Lake Storage

Figure A.3.3.2-1. Shasta Lake, End of May Storage

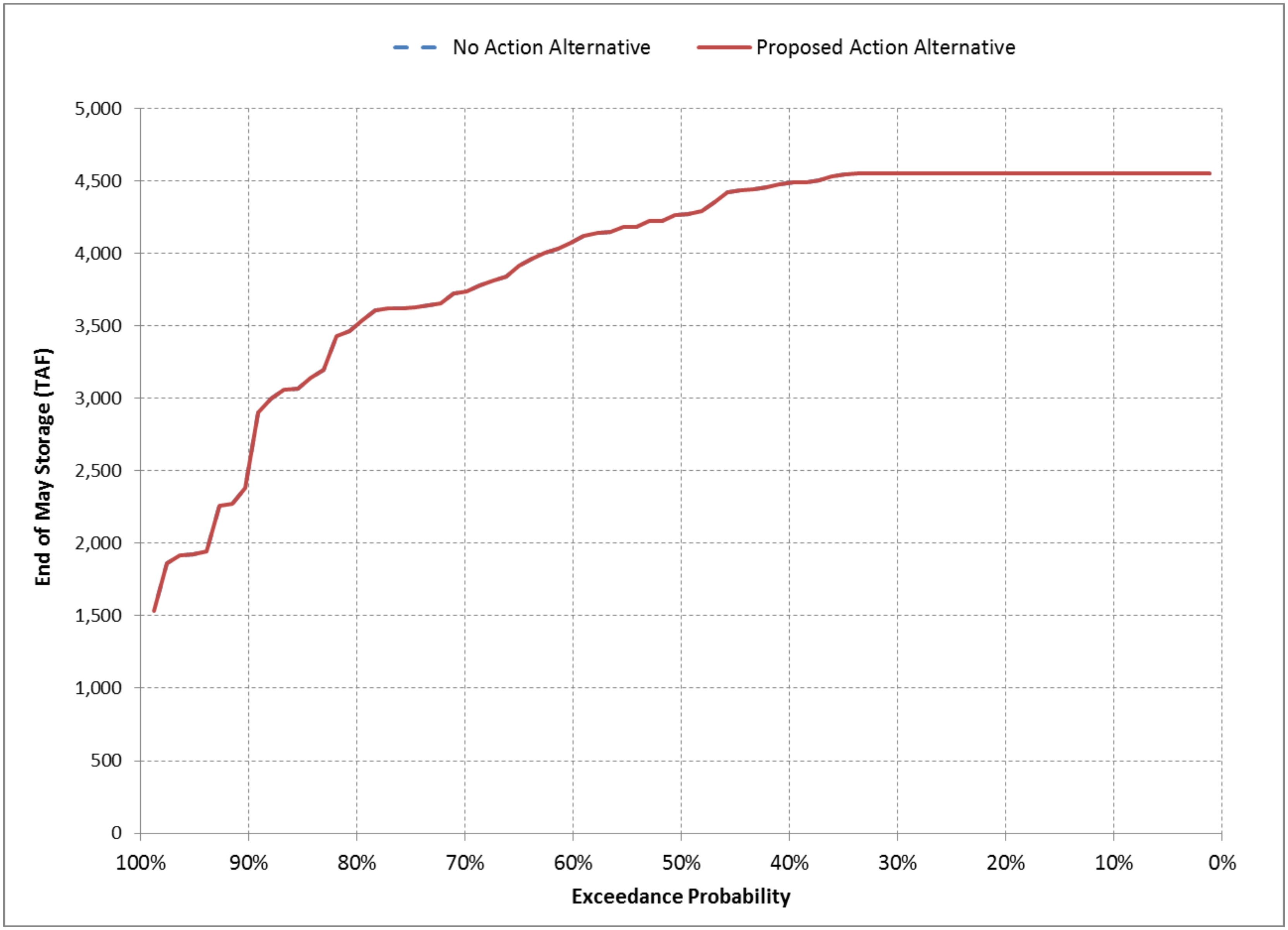


Figure A.3.3.2-2. Shasta Lake, End of September Storage

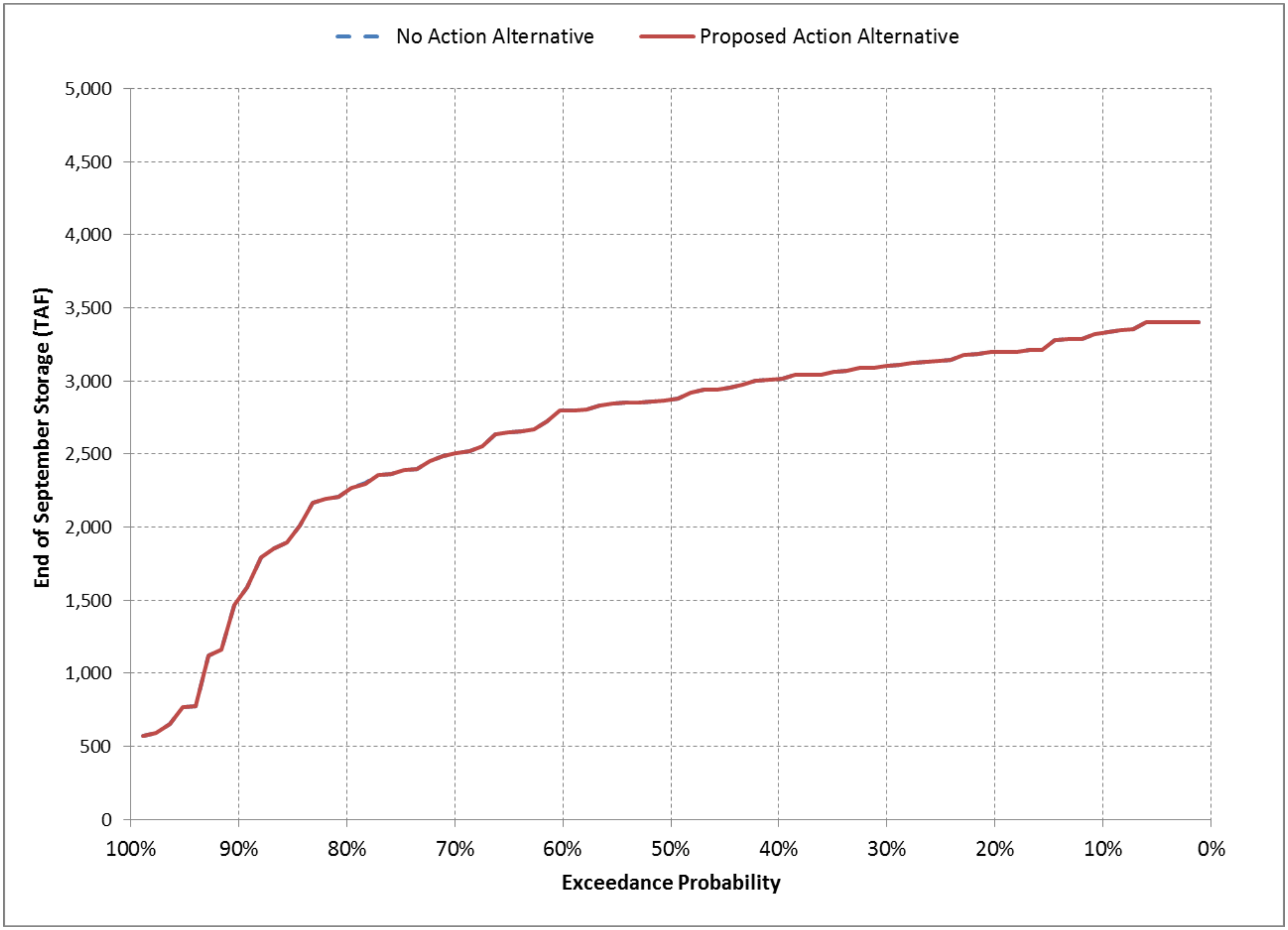


Table A.3.3.2-1. Shasta Lake, End of Month Storage

No Action Alternative

	End of Month Storage (TAF)											
Statistic	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Probability of Exceedance[a]												
10%	3,241	3,252	3,328	3,616	3,848	4,226	4,541	4,552	4,500	4,114	3,700	3,334
20%	3,167	3,074	3,306	3,531	3,769	4,106	4,461	4,552	4,343	3,955	3,631	3,200
30%	3,092	2,907	3,255	3,460	3,654	4,022	4,404	4,552	4,245	3,712	3,382	3,107
40%	2,938	2,799	3,091	3,339	3,518	3,953	4,296	4,488	4,050	3,470	3,199	3,016
50%	2,767	2,724	2,999	3,213	3,431	3,860	4,173	4,270	3,884	3,373	3,020	2,881
60%	2,686	2,666	2,769	3,060	3,292	3,694	4,058	4,120	3,748	3,177	2,908	2,797
70%	2,468	2,451	2,513	2,895	3,252	3,501	3,891	3,734	3,429	2,867	2,612	2,509
80%	2,152	2,141	2,313	2,607	2,835	3,384	3,665	3,537	3,126	2,650	2,299	2,266
90%	1,433	1,404	1,451	2,062	2,240	2,794	2,734	2,900	2,611	2,072	1,636	1,592
Long Term												
Full Simulation Period[b]	2574	2530	2705	2983	3259	3622	3922	3953	3648	3166	2846	2654
Water Year Types[c]												
Wet	2,816	2,822	3,125	3,414	3,638	3,860	4,317	4,474	4,291	3,877	3,530	3,103
Above Normal	2,509	2,431	2,601	3,101	3,381	3,960	4,405	4,477	4,121	3,537	3,207	3,010
Below Normal	2,618	2,540	2,606	2,932	3,284	3,685	4,057	4,079	3,736	3,238	2,922	2,859
Dry	2,522	2,485	2,640	2,812	3,181	3,661	3,810	3,729	3,352	2,831	2,530	2,492
Critical	2,140	2,054	2,111	2,248	2,403	2,639	2,591	2,490	2,127	1,674	1,389	1,334

Proposed Action Alternative

	End of Month Storage (TAF)											
Statistic	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Probability of Exceedance[a]												
10%	3,241	3,252	3,328	3,616	3,848	4,226	4,541	4,552	4,500	4,114	3,700	3,334
20%	3,167	3,074	3,306	3,531	3,769	4,106	4,461	4,552	4,343	3,955	3,631	3,200
30%	3,092	2,907	3,255	3,460	3,654	4,022	4,404	4,552	4,245	3,712	3,382	3,107
40%	2,938	2,799	3,091	3,339	3,518	3,953	4,296	4,488	4,050	3,470	3,199	3,016
50%	2,767	2,724	2,999	3,213	3,431	3,860	4,173	4,270	3,884	3,373	3,020	2,881
60%	2,686	2,666	2,769	3,060	3,292	3,694	4,058	4,120	3,748	3,177	2,908	2,797
70%	2,468	2,451	2,513	2,894	3,252	3,501	3,891	3,734	3,429	2,867	2,612	2,509
80%	2,152	2,141	2,313	2,607	2,835	3,384	3,665	3,537	3,126	2,650	2,299	2,266
90%	1,433	1,404	1,451	2,062	2,240	2,794	2,734	2,900	2,611	2,072	1,636	1,592
Long Term												
Full Simulation Period[b]	2574	2530	2705	2983	3259	3622	3922	3953	3648	3166	2846	2654
Water Year Types[c]												
Wet	2,816	2,822	3,125	3,414	3,638	3,860	4,317	4,474	4,291	3,877	3,530	3,103
Above Normal	2,509	2,431	2,601	3,101	3,381	3,960	4,405	4,477	4,121	3,537	3,207	3,010
Below Normal	2,618	2,540	2,605	2,932	3,284	3,685	4,057	4,079	3,736	3,238	2,922	2,859
Dry	2,522	2,485	2,640	2,812	3,181	3,661	3,810	3,729	3,352	2,831	2,530	2,492
Critical	2,140	2,054	2,111	2,248	2,403	2,639	2,591	2,490	2,127	1,674	1,389	1,333

Proposed Action Alternative minus No Action Alternative

	End of Month Storage (TAF)											
Statistic	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Probability of Exceedance[a]												
10%	0	0	0	0	0	0	0	0	0	0	0	0
20%	0	0	0	0	0	0	0	0	0	0	0	0
30%	0	0	0	0	0	0	0	0	0	0	0	0
40%	0	0	0	0	0	0	0	0	0	0	0	0
50%	0	0	0	0	0	0	0	0	0	0	0	0
60%	0	0	0	0	0	0	0	0	0	0	0	0
70%	0	0	0	0	0	0	0	0	0	0	0	0
80%	0	0	0	0	0	0	0	0	0	0	0	0
90%	0	0	0	0	0	0	0	0	0	0	0	0
Long Term												
Full Simulation Period[b]	0	0	0	0	0	0	0	0	0	0	0	0
Water Year Types[c]												
Wet	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0
Critical	0	0	0	0	0	0	0	0	0	0	0	0

a Exceedance probability is defined as the probability a given value will be exceeded in any one year

b Based on the 82-year simulation period

c As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

A.3.3.3. Lake Oroville Storage

Figure A.3.3.3-1. Lake Oroville, End of May Storage

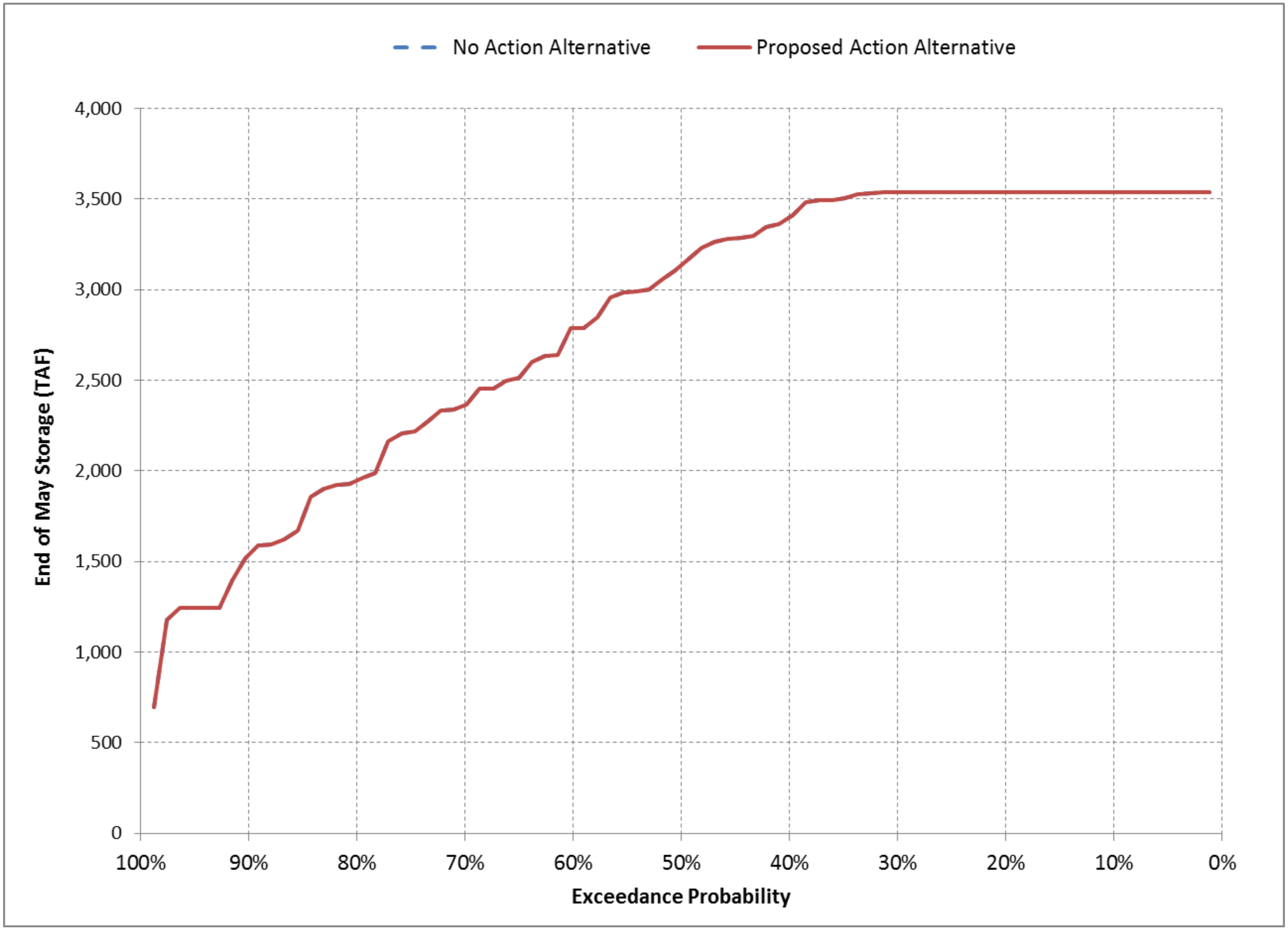


Figure A.3.3.3-2. Lake Oroville, End of September Storage

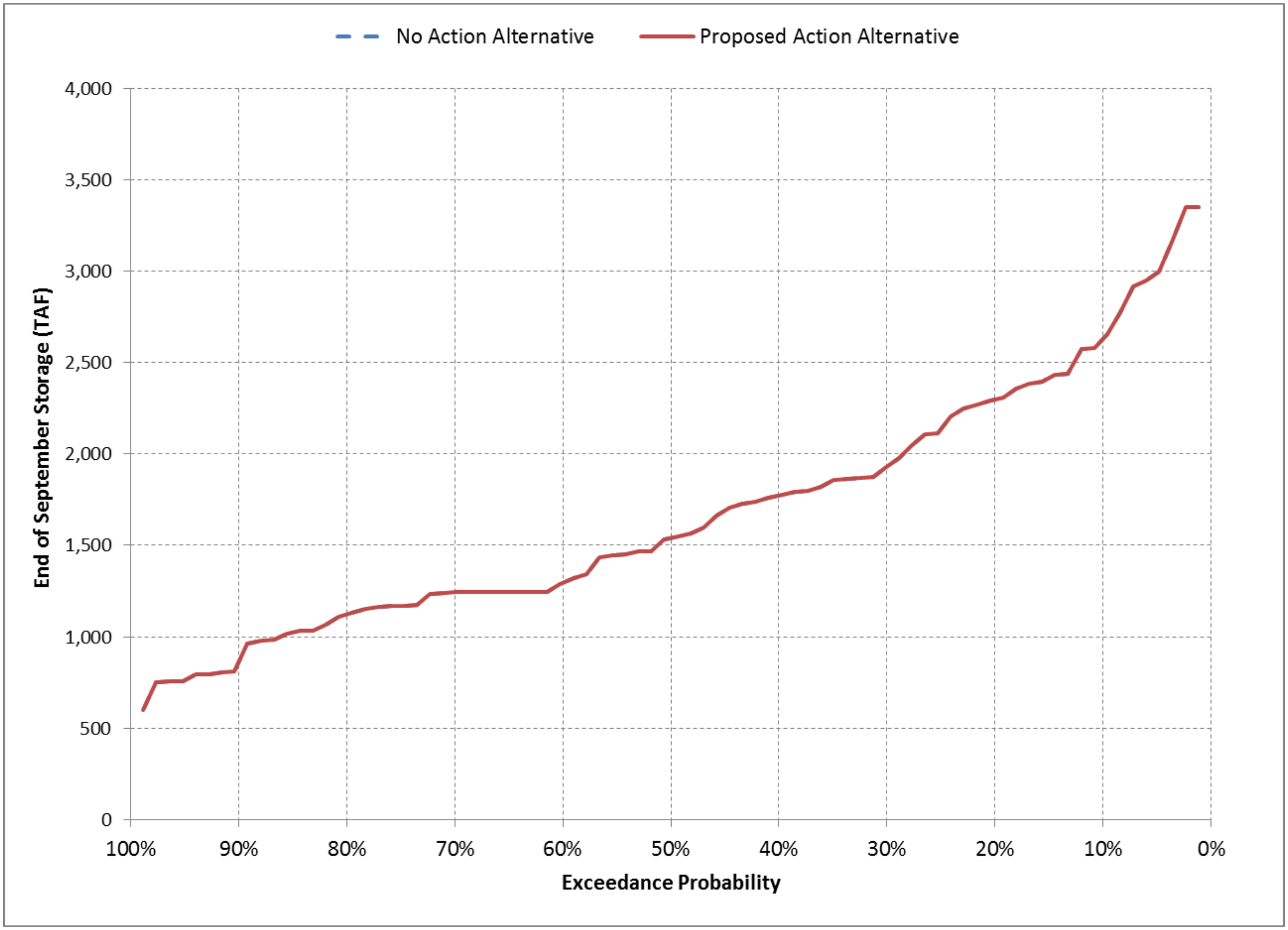


Table A.3.3.3-1. Lake Oroville, End of Month Storage

No Action Alternative

Statistic	End of Month Storage (TAF)											
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Probability of Exceedance[a]												
10%	2,447	2,403	2,788	2,788	2,952	3,054	3,362	3,538	3,538	3,341	3,184	2,656
20%	2,168	2,120	2,376	2,638	2,788	2,964	3,303	3,538	3,538	3,058	2,819	2,310
30%	1,858	1,872	1,990	2,301	2,788	2,918	3,277	3,538	3,538	2,975	2,496	1,976
40%	1,602	1,579	1,710	2,074	2,390	2,788	3,208	3,412	3,283	2,666	2,226	1,774
50%	1,444	1,354	1,515	1,877	2,289	2,690	2,991	3,162	3,018	2,420	1,934	1,549
60%	1,248	1,201	1,253	1,499	1,998	2,446	2,549	2,789	2,630	2,065	1,614	1,318
70%	1,108	1,041	1,178	1,286	1,592	1,987	2,322	2,367	2,141	1,579	1,349	1,243
80%	1,040	967	1,004	1,197	1,398	1,677	1,935	1,958	1,847	1,353	1,241	1,128
90%	912	900	921	1,061	1,217	1,404	1,637	1,591	1,313	1,169	1,058	963
Long Term												
Full Simulation Period[b]	1548	1525	1647	1865	2141	2393	2674	2813	2706	2254	1978	1673
Water Year Types[c]												
Wet	1,836	1,854	2,215	2,500	2,816	2,937	3,302	3,507	3,485	3,118	2,899	2,398
Above Normal	1,470	1,473	1,556	1,972	2,390	2,888	3,263	3,479	3,375	2,803	2,378	1,923
Below Normal	1,575	1,510	1,515	1,727	2,033	2,321	2,700	2,915	2,797	2,207	1,741	1,458
Dry	1,365	1,327	1,319	1,418	1,637	1,960	2,158	2,201	1,993	1,473	1,258	1,144
Critical	1,248	1,178	1,152	1,212	1,312	1,451	1,466	1,439	1,311	1,061	940	894

Proposed Action Alternative

Statistic	End of Month Storage (TAF)											
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Probability of Exceedance[a]												
10%	2,447	2,403	2,788	2,788	2,952	3,054	3,362	3,538	3,538	3,341	3,184	2,656
20%	2,168	2,120	2,376	2,638	2,788	2,964	3,303	3,538	3,538	3,058	2,819	2,310
30%	1,858	1,872	1,990	2,301	2,788	2,918	3,277	3,538	3,538	2,975	2,496	1,976
40%	1,602	1,579	1,710	2,074	2,390	2,788	3,208	3,412	3,283	2,666	2,226	1,774
50%	1,444	1,354	1,515	1,877	2,289	2,690	2,991	3,162	3,018	2,420	1,934	1,549
60%	1,248	1,201	1,253	1,499	1,998	2,446	2,549	2,789	2,630	2,065	1,614	1,318
70%	1,108	1,041	1,178	1,286	1,592	1,987	2,322	2,367	2,141	1,579	1,349	1,243
80%	1,040	967	1,004	1,197	1,398	1,677	1,935	1,958	1,847	1,353	1,241	1,128
90%	912	900	921	1,061	1,217	1,404	1,637	1,591	1,313	1,169	1,058	963
Long Term												
Full Simulation Period[b]	1548	1525	1647	1865	2141	2393	2674	2813	2706	2254	1978	1673
Water Year Types[c]												
Wet	1,836	1,854	2,215	2,500	2,816	2,937	3,302	3,507	3,485	3,118	2,899	2,398
Above Normal	1,470	1,473	1,556	1,972	2,390	2,888	3,263	3,479	3,375	2,803	2,378	1,923
Below Normal	1,575	1,510	1,515	1,727	2,033	2,321	2,700	2,915	2,797	2,207	1,741	1,458
Dry	1,365	1,327	1,319	1,418	1,637	1,960	2,158	2,201	1,993	1,473	1,258	1,144
Critical	1,248	1,178	1,152	1,212	1,312	1,451	1,466	1,439	1,311	1,061	940	894

Proposed Action Alternative minus No Action Alternative

Statistic	End of Month Storage (TAF)											
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Probability of Exceedance[a]												
10%	0	0	0	0	0	0	0	0	0	0	0	0
20%	0	0	0	0	0	0	0	0	0	0	0	0
30%	0	0	0	0	0	0	0	0	0	0	0	0
40%	0	0	0	0	0	0	0	0	0	0	0	0
50%	0	0	0	0	0	0	0	0	0	0	0	0
60%	0	0	0	0	0	0	0	0	0	0	0	0
70%	0	0	0	0	0	0	0	0	0	0	0	0
80%	0	0	0	0	0	0	0	0	0	0	0	0
90%	0	0	0	0	0	0	0	0	0	0	0	0
Long Term												
Full Simulation Period[b]	0	0	0	0	0	0	0	0	0	0	0	0
Water Year Types[c]												
Wet	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0
Critical	0	0	0	0	0	0	0	0	0	0	0	0

a Exceedance probability is defined as the probability a given value will be exceeded in any one year

b Based on the 82-year simulation period

c As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

A.3.3.4. Folsom Lake Storage

Figure A.3.3.4-1. Folsom Lake, End of May Storage

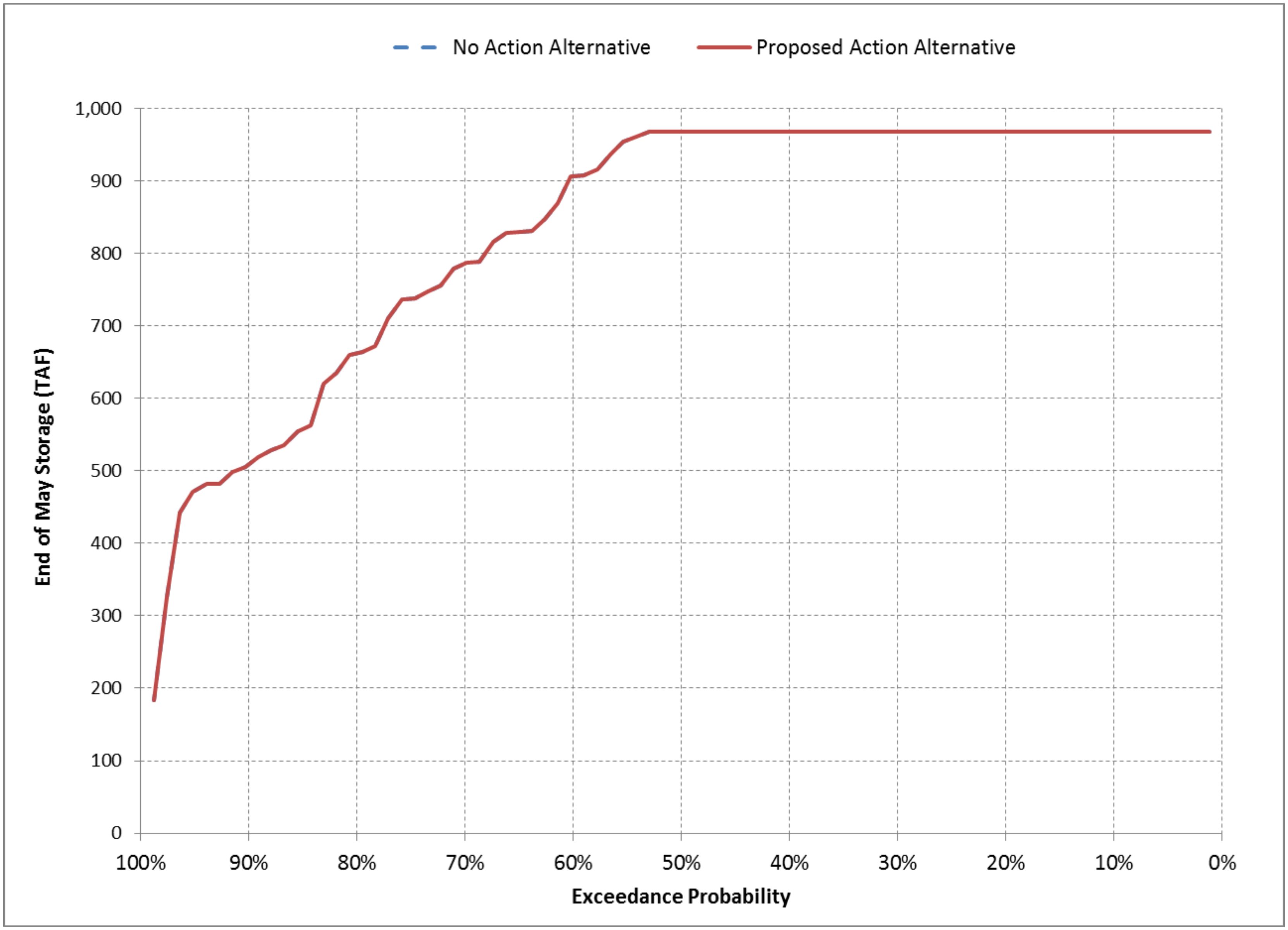


Figure A.3.3.4-2. Folsom Lake, End of September Storage

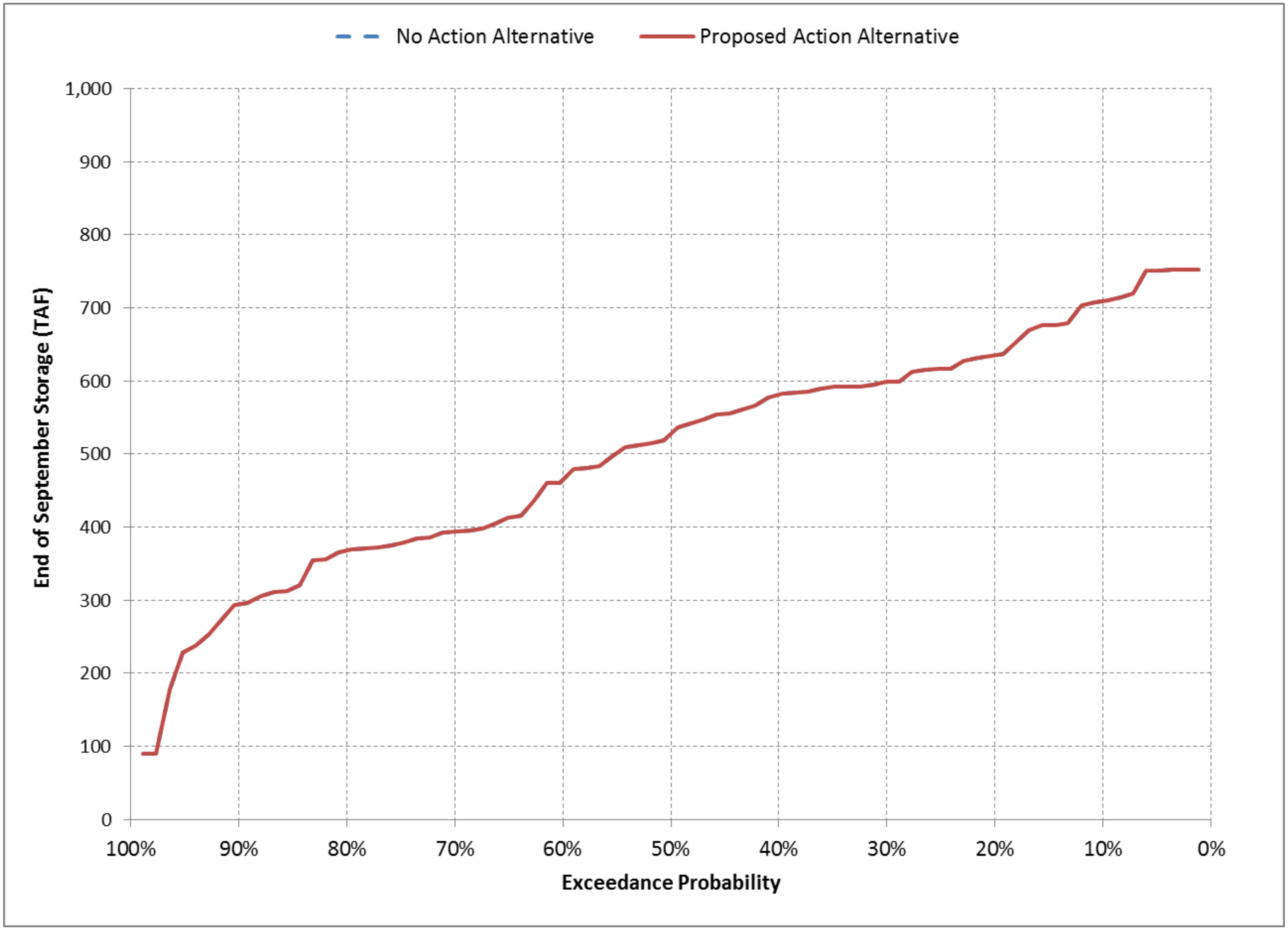


Table A.3.3.4-1. Folsom Lake, End of Month Storage

No Action Alternative

Statistic	End of Month Storage (TAF) Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Probability of Exceedance[a]												
10%	592	565	567	567	567	661	792	967	967	942	792	710
20%	574	515	567	566	566	656	792	967	967	921	792	637
30%	553	480	556	559	558	652	792	967	967	830	764	599
40%	522	459	503	538	554	646	792	967	967	740	688	582
50%	490	443	459	487	540	636	792	967	920	683	616	537
60%	421	430	426	460	499	622	792	908	842	615	547	479
70%	349	387	396	427	447	597	737	788	692	497	431	393
80%	322	334	367	384	422	543	636	664	581	419	375	370
90%	269	270	285	316	392	441	474	519	464	369	313	297
Long Term												
Full Simulation Period[b]	451	422	451	470	491	591	717	836	801	650	575	501
Water Year Types[c]												
Wet	486	463	521	525	515	631	787	958	955	862	757	619
Above Normal	434	387	416	506	531	642	787	955	922	715	639	529
Below Normal	462	438	450	489	538	624	779	912	886	658	607	572
Dry	440	417	439	434	479	586	691	762	683	514	442	416
Critical	399	360	356	344	364	421	459	472	424	321	279	262

Proposed Action Alternative

Statistic	End of Month Storage (TAF) Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Probability of Exceedance[a]												
10%	592	565	567	567	567	661	792	967	967	942	792	710
20%	574	515	567	566	566	656	792	967	967	921	792	637
30%	553	480	556	559	558	652	792	967	967	830	764	599
40%	522	459	503	538	554	646	792	967	967	740	688	582
50%	490	443	459	487	540	636	792	967	920	683	616	537
60%	421	430	426	460	499	622	792	908	842	615	547	479
70%	349	387	396	427	447	597	737	788	692	497	431	393
80%	322	334	367	384	422	543	636	664	581	419	375	370
90%	269	270	285	316	392	441	474	519	464	369	313	297
Long Term												
Full Simulation Period[b]	451	422	451	470	491	591	717	836	801	650	575	501
Water Year Types[c]												
Wet	486	463	521	525	515	631	787	958	955	862	757	619
Above Normal	434	387	416	506	531	642	787	955	922	715	639	529
Below Normal	462	438	450	489	538	624	779	912	886	658	607	572
Dry	440	417	439	434	479	586	691	762	683	514	442	416
Critical	399	360	356	344	364	421	459	472	424	321	279	262

Proposed Action Alternative minus No Action Alternative

Statistic	End of Month Storage (TAF) Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Probability of Exceedance[a]												
10%	0	0	0	0	0	0	0	0	0	0	0	0
20%	0	0	0	0	0	0	0	0	0	0	0	0
30%	0	0	0	0	0	0	0	0	0	0	0	0
40%	0	0	0	0	0	0	0	0	0	0	0	0
50%	0	0	0	0	0	0	0	0	0	0	0	0
60%	0	0	0	0	0	0	0	0	0	0	0	0
70%	0	0	0	0	0	0	0	0	0	0	0	0
80%	0	0	0	0	0	0	0	0	0	0	0	0
90%	0	0	0	0	0	0	0	0	0	0	0	0
Long Term												
Full Simulation Period[b]	0	0	0	0	0	0	0	0	0	0	0	0
Water Year Types[c]												
Wet	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0
Critical	0	0	0	0	0	0	0	0	0	0	0	0

a Exceedance probability is defined as the probability a given value will be exceeded in any one year

b Based on the 82-year simulation period

c As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

A.3.3.5. San Luis Storage

Figure A.3.3.5-3. San Luis Reservoir (SWP), End of May Storage

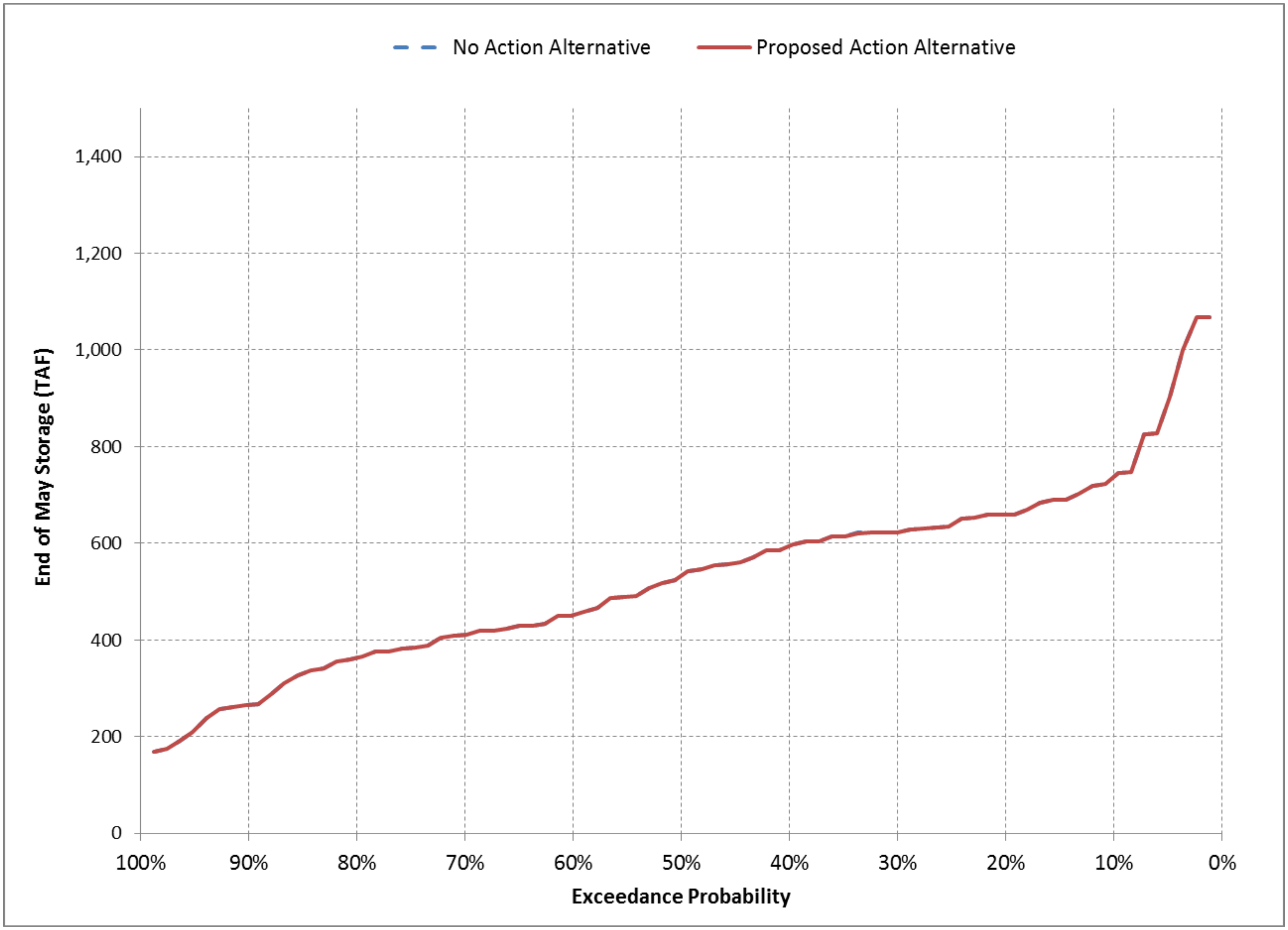


Figure A.3.3.5-4. San Luis Reservoir (SWP), End of September Storage

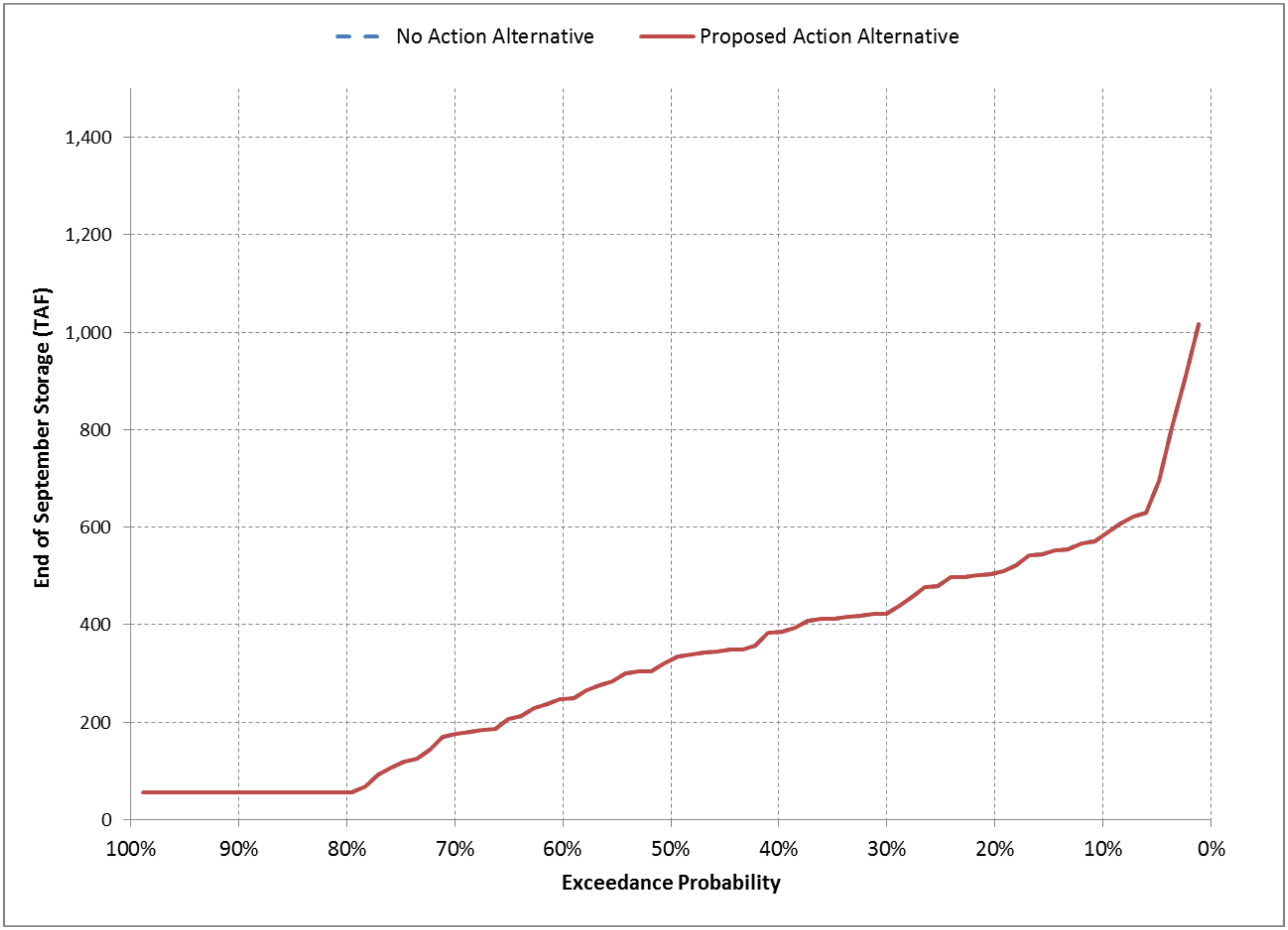


Table A.3.3.5-2. San Luis Reservoir (SWP), End of Month Storage

No Action Alternative

	End of Month Storage (TAF)											
Statistic	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Probability of Exceedance[a]												
10%	576	646	716	911	1,067	1,067	944	746	618	605	557	589
20%	481	446	581	750	899	1,054	906	659	506	520	489	510
30%	413	386	500	675	794	1,000	869	628	461	449	422	438
40%	346	304	426	567	705	864	767	598	397	392	345	385
50%	285	257	349	492	681	781	690	543	357	334	283	335
60%	213	185	313	465	624	722	630	457	260	275	241	249
70%	91	129	240	384	509	668	589	411	230	240	167	175
80%	55	55	131	282	411	562	489	366	197	203	118	55
90%	55	55	55	232	361	496	431	267	135	163	66	55
Long Term												
Full Simulation Period[b]	292	287	380	527	663	787	695	526	362	363	310	323
Water Year Types[c]												
Wet	352	361	432	590	756	917	797	585	451	462	464	498
Above Normal	296	283	427	577	692	814	693	476	306	315	332	390
Below Normal	274	255	335	453	591	733	631	446	248	294	320	348
Dry	259	269	390	545	664	755	684	555	369	383	205	172
Critical	226	194	254	397	517	586	570	498	348	248	101	73

Proposed Action Alternative

	End of Month Storage (TAF)											
Statistic	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Probability of Exceedance[a]												
10%	576	646	716	911	1,067	1,067	944	746	618	605	557	589
20%	481	446	581	750	899	1,054	906	659	506	520	489	510
30%	413	386	500	675	794	1,000	869	628	461	449	422	438
40%	346	304	426	567	705	864	767	598	397	392	345	385
50%	285	257	349	492	681	781	690	543	357	334	283	335
60%	213	185	313	465	624	722	630	457	260	275	241	249
70%	91	129	240	384	509	668	589	411	230	240	167	175
80%	55	55	131	281	411	562	489	366	197	203	118	55
90%	55	55	55	232	361	496	431	267	135	163	66	55
Long Term												
Full Simulation Period[b]	292	287	380	527	663	787	695	526	362	363	310	323
Water Year Types[c]												
Wet	352	361	432	590	756	917	797	585	451	462	464	498
Above Normal	296	283	427	577	692	814	693	476	306	315	332	390
Below Normal	274	255	335	453	591	733	631	446	248	294	320	348
Dry	259	269	390	545	664	755	684	555	369	383	205	172
Critical	226	194	254	397	517	586	570	498	348	248	101	73

Proposed Action Alternative minus No Action Alternative

	End of Month Storage (TAF)											
Statistic	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Probability of Exceedance[a]												
10%	0	0	0	0	0	0	0	0	0	0	0	0
20%	0	0	0	0	0	0	0	0	0	0	0	0
30%	0	0	0	0	0	0	0	0	0	0	0	0
40%	0	0	0	0	0	0	0	0	0	0	0	0
50%	0	0	0	0	0	0	0	0	0	0	0	0
60%	0	0	0	0	0	0	0	0	0	0	0	0
70%	0	0	0	0	0	0	0	0	0	0	0	0
80%	0	0	0	0	0	0	0	0	0	0	0	0
90%	0	0	0	0	0	0	0	0	0	0	0	0
Long Term												
Full Simulation Period[b]	0	0	0	0	0	0	0	0	0	0	0	0
Water Year Types[c]												
Wet	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0
Critical	0	0	0	0	0	0	0	0	0	0	0	0

a Exceedance probability is defined as the probability a given value will be exceeded in any one year

b Based on the 82-year simulation period

c As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

Figure A.3.3.5-5. San Luis Reservoir (CVP), End of May Storage

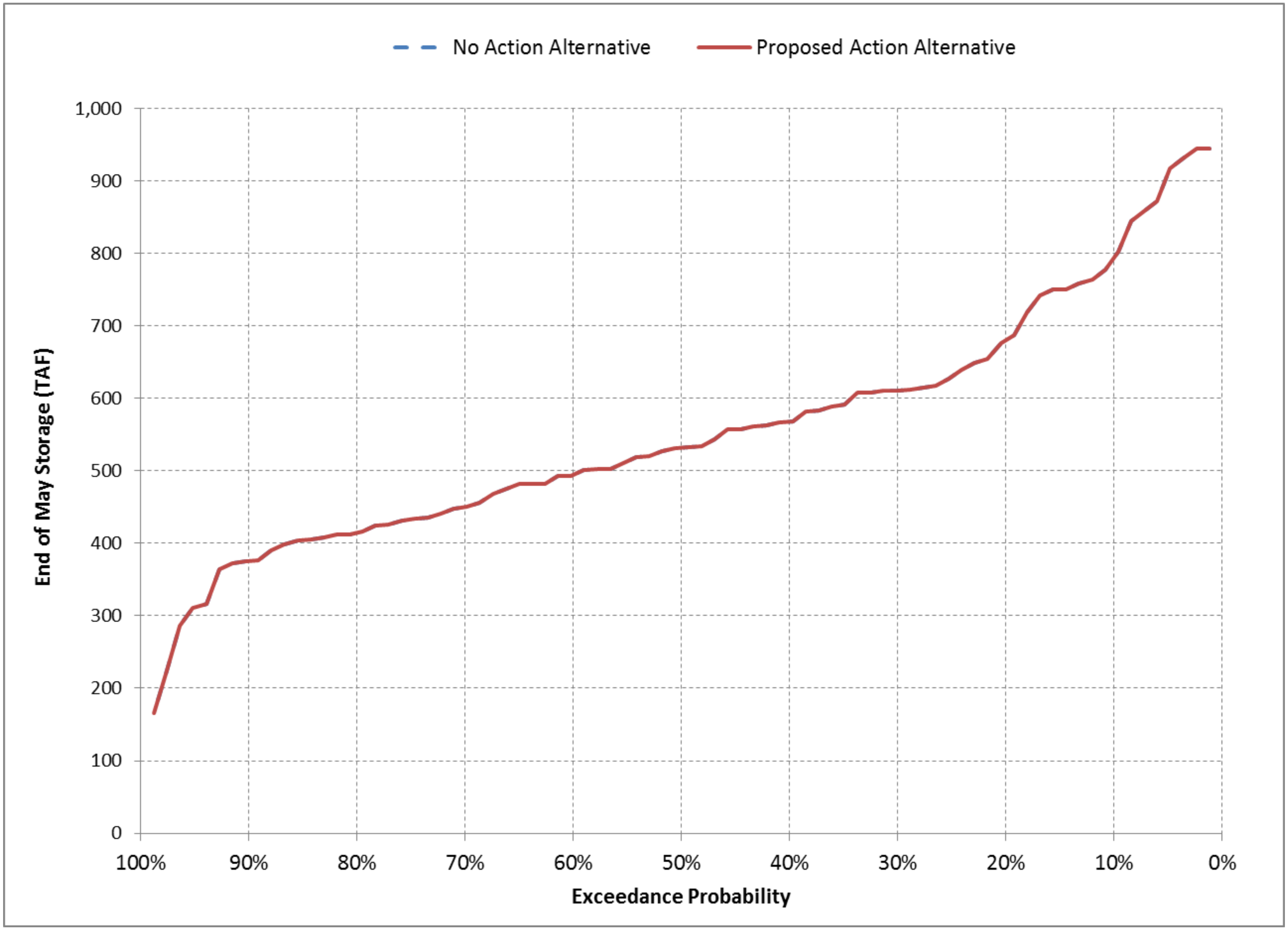


Figure A.3.3.5-6. San Luis Reservoir (CVP), End of September Storage

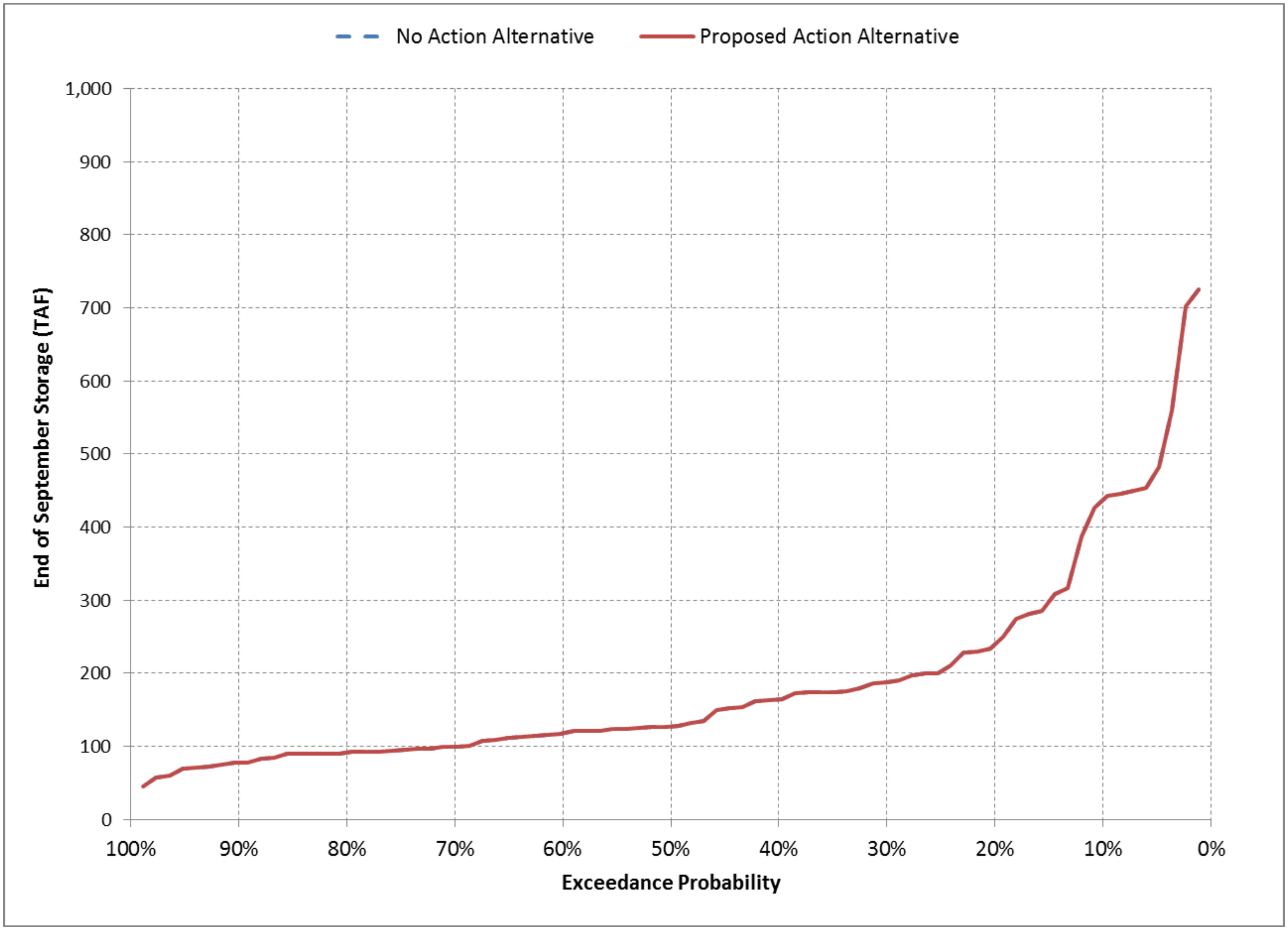


Table A.3.3.5-3. San Luis Reservoir (CVP), End of Month Storage

Statistic	End of Month Storage (TAF)											
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Probability of Exceedance[a]												
10%	484	600	799	968	972	972	922	803	686	496	387	443
20%	309	421	593	759	914	972	873	687	541	380	235	250
30%	250	367	558	689	816	938	827	612	436	303	175	191
40%	207	367	544	654	777	864	760	567	375	243	139	164
50%	183	362	533	634	730	819	709	533	340	197	109	128
60%	177	327	504	608	685	758	663	502	319	175	91	121
70%	165	306	479	584	641	713	624	450	261	135	78	99
80%	152	266	436	545	614	670	584	416	222	112	56	92
90%	127	188	354	480	538	596	546	377	181	93	45	78
Long Term												
Full Simulation Period[b]	243	365	533	648	734	799	715	554	380	248	160	185
Water Year Types[c]												
Wet	243	374	543	669	789	890	808	643	490	301	186	210
Above Normal	234	377	551	654	736	839	733	536	360	185	111	132
Below Normal	272	405	585	692	756	817	727	554	381	278	206	258
Dry	218	328	506	630	704	731	642	480	278	201	112	135
Critical	252	340	471	571	630	642	590	487	316	230	175	176

Proposed Action Alternative

Statistic	End of Month Storage (TAF)											
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Probability of Exceedance[a]												
10%	484	600	798	968	972	972	922	803	686	496	387	443
20%	309	421	593	759	914	972	873	687	541	380	235	250
30%	250	367	558	689	816	938	827	612	436	303	175	191
40%	207	367	544	654	777	864	760	567	375	243	139	164
50%	183	362	533	634	730	819	709	533	340	197	109	128
60%	177	327	504	608	685	758	663	502	319	175	91	121
70%	165	306	479	584	641	713	624	450	261	135	78	99
80%	152	266	436	545	614	670	584	416	222	112	56	92
90%	127	188	354	480	538	596	546	377	181	93	45	78
Long Term												
Full Simulation Period[b]	243	365	533	648	734	799	715	554	380	248	160	185
Water Year Types[c]												
Wet	243	374	543	669	789	890	808	643	490	301	186	210
Above Normal	234	377	551	654	736	839	733	536	360	185	111	132
Below Normal	272	405	585	692	756	817	727	554	381	278	206	258
Dry	218	328	506	630	704	731	642	480	278	201	112	135
Critical	252	340	471	571	630	642	590	487	316	230	175	176

Proposed Action Alternative minus No Action Alternative

Statistic	End of Month Storage (TAF)											
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Probability of Exceedance[a]												
10%	0	0	0	0	0	0	0	0	0	0	0	0
20%	0	0	0	0	0	0	0	0	0	0	0	0
30%	0	0	0	0	0	0	0	0	0	0	0	0
40%	0	0	0	0	0	0	0	0	0	0	0	0
50%	0	0	0	0	0	0	0	0	0	0	0	0
60%	0	0	0	0	0	0	0	0	0	0	0	0
70%	0	0	0	0	0	0	0	0	0	0	0	0
80%	0	0	0	0	0	0	0	0	0	0	0	0
90%	0	0	0	0	0	0	0	0	0	0	0	0
Long Term												
Full Simulation Period[b]	0	0	0	0	0	0	0	0	0	0	0	0
Water Year Types[c]												
Wet	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0
Critical	0	0	0	0	0	0	0	0	0	0	0	0

a Exceedance probability is defined as the probability a given value will be exceeded in any one year
b Based on the 82-year simulation period
c As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

A.3.3.6. New Melones Reservoir Storage

Figure A.3.3.6-1. New Melones Reservoir, End of May Storage

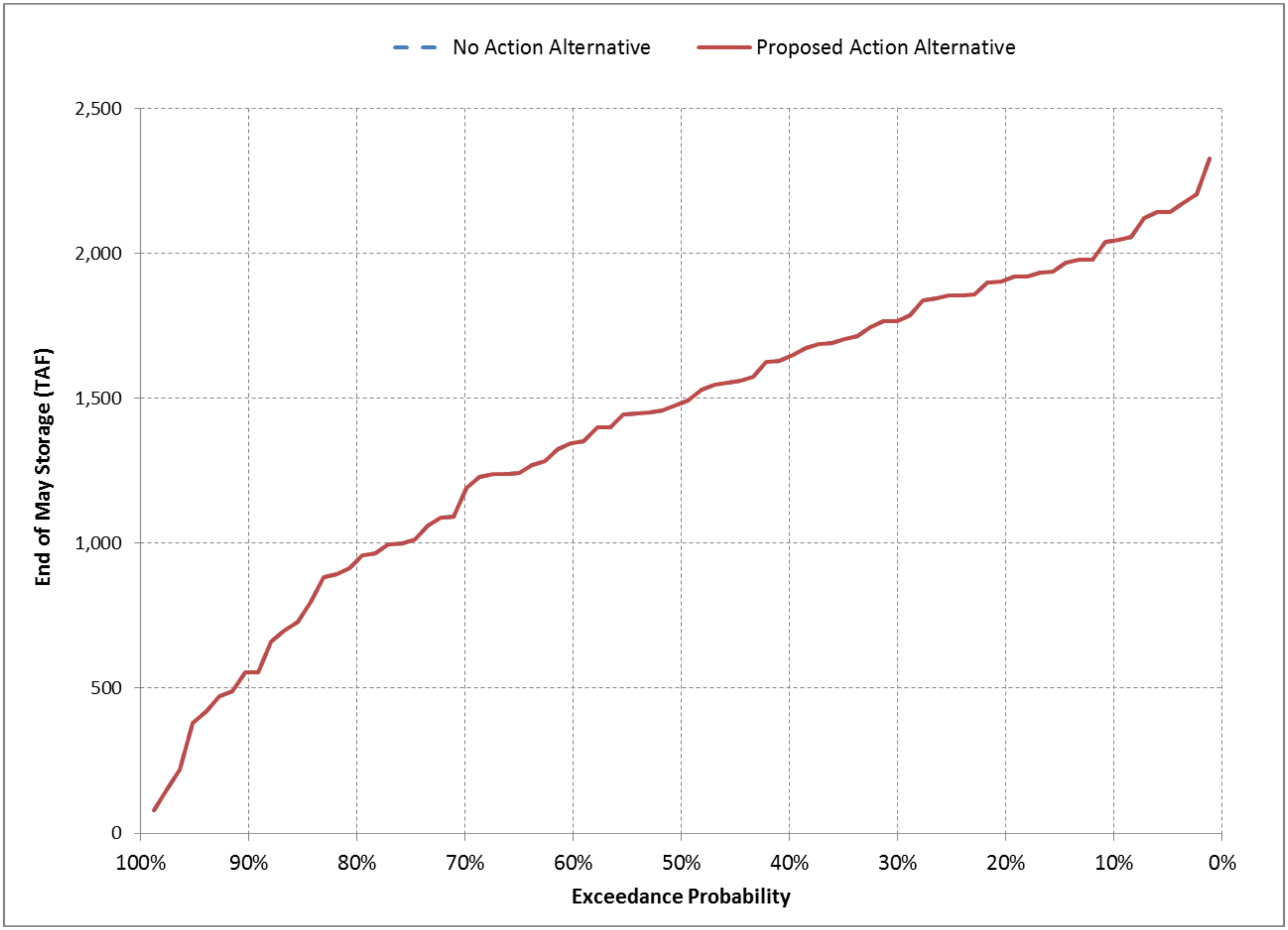


Figure A.3.3.6-2. New Melones Reservoir, End of September Storage

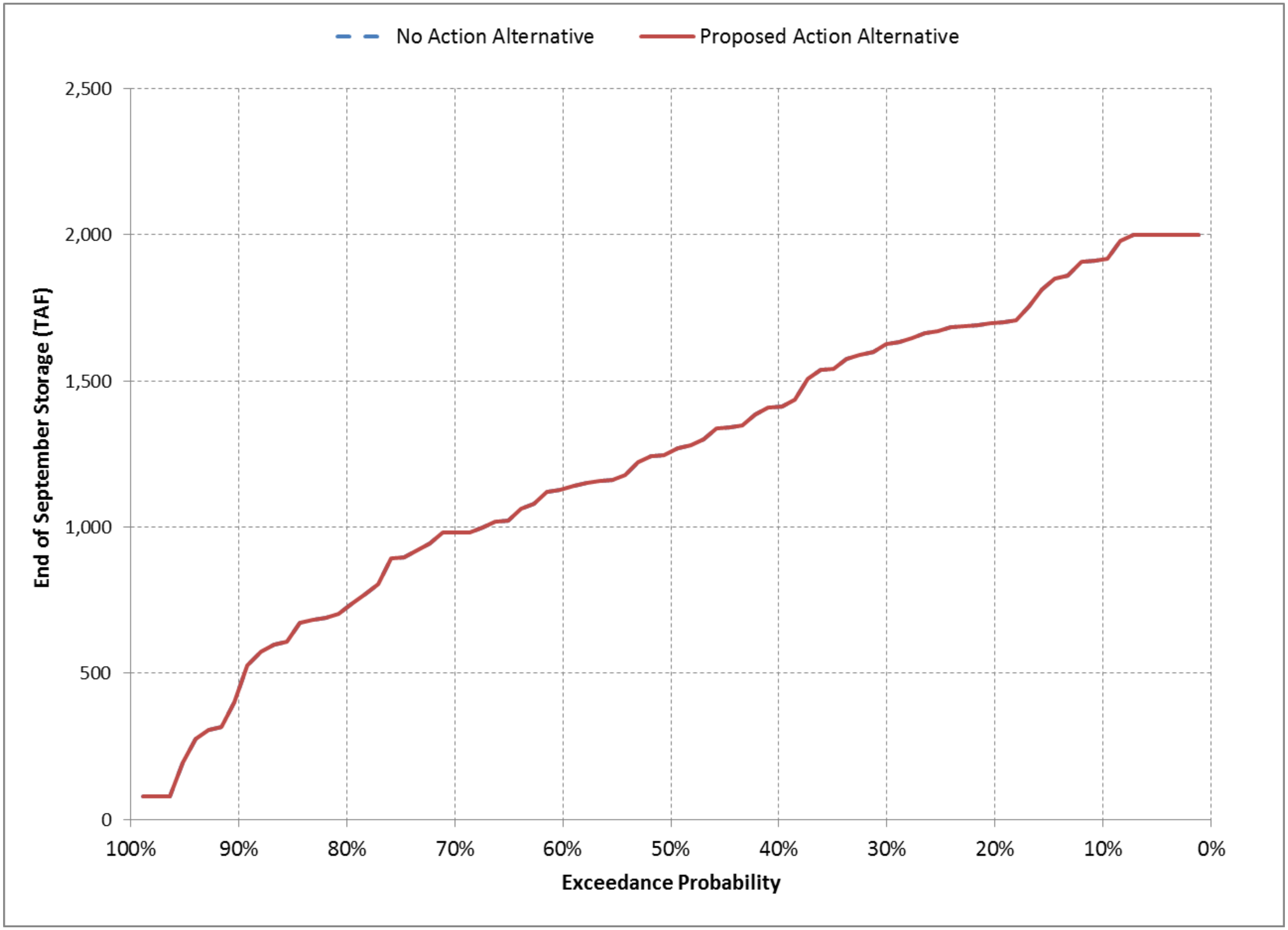


Table A.3.3.6-1. New Melones Reservoir, End of Month Storage

No Action Alternative

	End of Month Storage (TAF)											
Statistic	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Probability of Exceedance[a]												
10%	1,865	1,877	1,943	1,970	1,970	1,986	1,935	2,046	2,140	2,074	1,979	1,918
20%	1,669	1,703	1,715	1,758	1,835	1,861	1,866	1,918	1,906	1,848	1,757	1,701
30%	1,611	1,623	1,648	1,695	1,779	1,792	1,744	1,788	1,820	1,762	1,675	1,634
40%	1,386	1,416	1,507	1,580	1,678	1,672	1,673	1,648	1,616	1,567	1,470	1,413
50%	1,223	1,250	1,330	1,416	1,558	1,553	1,556	1,491	1,490	1,425	1,327	1,271
60%	1,119	1,138	1,155	1,194	1,293	1,367	1,341	1,351	1,353	1,273	1,179	1,140
70%	954	972	1,018	1,067	1,078	1,096	1,056	1,190	1,164	1,086	1,013	980
80%	697	688	699	730	835	906	944	959	908	850	776	737
90%	492	482	492	507	582	641	565	554	639	622	564	526
Long Term												
Full Simulation Period[b]	1,204	1,213	1,245	1,294	1,355	1,393	1,380	1,408	1,426	1,360	1,276	1,231
Water Year Types[c]												
Wet	1,401	1,412	1,464	1,554	1,649	1,704	1,742	1,846	1,939	1,886	1,786	1,724
Above Normal	1,157	1,182	1,230	1,312	1,404	1,477	1,474	1,540	1,560	1,485	1,399	1,355
Below Normal	1,136	1,144	1,167	1,199	1,257	1,292	1,278	1,332	1,336	1,261	1,176	1,133
Dry	1,270	1,271	1,286	1,299	1,326	1,352	1,296	1,243	1,200	1,123	1,045	1,004
Critical	803	803	814	820	827	811	742	666	622	565	516	490

Proposed Action Alternative

	End of Month Storage (TAF)											
Statistic	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Probability of Exceedance[a]												
10%	1,865	1,877	1,943	1,970	1,970	1,986	1,935	2,046	2,140	2,074	1,979	1,918
20%	1,669	1,703	1,715	1,758	1,835	1,861	1,866	1,918	1,906	1,848	1,757	1,701
30%	1,611	1,623	1,648	1,695	1,779	1,792	1,744	1,788	1,820	1,762	1,675	1,634
40%	1,386	1,416	1,507	1,580	1,678	1,672	1,673	1,648	1,616	1,567	1,470	1,413
50%	1,223	1,250	1,330	1,416	1,558	1,553	1,556	1,491	1,490	1,425	1,327	1,271
60%	1,119	1,138	1,155	1,194	1,293	1,367	1,341	1,351	1,353	1,273	1,179	1,140
70%	954	972	1,018	1,067	1,078	1,096	1,056	1,190	1,164	1,086	1,013	980
80%	697	688	699	730	835	906	944	959	908	850	776	737
90%	492	482	492	507	582	641	565	554	639	622	564	526
Long Term												
Full Simulation Period[b]	1,204	1,213	1,245	1,294	1,355	1,393	1,380	1,408	1,426	1,360	1,276	1,231
Water Year Types[c]												
Wet	1,401	1,412	1,464	1,554	1,649	1,704	1,742	1,846	1,939	1,886	1,786	1,724
Above Normal	1,157	1,182	1,230	1,312	1,404	1,477	1,474	1,540	1,560	1,485	1,399	1,355
Below Normal	1,136	1,144	1,167	1,199	1,257	1,292	1,278	1,332	1,336	1,261	1,176	1,133
Dry	1,270	1,271	1,286	1,299	1,326	1,352	1,296	1,243	1,200	1,123	1,045	1,004
Critical	803	803	814	820	827	811	742	666	622	565	516	490

Proposed Action Alternative minus No Action Alternative

	End of Month Storage (TAF)											
Statistic	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Probability of Exceedance[a]												
10%	0	0	0	0	0	0	0	0	0	0	0	0
20%	0	0	0	0	0	0	0	0	0	0	0	0
30%	0	0	0	0	0	0	0	0	0	0	0	0
40%	0	0	0	0	0	0	0	0	0	0	0	0
50%	0	0	0	0	0	0	0	0	0	0	0	0
60%	0	0	0	0	0	0	0	0	0	0	0	0
70%	0	0	0	0	0	0	0	0	0	0	0	0
80%	0	0	0	0	0	0	0	0	0	0	0	0
90%	0	0	0	0	0	0	0	0	0	0	0	0
Long Term												
Full Simulation Period[b]	0	0	0	0	0	0	0	0	0	0	0	0
Water Year Types[c]												
Wet	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0
Critical	0	0	0	0	0	0	0	0	0	0	0	0

a Exceedance probability is defined as the probability a given value will be exceeded in any one year

b Based on the 82-year simulation period

c As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

A.3.3.7. Millerton Lake Storage

Figure A.3.3.7-1. Millerton Lake Reservoir, End of May Storage

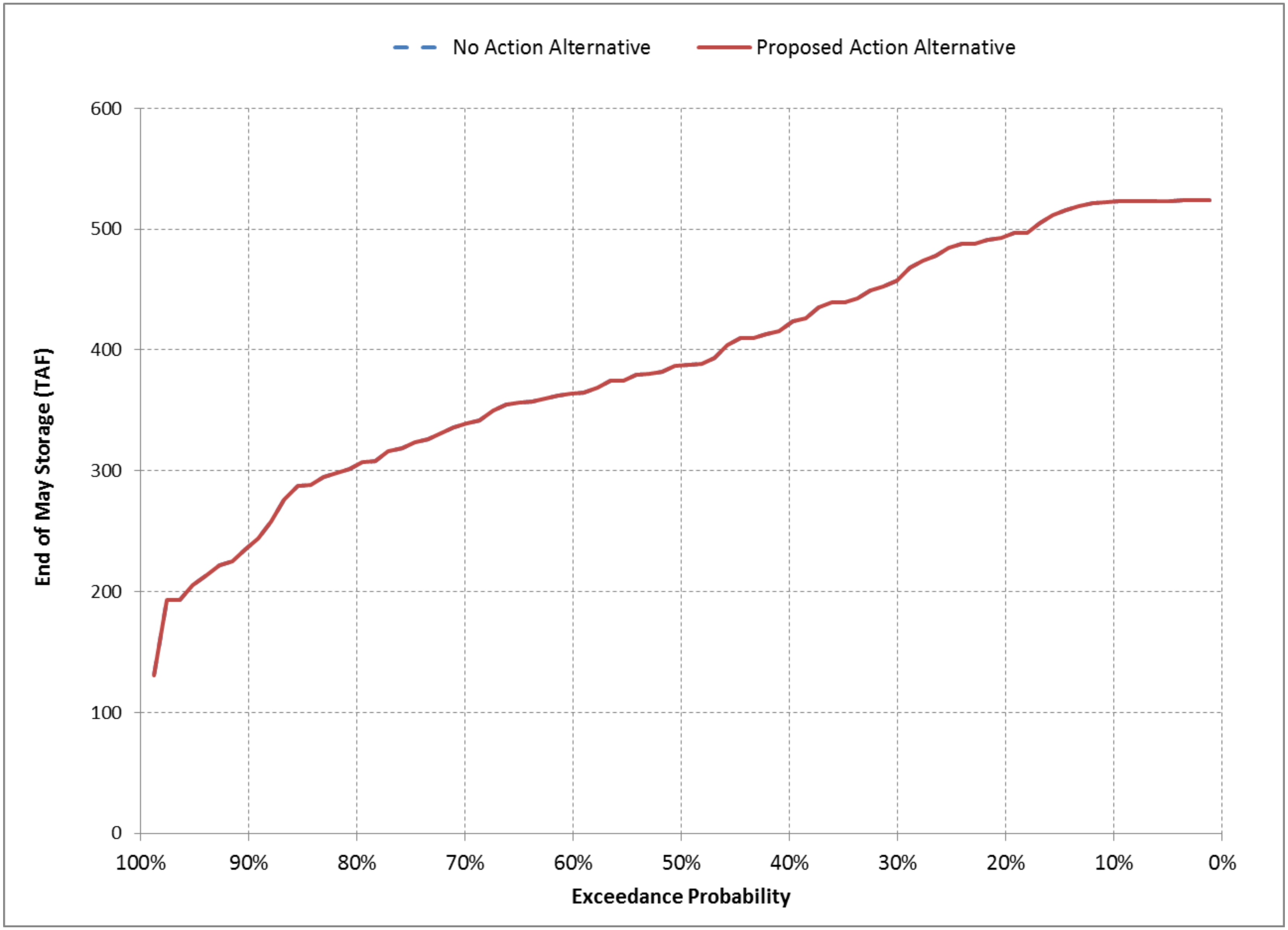
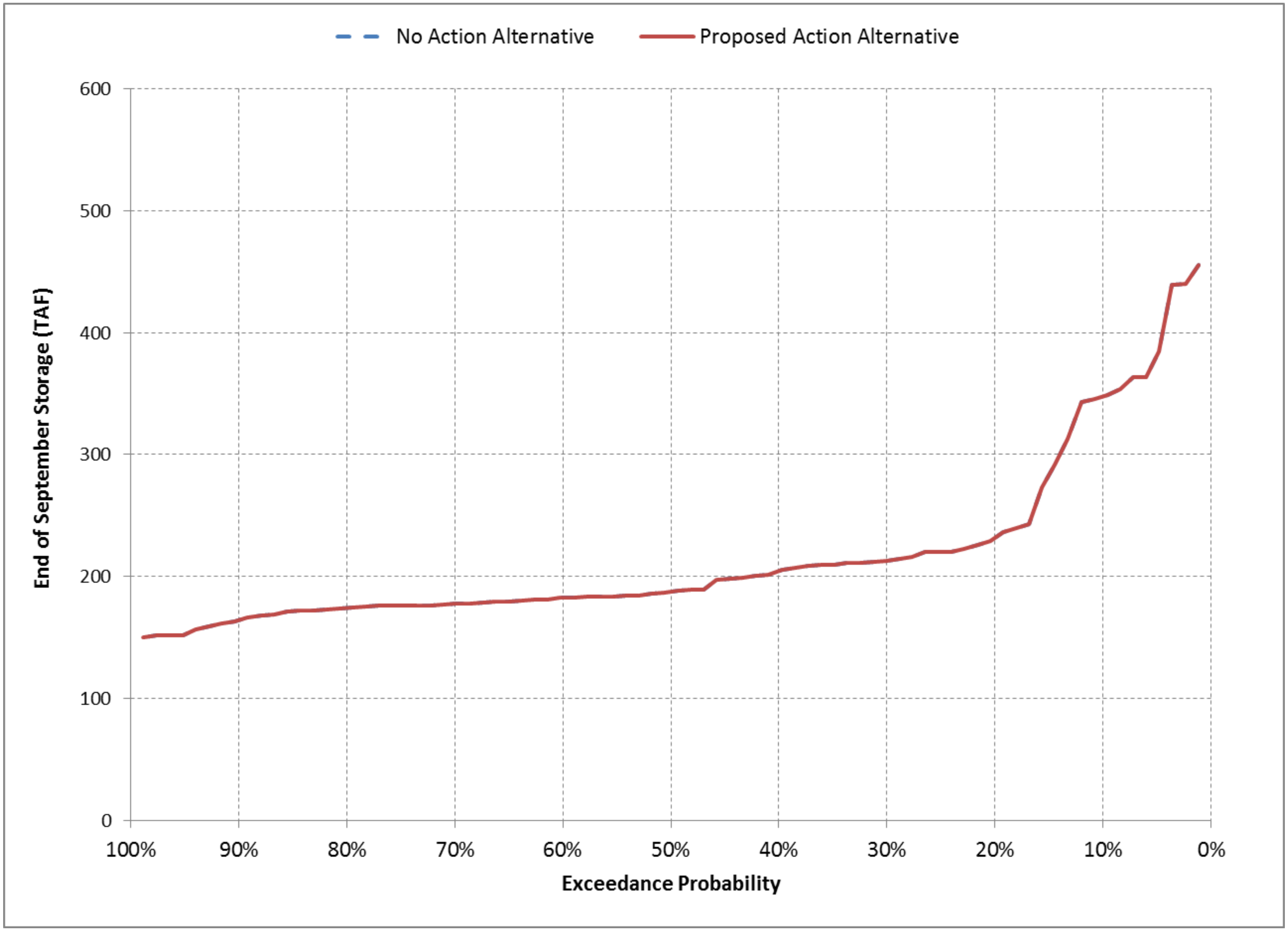


Figure A.3.3.7-2. Millerton Lake Reservoir, End of September Storage



No Action Alternative
Proposed Action Alternative
600
500
400
300
200
100
0
End of September Storage (TAF)
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Exceedance Probability

Table A.3.3.7-1. Millerton Lake Reservoir, End of Month Storage

No Action Alternative

Statistic	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
	End of Month Storage (TAF)											
Probability of Exceedance[a]												
10%	310	341	407	439	439	479	456	523	524	524	422	349
20%	256	315	355	424	439	479	424	496	509	437	289	236
30%	235	283	327	383	439	466	402	468	490	389	249	214
40%	222	258	291	351	429	441	378	423	449	360	228	205
50%	202	226	272	337	387	417	349	388	424	289	188	188
60%	192	206	261	306	371	376	333	365	396	268	175	182
70%	178	182	227	287	314	326	293	339	349	241	164	178
80%	167	175	205	253	282	281	264	307	314	210	157	175
90%	158	153	176	201	213	209	230	244	251	174	142	166
Long Term												
Full Simulation Period[b]	219	240	279	325	360	375	345	390	403	319	229	217
Water Year Types[c]												
Wet	234	258	320	384	424	447	361	395	468	414	310	268
Above Normal	198	229	261	339	389	415	345	419	456	372	255	234
Below Normal	240	264	300	331	381	397	374	442	435	320	206	197
Dry	215	232	260	289	314	317	342	386	351	241	168	177
Critical	191	198	212	232	238	242	285	292	248	177	146	169

Proposed Action Alternative

Statistic	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
	End of Month Storage (TAF)											
Probability of Exceedance[a]												
10%	310	341	407	439	439	479	456	523	524	524	422	349
20%	256	315	355	424	439	479	424	496	509	437	289	236
30%	235	283	327	383	439	466	402	468	490	389	249	214
40%	222	258	291	351	429	441	378	423	449	360	228	205
50%	202	226	272	337	387	417	349	388	424	289	188	188
60%	192	206	261	306	371	376	333	365	396	268	175	182
70%	178	182	227	287	314	326	293	339	349	241	164	178
80%	167	175	205	253	282	281	264	307	314	210	157	175
90%	158	153	176	201	213	209	230	244	251	174	142	166
Long Term												
Full Simulation Period[b]	219	240	279	325	360	375	345	390	403	319	229	217
Water Year Types[c]												
Wet	234	258	320	384	424	447	361	395	468	414	310	268
Above Normal	198	229	261	339	389	415	345	419	456	372	255	234
Below Normal	240	264	300	331	381	397	374	442	435	320	206	197
Dry	215	232	260	289	314	317	342	386	351	241	168	177
Critical	191	198	212	232	238	242	285	292	248	177	146	169

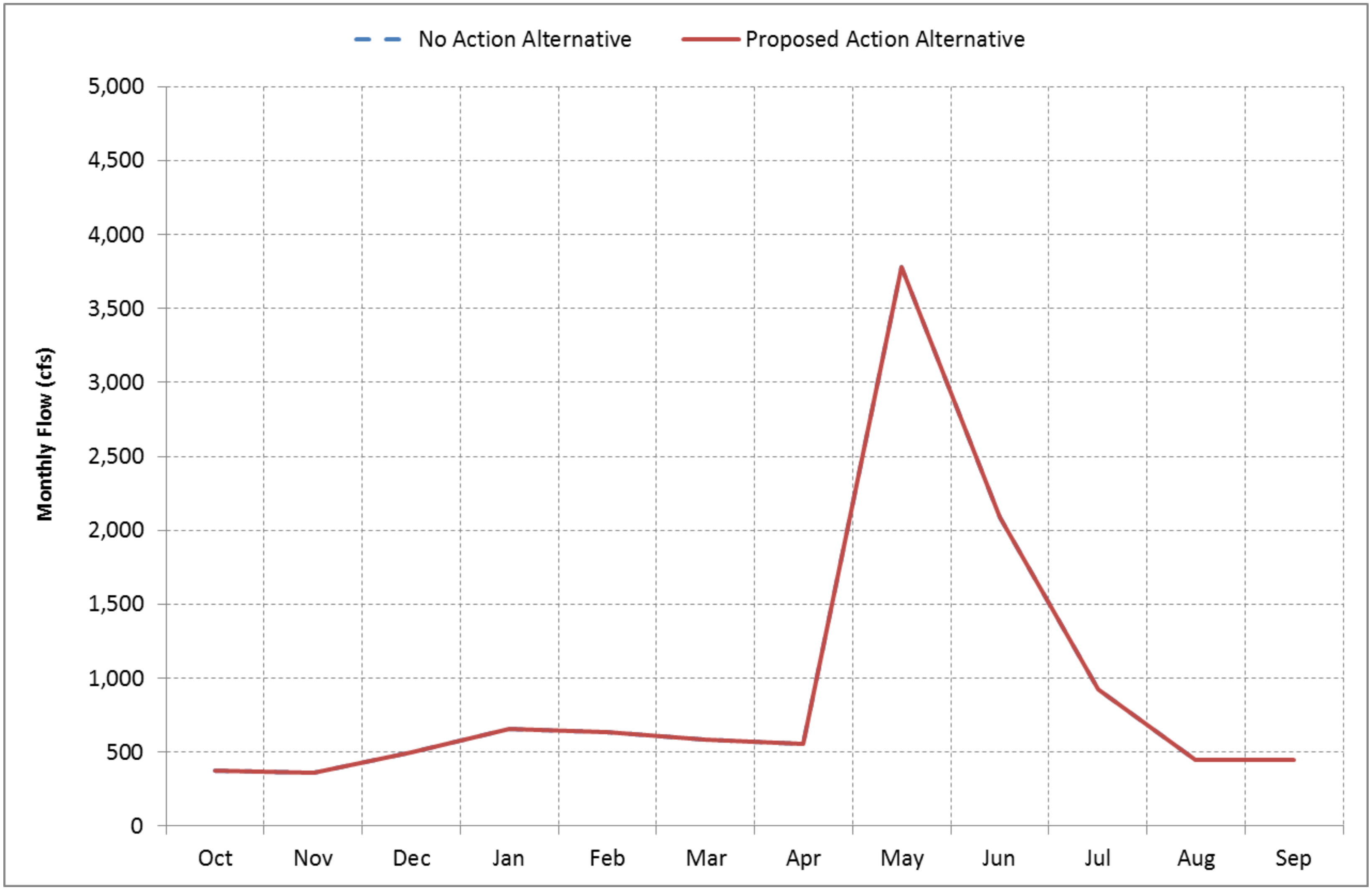
Proposed Action Alternative minus No Action Alternative

Statistic	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
	End of Month Storage (TAF)											
Probability of Exceedance[a]												
10%	0	0	0	0	0	0	0	0	0	0	0	0
20%	0	0	0	0	0	0	0	0	0	0	0	0
30%	0	0	0	0	0	0	0	0	0	0	0	0
40%	0	0	0	0	0	0	0	0	0	0	0	0
50%	0	0	0	0	0	0	0	0	0	0	0	0
60%	0	0	0	0	0	0	0	0	0	0	0	0
70%	0	0	0	0	0	0	0	0	0	0	0	0
80%	0	0	0	0	0	0	0	0	0	0	0	0
90%	0	0	0	0	0	0	0	0	0	0	0	0
Long Term												
Full Simulation Period[b]	0	0	0	0	0	0	0	0	0	0	0	0
Water Year Types[c]												
Wet	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0
Critical	0	0	0	0	0	0	0	0	0	0	0	0

a Exceedance probability is defined as the probability a given value will be exceeded in any one year
b Based on the 82-year simulation period
c As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

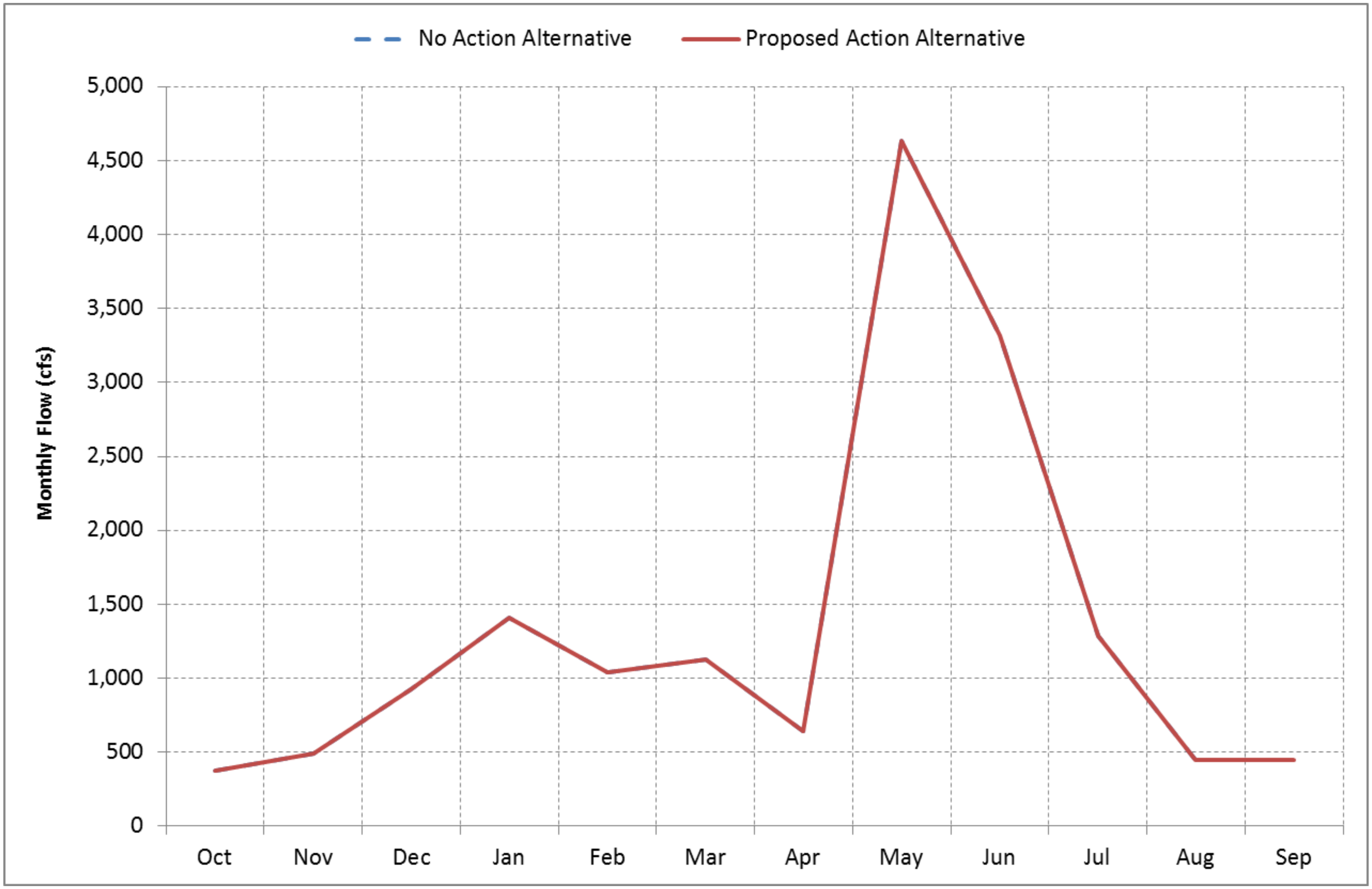
A.3.3.8. Trinity River Flow below Lewiston

Figure A.3.3.8-1. Trinity River below Lewiston Reservoir, Long-Term* Average Flow



* Based on the 82-year simulation period.

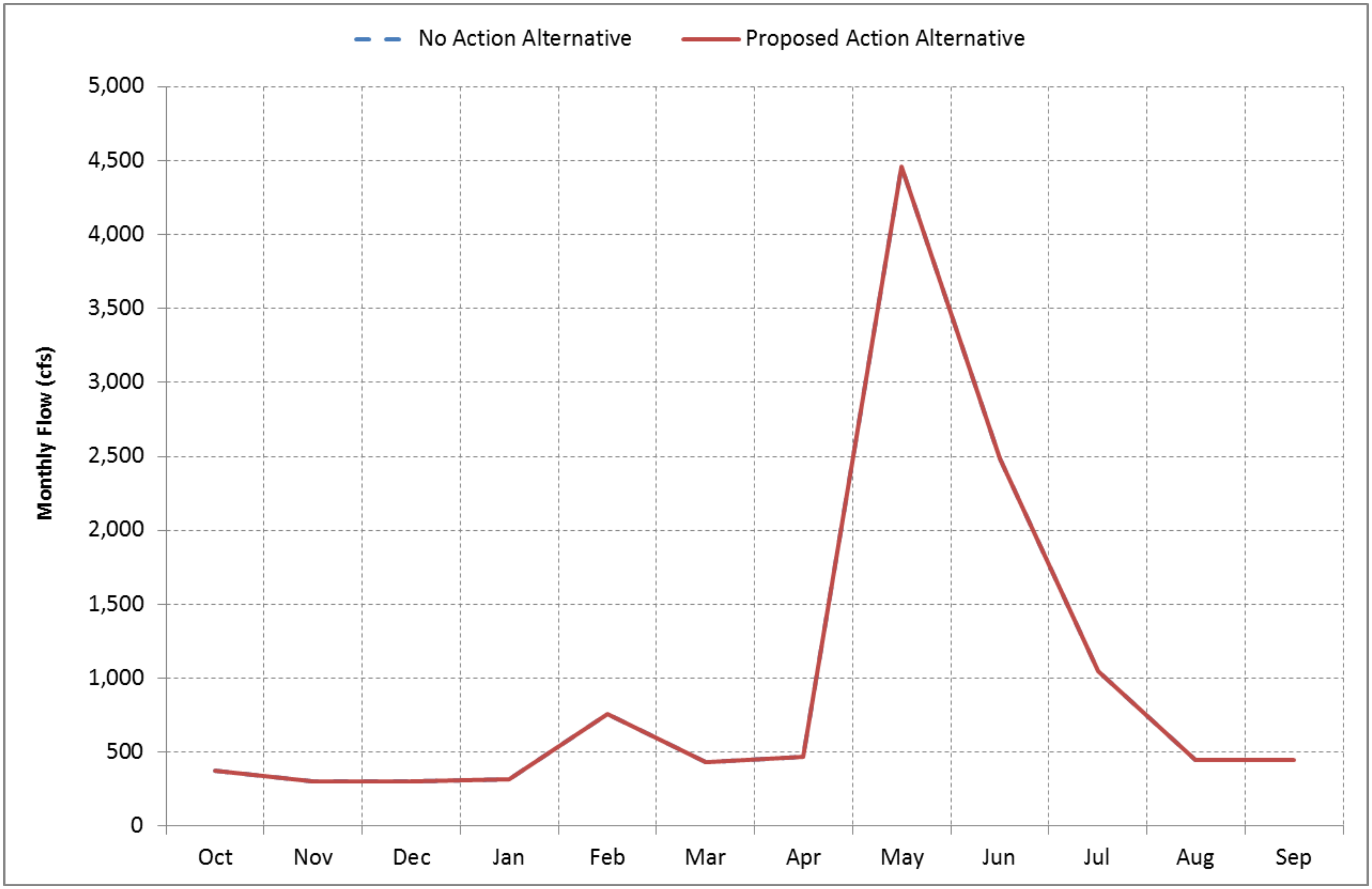
Figure A.3.3.8-2. Trinity River below Lewiston Reservoir, Wet Year* Long-Term Average Flow**



*As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

** Based on the 82-year simulation period.

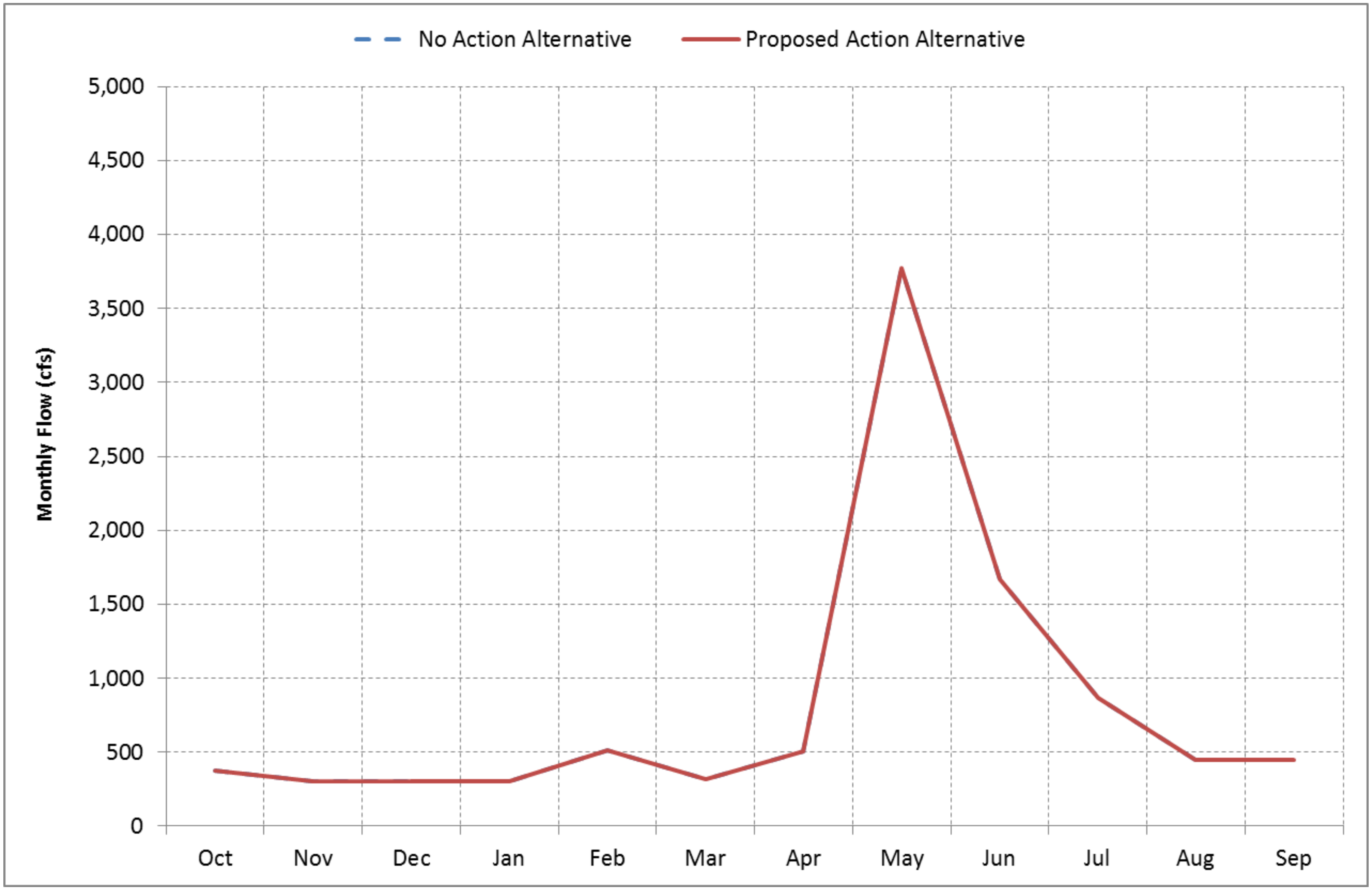
Figure A.3.3.8-3. Trinity River below Lewiston Reservoir, Above Normal Year* Long-Term Average Flow**



*As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

** Based on the 82-year simulation period.

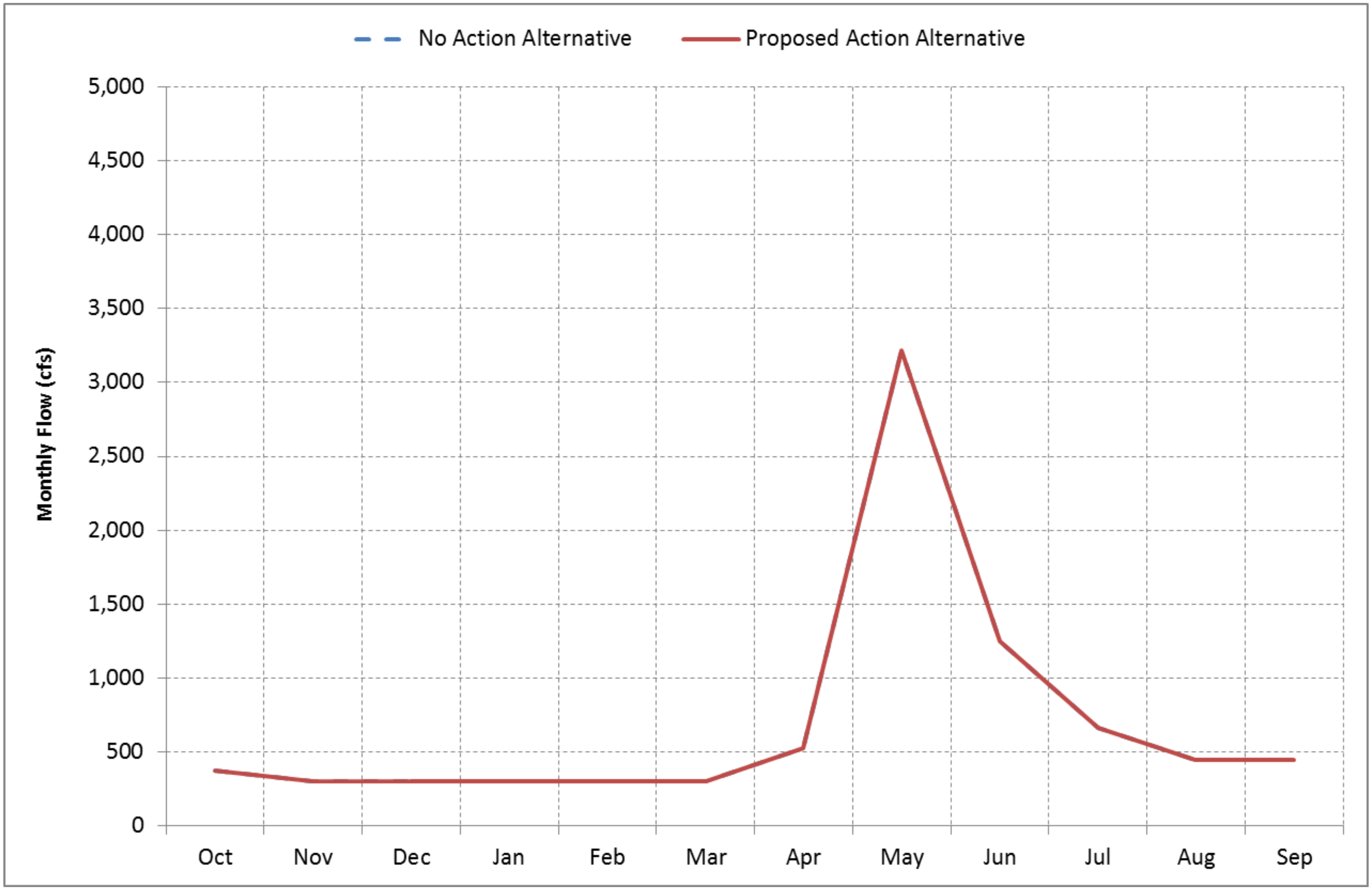
Figure A.3.3.8-4. Trinity River below Lewiston Reservoir, Below Normal Year* Long-Term Average Flow**



*As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

** Based on the 82-year simulation period.

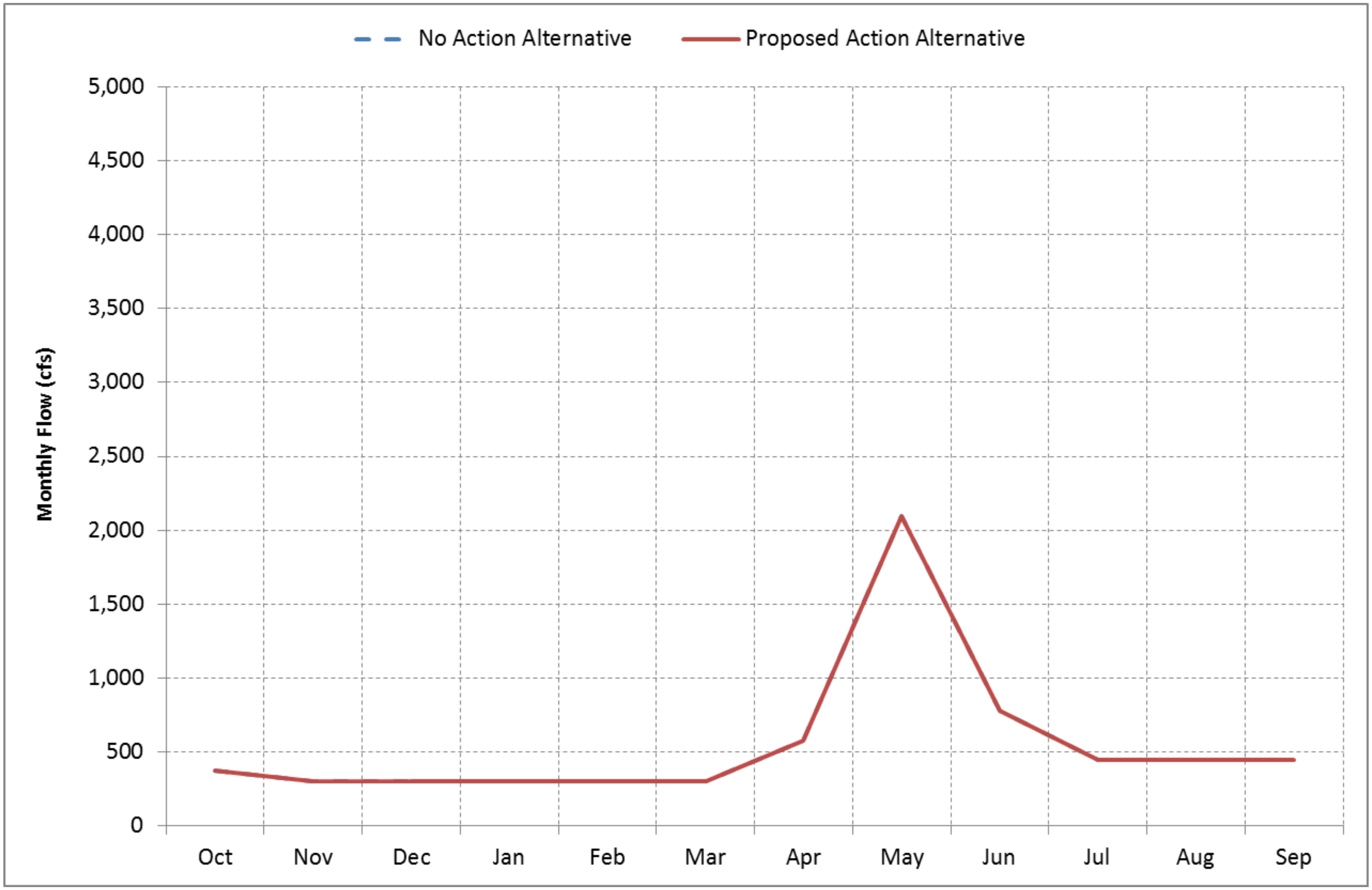
Figure A.3.3.8-5. Trinity River below Lewiston Reservoir, Dry Year* Long-Term Average Flow**



*As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

** Based on the 82-year simulation period.

Figure A.3.3.8-6. Trinity River below Lewiston Reservoir, Critical Dry Year* Long-Term Average Flow**



*As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

** Based on the 82-year simulation period.

Table A.3.3.8-1. Trinity River below Lewiston Reservoir, Monthly Flow

No Action Alternative

	Monthly Flow (cfs)											
Statistic	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Probability of Exceedance[a]												
10%	373	300	300	1,578	2,347	560	600	4,709	4,626	1,102	450	450
20%	373	300	300	300	300	300	540	4,709	2,526	1,102	450	450
30%	373	300	300	300	300	300	540	4,709	2,526	1,102	450	450
40%	373	300	300	300	300	300	540	4,570	2,526	1,102	450	450
50%	373	300	300	300	300	300	493	4,189	2,120	1,102	450	450
60%	373	300	300	300	300	300	493	4,189	2,120	1,102	450	450
70%	373	300	300	300	300	300	460	2,924	783	450	450	450
80%	373	300	300	300	300	300	460	2,924	783	450	450	450
90%	373	300	300	300	300	300	460	1,498	783	450	450	450
Long Term												
Full Simulation Period[b]	373	360	499	654	638	585	559	3,779	2,091	923	450	450
Water Year Types[c]												
Wet	373	491	926	1,410	1,040	1,127	640	4,636	3,318	1,289	450	450
Above Normal	373	300	300	316	760	436	469	4,462	2,488	1,048	450	450
Below Normal	373	300	300	300	514	319	507	3,774	1,672	869	450	450
Dry	373	300	300	300	300	300	529	3,216	1,251	667	450	450
Critical	373	300	300	300	300	300	575	2,092	783	450	450	450

Proposed Action Alternative

	Monthly Flow (cfs)											
Statistic	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Probability of Exceedance[a]												
10%	373	300	300	1,578	2,347	560	600	4,709	4,626	1,102	450	450
20%	373	300	300	300	300	300	540	4,709	2,526	1,102	450	450
30%	373	300	300	300	300	300	540	4,709	2,526	1,102	450	450
40%	373	300	300	300	300	300	540	4,570	2,526	1,102	450	450
50%	373	300	300	300	300	300	493	4,189	2,120	1,102	450	450
60%	373	300	300	300	300	300	493	4,189	2,120	1,102	450	450
70%	373	300	300	300	300	300	460	2,924	783	450	450	450
80%	373	300	300	300	300	300	460	2,924	783	450	450	450
90%	373	300	300	300	300	300	460	1,498	783	450	450	450
Long Term												
Full Simulation Period[b]	373	360	499	654	638	585	559	3,779	2,091	923	450	450
Water Year Types[c]												
Wet	373	491	926	1,410	1,039	1,127	640	4,636	3,318	1,289	450	450
Above Normal	373	300	300	316	760	436	469	4,462	2,488	1,048	450	450
Below Normal	373	300	300	300	514	319	507	3,774	1,672	869	450	450
Dry	373	300	300	300	300	300	529	3,216	1,251	667	450	450
Critical	373	300	300	300	300	300	575	2,092	783	450	450	450

Proposed Action Alternative minus No Action Alternative

	Monthly Flow (cfs)											
Statistic	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Probability of Exceedance[a]												
10%	0	0	0	0	0	0	0	0	0	0	0	0
20%	0	0	0	0	0	0	0	0	0	0	0	0
30%	0	0	0	0	0	0	0	0	0	0	0	0
40%	0	0	0	0	0	0	0	0	0	0	0	0
50%	0	0	0	0	0	0	0	0	0	0	0	0
60%	0	0	0	0	0	0	0	0	0	0	0	0
70%	0	0	0	0	0	0	0	0	0	0	0	0
80%	0	0	0	0	0	0	0	0	0	0	0	0
90%	0	0	0	0	0	0	0	0	0	0	0	0
Long Term												
Full Simulation Period[b]	0	0	0	0	0	0	0	0	0	0	0	0
Water Year Types[c]												
Wet	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0
Critical	0	0	0	0	0	0	0	0	0	0	0	0

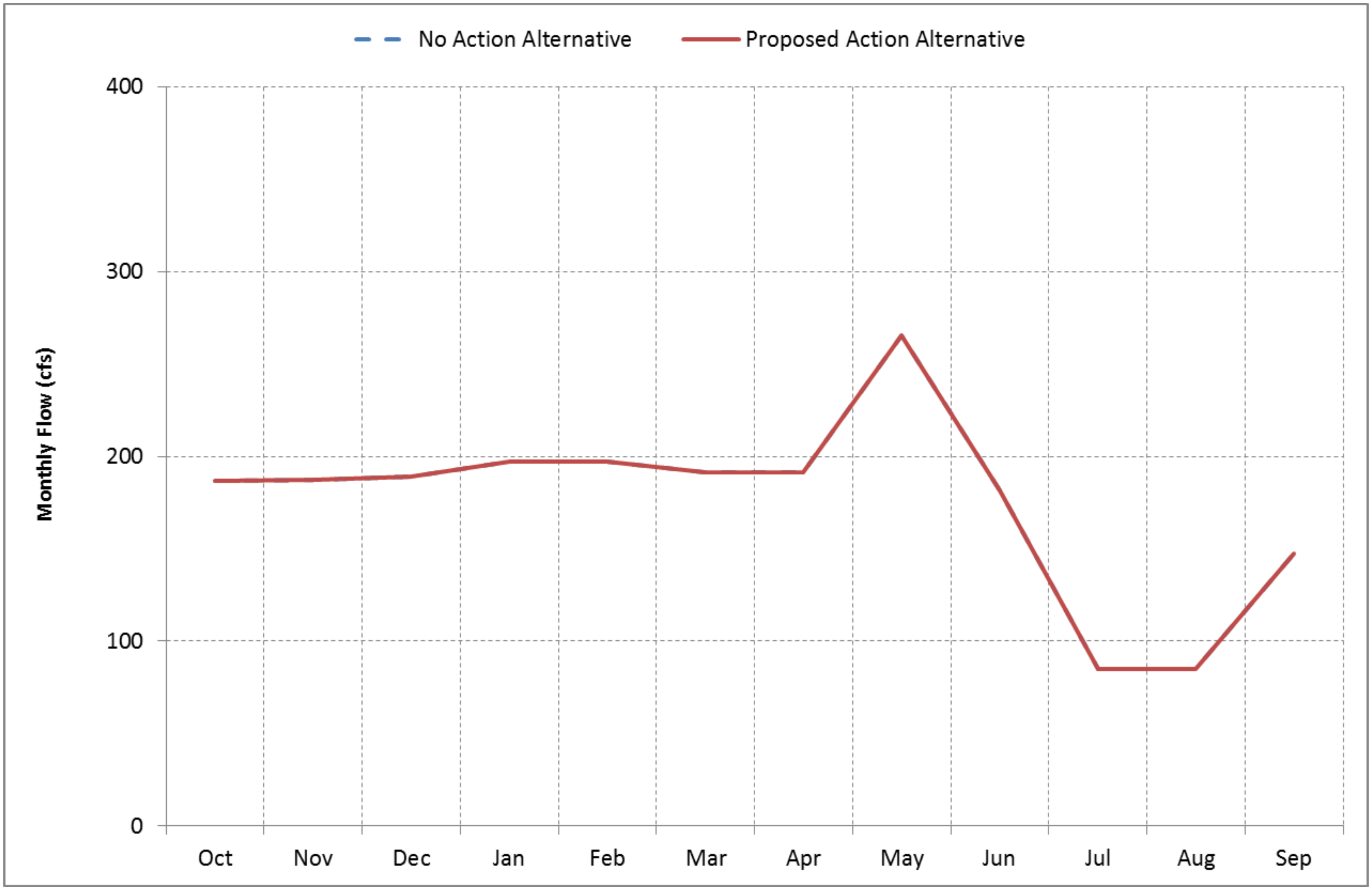
a Exceedance probability is defined as the probability a given value will be exceeded in any one year

b Based on the 82-year simulation period

c As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

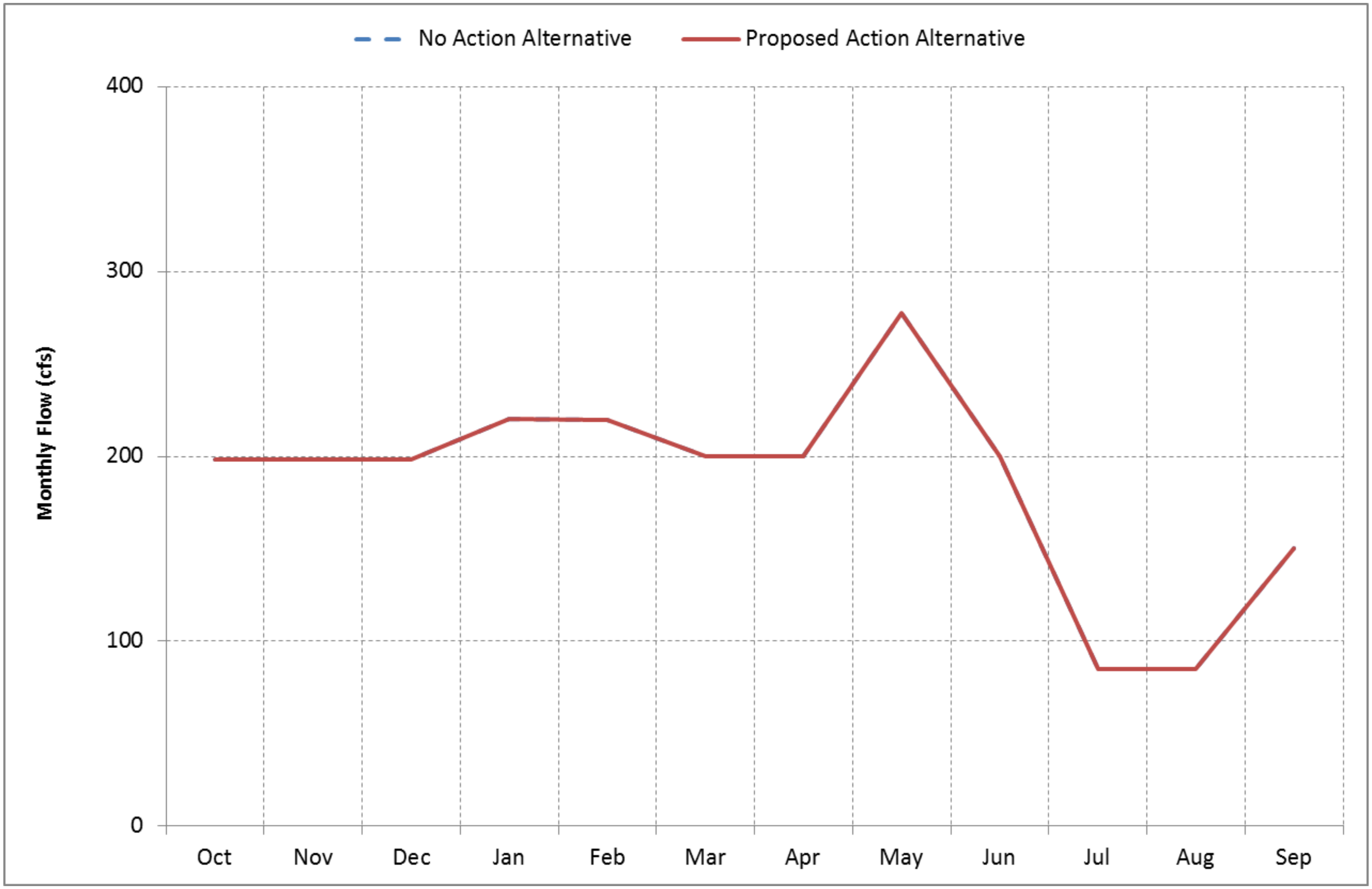
A.3.3.9. Clear Creek Flow below Whiskeytown

Figure A.3.3.9-1. Clear Creek below Whiskeytown, Long-Term* Average Flow



* Based on the 82-year simulation period.

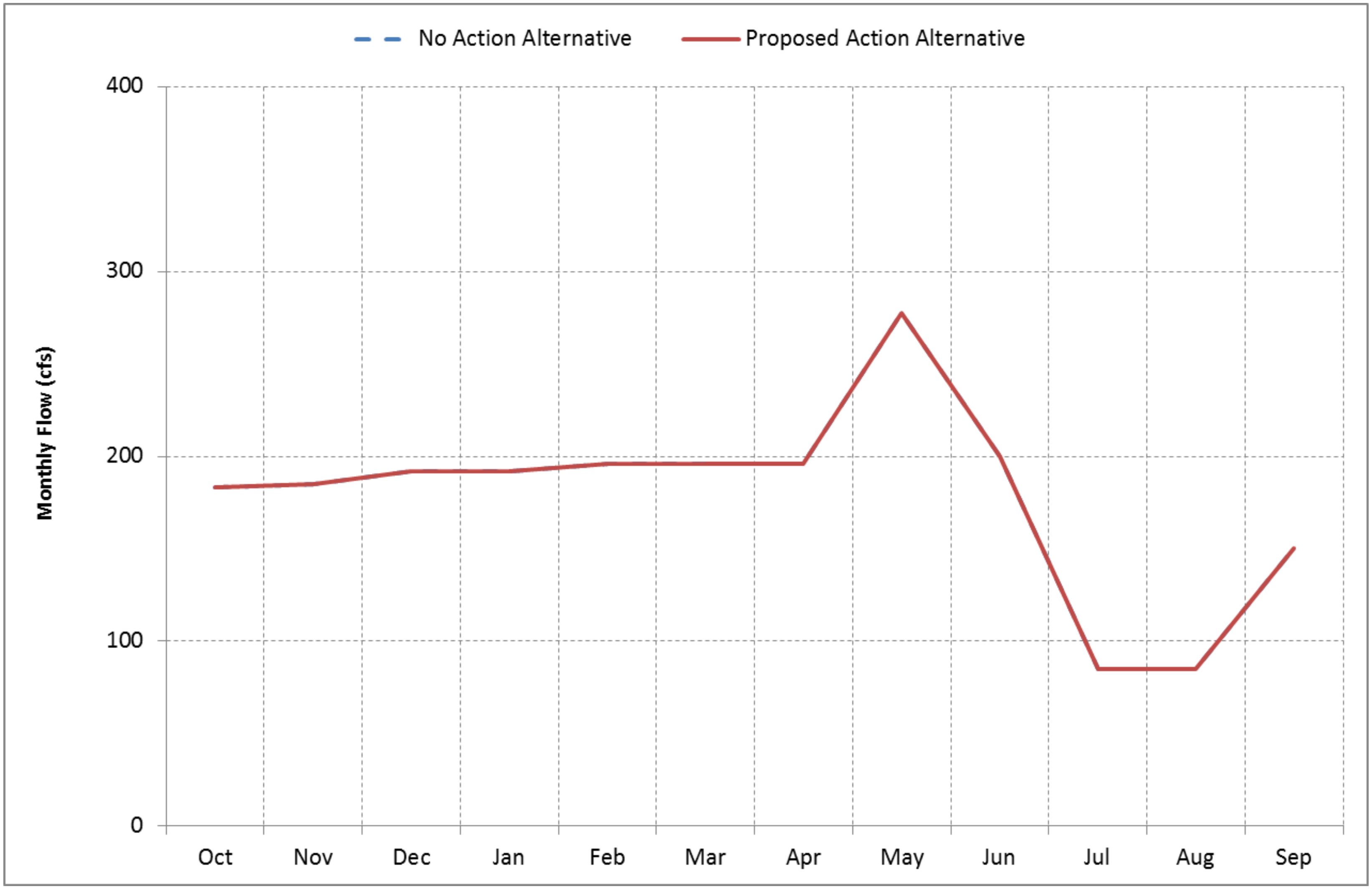
Figure A.3.3.9-2. Clear Creek below Whiskeytown, Wet Year* Long-Term Average Flow**



*As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

** Based on the 82-year simulation period.

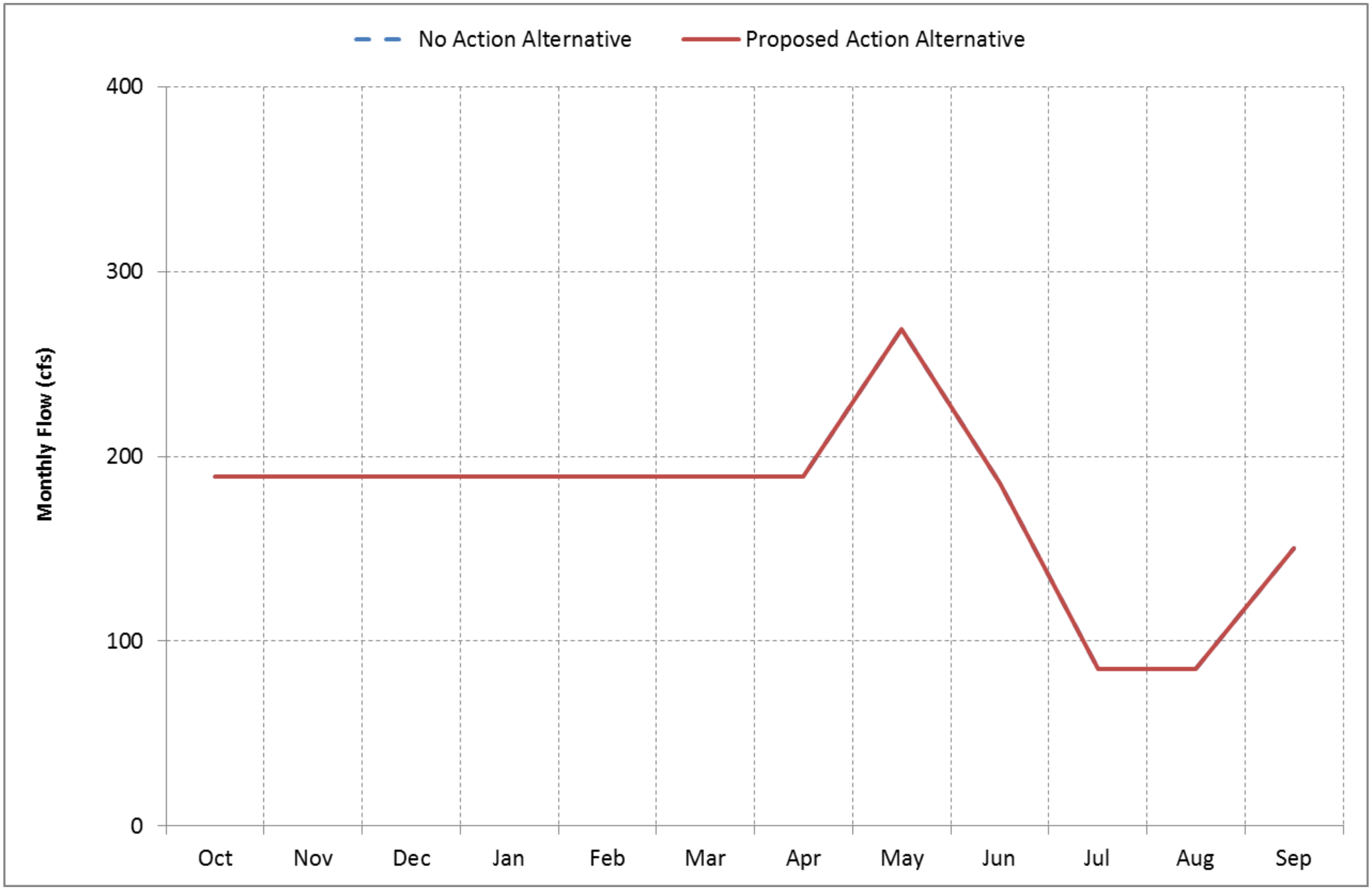
Figure A.3.3.9-3. Clear Creek below Whiskeytown, Above Normal Year* Long-Term Average Flow**



*As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

** Based on the 82-year simulation period.

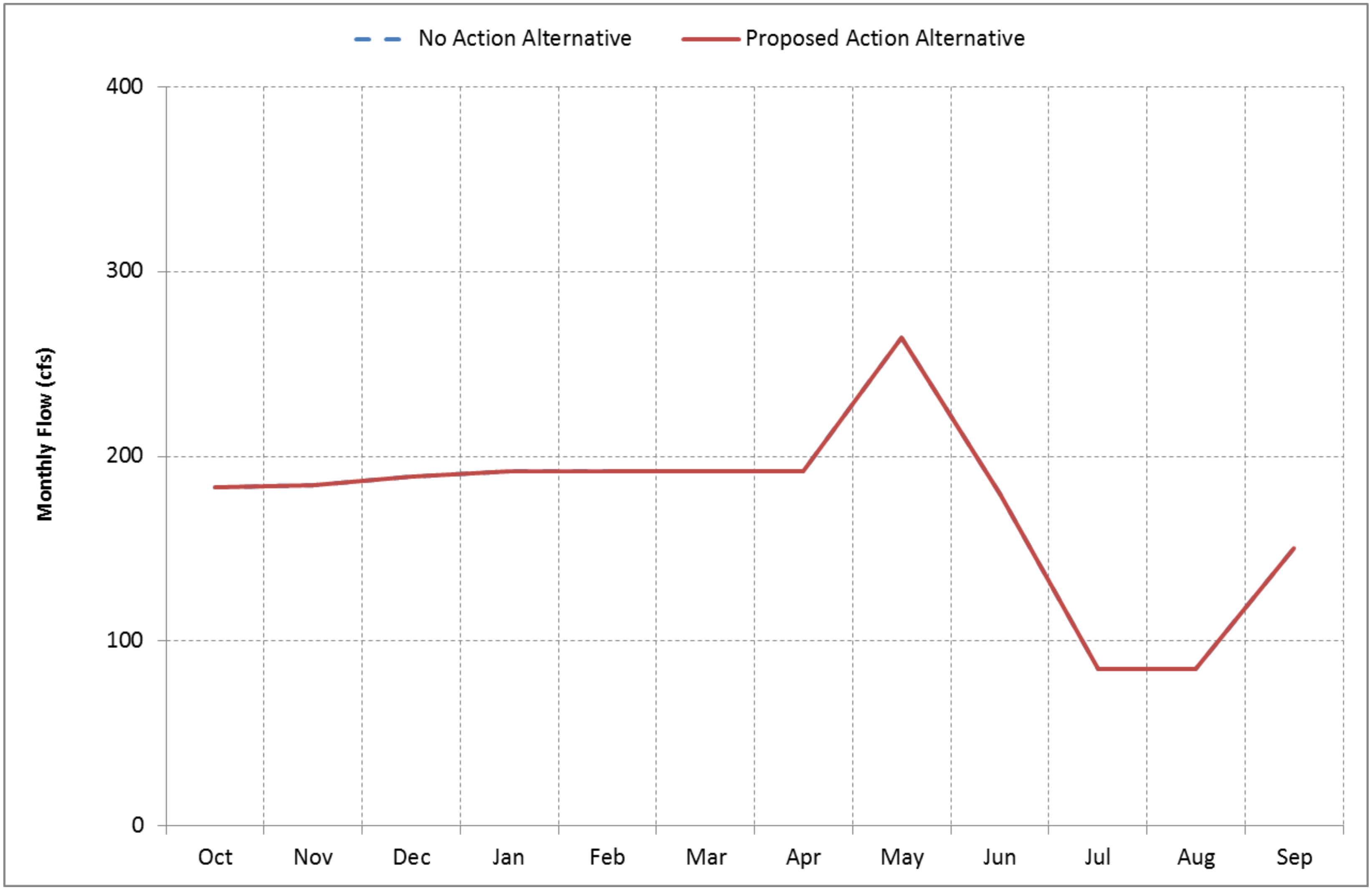
Figure A.3.3.9-4. Clear Creek below Whiskeytown, Below Normal Year* Long-Term Average Flow**



*As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

** Based on the 82-year simulation period.

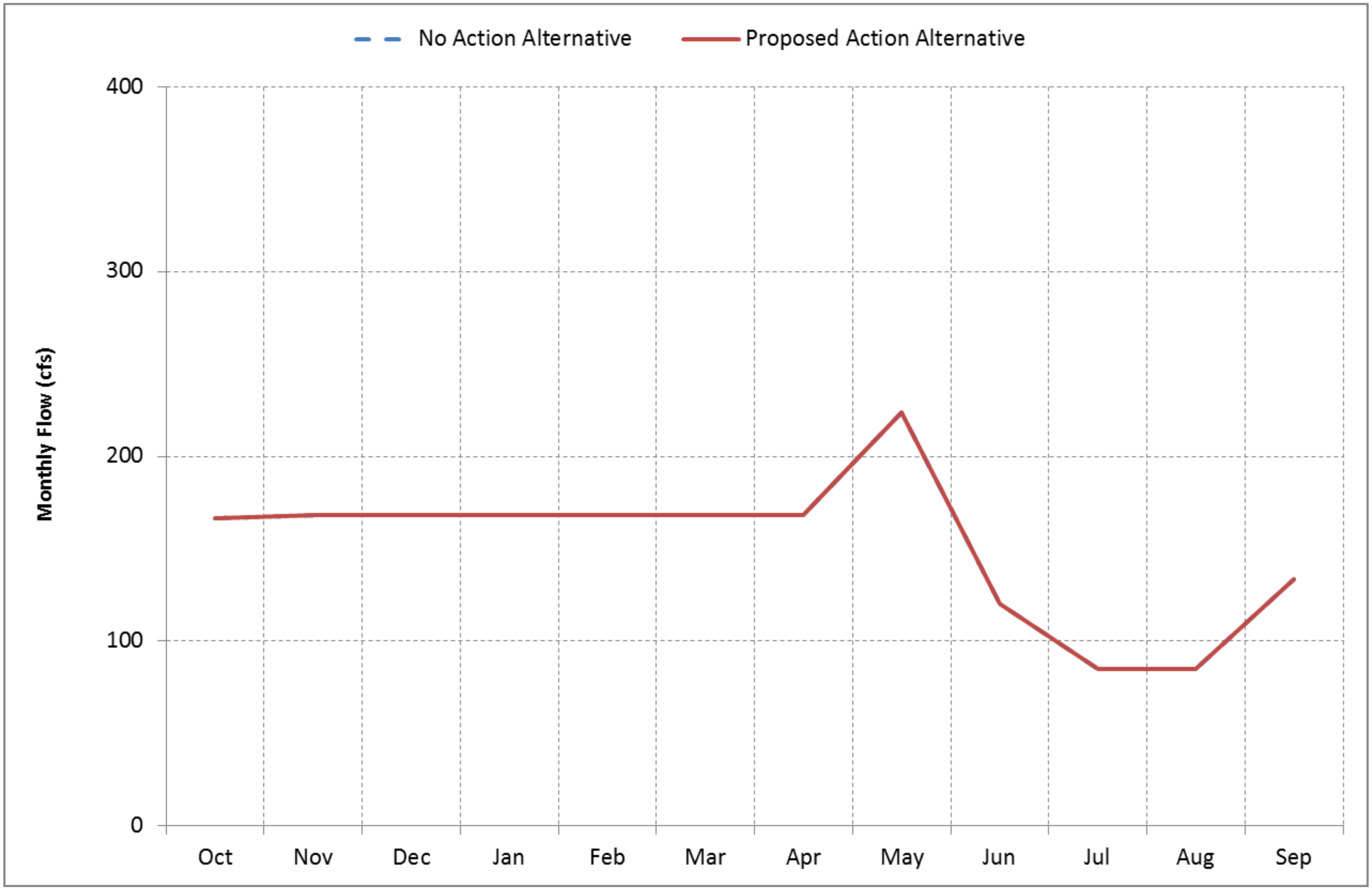
Figure A.3.3.9-5. Clear Creek below Whiskeytown, Dry Year* Long-Term Average Flow**



*As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

** Based on the 82-year simulation period.

Figure A.3.3.9-6. Clear Creek below Whiskeytown, Critical Dry Year* Long-Term Average Flow**



*As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

** Based on the 82-year simulation period.

Table A.3.3.9-1. Clear Creek below Whiskeytown, Monthly Flow

No Action Alternative

Statistic	Monthly Flow (cfs)											
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Probability of Exceedance[a]												
10%	200	200	200	200	200	200	200	277	200	85	85	150
20%	200	200	200	200	200	200	200	277	200	85	85	150
30%	200	200	200	200	200	200	200	277	200	85	85	150
40%	200	200	200	200	200	200	200	277	200	85	85	150
50%	200	200	200	200	200	200	200	277	200	85	85	150
60%	200	200	200	200	200	200	200	277	200	85	85	150
70%	200	200	200	200	200	200	200	277	200	85	85	150
80%	200	200	200	200	200	200	200	277	150	85	85	150
90%	150	150	150	150	150	150	150	237	150	85	85	150
Long Term												
Full Simulation Period[b]	187	187	189	197	197	191	191	265	181	85	85	148
Water Year Types[c]												
Wet	198	198	198	220	220	200	200	277	200	85	85	150
Above Normal	183	185	192	192	196	196	196	277	200	85	85	150
Below Normal	189	189	189	189	189	189	189	269	186	85	85	150
Dry	183	184	189	192	192	192	192	264	180	85	85	150
Critical	167	168	168	168	168	168	168	224	120	85	85	133

Proposed Action Alternative

Statistic	Monthly Flow (cfs)											
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Probability of Exceedance[a]												
10%	200	200	200	200	200	200	200	277	200	85	85	150
20%	200	200	200	200	200	200	200	277	200	85	85	150
30%	200	200	200	200	200	200	200	277	200	85	85	150
40%	200	200	200	200	200	200	200	277	200	85	85	150
50%	200	200	200	200	200	200	200	277	200	85	85	150
60%	200	200	200	200	200	200	200	277	200	85	85	150
70%	200	200	200	200	200	200	200	277	200	85	85	150
80%	200	200	200	200	200	200	200	277	150	85	85	150
90%	150	150	150	150	150	150	150	237	150	85	85	150
Long Term												
Full Simulation Period[b]	187	187	189	197	197	191	191	265	181	85	85	148
Water Year Types[c]												
Wet	198	198	198	220	220	200	200	277	200	85	85	150
Above Normal	183	185	192	192	196	196	196	277	200	85	85	150
Below Normal	189	189	189	189	189	189	189	269	186	85	85	150
Dry	183	184	189	192	192	192	192	264	180	85	85	150
Critical	167	168	168	168	168	168	168	224	120	85	85	133

Proposed Action Alternative minus No Action Alternative

Statistic	Monthly Flow (cfs)											
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Probability of Exceedance[a]												
10%	0	0	0	0	0	0	0	0	0	0	0	0
20%	0	0	0	0	0	0	0	0	0	0	0	0
30%	0	0	0	0	0	0	0	0	0	0	0	0
40%	0	0	0	0	0	0	0	0	0	0	0	0
50%	0	0	0	0	0	0	0	0	0	0	0	0
60%	0	0	0	0	0	0	0	0	0	0	0	0
70%	0	0	0	0	0	0	0	0	0	0	0	0
80%	0	0	0	0	0	0	0	0	0	0	0	0
90%	0	0	0	0	0	0	0	0	0	0	0	0
Long Term												
Full Simulation Period[b]	0	0	0	0	0	0	0	0	0	0	0	0
Water Year Types[c]												
Wet	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0
Critical	0	0	0	0	0	0	0	0	0	0	0	0

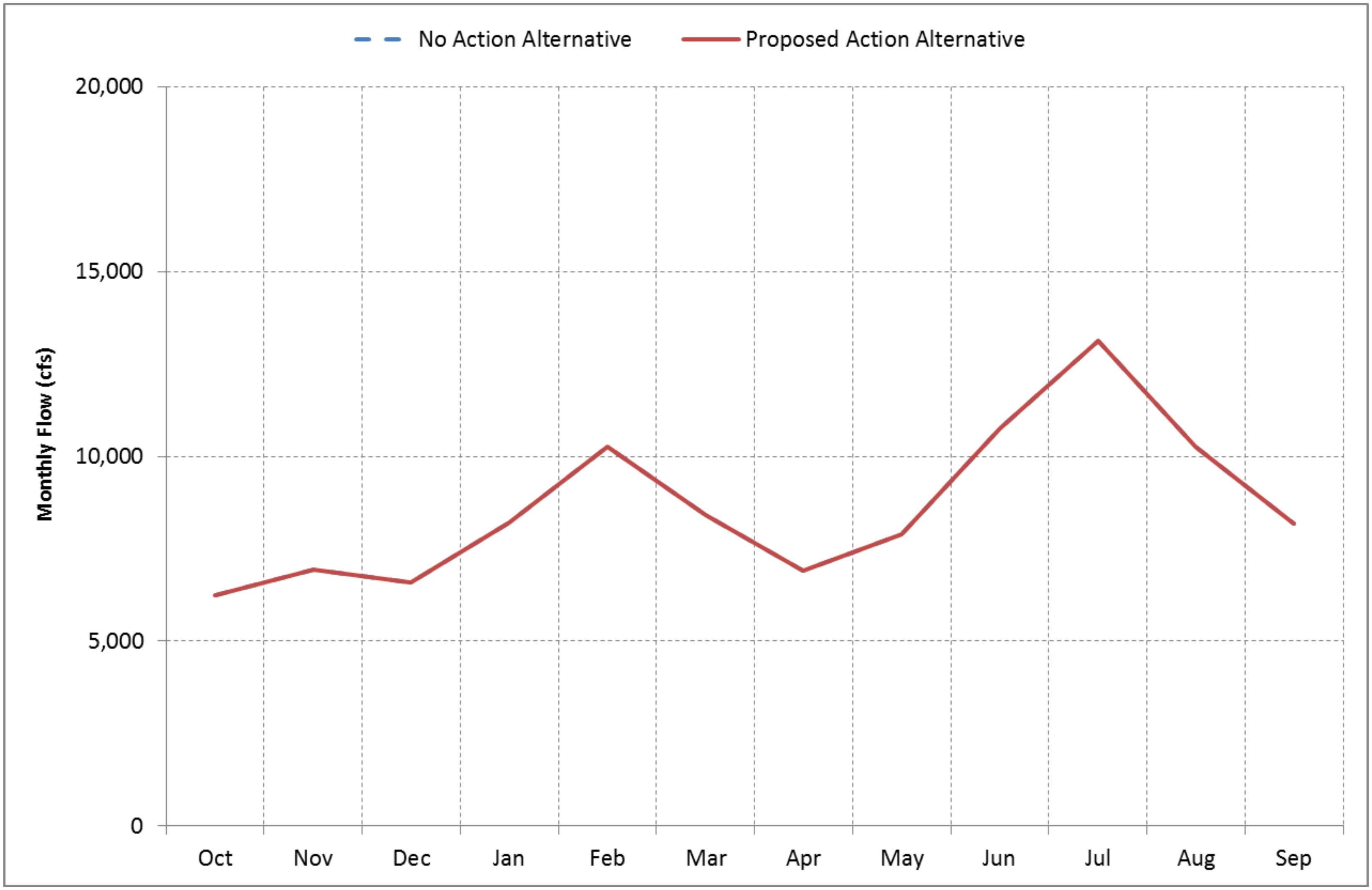
a Exceedance probability is defined as the probability a given value will be exceeded in any one year

b Based on the 82-year simulation period

c As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

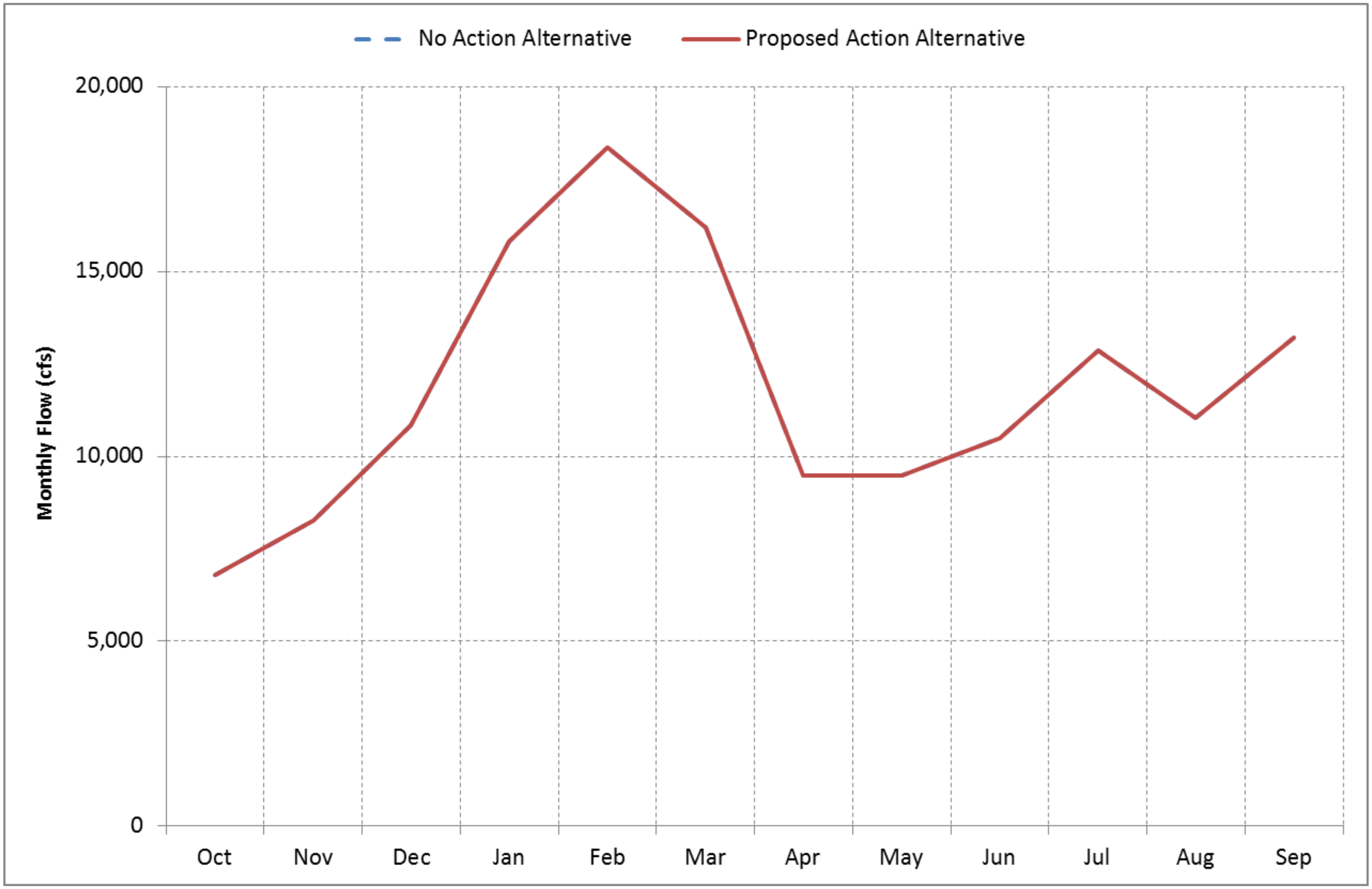
A.3.3.10. Sacramento River Flow downstream of Keswick Reservoir

Figure A.3.3.10-1. Sacramento River downstream of Keswick Reservoir, Long-Term* Average Flow



* Based on the 82-year simulation period.

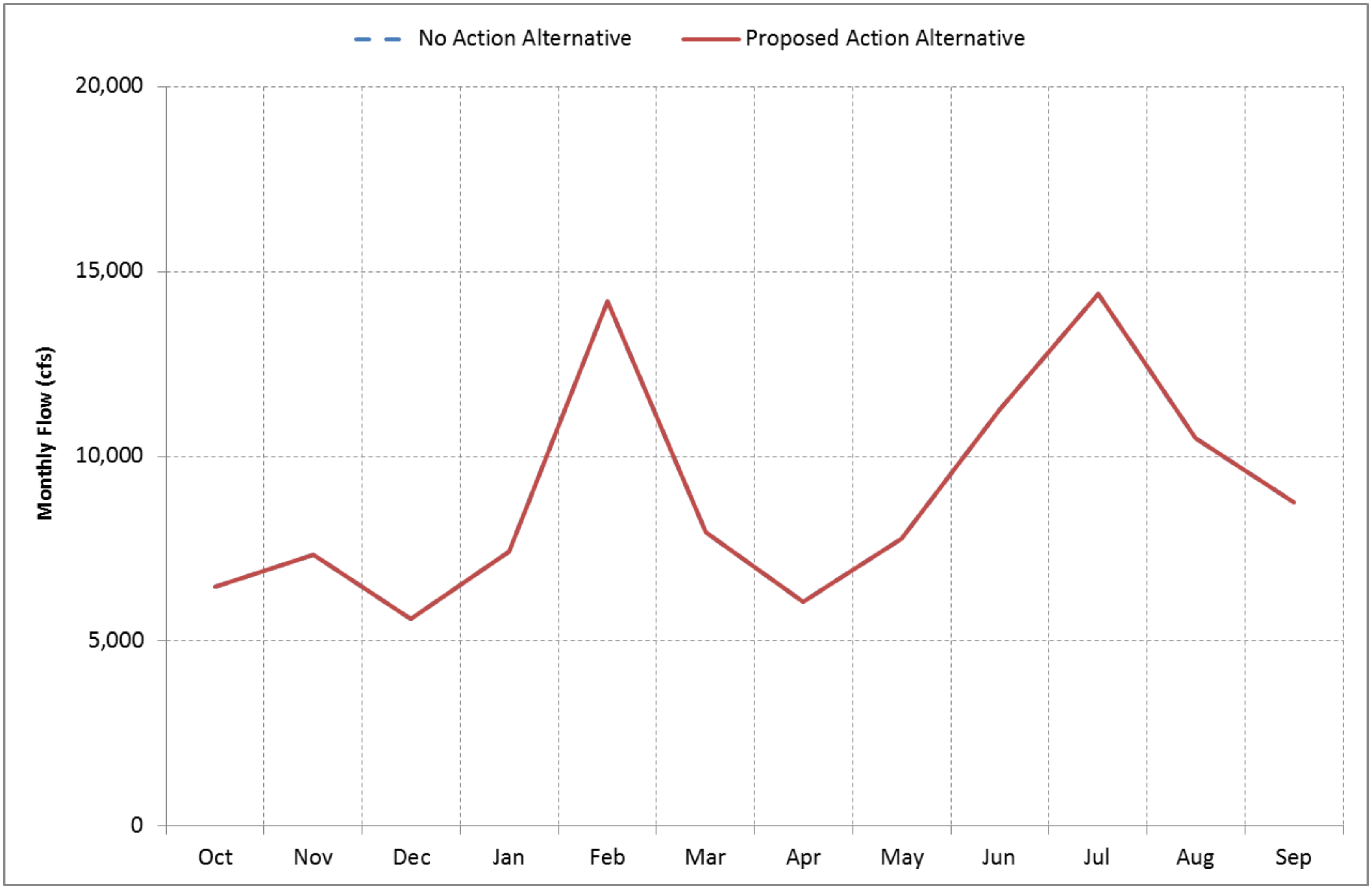
Figure A.3.3.10-2. Sacramento River downstream of Keswick Reservoir, Wet Year* Long-Term Average Flow**



*As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

** Based on the 82-year simulation period.

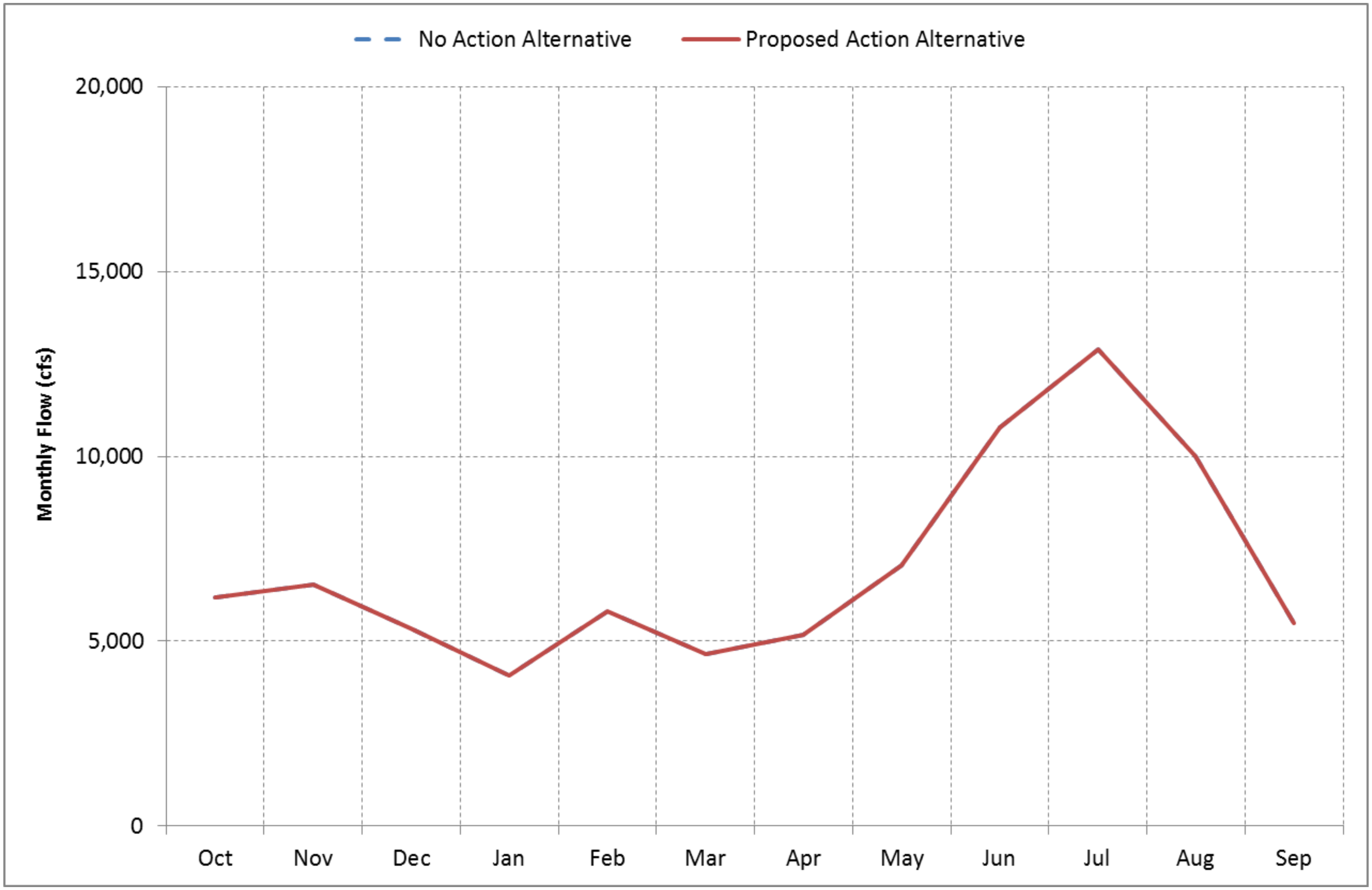
Figure A.3.3.10-3. Sacramento River downstream of Keswick Reservoir, Above Normal Year* Long-Term Average Flow**



*As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

** Based on the 82-year simulation period.

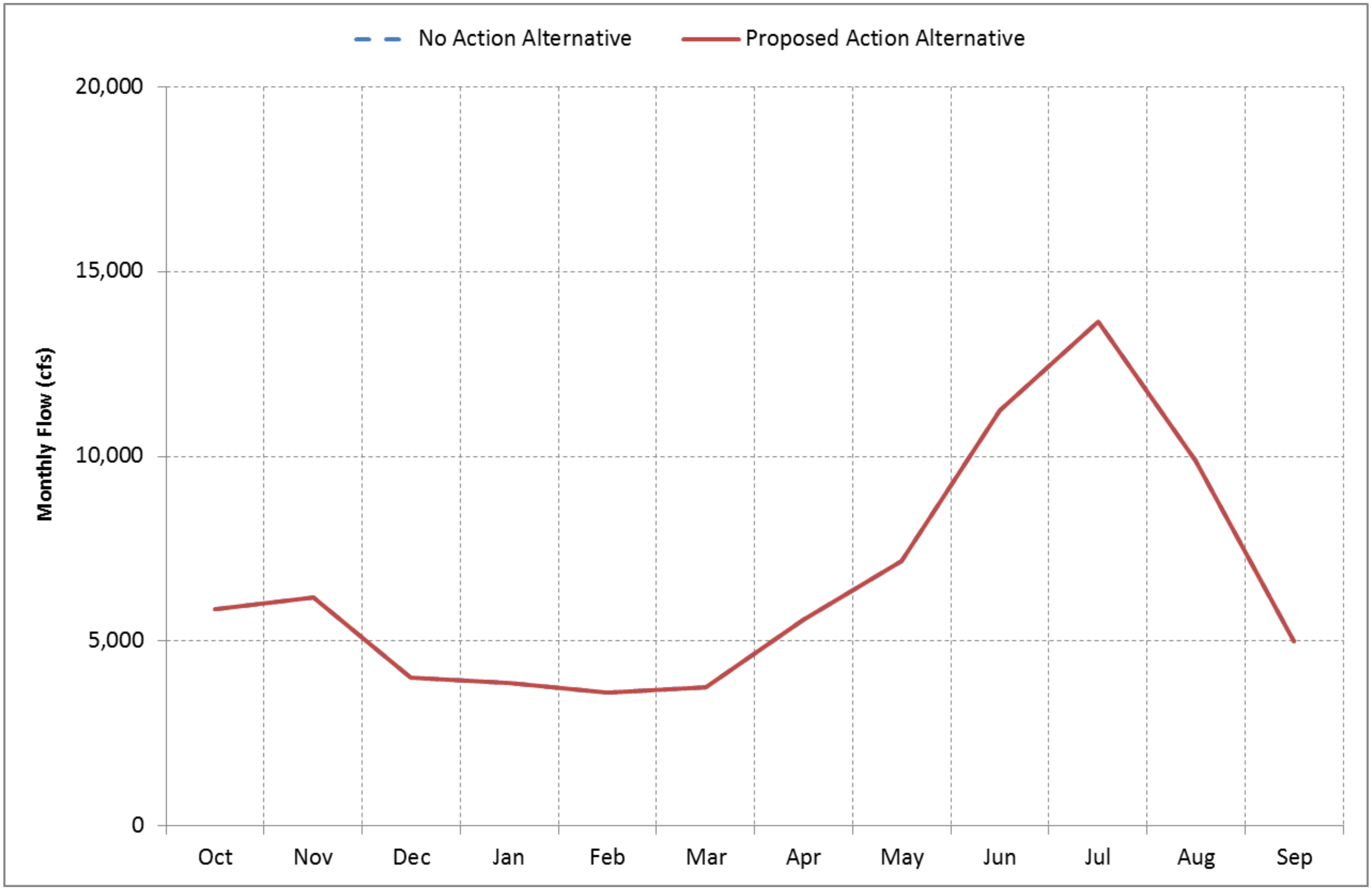
Figure A.3.3.10-4. Sacramento River downstream of Keswick Reservoir, Below Normal Year* Long-Term Average Flow**



*As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

** Based on the 82-year simulation period.

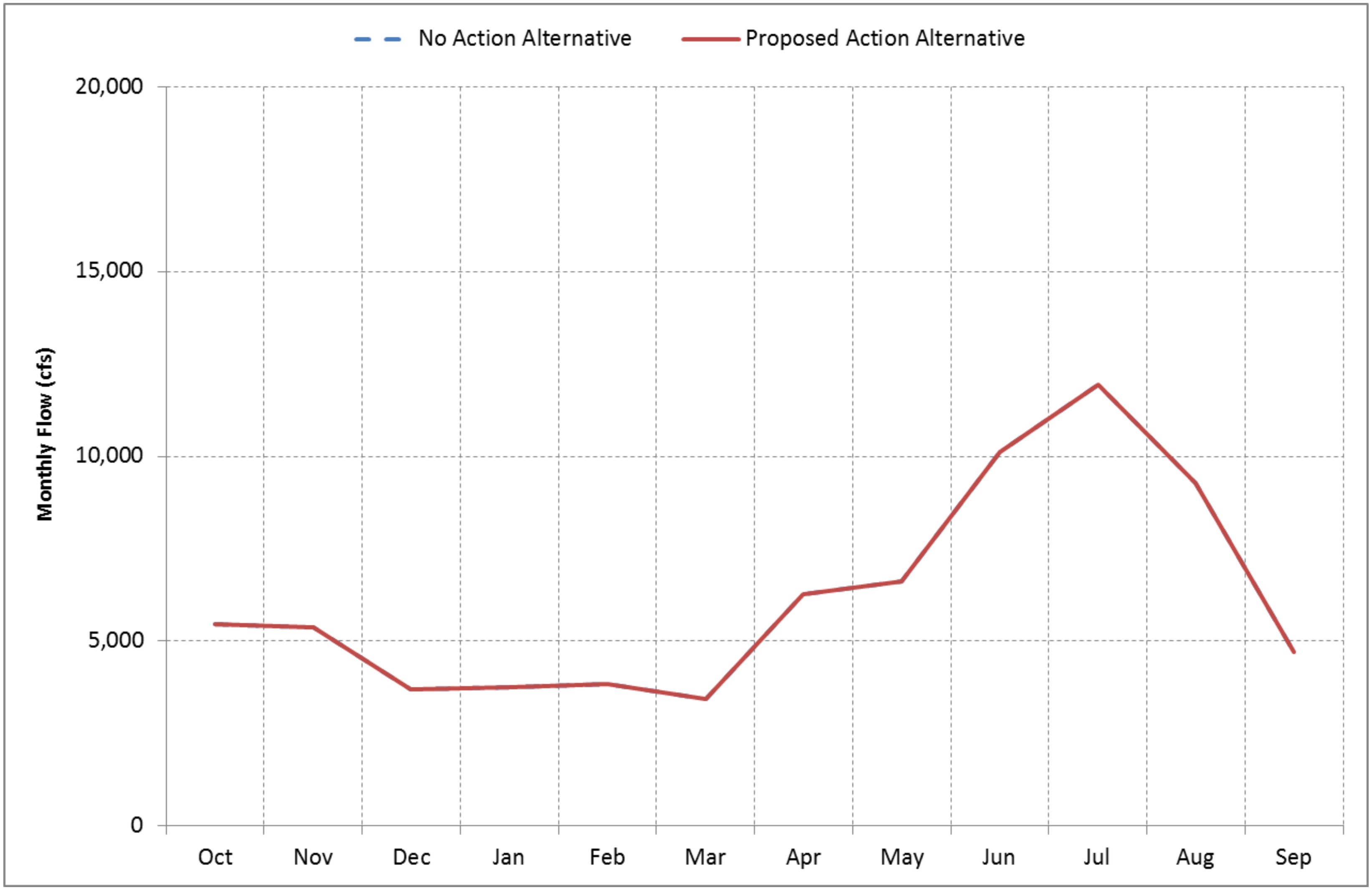
Figure A.3.3.10-5. Sacramento River downstream of Keswick Reservoir, Dry Year* Long-Term Average Flow**



*As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

** Based on the 82-year simulation period.

Figure A.3.3.10-6. Sacramento River downstream of Keswick Reservoir, Critical Dry Year* Long-Term Average Flow**



*As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

** Based on the 82-year simulation period.

Table A.3.3.10-1. Sacramento River downstream of Keswick Reservoir, Monthly Flow

No Action Alternative

Statistic	Monthly Flow (cfs) Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Probability of Exceedance[a]												
10%	8,393	11,127	18,063	20,927	28,992	19,854	11,770	10,962	13,255	15,000	12,208	14,998
20%	7,730	9,988	8,872	10,566	21,309	12,569	7,933	9,260	12,018	15,000	11,513	12,749
30%	7,079	8,706	5,544	7,446	11,168	8,373	7,212	8,999	11,433	14,756	10,956	11,342
40%	6,626	7,249	4,318	4,500	5,550	4,500	6,298	8,181	10,944	13,859	10,671	8,712
50%	6,248	5,786	4,000	4,465	4,500	4,500	5,664	7,528	10,344	13,162	10,267	5,935
60%	5,759	4,995	4,000	3,926	4,146	3,602	5,343	6,889	10,082	12,534	9,763	5,531
70%	5,361	4,473	3,596	3,250	3,250	3,250	4,544	6,519	9,712	12,122	9,305	5,146
80%	4,742	4,101	3,251	3,250	3,250	3,250	4,500	6,057	9,386	11,691	9,032	4,739
90%	4,409	3,618	3,250	3,250	3,250	3,250	3,700	5,309	8,678	10,995	8,488	4,275
Long Term												
Full Simulation Period[b]	6,246	6,949	6,586	8,203	10,247	8,420	6,918	7,885	10,764	13,129	10,265	8,191
Water Year Types[c]												
Wet	6,783	8,259	10,831	15,824	18,367	16,190	9,473	9,466	10,493	12,874	11,028	13,203
Above Normal	6,479	7,333	5,620	7,439	14,205	7,938	6,078	7,765	11,277	14,398	10,482	8,751
Below Normal	6,187	6,519	5,333	4,079	5,809	4,652	5,181	7,046	10,788	12,878	10,008	5,477
Dry	5,878	6,187	4,006	3,871	3,609	3,770	5,579	7,179	11,233	13,648	9,880	5,006
Critical	5,469	5,372	3,686	3,765	3,830	3,442	6,259	6,620	10,106	11,929	9,269	4,717

Proposed Action Alternative

Statistic	Monthly Flow (cfs) Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Probability of Exceedance[a]												
10%	8,393	11,127	18,063	20,927	28,992	19,854	11,770	10,962	13,255	15,000	12,208	14,998
20%	7,730	9,988	8,872	10,565	21,309	12,569	7,933	9,260	12,018	15,000	11,513	12,749
30%	7,079	8,705	5,544	7,446	11,168	8,373	7,212	8,999	11,433	14,756	10,956	11,342
40%	6,626	7,249	4,318	4,500	5,550	4,500	6,298	8,182	10,944	13,859	10,671	8,712
50%	6,248	5,786	4,000	4,465	4,500	4,500	5,664	7,528	10,344	13,162	10,267	5,935
60%	5,763	4,995	4,000	3,926	4,146	3,602	5,343	6,889	10,082	12,534	9,763	5,531
70%	5,361	4,473	3,596	3,250	3,250	3,250	4,544	6,519	9,712	12,122	9,305	5,146
80%	4,742	4,101	3,251	3,250	3,250	3,250	4,500	6,057	9,386	11,691	9,032	4,739
90%	4,409	3,618	3,250	3,250	3,250	3,250	3,700	5,309	8,678	10,995	8,488	4,275
Long Term												
Full Simulation Period[b]	6,246	6,949	6,586	8,203	10,247	8,420	6,918	7,885	10,764	13,129	10,265	8,191
Water Year Types[c]												
Wet	6,783	8,259	10,831	15,824	18,367	16,190	9,473	9,466	10,493	12,874	11,028	13,203
Above Normal	6,480	7,333	5,620	7,439	14,205	7,938	6,078	7,765	11,277	14,398	10,482	8,751
Below Normal	6,187	6,519	5,333	4,079	5,809	4,652	5,181	7,046	10,788	12,878	10,008	5,477
Dry	5,878	6,187	4,006	3,871	3,609	3,770	5,579	7,179	11,233	13,648	9,880	5,006
Critical	5,469	5,372	3,686	3,765	3,830	3,442	6,259	6,620	10,106	11,929	9,269	4,717

Proposed Action Alternative minus No Action Alternative

Statistic	Monthly Flow (cfs) Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Probability of Exceedance[a]												
10%	0	0	0	0	0	0	0	0	0	0	0	0
20%	0	0	0	0	0	0	0	0	0	0	0	0
30%	0	-1	0	0	0	0	0	0	0	0	0	0
40%	0	0	0	0	0	0	0	0	0	0	0	0
50%	0	0	0	0	0	0	0	0	0	0	0	0
60%	4	0	0	0	0	0	0	0	0	0	0	0
70%	0	0	0	0	0	0	0	0	0	0	0	0
80%	0	0	0	0	0	0	0	0	0	0	0	0
90%	0	0	0	0	0	0	0	0	0	0	0	0
Long Term												
Full Simulation Period[b]	0	0	0	0	0	0	0	0	0	0	0	0
Water Year Types[c]												
Wet	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	1	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	-1	0	0	0	0	0	0	0	0	0	0
Critical	0	0	0	0	0	0	0	0	0	0	1	0

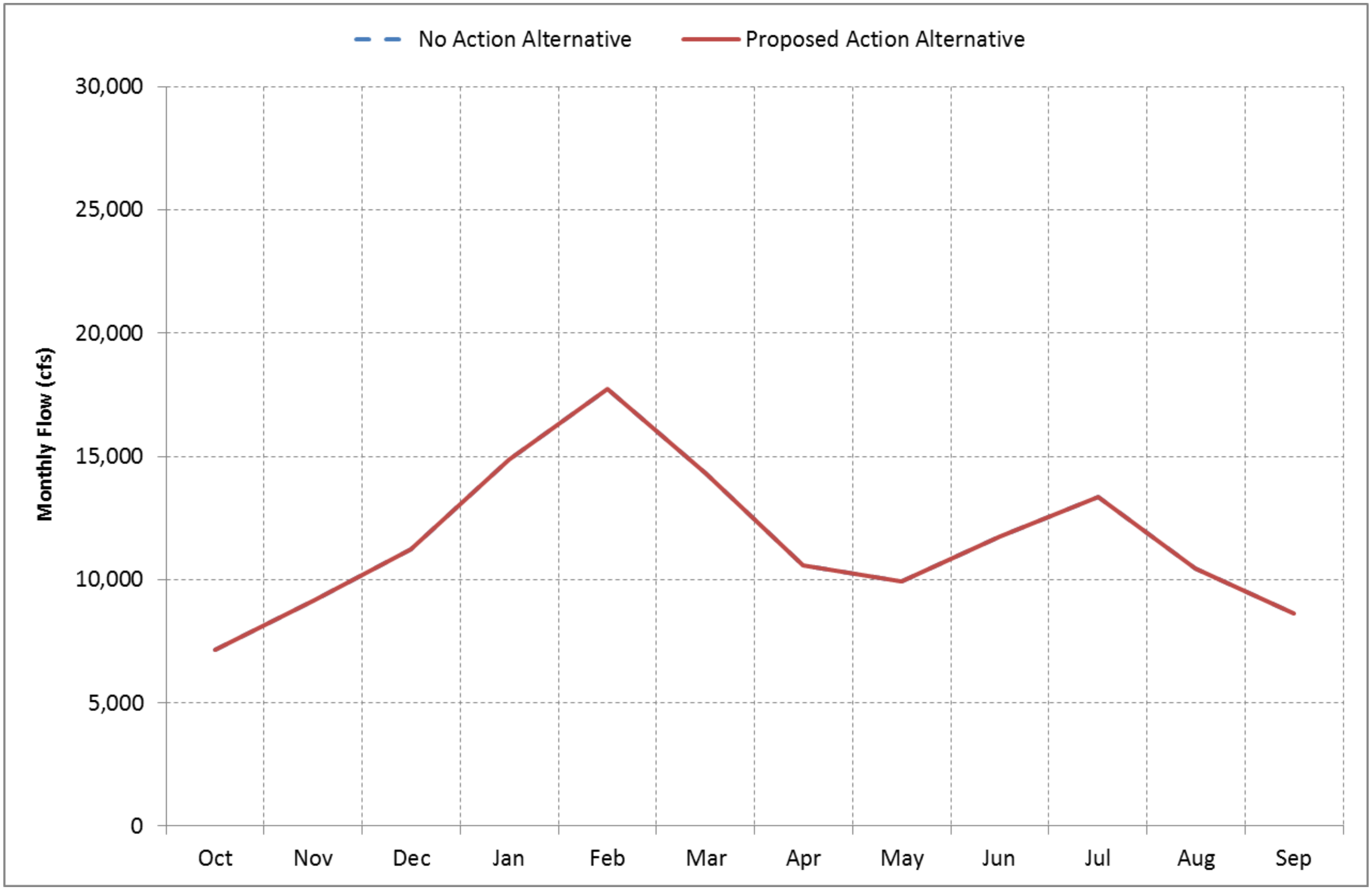
a Exceedance probability is defined as the probability a given value will be exceeded in any one year

b Based on the 82-year simulation period

c As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

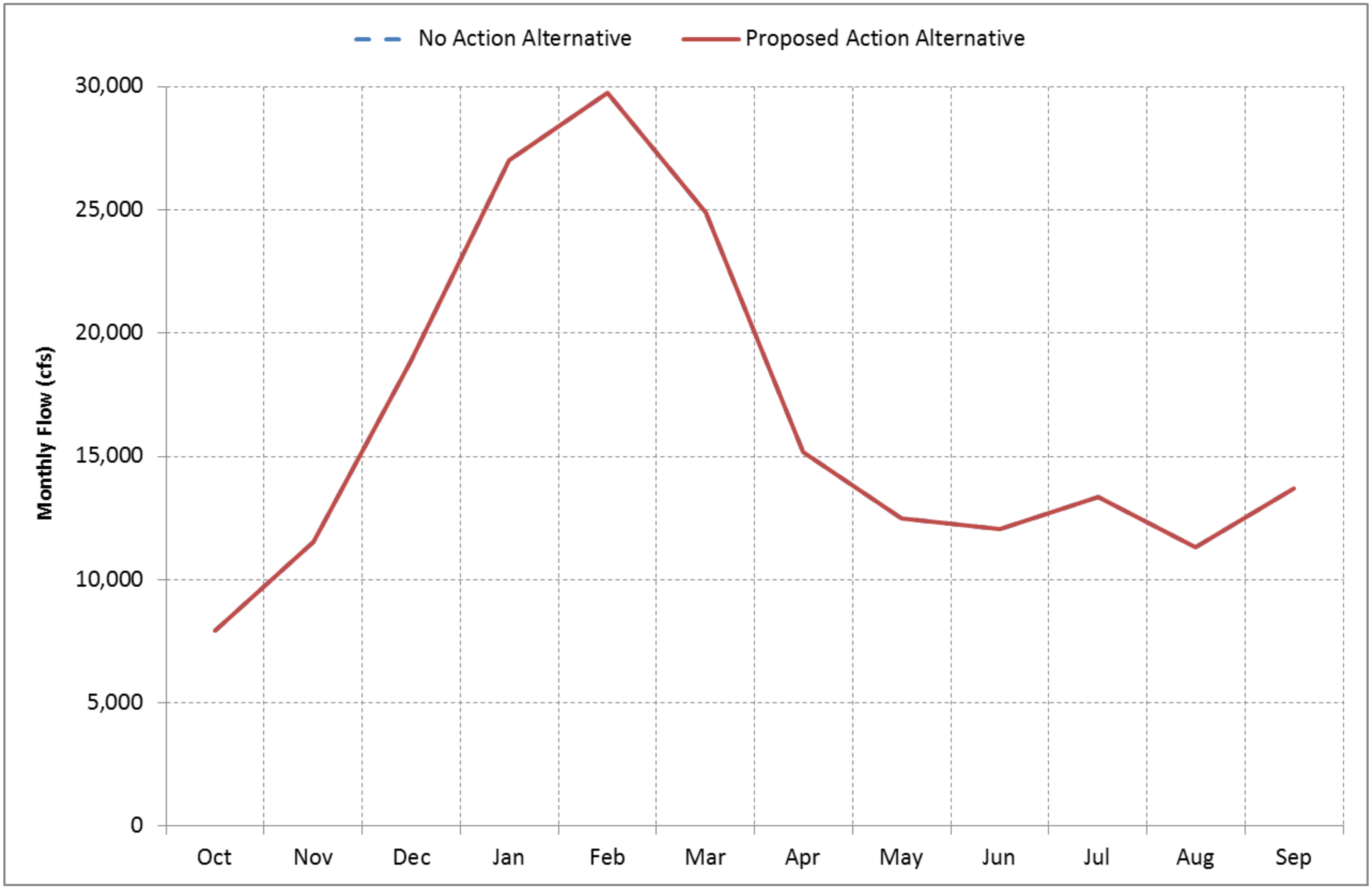
A.3.3.11. Sacramento River Flow at Bend Bridge

Figure A.3.3.11-1. Sacramento River at Bend Bridge, Long-Term* Average Flow



* Based on the 82-year simulation period.

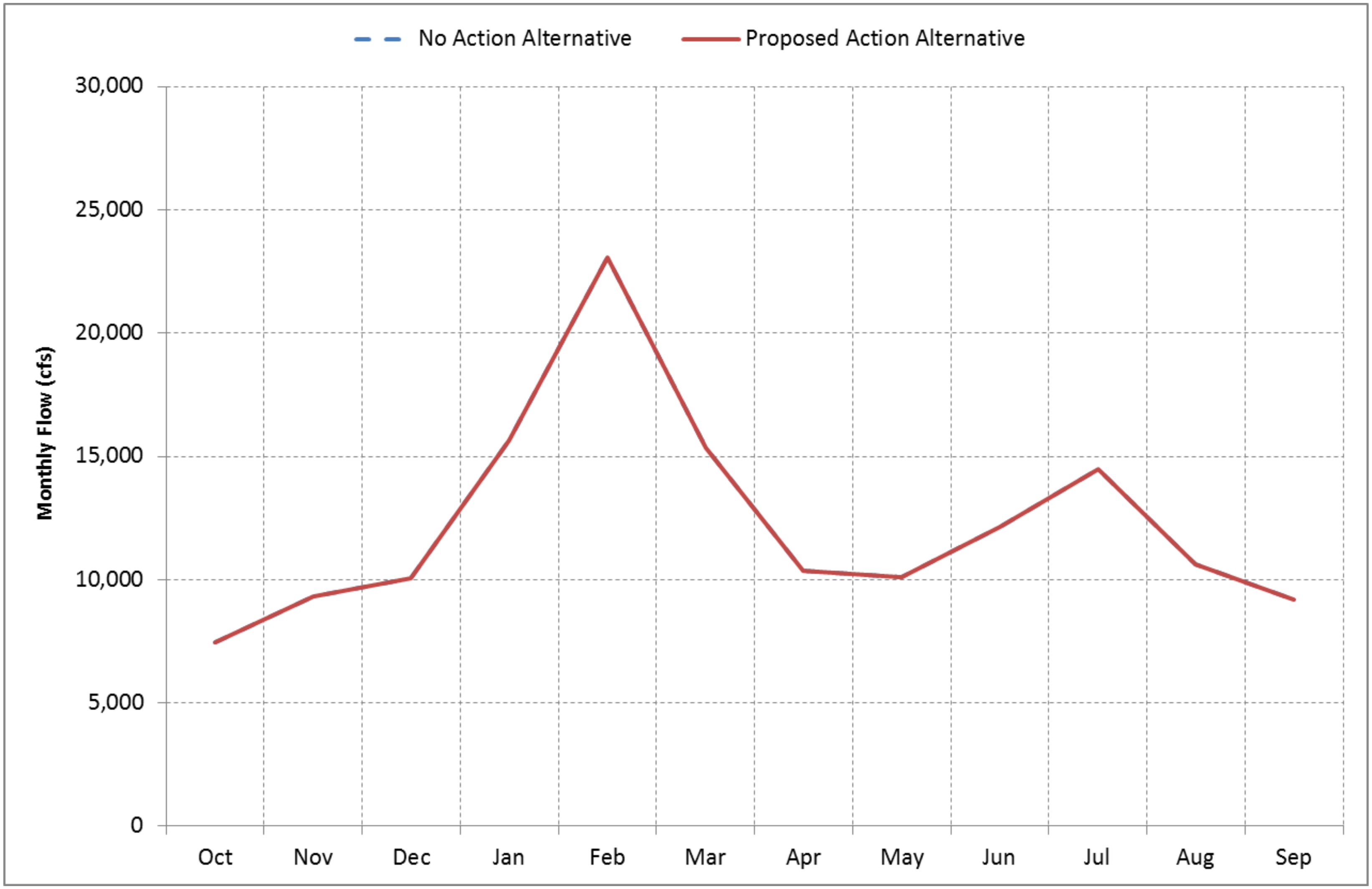
Figure A.3.3.11-2. Sacramento River at Bend Bridge, Wet Year* Long-Term Average Flow**



*As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

** Based on the 82-year simulation period.

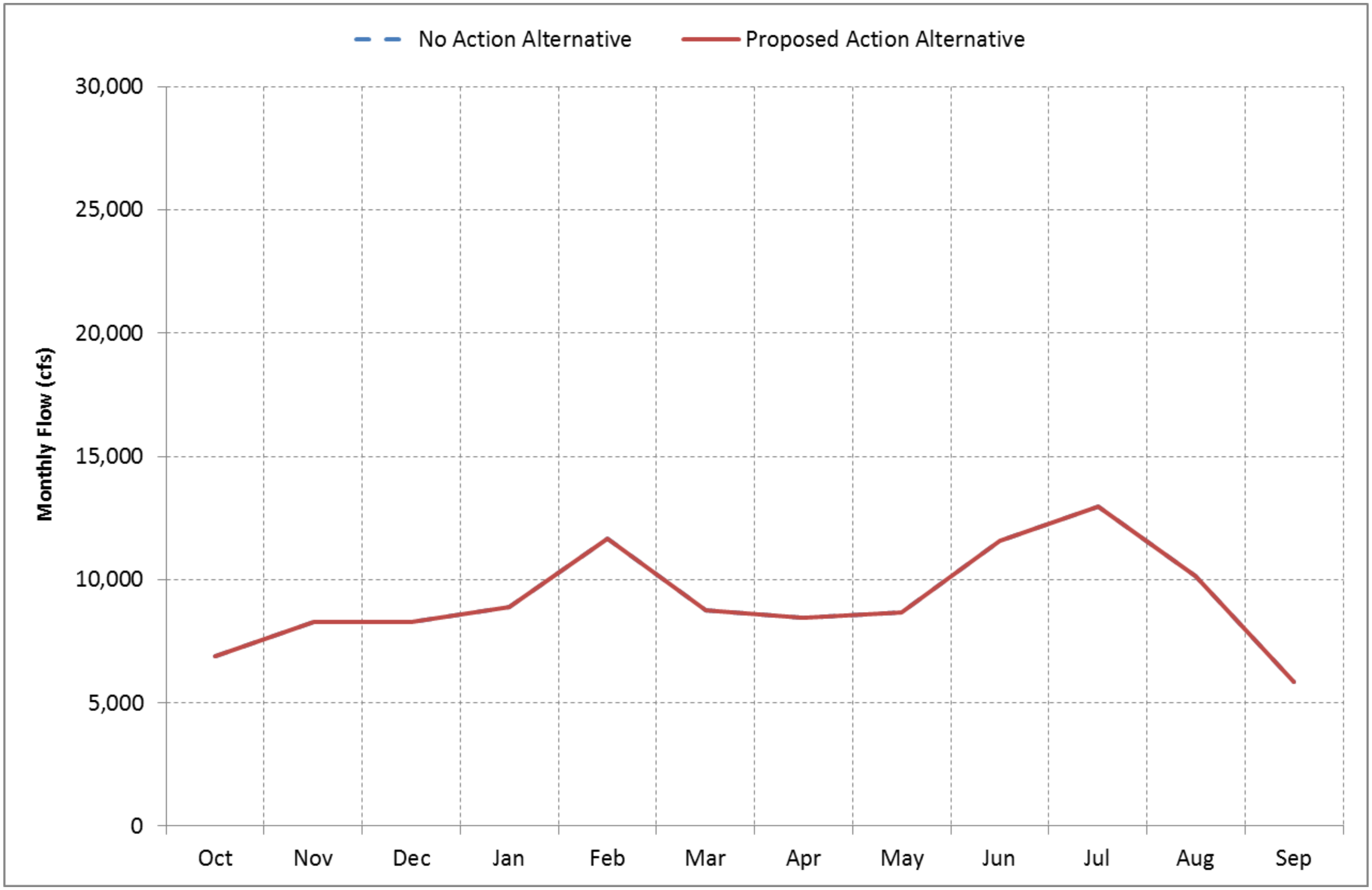
Figure A.3.3.11-3. Sacramento River at Bend Bridge, Above Normal Year* Long-Term Average Flow**



*As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

** Based on the 82-year simulation period.

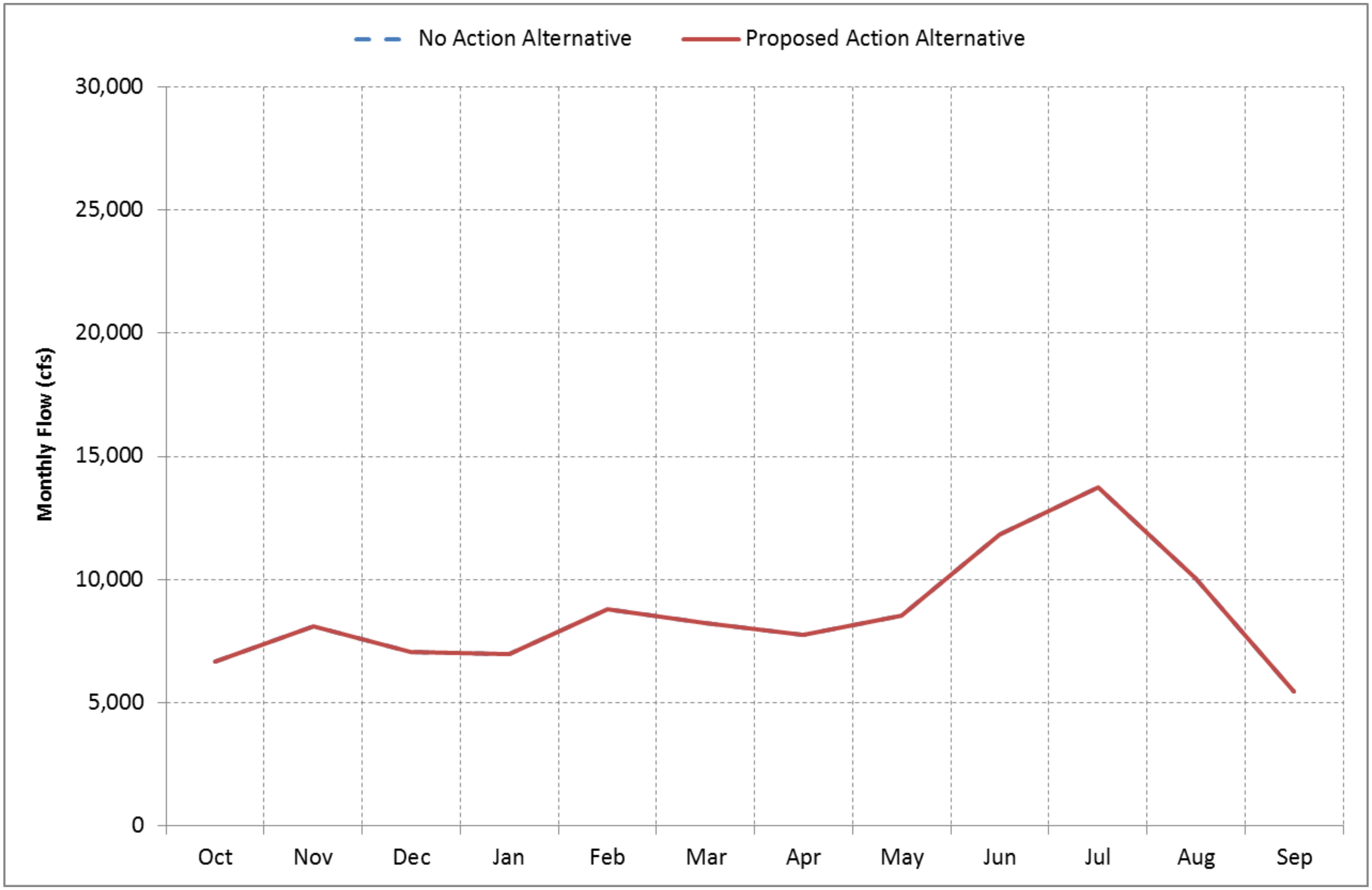
Figure A.3.3.11-4. Sacramento River at Bend Bridge, Below Normal Year* Long-Term Average Flow**



*As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

** Based on the 82-year simulation period.

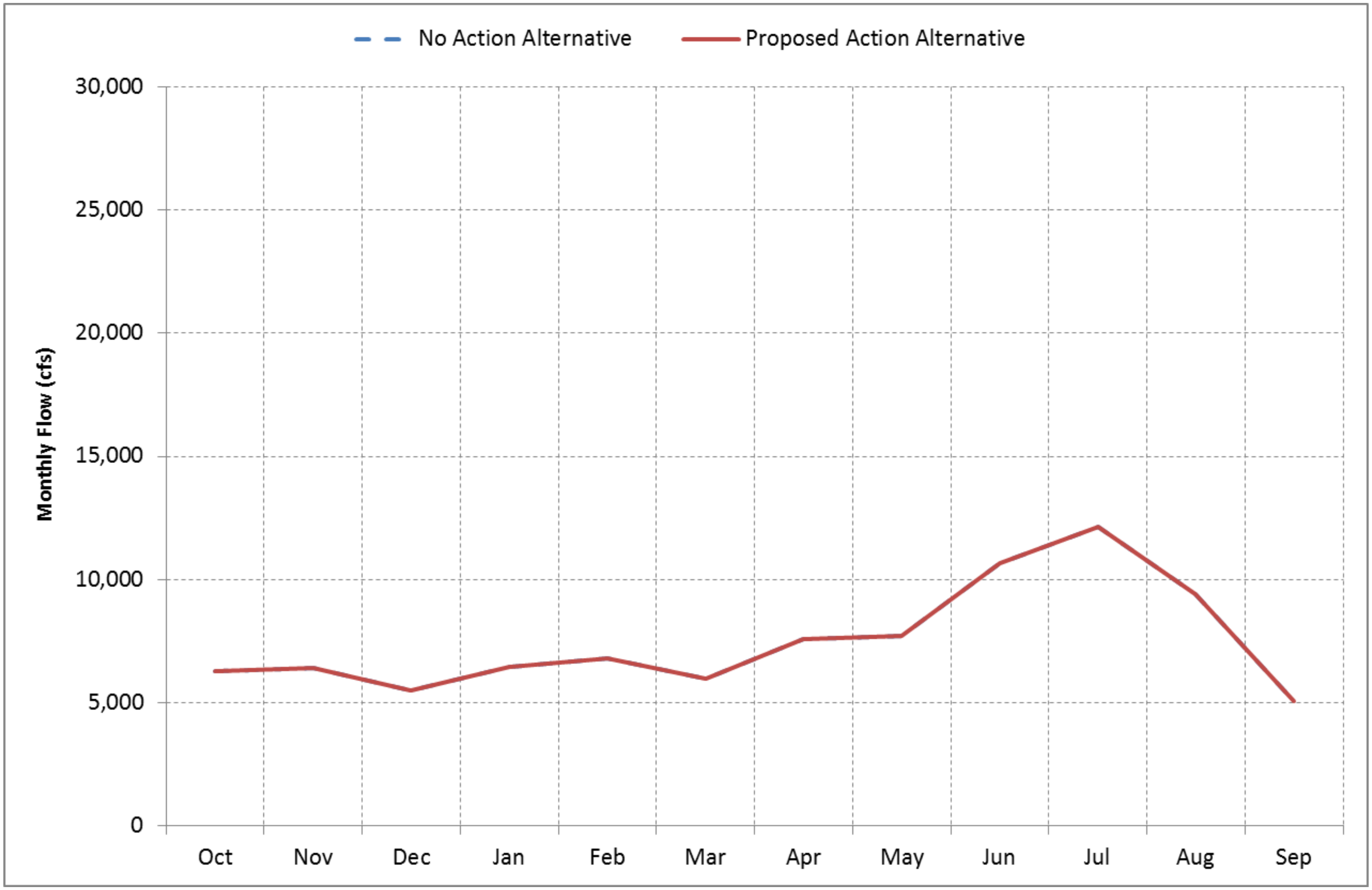
Figure A.3.3.11-5. Sacramento River at Bend Bridge, Dry Year* Long-Term Average Flow**



*As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

** Based on the 82-year simulation period.

Figure A.3.3.11-6. Sacramento River at Bend Bridge, Critical Dry Year* Long-Term Average Flow**



*As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

** Based on the 82-year simulation period.

Table A.3.3.11-1. Sacramento River at Bend Bridge, Monthly Flow

No Action Alternative

Statistic	Monthly Flow (cfs)											
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Probability of Exceedance[a]												
10%	9,524	13,010	29,346	33,649	43,393	31,760	17,450	14,820	13,579	15,331	12,361	15,298
20%	8,762	12,129	15,569	23,327	30,702	19,555	14,055	12,046	12,663	14,999	11,851	13,325
30%	7,854	11,470	11,769	15,125	20,535	14,685	10,320	10,331	12,133	14,728	11,058	12,033
40%	7,470	9,931	8,638	11,463	13,229	10,842	8,864	9,506	11,742	14,037	10,729	9,225
50%	7,032	8,534	7,119	9,655	10,640	8,998	8,503	8,933	11,473	13,421	10,396	6,626
60%	6,388	7,283	6,522	7,590	8,516	8,004	8,024	8,425	11,263	12,828	10,092	5,930
70%	6,018	6,354	5,963	6,563	7,635	7,155	7,424	7,988	10,948	12,399	9,626	5,425
80%	5,752	5,653	5,484	5,998	6,584	5,824	7,016	7,678	10,409	12,003	9,143	5,126
90%	5,317	5,132	5,083	4,979	5,126	4,999	6,618	7,149	10,037	11,335	8,687	4,689
Long Term												
Full Simulation Period[b]	7,173	9,149	11,227	14,849	17,730	14,310	10,574	9,929	11,729	13,372	10,454	8,630
Water Year Types[c]												
Wet	7,933	11,518	18,881	27,020	29,761	24,887	15,160	12,506	12,050	13,372	11,306	13,694
Above Normal	7,476	9,309	10,070	15,652	23,065	15,329	10,358	10,091	12,158	14,496	10,642	9,199
Below Normal	6,911	8,285	8,274	8,901	11,655	8,755	8,461	8,678	11,555	12,977	10,123	5,852
Dry	6,674	8,125	7,059	6,965	8,795	8,233	7,739	8,549	11,836	13,761	10,042	5,468
Critical	6,276	6,396	5,501	6,442	6,817	5,973	7,569	7,711	10,650	12,127	9,424	5,076

Proposed Action Alternative

Statistic	Monthly Flow (cfs)											
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Probability of Exceedance[a]												
10%	9,524	13,010	29,346	33,648	43,393	31,760	17,450	14,820	13,579	15,331	12,361	15,298
20%	8,762	12,129	15,569	23,327	30,702	19,555	14,055	12,046	12,663	14,999	11,851	13,325
30%	7,854	11,470	11,769	15,125	20,535	14,685	10,320	10,331	12,133	14,728	11,058	12,033
40%	7,470	9,931	8,638	11,463	13,229	10,842	8,864	9,506	11,742	14,037	10,729	9,225
50%	7,032	8,534	7,119	9,655	10,640	8,998	8,503	8,929	11,473	13,421	10,396	6,626
60%	6,388	7,283	6,522	7,590	8,516	8,004	8,024	8,425	11,263	12,828	10,092	5,930
70%	6,018	6,354	5,963	6,563	7,635	7,155	7,424	7,988	10,948	12,399	9,626	5,425
80%	5,752	5,653	5,484	5,997	6,584	5,824	7,016	7,678	10,409	12,003	9,143	5,126
90%	5,317	5,132	5,083	4,979	5,126	4,999	6,618	7,149	10,037	11,336	8,687	4,689
Long Term												
Full Simulation Period[b]	7,173	9,148	11,227	14,849	17,730	14,310	10,574	9,929	11,729	13,372	10,454	8,630
Water Year Types[c]												
Wet	7,933	11,518	18,881	27,020	29,761	24,887	15,160	12,506	12,050	13,372	11,306	13,694
Above Normal	7,476	9,309	10,070	15,652	23,065	15,329	10,358	10,090	12,158	14,496	10,642	9,199
Below Normal	6,911	8,285	8,274	8,901	11,655	8,755	8,461	8,678	11,555	12,977	10,123	5,852
Dry	6,674	8,125	7,059	6,965	8,795	8,233	7,739	8,549	11,836	13,761	10,042	5,468
Critical	6,276	6,396	5,501	6,442	6,817	5,973	7,569	7,711	10,650	12,127	9,424	5,076

Proposed Action Alternative minus No Action Alternative

Statistic	Monthly Flow (cfs)											
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Probability of Exceedance[a]												
10%	0	0	0	-1	0	0	0	0	0	0	0	0
20%	0	0	0	0	0	0	0	0	0	0	0	0
30%	0	0	0	0	0	0	0	0	0	0	0	0
40%	0	0	0	0	0	0	0	0	0	0	0	0
50%	0	0	0	0	0	0	0	-4	0	0	0	0
60%	0	0	0	0	0	0	0	0	0	0	0	0
70%	0	0	0	0	0	0	0	0	0	0	0	0
80%	0	0	0	-1	0	0	0	0	0	0	0	0
90%	0	0	0	0	0	0	0	0	0	0	0	0
Long Term												
Full Simulation Period[b]	0	0	0	0	0	0	0	0	0	0	0	0
Water Year Types[c]												
Wet	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	1	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	-1	0	0	0	0	0	0	0	0	0	0
Critical	0	0	0	0	0	0	0	0	0	0	1	0

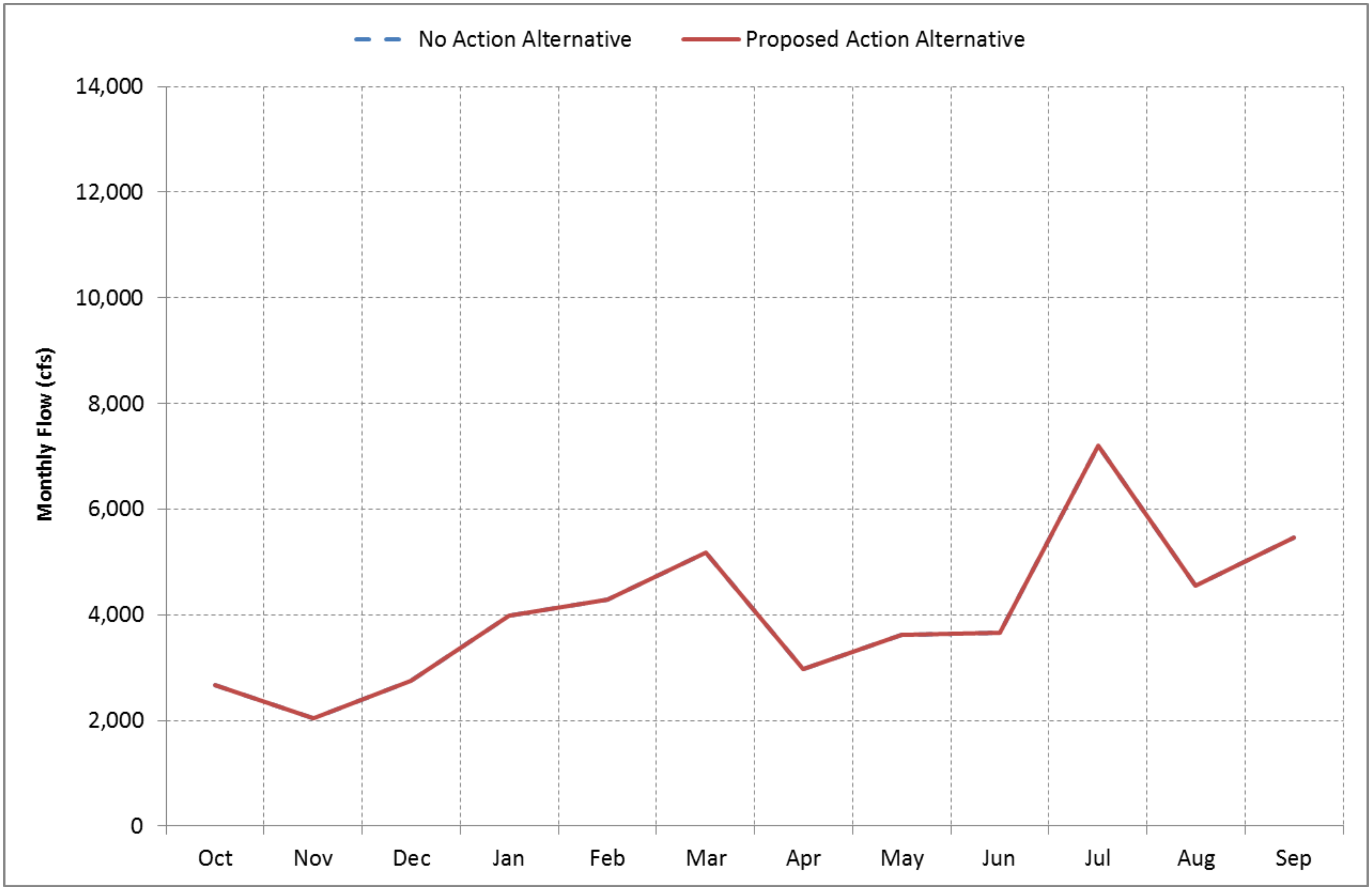
a Exceedance probability is defined as the probability a given value will be exceeded in any one year

b Based on the 82-year simulation period

c As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

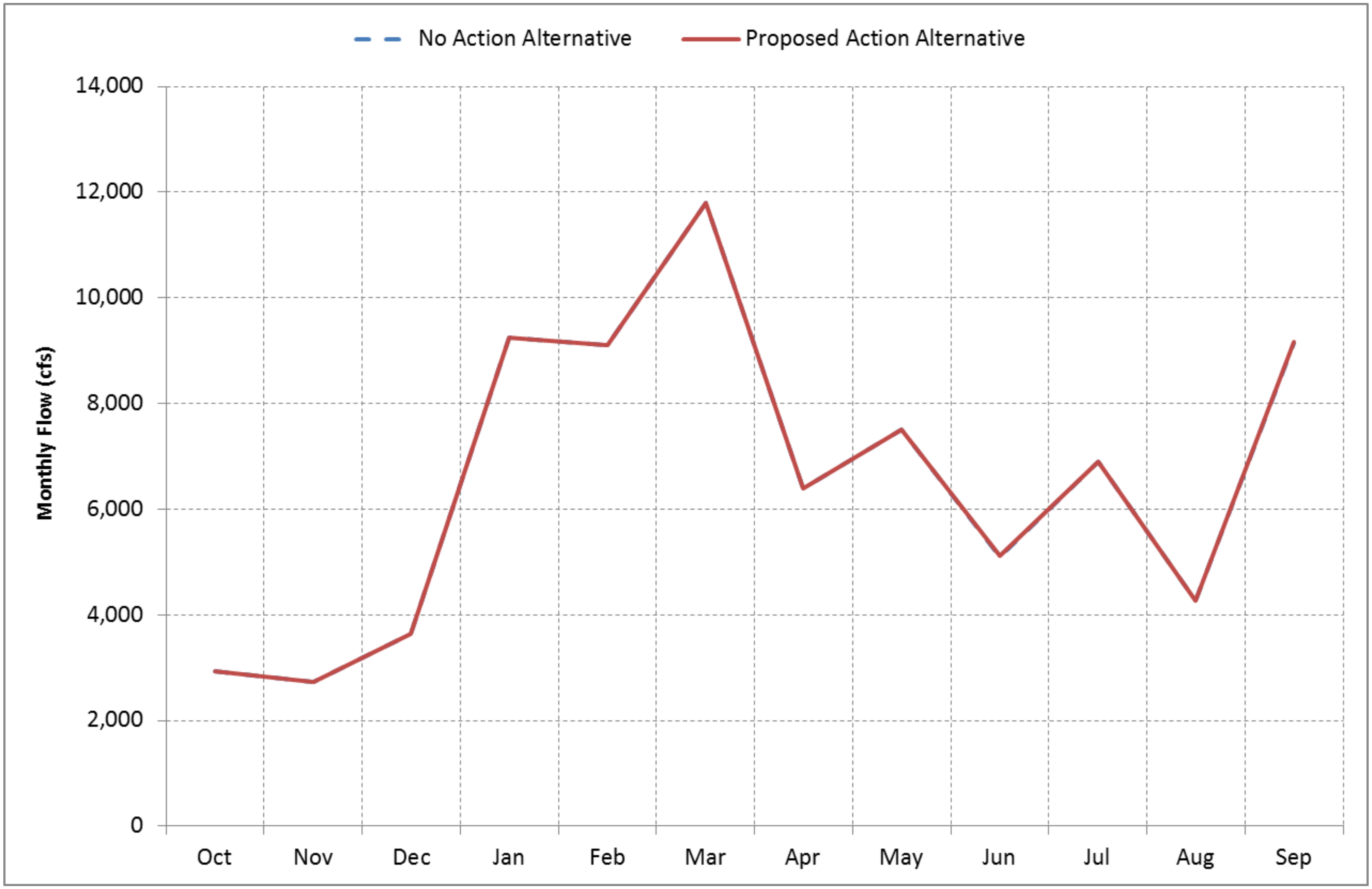
A.3.3.12. Feather River Flow downstream of Thermalito

Figure A.3.3.12-1. Feather River downstream of Thermalito, Long-Term* Average Flow



* Based on the 82-year simulation period.

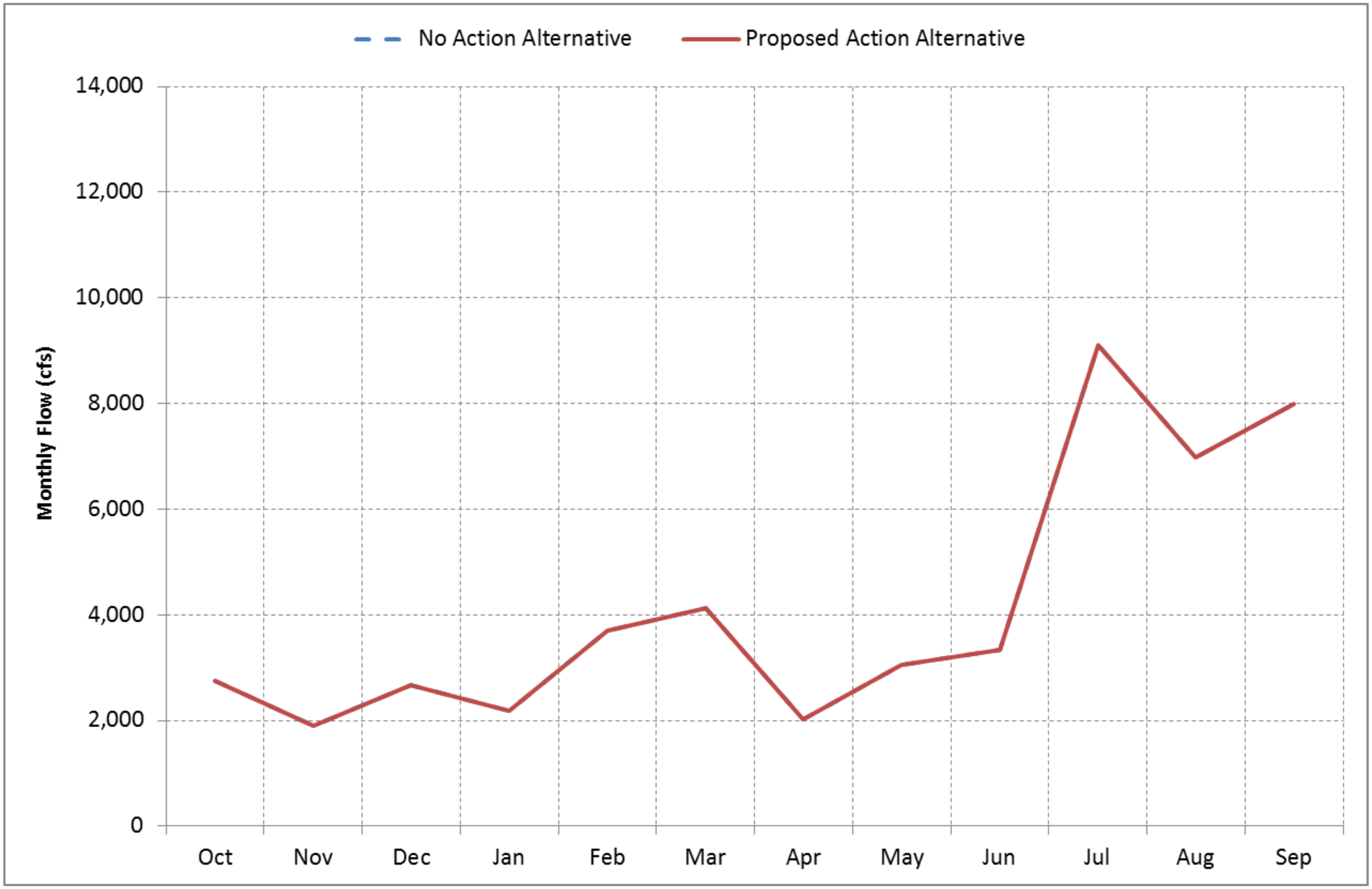
Figure A.3.3.12-2. Feather River downstream of Thermalito, Wet Year* Long-Term** Average Flow



*As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

** Based on the 82-year simulation period.

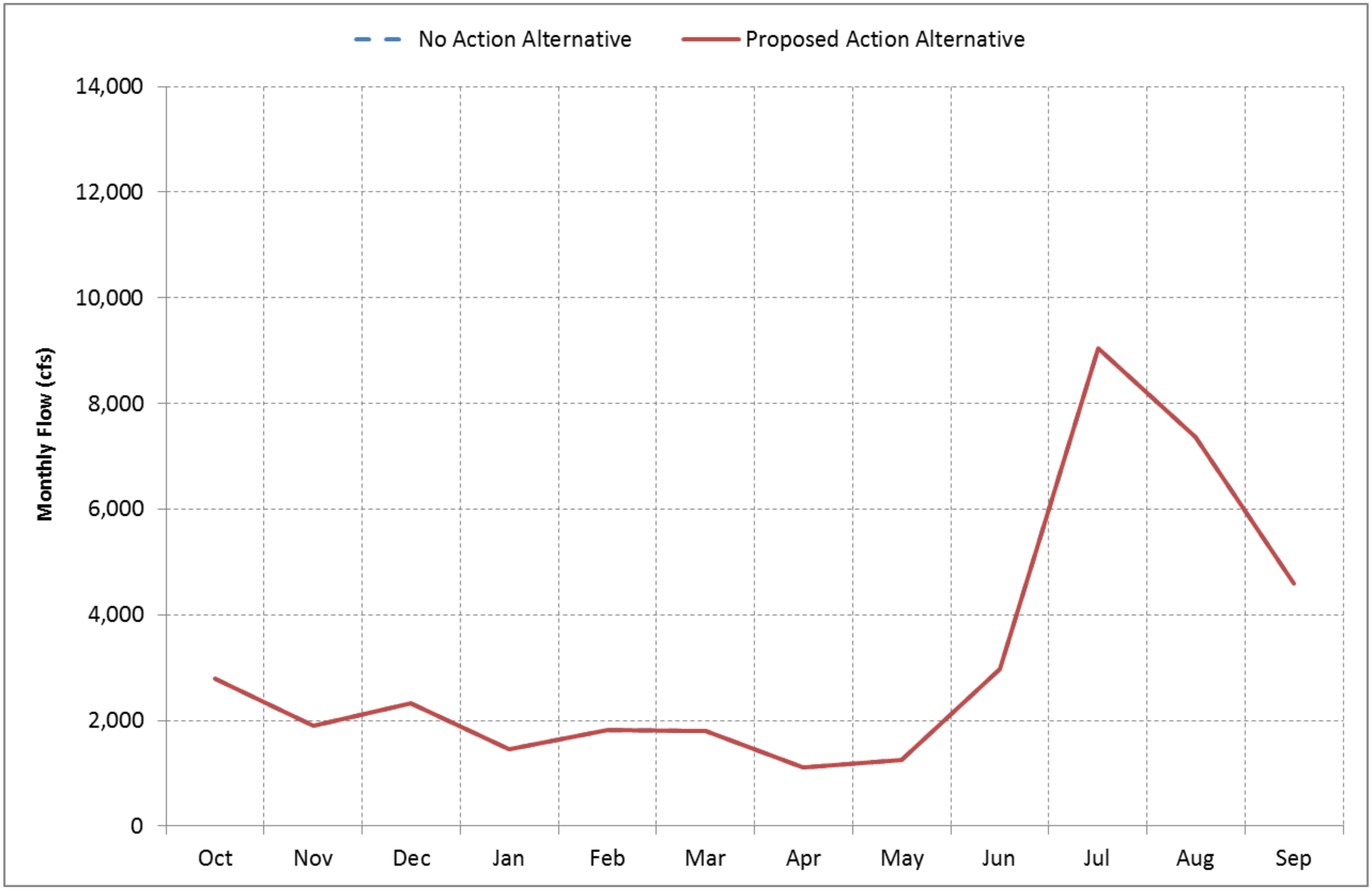
Figure A.3.3.12-3. Feather River downstream of Thermalito, Above Normal Year* Long-Term Average Flow**



*As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

** Based on the 82-year simulation period.

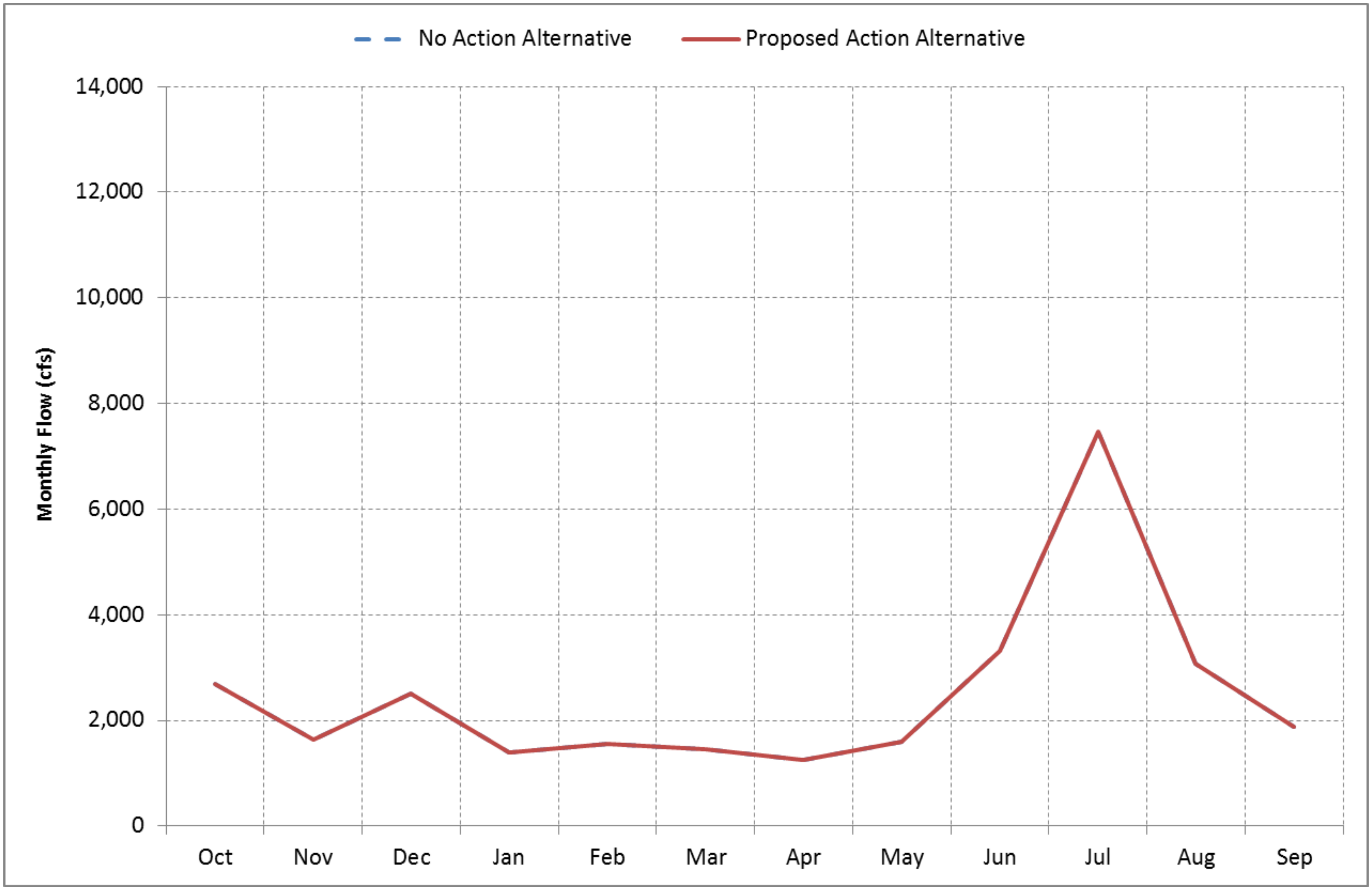
Figure A.3.3.12-4. Feather River downstream of Thermalito, Below Normal Year* Long-Term Average Flow**



*As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

** Based on the 82-year simulation period.

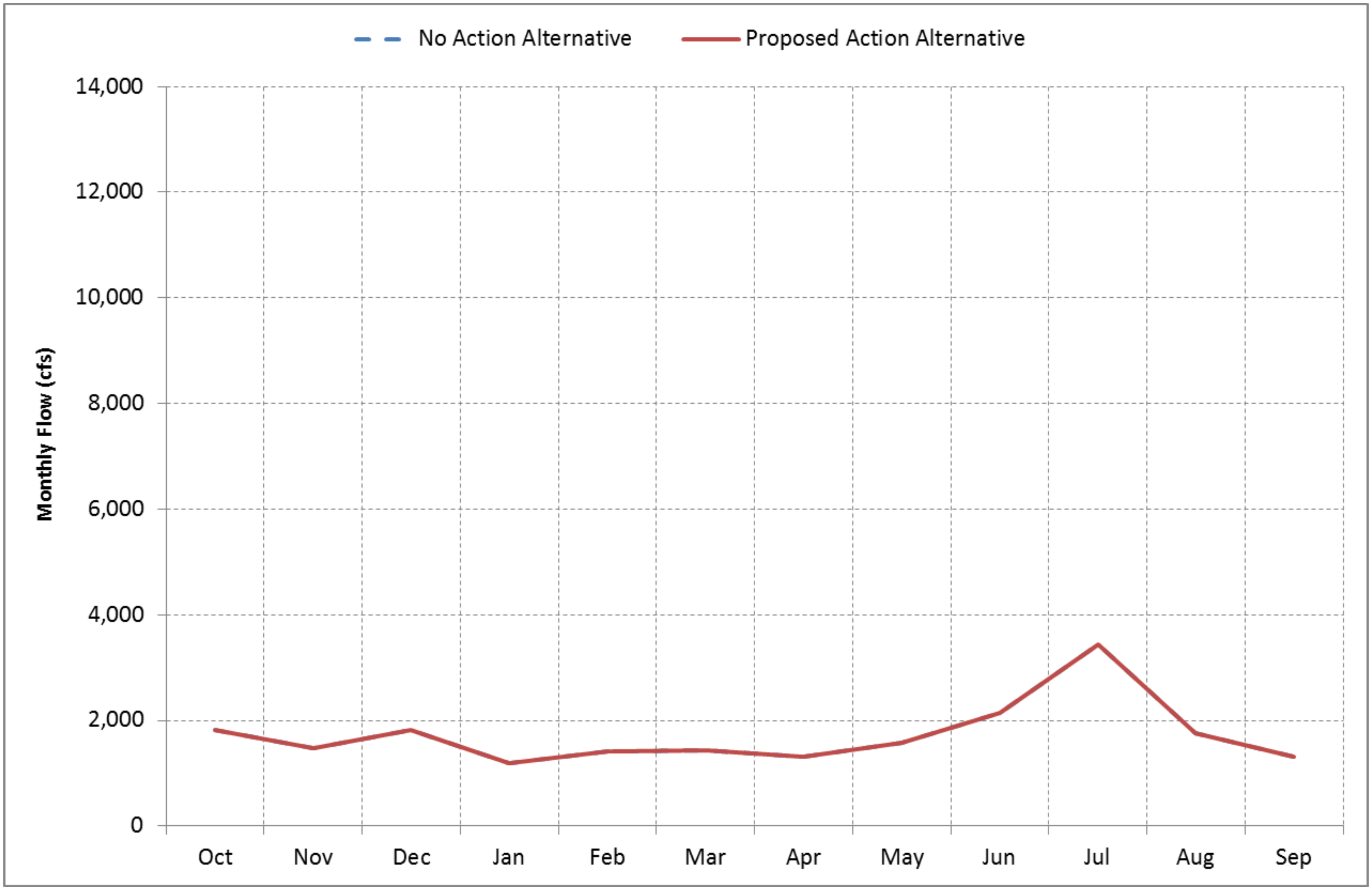
Figure A.3.3.12-5. Feather River downstream of Thermalito, Dry Year* Long-Term Average Flow**



*As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

** Based on the 82-year simulation period.

Figure A.3.3.12-6. Feather River downstream of Thermalito, Critical Dry Year* Long-Term Average Flow**



*As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

** Based on the 82-year simulation period.

Table A.3.3.12-1. Feather River downstream of Thermalito, Monthly Flow

No Action Alternative

	Monthly Flow (cfs)											
Statistic	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Probability of Exceedance[a]												
10%	4,000	2,500	5,258	13,307	12,472	13,891	8,450	10,507	6,741	10,000	8,066	10,000
20%	4,000	2,500	4,074	2,926	7,952	8,289	4,215	7,749	4,820	9,436	7,639	9,711
30%	4,000	2,500	3,090	1,700	3,984	5,310	2,692	3,065	4,245	9,186	7,222	8,280
40%	4,000	2,500	1,700	1,700	1,700	2,767	1,649	2,046	3,741	8,756	5,422	7,483
50%	2,441	1,700	1,700	1,700	1,700	1,700	1,000	1,496	3,085	8,404	4,530	5,613
60%	1,964	1,700	1,700	1,700	1,700	1,700	1,000	1,051	2,761	7,807	3,383	4,421
70%	1,700	1,200	1,700	1,200	1,652	1,700	1,000	1,000	2,319	6,668	2,234	2,110
80%	1,200	1,200	1,200	1,136	1,200	1,000	1,000	1,000	1,868	4,038	1,602	1,267
90%	900	900	900	900	900	800	779	1,000	1,272	2,362	1,329	1,000
Long Term												
Full Simulation Period[b]	2,666	2,046	2,760	3,985	4,292	5,182	2,983	3,619	3,654	7,203	4,560	5,461
Water Year Types[c]												
Wet	2,928	2,736	3,638	9,255	9,104	11,803	6,397	7,502	5,108	6,892	4,263	9,155
Above Normal	2,742	1,904	2,666	2,185	3,711	4,127	2,019	3,057	3,338	9,101	6,977	7,992
Below Normal	2,793	1,893	2,332	1,464	1,829	1,795	1,120	1,253	2,972	9,036	7,360	4,589
Dry	2,700	1,642	2,516	1,395	1,566	1,454	1,258	1,594	3,309	7,468	3,072	1,877
Critical	1,825	1,479	1,816	1,195	1,409	1,435	1,306	1,568	2,135	3,439	1,750	1,323

Proposed Action Alternative

	Monthly Flow (cfs)											
Statistic	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Probability of Exceedance[a]												
10%	4,000	2,500	5,258	13,307	12,472	13,891	8,450	10,507	6,741	10,000	8,066	10,000
20%	4,000	2,500	4,074	2,926	7,952	8,289	4,215	7,749	4,820	9,436	7,639	9,711
30%	4,000	2,500	3,090	1,700	3,984	5,310	2,692	3,065	4,245	9,186	7,222	8,280
40%	4,000	2,500	1,700	1,700	1,700	2,767	1,649	2,046	3,741	8,757	5,422	7,484
50%	2,441	1,700	1,700	1,700	1,700	1,700	1,000	1,496	3,085	8,404	4,530	5,613
60%	1,964	1,700	1,700	1,700	1,700	1,700	1,000	1,051	2,761	7,807	3,383	4,421
70%	1,700	1,200	1,700	1,200	1,652	1,700	1,000	1,000	2,319	6,668	2,234	2,110
80%	1,200	1,200	1,200	1,136	1,200	1,000	1,000	1,000	1,868	4,038	1,602	1,267
90%	900	900	900	900	900	800	779	1,000	1,272	2,362	1,303	1,000
Long Term												
Full Simulation Period[b]	2,666	2,046	2,760	3,985	4,292	5,182	2,983	3,620	3,655	7,202	4,559	5,462
Water Year Types[c]												
Wet	2,928	2,736	3,638	9,255	9,104	11,802	6,399	7,503	5,111	6,890	4,261	9,156
Above Normal	2,742	1,904	2,666	2,185	3,711	4,127	2,019	3,057	3,338	9,101	6,977	7,992
Below Normal	2,793	1,893	2,332	1,464	1,829	1,795	1,120	1,253	2,972	9,036	7,360	4,589
Dry	2,700	1,643	2,516	1,395	1,566	1,454	1,258	1,594	3,309	7,468	3,072	1,877
Critical	1,826	1,479	1,816	1,195	1,409	1,435	1,306	1,568	2,135	3,439	1,750	1,323

Proposed Action Alternative minus No Action Alternative

	Monthly Flow (cfs)											
Statistic	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Probability of Exceedance[a]												
10%	0	0	0	0	0	0	0	0	0	0	0	0
20%	0	0	0	0	0	0	0	0	0	0	0	0
30%	0	0	0	0	0	0	0	0	0	0	0	0
40%	0	0	0	0	0	0	0	0	0	0	0	0
50%	0	0	0	0	0	0	0	0	0	0	0	0
60%	0	0	0	0	0	0	0	0	0	0	0	0
70%	0	0	0	0	0	0	0	0	0	0	0	0
80%	0	0	0	0	0	0	0	0	0	0	0	0
90%	0	0	0	0	0	0	0	0	0	0	-26	0
Long Term												
Full Simulation Period[b]	0	0	0	0	0	0	0	0	1	-1	-1	0
Water Year Types[c]												
Wet	0	0	0	0	0	0	1	1	3	-2	-2	0
Above Normal	1	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0
Critical	1	0	0	0	0	0	0	0	0	0	0	0

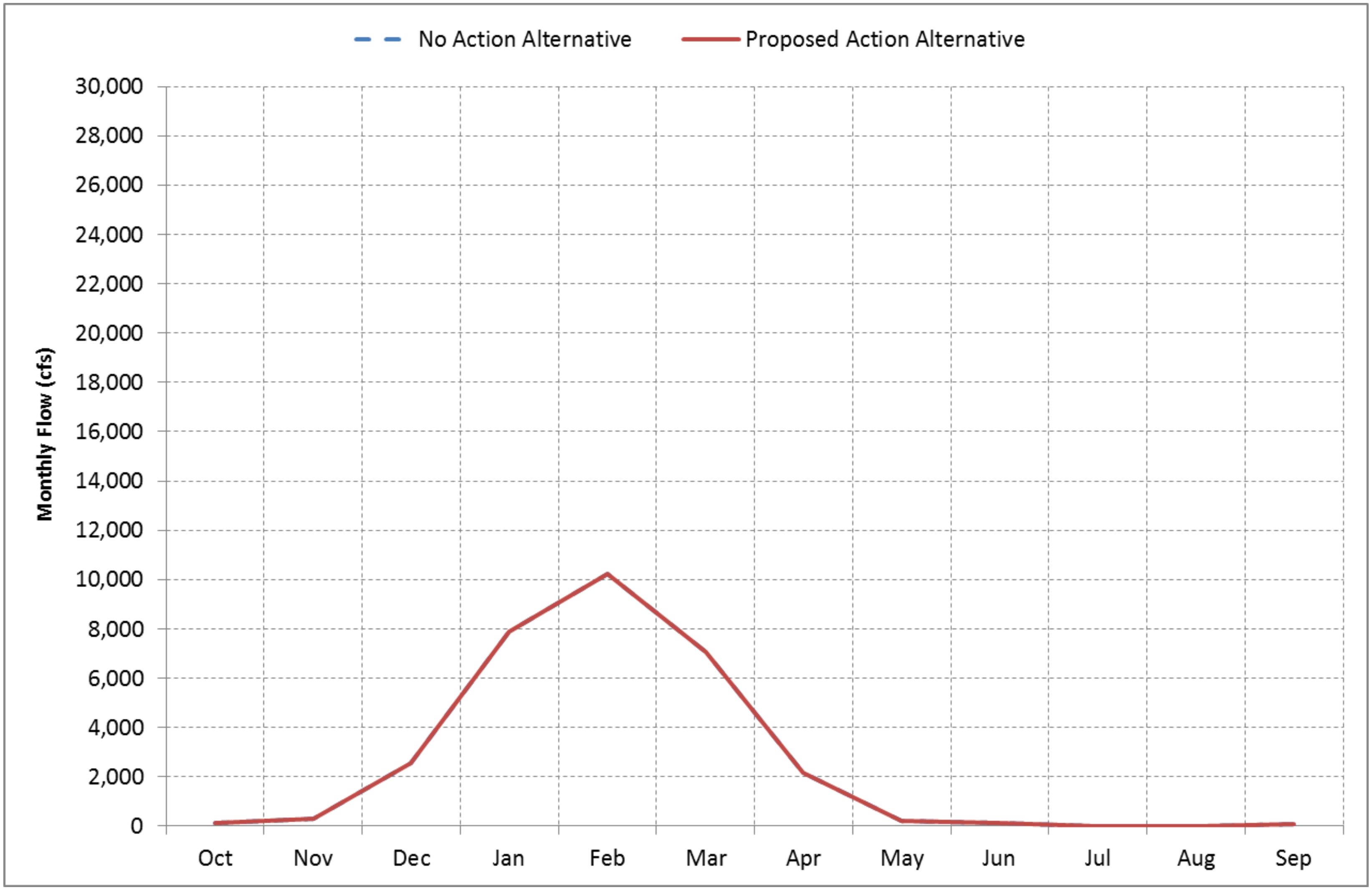
a Exceedance probability is defined as the probability a given value will be exceeded in any one year

b Based on the 82-year simulation period

c As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

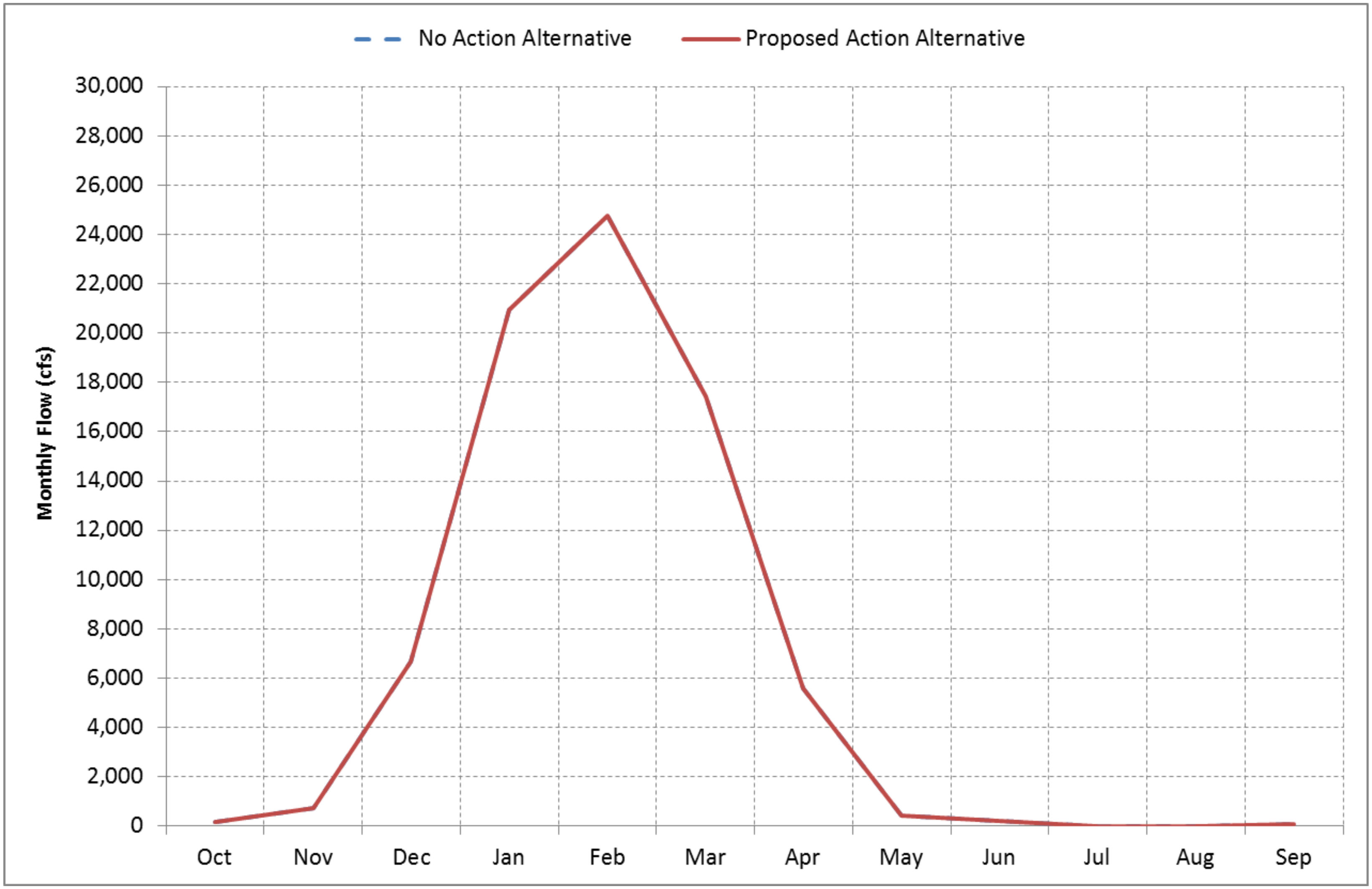
A.3.3.13. Fremont Weir Spills

Figure A.3.3.13-1. Fremont Weir, Long-Term* Average Spills



* Based on the 82-year simulation period.

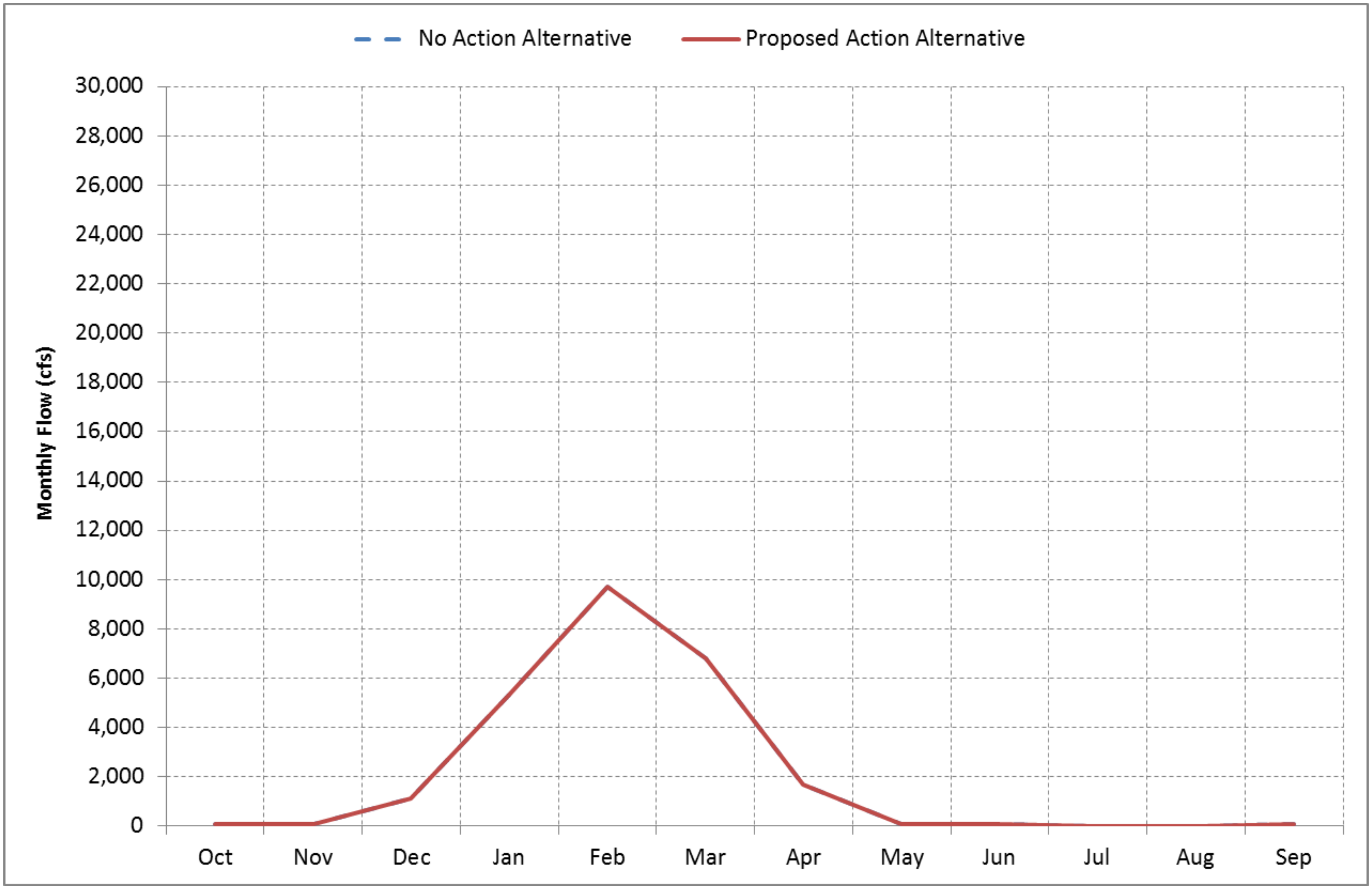
Figure A.3.3.13-2. Fremont Weir, Wet Year* Long-Term Average Spills**



*As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

** Based on the 82-year simulation period.

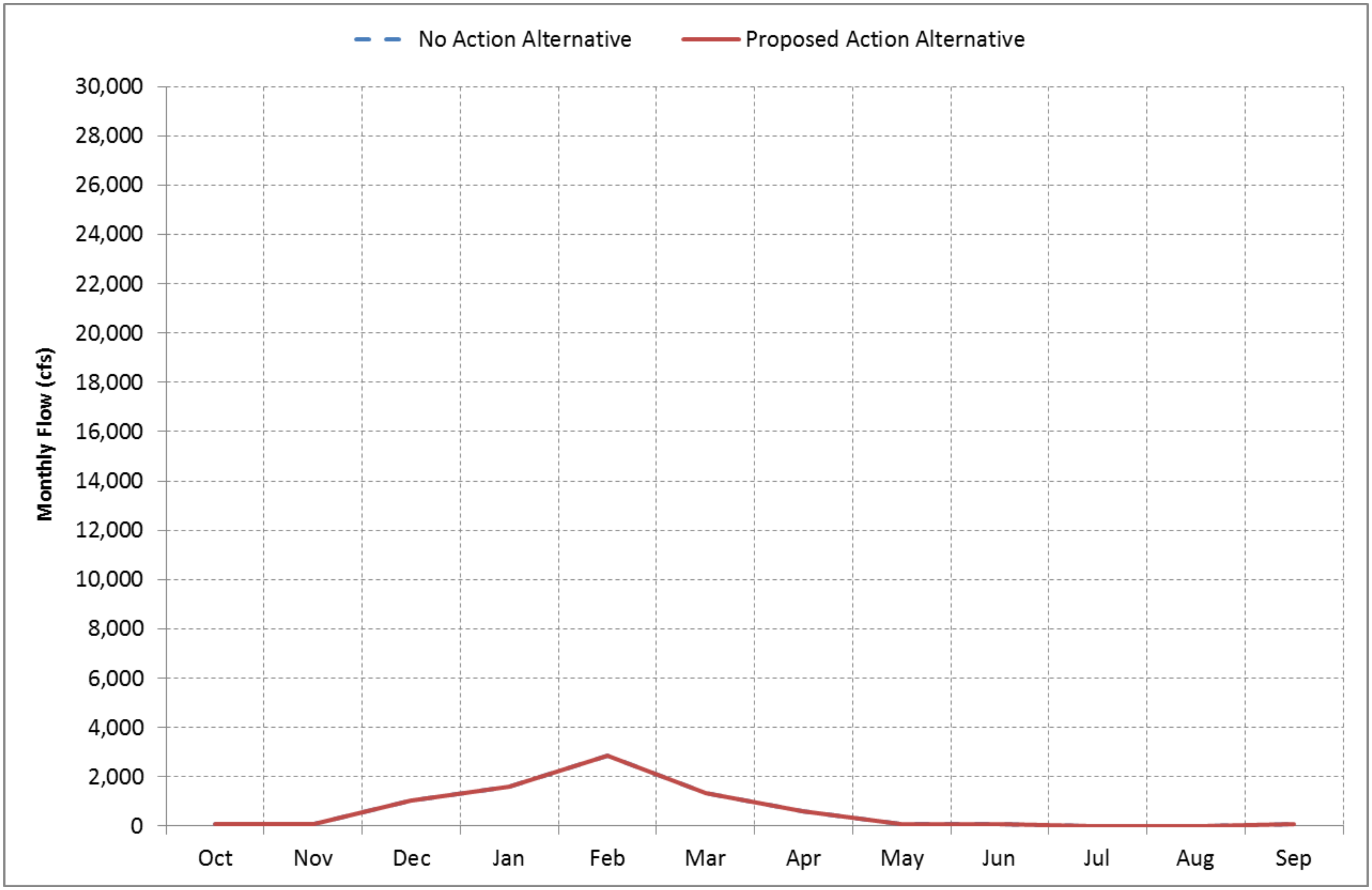
Figure A.3.3.13-3. Fremont Weir, Above Normal Year* Long-Term Average Spills**



*As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

** Based on the 82-year simulation period.

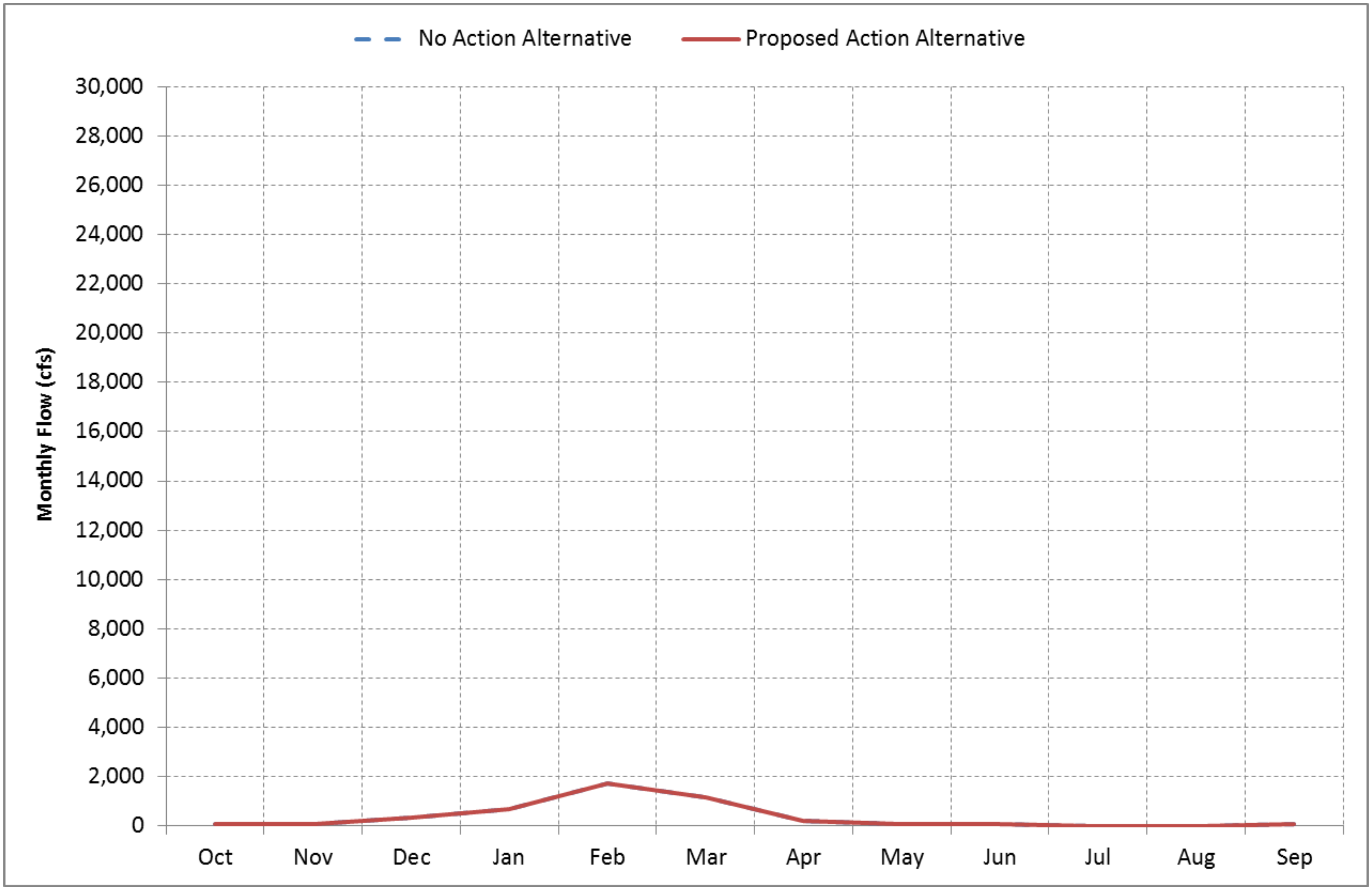
Figure A.3.3.13-4. Fremont Weir, Below Normal Year* Long-Term Average Spills**



*As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

** Based on the 82-year simulation period.

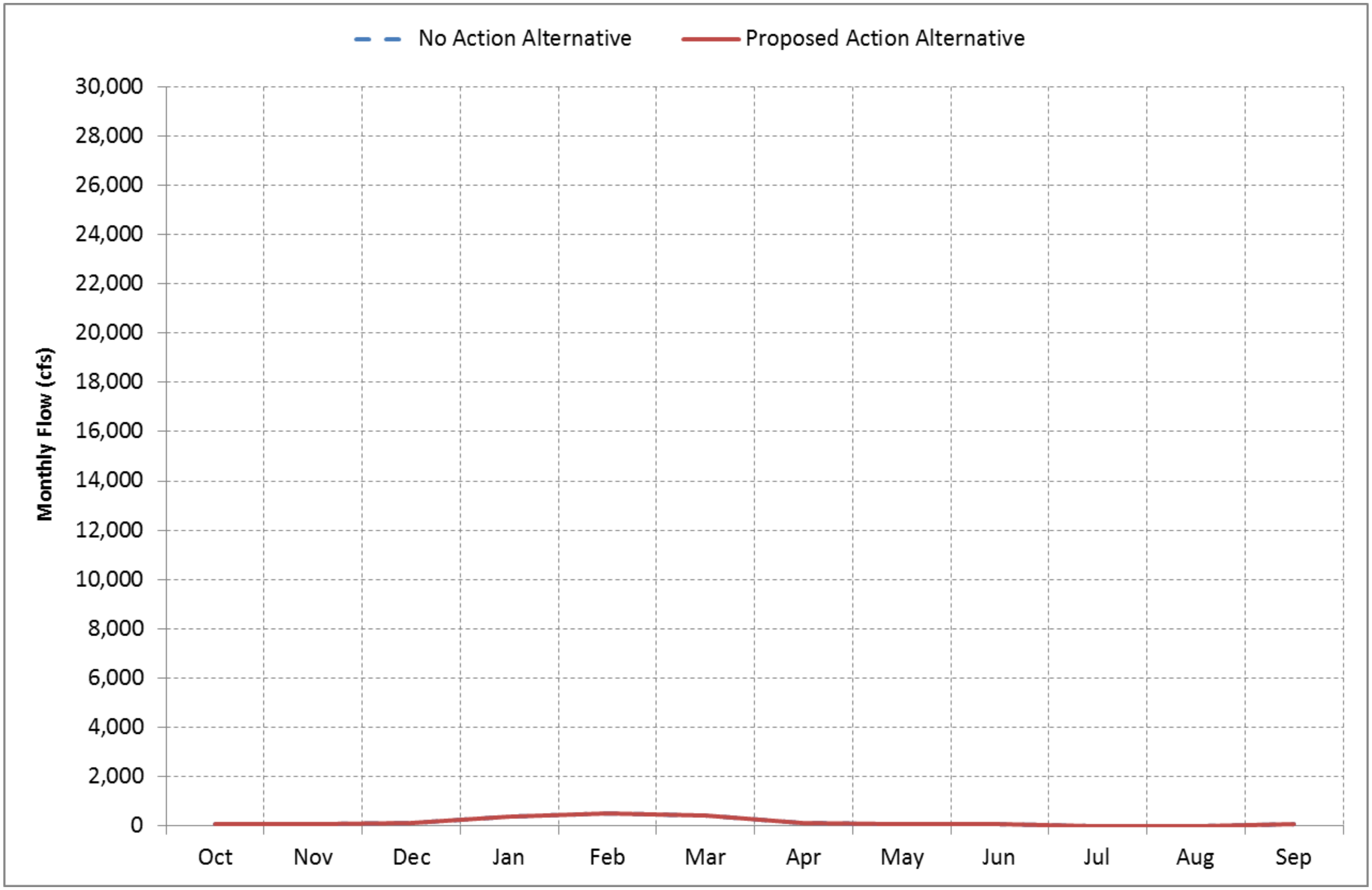
Figure A.3.3.13-5. Fremont Weir, Dry Year* Long-Term Average Spills**



*As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

** Based on the 82-year simulation period.

Figure A.3.3.13-6. Fremont Weir, Critical Dry Year* Long-Term Average Spills**



*As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

** Based on the 82-year simulation period.

Table A.3.3.13-1. Fremont Weir, Monthly Spills

No Action Alternative

	Monthly Flow (cfs)											
Statistic	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Probability of Exceedance[a]												
10%	100	100	6,693	24,113	35,663	17,925	5,916	100	100	0	0	100
20%	100	100	2,946	10,542	11,453	6,281	4,616	100	100	0	0	100
30%	100	100	1,589	4,717	6,958	4,704	1,301	100	100	0	0	100
40%	100	100	486	2,607	4,697	3,597	359	100	100	0	0	100
50%	100	100	213	1,422	3,128	1,761	128	100	100	0	0	100
60%	100	100	100	865	2,108	1,009	100	100	100	0	0	100
70%	100	100	100	145	912	339	100	100	100	0	0	100
80%	100	100	100	100	178	170	100	100	100	0	0	100
90%	100	100	100	100	100	100	100	100	100	0	0	100
Long Term												
Full Simulation Period[b]	123	301	2,552	7,902	10,218	7,056	2,181	210	132	0	0	100
Water Year Types[c]												
Wet	171	735	6,686	20,944	24,764	17,408	5,582	446	201	0	0	100
Above Normal	100	100	1,133	5,348	9,721	6,789	1,709	100	100	0	0	100
Below Normal	100	100	1,023	1,581	2,854	1,325	593	100	100	0	0	100
Dry	100	100	327	692	1,721	1,165	201	100	100	0	0	100
Critical	100	100	136	384	533	418	107	100	100	0	0	100

Proposed Action Alternative

	Monthly Flow (cfs)											
Statistic	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Probability of Exceedance[a]												
10%	100	100	6,693	24,113	35,663	17,925	5,916	100	100	0	0	100
20%	100	100	2,946	10,541	11,453	6,281	4,616	100	100	0	0	100
30%	100	100	1,589	4,717	6,958	4,704	1,301	100	100	0	0	100
40%	100	100	486	2,607	4,697	3,597	359	100	100	0	0	100
50%	100	100	213	1,422	3,127	1,761	128	100	100	0	0	100
60%	100	100	100	865	2,108	1,009	100	100	100	0	0	100
70%	100	100	100	145	912	339	100	100	100	0	0	100
80%	100	100	100	100	178	170	100	100	100	0	0	100
90%	100	100	100	100	100	100	100	100	100	0	0	100
Long Term												
Full Simulation Period[b]	123	301	2,552	7,902	10,218	7,056	2,181	210	132	0	0	100
Water Year Types[c]												
Wet	171	735	6,686	20,944	24,764	17,408	5,582	446	201	0	0	100
Above Normal	100	100	1,133	5,348	9,721	6,789	1,709	100	100	0	0	100
Below Normal	100	100	1,023	1,581	2,854	1,325	593	100	100	0	0	100
Dry	100	100	327	692	1,721	1,165	201	100	100	0	0	100
Critical	100	100	136	384	533	418	107	100	100	0	0	100

Proposed Action Alternative minus No Action Alternative

	Monthly Flow (cfs)											
Statistic	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Probability of Exceedance[a]												
10%	0	0	0	0	0	0	0	0	0	0	0	0
20%	0	0	0	-1	0	0	0	0	0	0	0	0
30%	0	0	0	0	0	0	0	0	0	0	0	0
40%	0	0	0	0	0	0	0	0	0	0	0	0
50%	0	0	0	0	-1	0	0	0	0	0	0	0
60%	0	0	0	0	0	0	0	0	0	0	0	0
70%	0	0	0	0	0	0	0	0	0	0	0	0
80%	0	0	0	0	0	0	0	0	0	0	0	0
90%	0	0	0	0	0	0	0	0	0	0	0	0
Long Term												
Full Simulation Period[b]	0	0	0	0	0	0	0	0	0	0	0	0
Water Year Types[c]												
Wet	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0
Critical	0	0	0	0	0	0	0	0	0	0	0	0

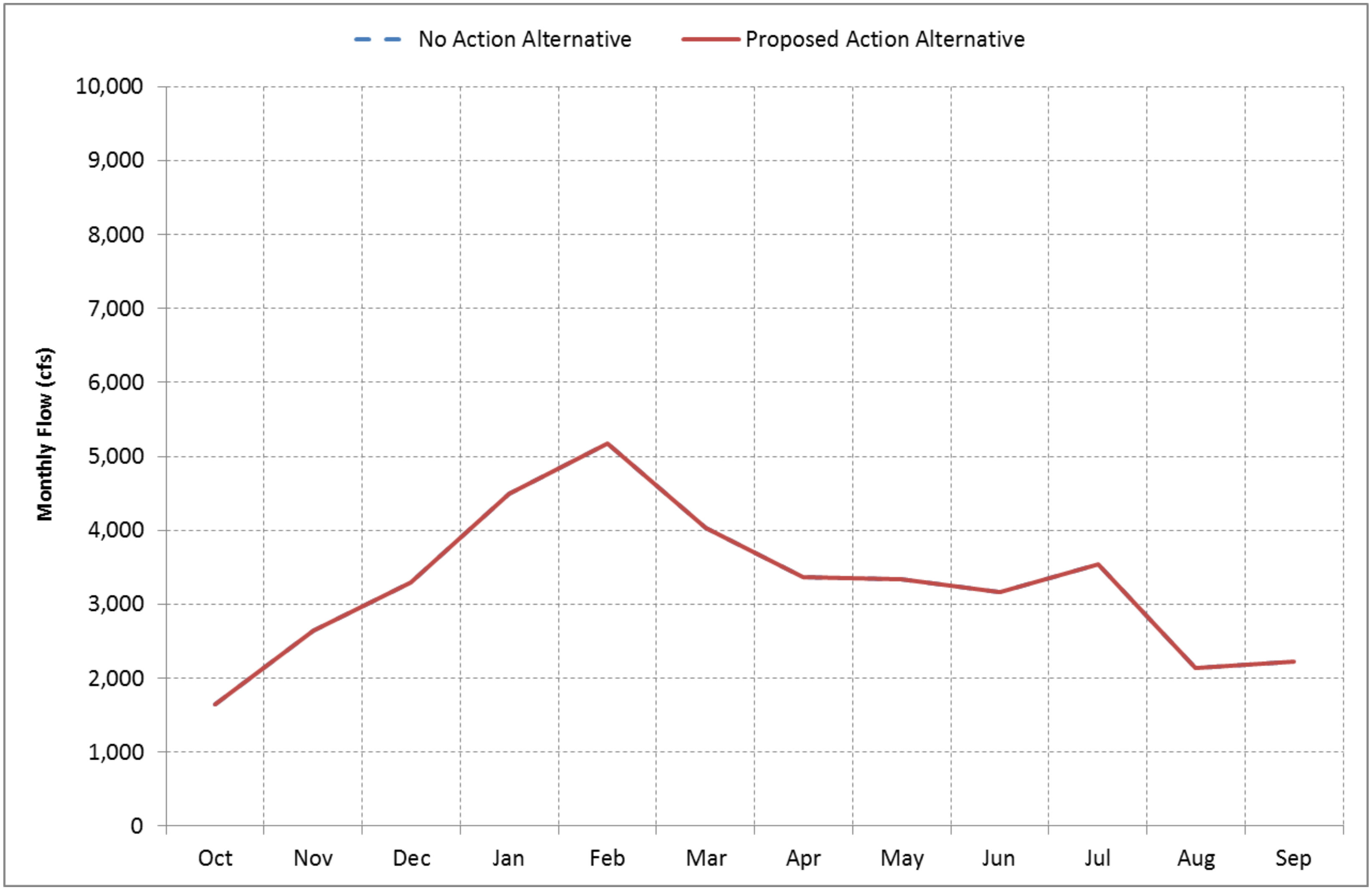
a Exceedance probability is defined as the probability a given value will be exceeded in any one year

b Based on the 82-year simulation period

c As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

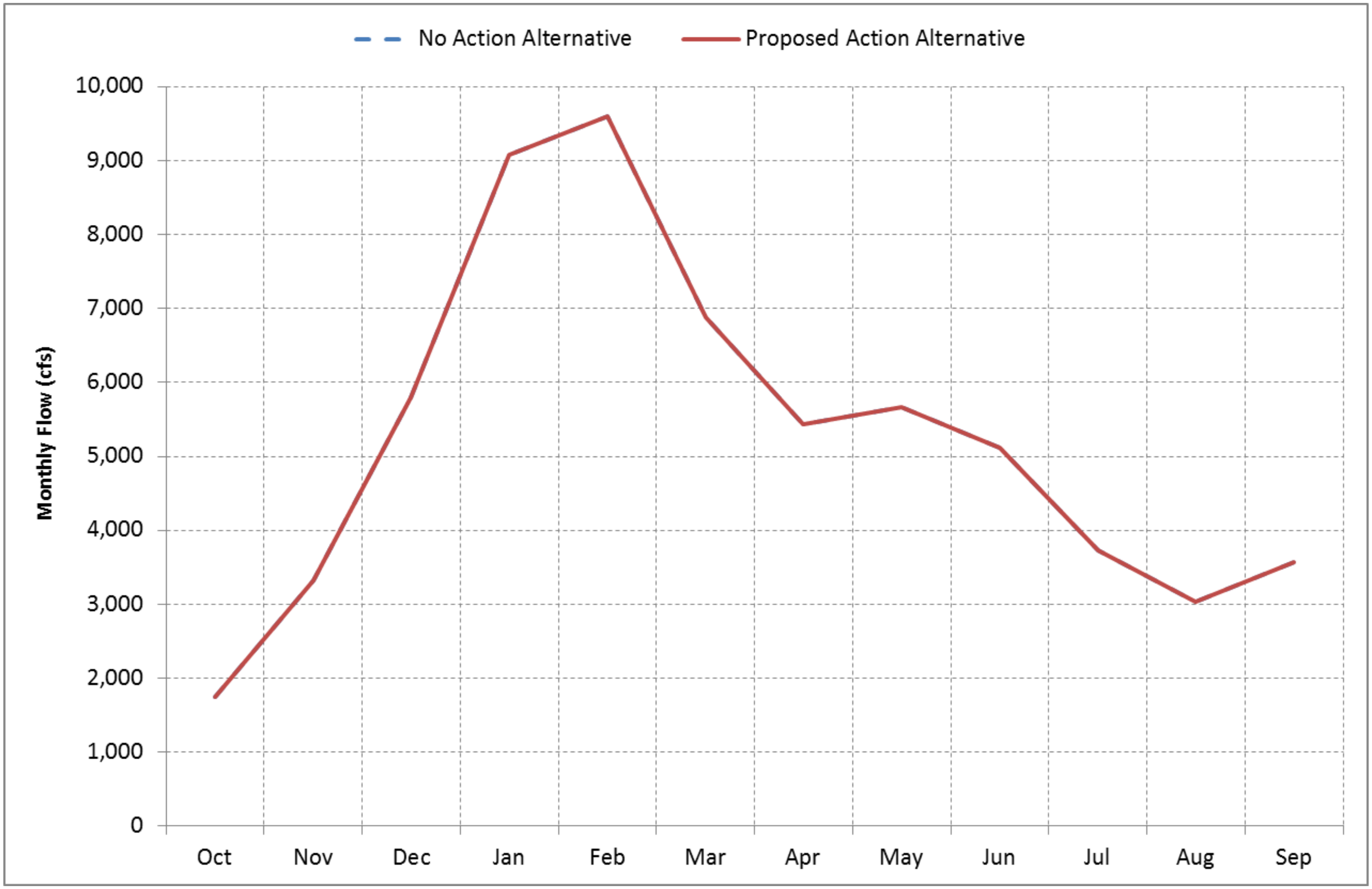
A.3.3.14. American River Flow downstream of Nimbus Dam

Figure A.3.3.14-1. American River downstream of Nimbus Dam, Long-Term* Average Flow



*Based on the 82-year simulation period.

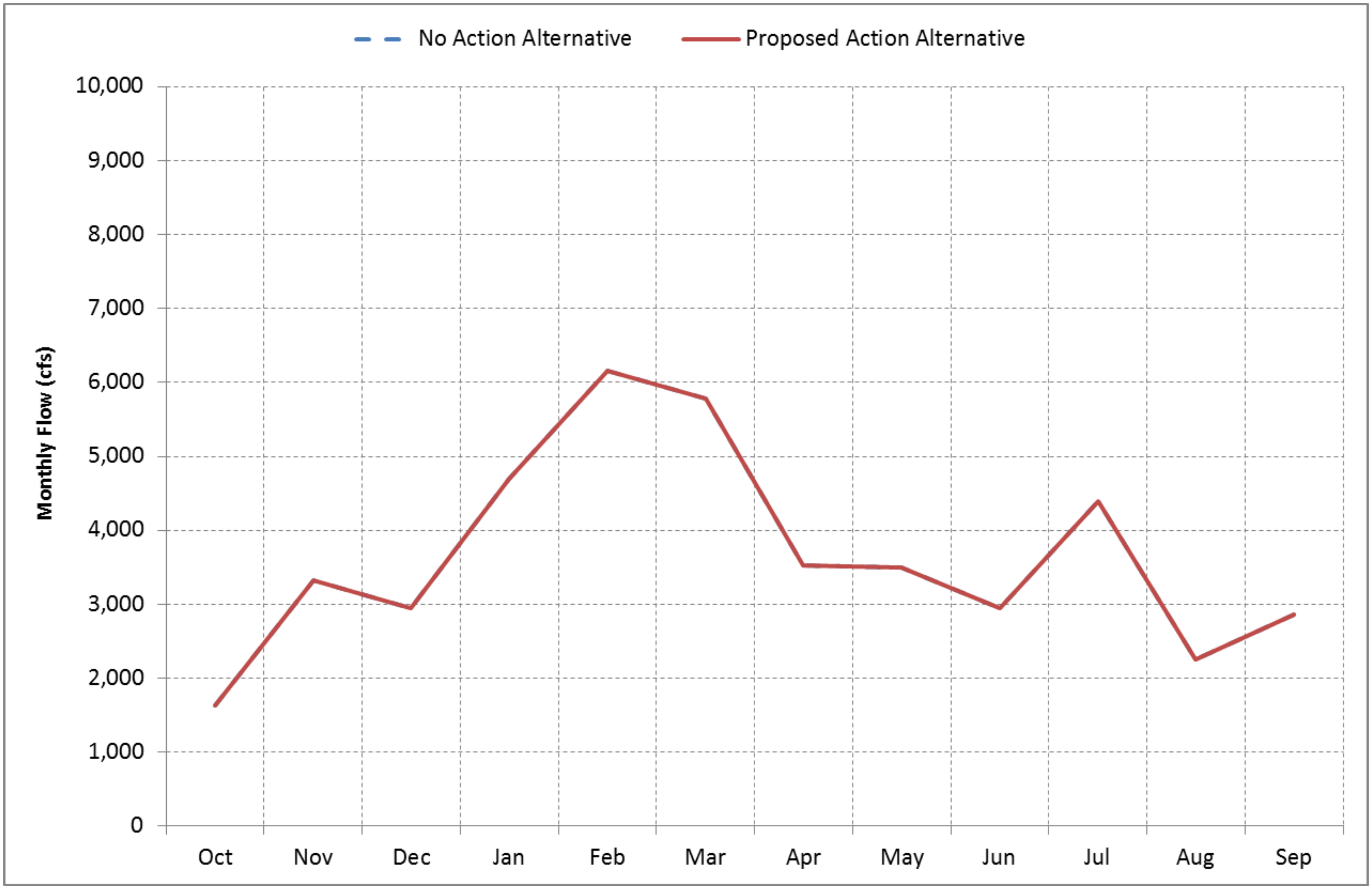
Figure A.3.3.14-2. American River downstream of Nimbus Dam, Wet Year* Long-Term Average Flow**



*As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

** Based on the 82-year simulation period.

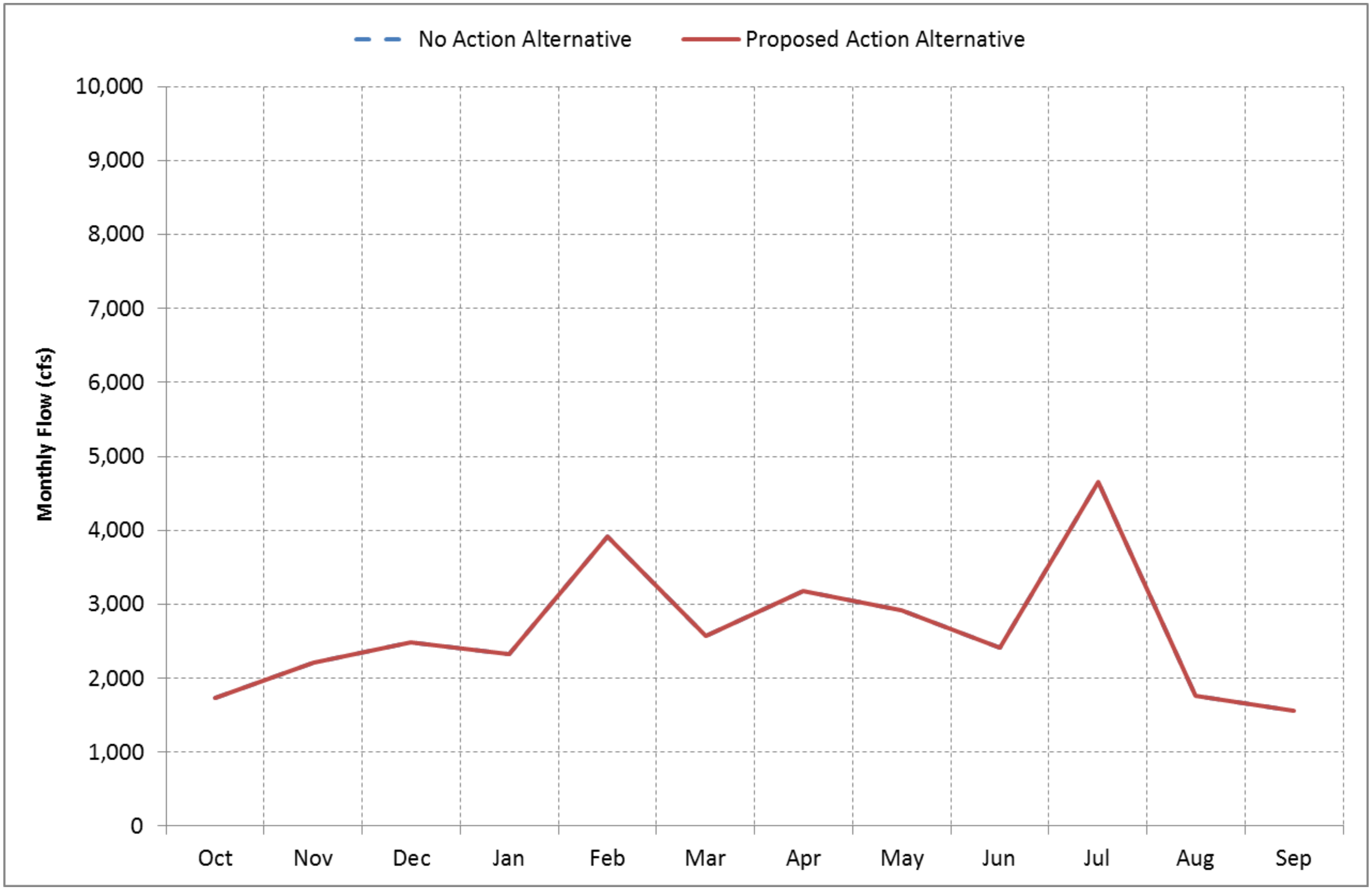
Figure A.3.3.14-3. American River downstream of Nimbus Dam, Above Normal Year* Long-Term Average Flow**



*As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

** Based on the 82-year simulation period.

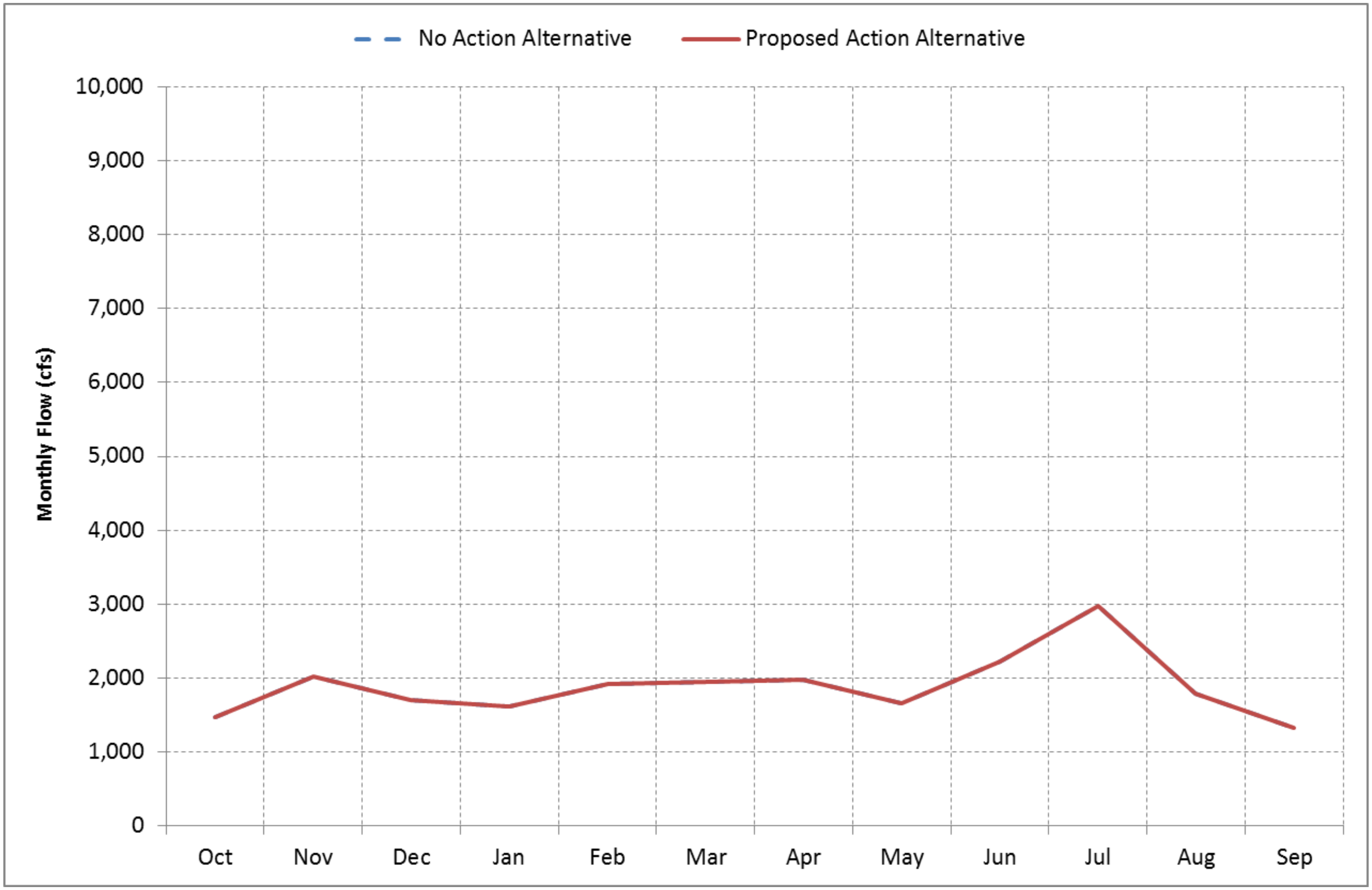
Figure A.3.3.14-4. American River downstream of Nimbus Dam, Below Normal Year* Long-Term Average Flow**



*As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

** Based on the 82-year simulation period.

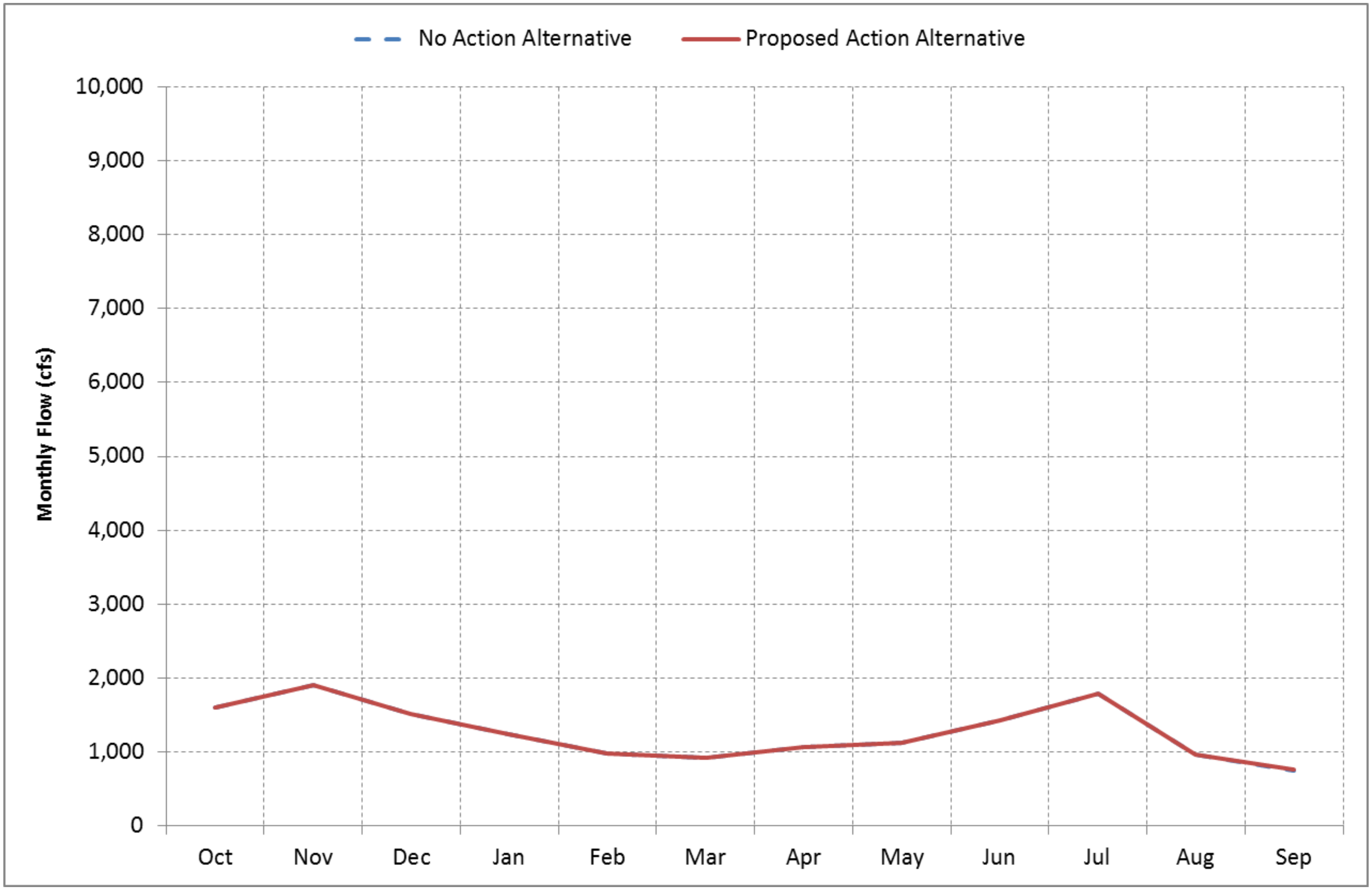
Figure A.3.3.14-5. American River downstream of Nimbus Dam, Dry Year* Long-Term Average Flow**



*As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

** Based on the 82-year simulation period.

Figure A.3.3.14-6. American River downstream of Nimbus Dam, Critical Dry Year* Long-Term Average Flow**



*As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

** Based on the 82-year simulation period.

Table A.3.3.14-1. American River downstream of Nimbus Dam, Monthly Flow

No Action Alternative

Statistic	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
	Monthly Flow (cfs)											
Probability of Exceedance[a]												
10%	2,499	4,705	8,723	11,063	12,786	9,738	6,715	7,717	6,273	5,000	3,841	4,528
20%	1,922	3,549	3,855	7,035	9,985	6,973	5,644	5,254	4,706	5,000	3,413	3,848
30%	1,605	3,023	2,173	5,016	7,101	4,748	4,218	4,084	3,657	4,715	2,391	2,758
40%	1,500	2,706	2,000	2,693	5,286	3,871	3,462	3,468	2,971	4,123	2,014	2,332
50%	1,500	1,925	2,000	1,750	3,000	2,944	2,611	2,559	2,450	3,653	1,861	1,659
60%	1,500	1,781	2,000	1,700	2,013	2,074	2,281	1,874	2,125	3,108	1,750	1,533
70%	1,500	1,632	1,697	1,700	1,445	1,750	1,750	1,659	1,750	2,709	1,750	1,530
80%	1,445	1,387	1,387	1,444	1,445	1,024	1,231	1,226	1,750	2,472	1,176	886
90%	993	800	800	928	1,085	800	800	809	1,024	1,989	800	800
Long Term												
Full Simulation Period[b]	1,646	2,644	3,291	4,499	5,181	4,030	3,370	3,338	3,160	3,538	2,132	2,220
Water Year Types[c]												
Wet	1,743	3,326	5,801	9,081	9,601	6,876	5,430	5,670	5,110	3,733	3,037	3,569
Above Normal	1,628	3,327	2,950	4,692	6,162	5,779	3,522	3,495	2,945	4,397	2,258	2,863
Below Normal	1,734	2,215	2,483	2,327	3,909	2,577	3,173	2,921	2,411	4,656	1,765	1,563
Dry	1,479	2,028	1,705	1,614	1,926	1,949	1,983	1,665	2,219	2,982	1,798	1,329
Critical	1,598	1,910	1,513	1,237	987	929	1,065	1,127	1,434	1,785	972	758

Proposed Action Alternative

Statistic	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
	Monthly Flow (cfs)											
Probability of Exceedance[a]												
10%	2,499	4,705	8,723	11,063	12,786	9,738	6,715	7,717	6,273	5,000	3,841	4,528
20%	1,922	3,549	3,855	7,035	9,985	6,973	5,644	5,254	4,706	5,000	3,412	3,848
30%	1,605	3,023	2,173	5,016	7,101	4,748	4,218	4,084	3,657	4,715	2,391	2,758
40%	1,500	2,706	2,000	2,693	5,286	3,871	3,462	3,468	2,971	4,123	2,014	2,332
50%	1,500	1,925	2,000	1,750	3,000	2,944	2,611	2,559	2,450	3,653	1,861	1,659
60%	1,500	1,781	2,000	1,700	2,013	2,074	2,281	1,874	2,125	3,108	1,750	1,533
70%	1,500	1,632	1,697	1,700	1,445	1,750	1,750	1,659	1,750	2,709	1,750	1,530
80%	1,445	1,387	1,387	1,444	1,445	1,024	1,231	1,226	1,750	2,472	1,176	886
90%	993	800	800	928	1,085	800	800	809	1,024	1,989	800	800
Long Term												
Full Simulation Period[b]	1,646	2,644	3,291	4,499	5,181	4,030	3,370	3,338	3,160	3,538	2,132	2,221
Water Year Types[c]												
Wet	1,743	3,326	5,801	9,081	9,601	6,876	5,430	5,670	5,110	3,733	3,037	3,569
Above Normal	1,628	3,327	2,950	4,692	6,162	5,779	3,522	3,495	2,945	4,397	2,258	2,863
Below Normal	1,734	2,215	2,483	2,327	3,909	2,577	3,173	2,921	2,411	4,656	1,765	1,563
Dry	1,479	2,028	1,705	1,614	1,926	1,949	1,983	1,665	2,219	2,982	1,798	1,329
Critical	1,598	1,910	1,513	1,237	987	929	1,065	1,127	1,434	1,785	972	761

Proposed Action Alternative minus No Action Alternative

Statistic	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
	Monthly Flow (cfs)											
Probability of Exceedance[a]												
10%	0	0	0	0	0	0	0	0	0	0	0	0
20%	0	0	0	0	0	0	0	0	0	0	0	0
30%	0	0	0	0	0	0	0	0	0	0	0	0
40%	0	0	0	0	0	0	0	0	0	0	0	0
50%	0	0	0	0	0	0	0	0	0	0	0	0
60%	0	0	0	0	0	0	0	0	0	0	0	0
70%	0	0	0	0	0	0	0	0	0	0	0	0
80%	0	0	0	0	0	0	0	0	0	0	0	0
90%	0	0	0	0	0	0	0	0	0	0	0	0
Long Term												
Full Simulation Period[b]	0	0	0	0	0	0	0	0	0	0	0	1
Water Year Types[c]												
Wet	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0
Critical	0	0	0	0	0	0	0	0	0	0	0	4

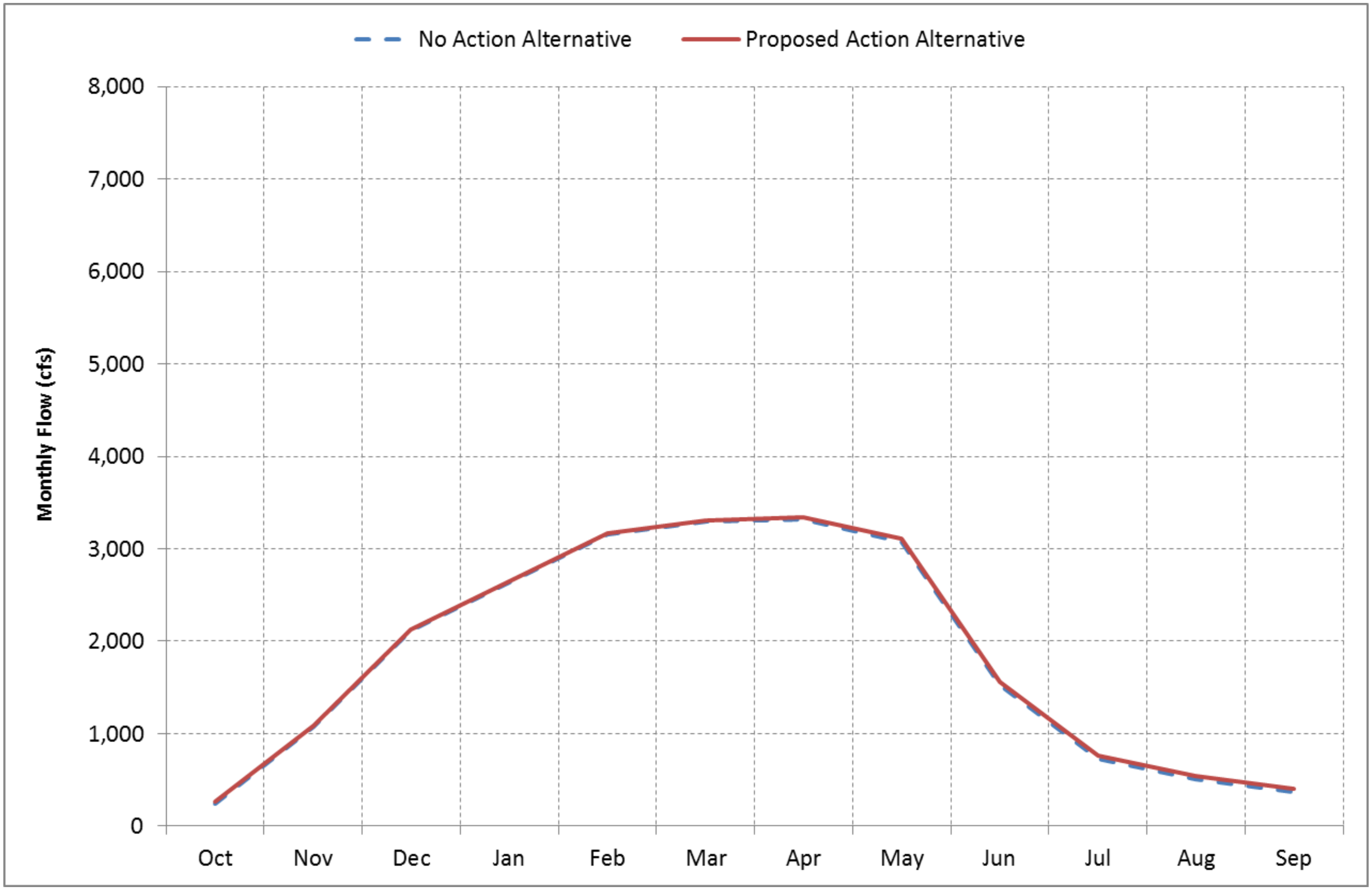
a Exceedance probability is defined as the probability a given value will be exceeded in any one year

b Based on the 82-year simulation period

c As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

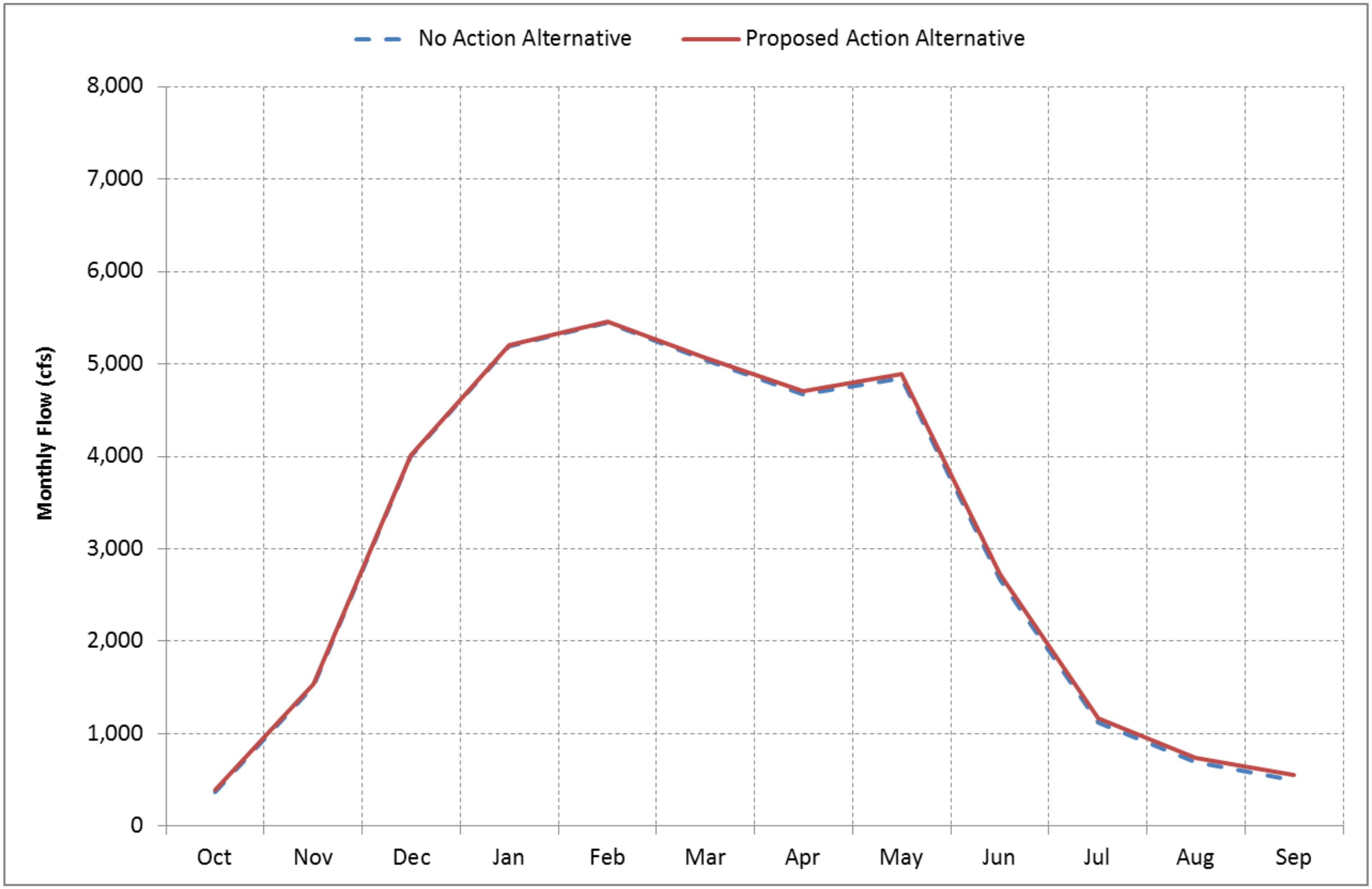
A.3.3.15. North Fork American River Flow below American River Pump Station

Figure A.3.3.15-1. North Fork American River below American River Pump Station, Long-Term* Average Flow



* Based on the 82-year simulation period.

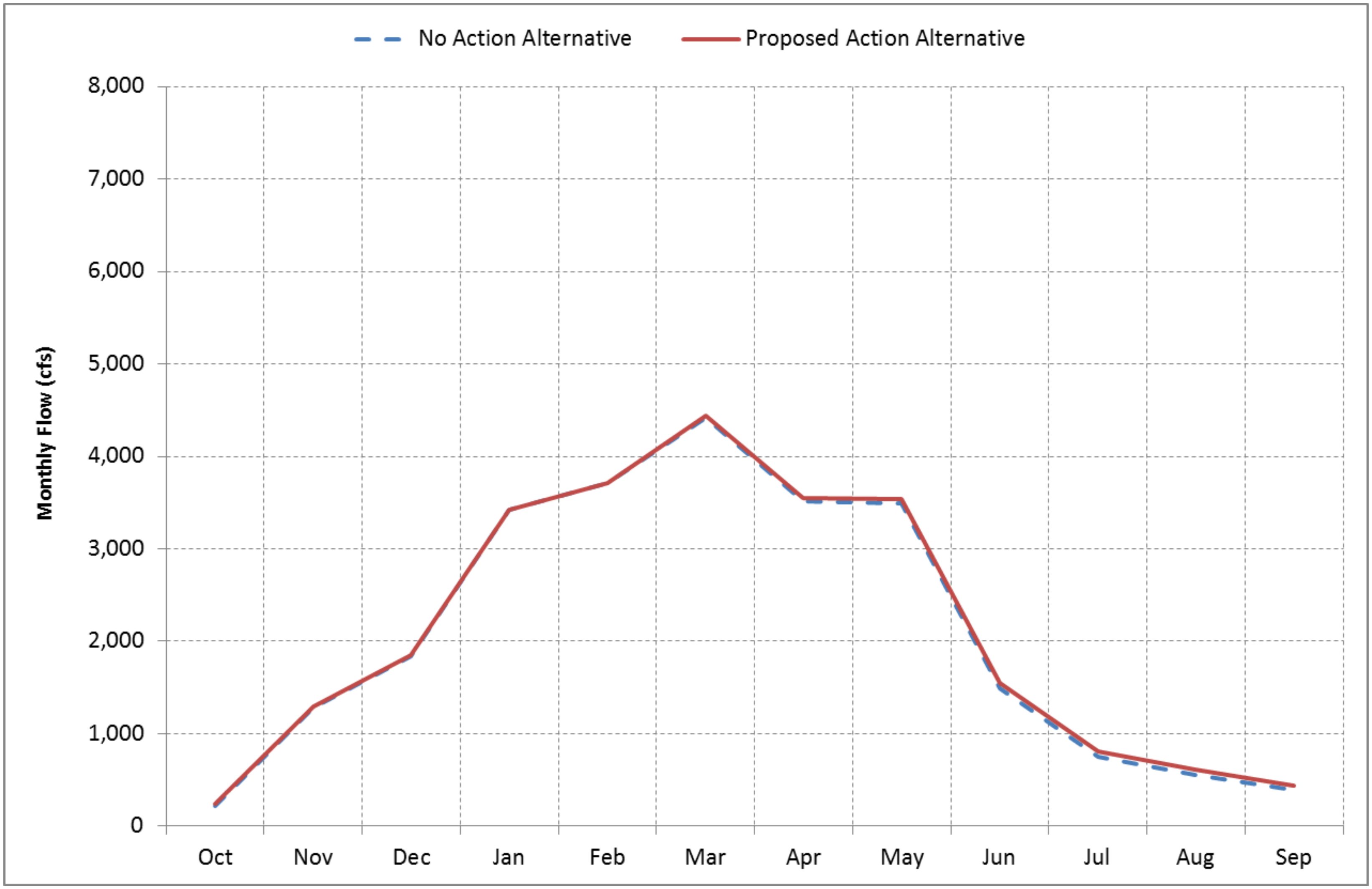
Figure A.3.3.15-2. North Fork American River below American River Pump Station, Wet Year* Long-Term** Average Flow



*As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

** Based on the 82-year simulation period.

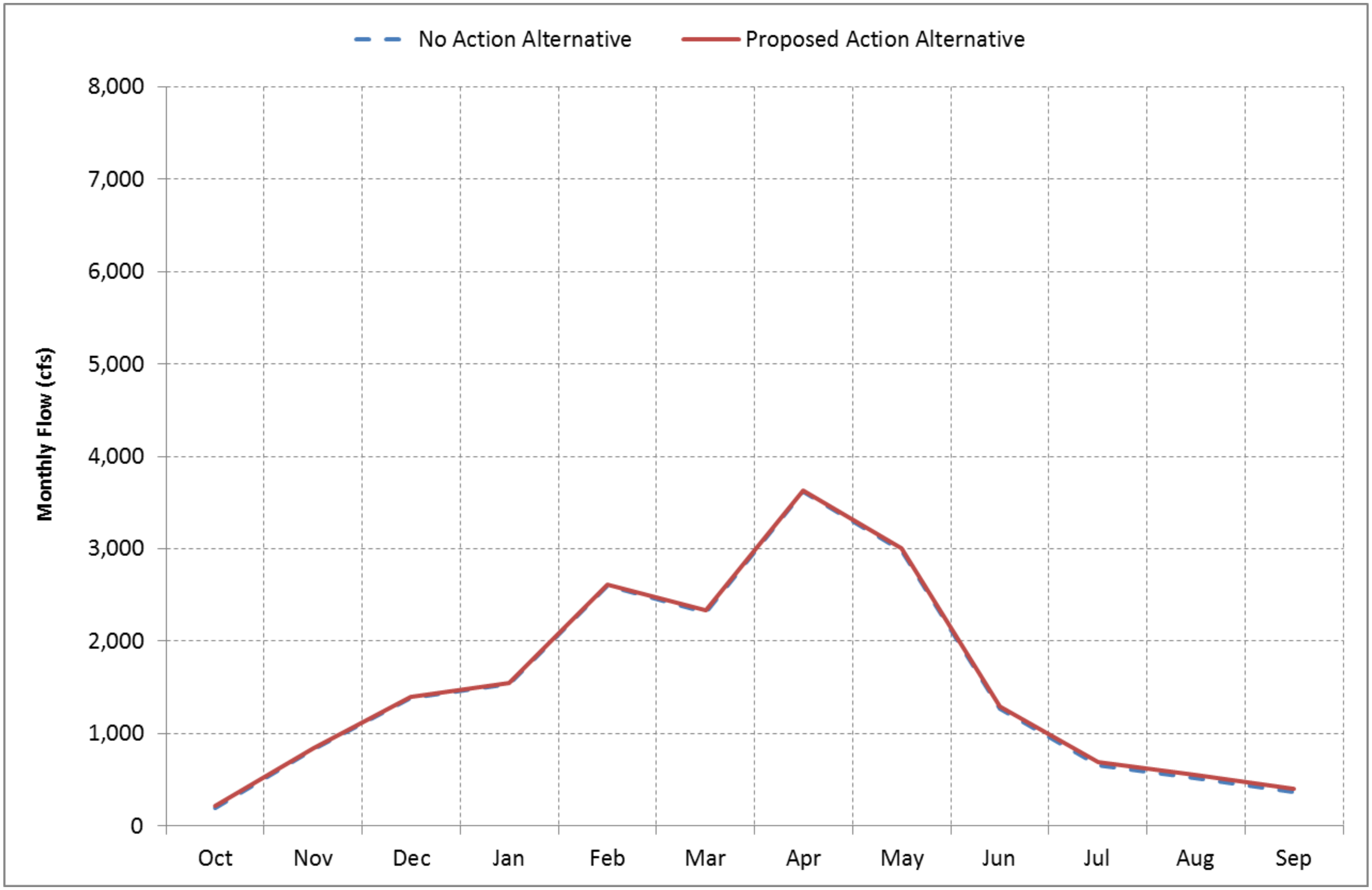
Figure A.3.3.15-3. North Fork American River below American River Pump Station, Above Normal Year* Long-Term Average Flow**



*As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

** Based on the 82-year simulation period.

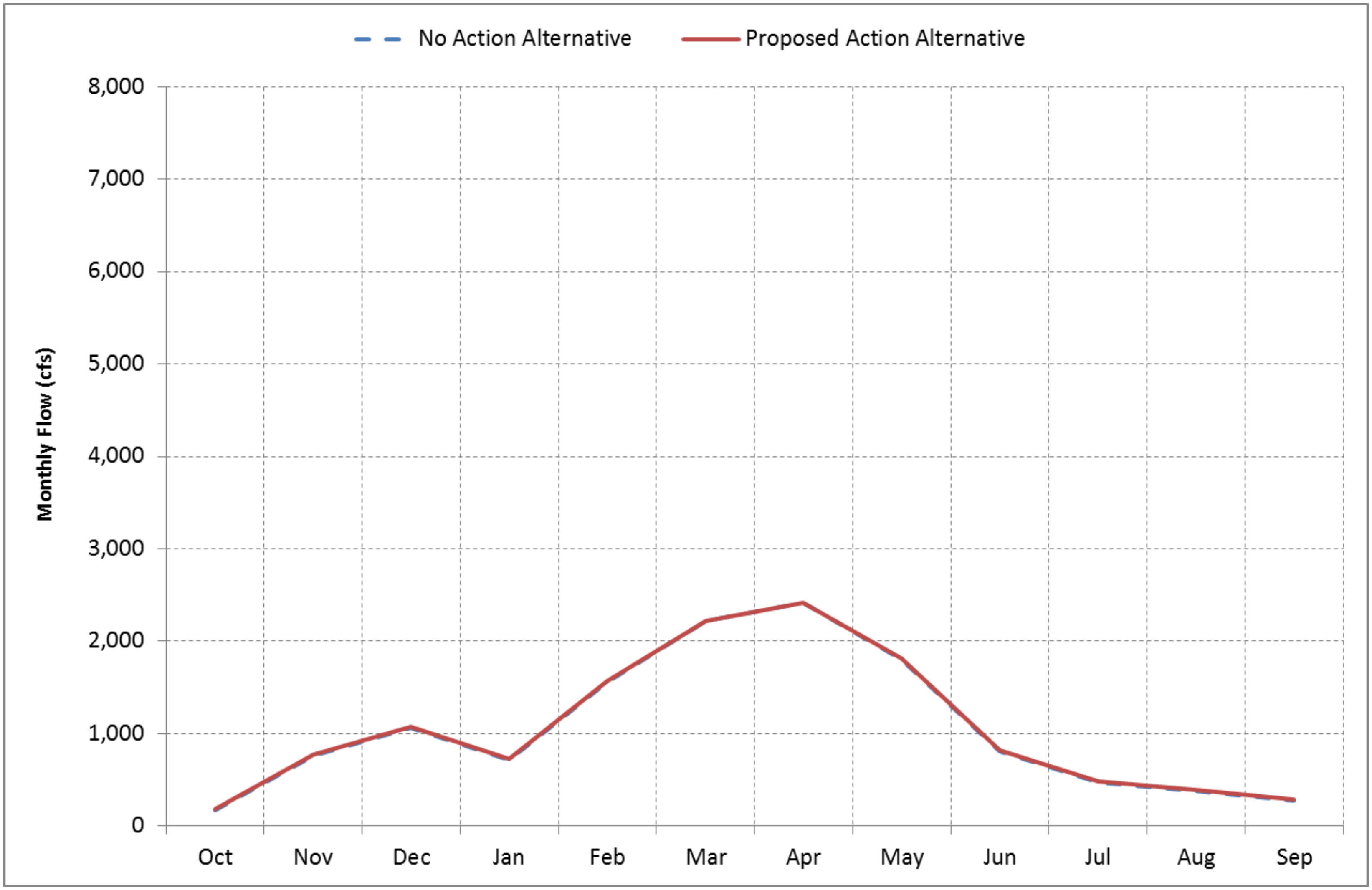
Figure A.3.3.15-4. North Fork American River below American River Pump Station, Below Normal Year* Long-Term Average Flow**



*As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

** Based on the 82-year simulation period.

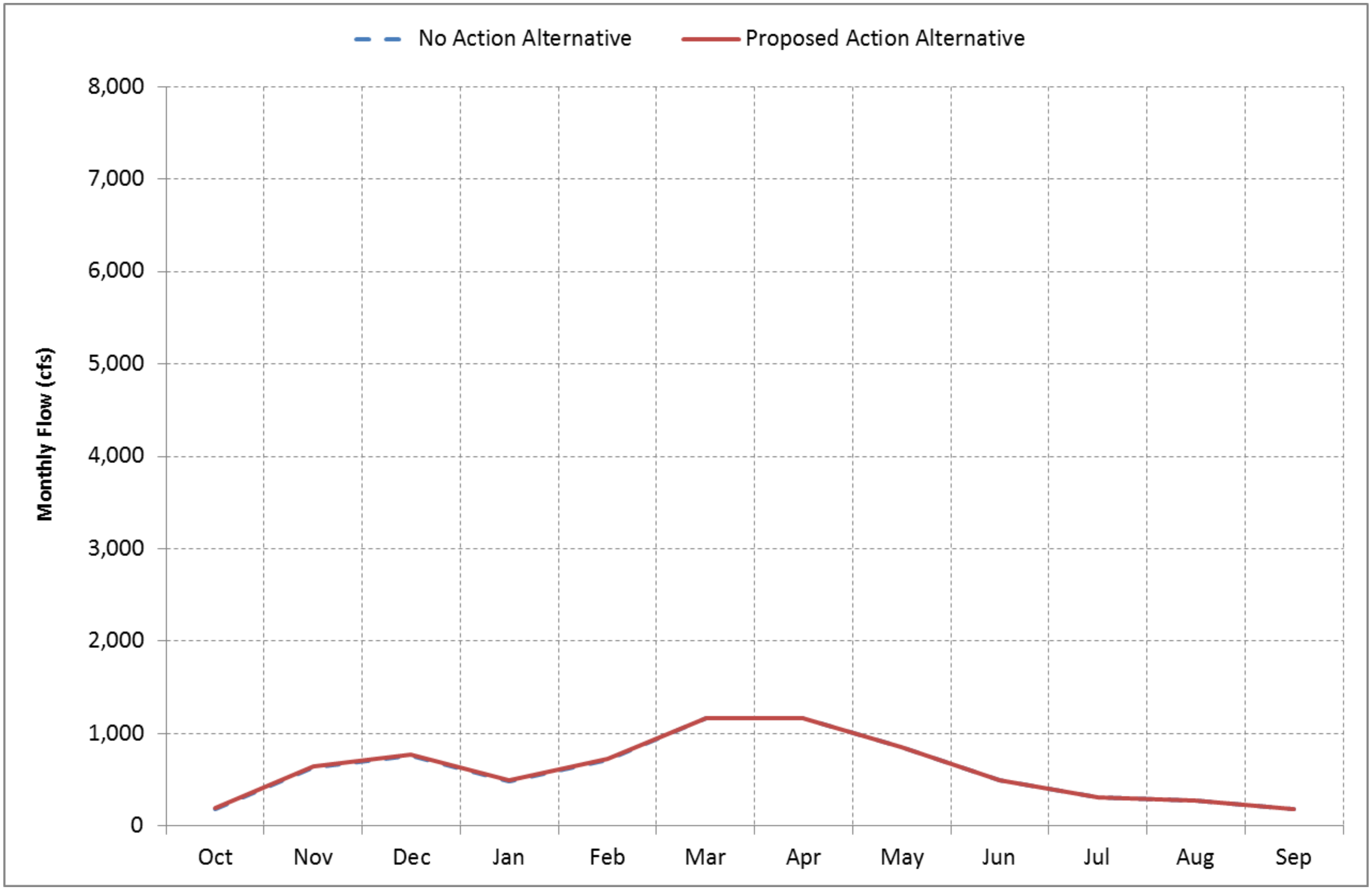
Figure A.3.3.15-5. North Fork American River below American River Pump Station, Dry Year* Long-Term Average Flow**



*As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

** Based on the 82-year simulation period.

Figure A.3.3.15-6. North Fork American River below American River Pump Station, Critical Dry Year* Long-Term Average Flow**



*As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

** Based on the 82-year simulation period.

Table A.3.3.15-1. North Fork American River below American River Pump Station, Monthly Flow

No Action Alternative

	Monthly Flow (cfs)											
Statistic	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Probability of Exceedance[a]												
10%	348	1,734	4,795	6,463	6,919	6,863	5,649	6,294	3,218	1,210	785	494
20%	259	1,309	3,282	4,542	5,185	4,963	4,602	4,661	2,490	1,010	639	440
30%	239	1,131	2,022	3,540	3,881	3,808	4,181	4,011	2,022	851	592	401
40%	214	908	1,463	2,458	3,305	3,315	3,609	3,552	1,429	701	555	384
50%	194	829	1,192	1,330	2,485	2,771	3,182	3,008	1,260	644	524	362
60%	184	695	1,007	1,062	1,812	2,325	2,923	2,334	915	559	484	343
70%	155	633	894	737	1,285	1,834	2,156	1,724	721	503	419	305
80%	134	541	736	407	924	1,628	1,623	1,150	526	375	294	243
90%	123	392	619	307	745	1,128	1,307	707	316	283	244	200
Long Term												
Full Simulation Period[b]	246	1,069	2,119	2,635	3,158	3,298	3,316	3,078	1,530	726	513	365
Water Year Types[c]												
Wet	367	1,517	4,000	5,188	5,441	5,038	4,675	4,848	2,670	1,117	690	498
Above Normal	224	1,279	1,836	3,418	3,707	4,418	3,520	3,495	1,493	749	558	389
Below Normal	197	826	1,388	1,534	2,601	2,316	3,614	2,980	1,266	657	525	365
Dry	168	763	1,067	718	1,555	2,218	2,413	1,802	805	472	377	277
Critical	183	632	759	484	719	1,169	1,172	855	492	317	273	185

Proposed Action Alternative

	Monthly Flow (cfs)											
Statistic	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Probability of Exceedance[a]												
10%	366	1,734	4,816	6,483	6,919	6,889	5,686	6,346	3,278	1,271	844	553
20%	295	1,315	3,282	4,555	5,206	4,989	4,638	4,713	2,550	1,071	698	499
30%	272	1,159	2,042	3,559	3,886	3,833	4,217	4,063	2,082	912	652	457
40%	236	927	1,476	2,478	3,305	3,320	3,646	3,605	1,474	762	614	426
50%	220	858	1,192	1,336	2,485	2,797	3,218	3,010	1,263	705	579	412
60%	196	719	1,028	1,081	1,834	2,350	2,960	2,334	964	580	501	384
70%	175	658	914	737	1,307	1,860	2,156	1,724	748	538	419	307
80%	154	566	753	411	945	1,628	1,623	1,150	530	375	294	243
90%	123	392	640	324	767	1,128	1,307	707	316	283	244	200
Long Term												
Full Simulation Period[b]	266	1,085	2,131	2,646	3,170	3,312	3,336	3,108	1,563	760	546	398
Water Year Types[c]												
Wet	388	1,534	4,012	5,199	5,453	5,061	4,707	4,895	2,723	1,171	742	550
Above Normal	237	1,291	1,845	3,426	3,716	4,442	3,553	3,543	1,548	805	612	443
Below Normal	223	846	1,403	1,548	2,617	2,331	3,635	3,010	1,300	692	559	399
Dry	186	777	1,078	728	1,566	2,224	2,421	1,813	818	486	391	290
Critical	201	646	769	493	730	1,169	1,172	855	492	317	273	185

Proposed Action Alternative minus No Action Alternative

	Monthly Flow (cfs)											
Statistic	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Probability of Exceedance[a]												
10%	17	0	21	19	0	26	36	53	60	61	59	59
20%	36	6	0	14	21	26	36	53	60	61	59	59
30%	33	28	21	19	5	26	36	53	60	61	59	56
40%	22	19	13	19	0	5	36	53	45	61	59	42
50%	26	28	0	6	0	26	36	3	3	61	55	50
60%	12	24	21	19	22	26	36	0	49	22	17	41
70%	20	25	20	0	22	26	0	0	27	34	0	3
80%	20	26	17	4	21	0	0	0	4	0	0	0
90%	0	0	21	17	22	0	0	0	0	0	0	0
Long Term												
Full Simulation Period[b]	20	15	11	11	12	14	20	29	34	34	33	33
Water Year Types[c]												
Wet	21	16	12	11	12	23	32	46	53	54	52	52
Above Normal	14	12	9	8	9	23	33	48	55	56	54	54
Below Normal	26	20	15	14	15	15	21	30	34	35	34	34
Dry	18	14	10	10	11	6	8	12	13	14	13	13
Critical	18	14	10	10	11	0	0	0	0	0	0	0

a Exceedance probability is defined as the probability a given value will be exceeded in any one year

b Based on the 82-year simulation period

c As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

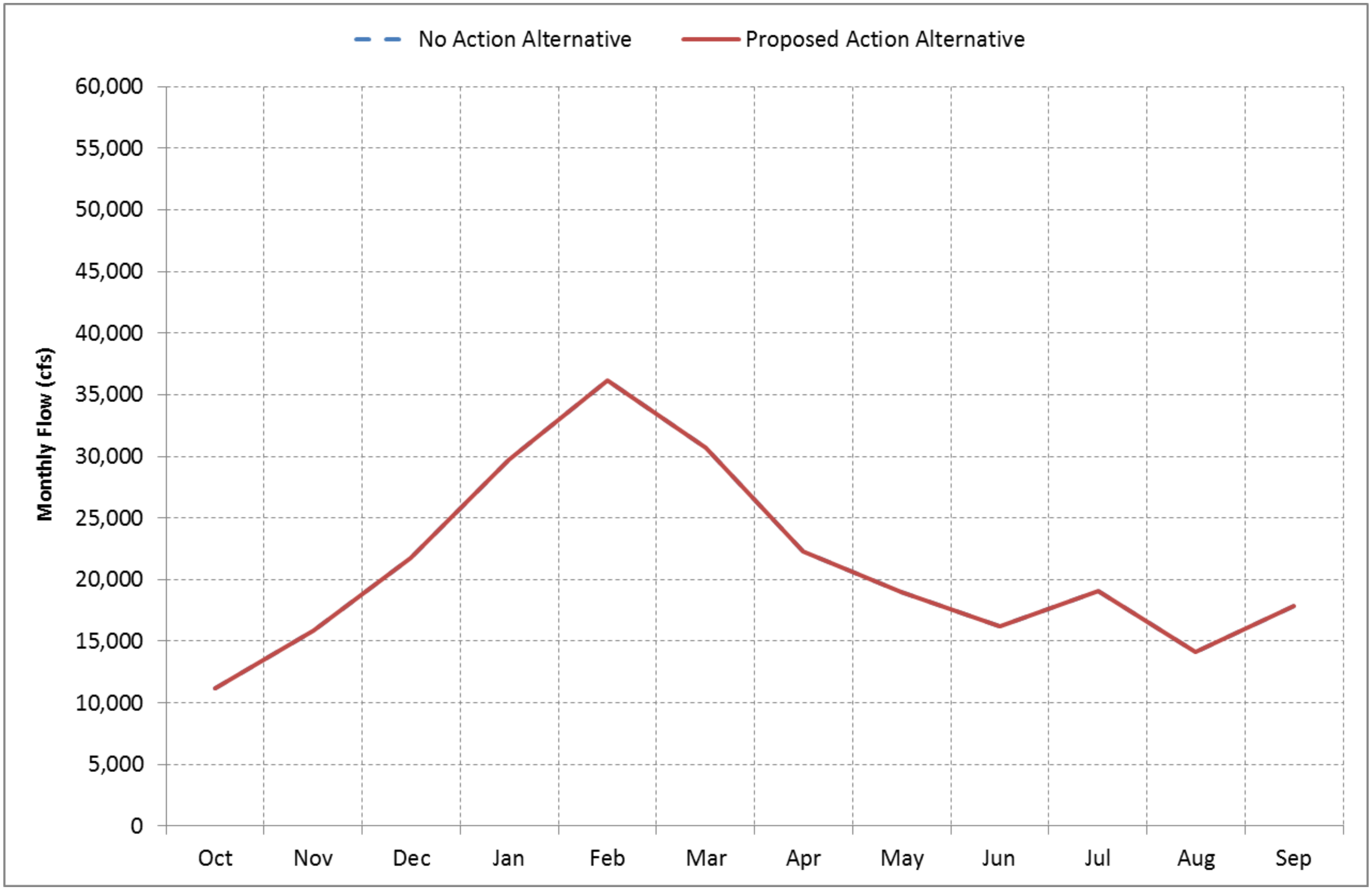
Table A.3.3.15-2. North Fork American River below American River Pump Station, Annual Flow

Average Annual Flow Volume, TAF			
	No Action Alternative	**Proposed Action Alternative**	**Proposed Action minus No Action**
Full Simulation Period[a]	1,326	1,343	17
Water Year Types[b]			
Wet	2,167	2,191	24
Above Normal	1,510	1,533	23
Below Normal	1,098	1,115	17
Dry	760	769	9
Critical Dry	437	440	3

a based on the 82-year simulation period
b As defined by the Sacramento Valley 40-30-30 index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

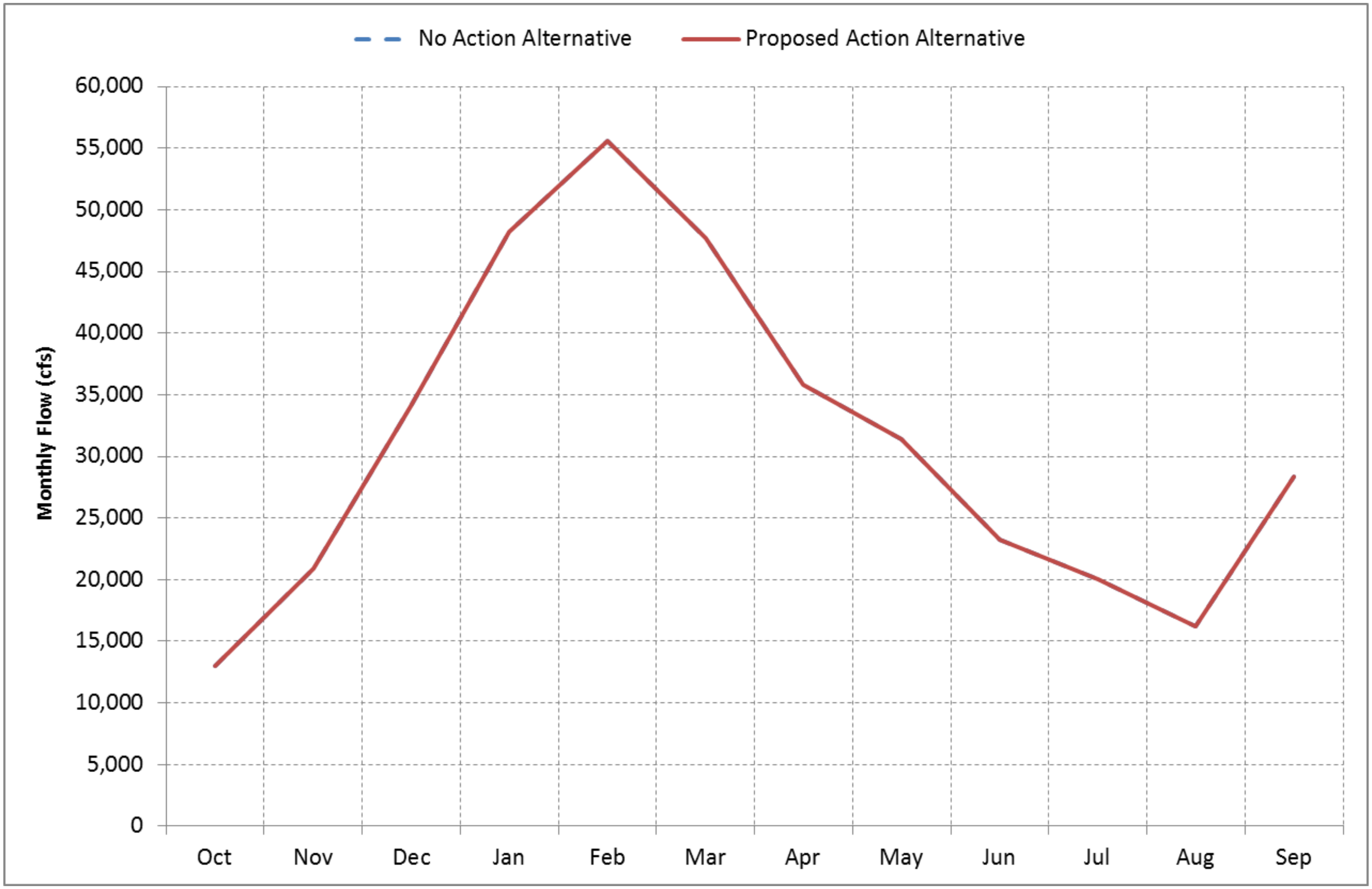
A.3.3.16. Sacramento River Flow at Freeport

Figure A.3.3.16-1. Sacramento River at Freeport, Long-Term* Average Flow



* Based on the 82-year simulation period.

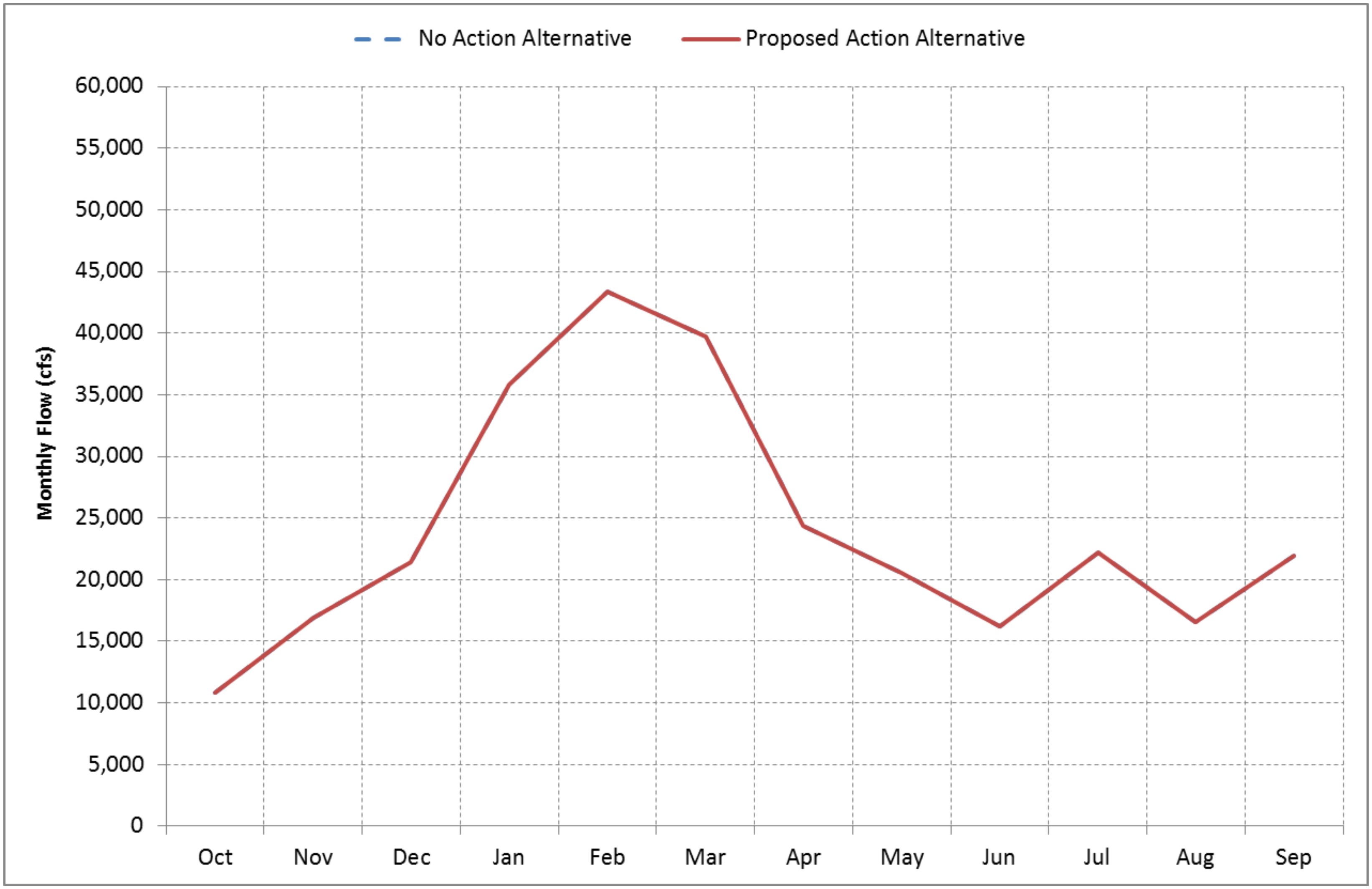
Figure A.3.3.16-2. Sacramento River at Freeport, Wet Year* Long-Term Average Flow**



*As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

** Based on the 82-year simulation period.

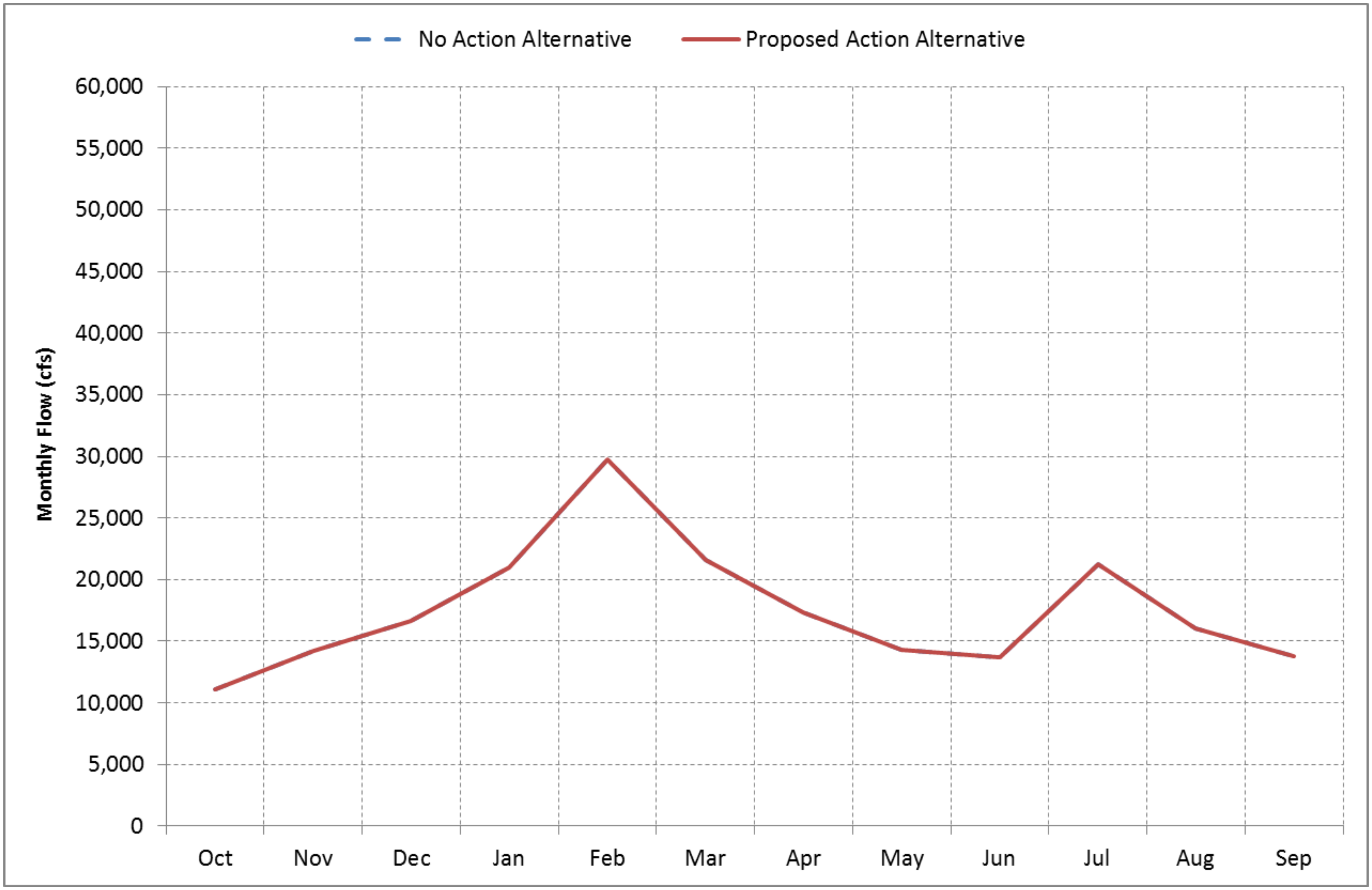
Figure A.3.3.16-3. Sacramento River at Freeport, Above Normal Year* Long-Term Average Flow**



*As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

** Based on the 82-year simulation period.

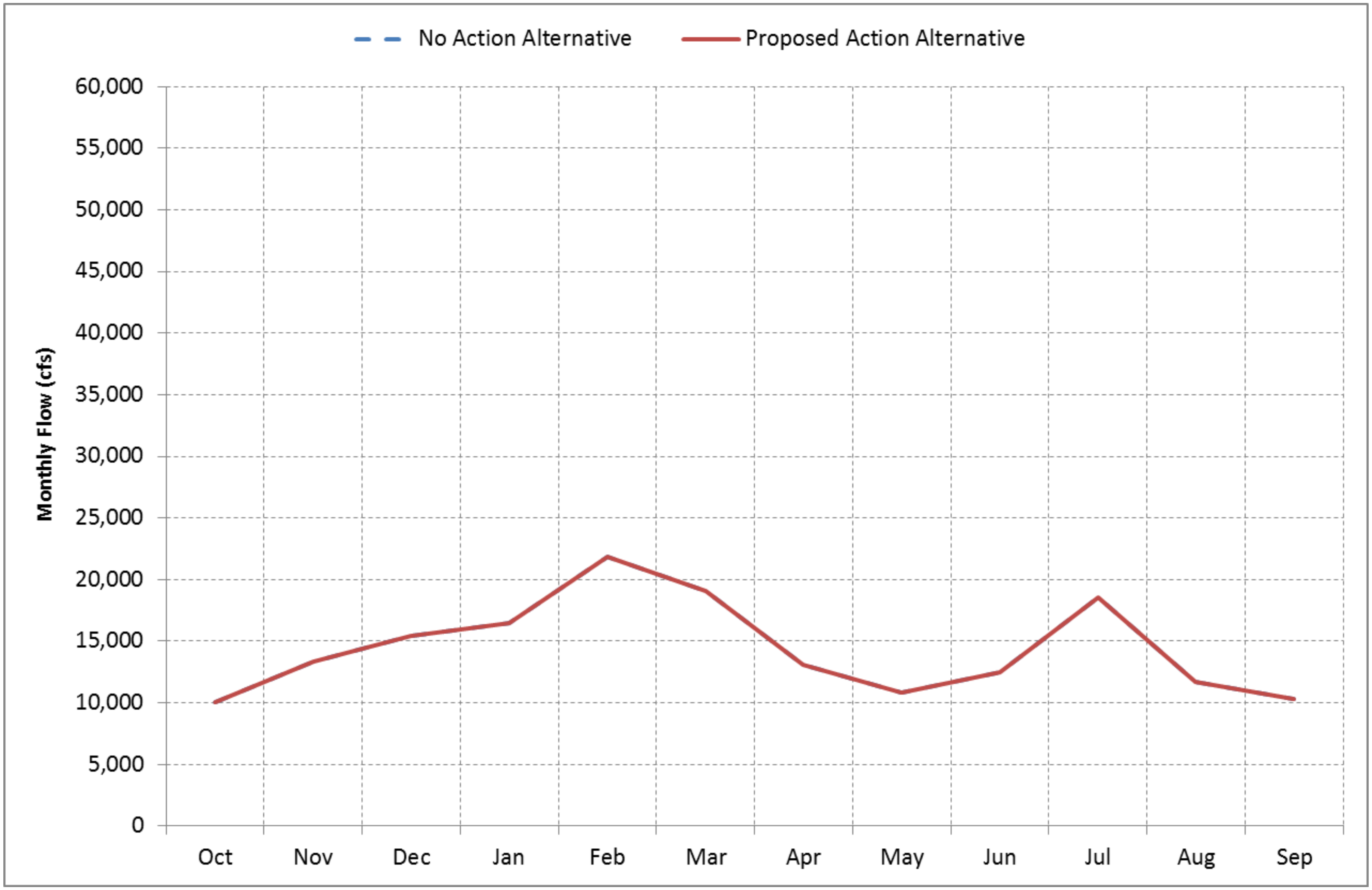
Figure A.3.3.16-4. Sacramento River at Freeport, Below Normal Year* Long-Term Average Flow**



*As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

** Based on the 82-year simulation period.

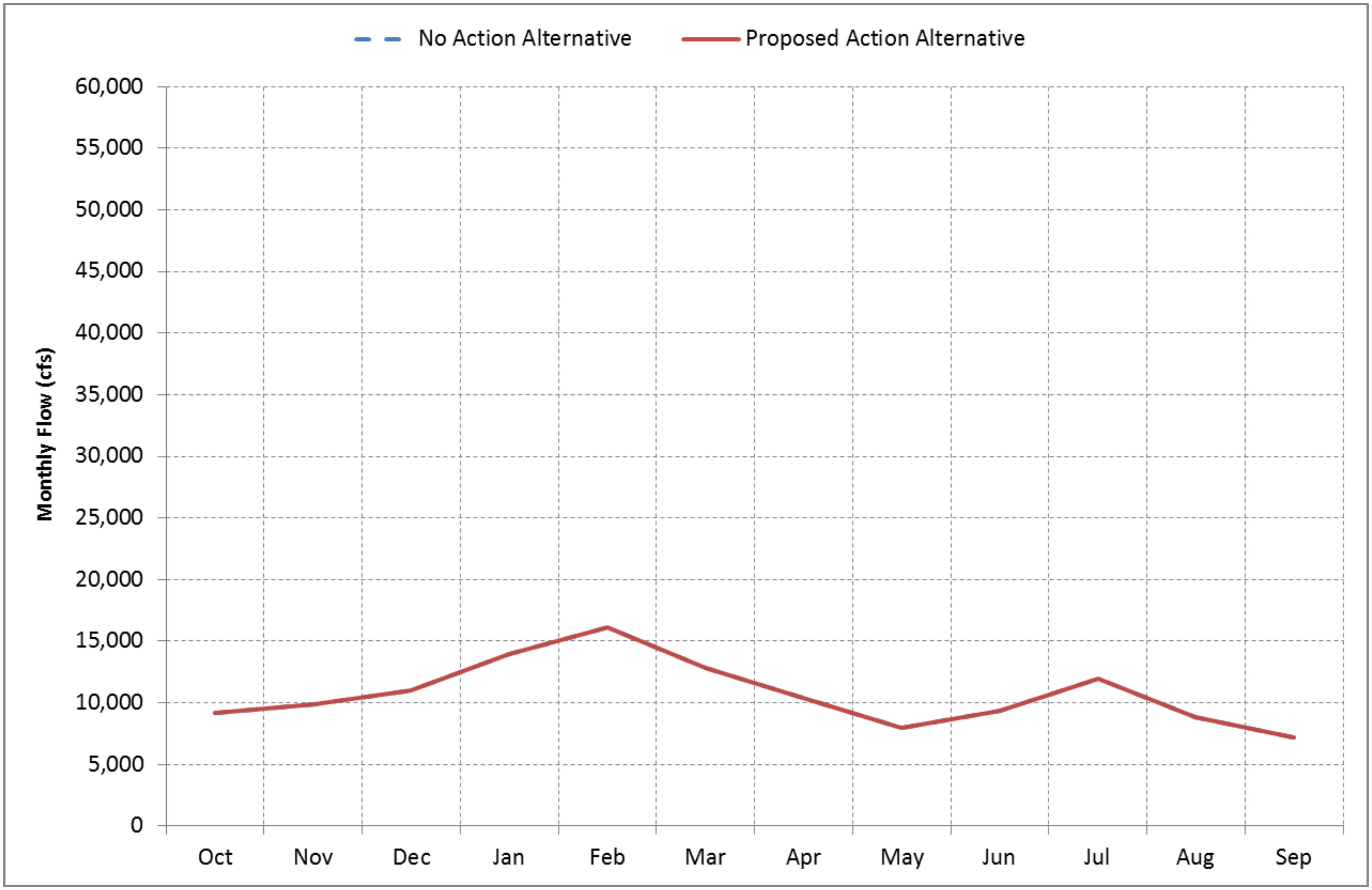
Figure A.3.3.16-5. Sacramento River at Freeport, Dry Year* Long-Term Average Flow**



*As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

** Based on the 82-year simulation period.

Figure A.3.3.16-6. Sacramento River at Freeport, Critical Dry Year* Long-Term Average Flow**



*As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

** Based on the 82-year simulation period.

Table A.3.3.16-1. Sacramento River at Freeport, Monthly Flow

No Action Alternative

	Monthly Flow (cfs)											
Statistic	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Probability of Exceedance[a]												
10%	14,654	24,563	48,476	62,269	68,157	61,865	51,389	42,267	28,298	24,063	17,268	29,531
20%	13,307	19,848	30,613	53,788	58,847	52,051	34,443	29,166	20,022	23,156	16,933	29,118
30%	12,942	18,994	21,591	39,964	49,284	36,000	23,629	19,282	15,386	22,262	16,521	23,776
40%	12,300	16,820	18,131	24,123	42,481	30,550	20,163	15,000	13,845	20,528	15,905	21,671
50%	11,212	15,490	15,576	21,536	31,598	24,475	16,668	13,704	13,489	19,933	15,482	15,323
60%	10,646	13,142	14,976	18,710	24,819	20,588	13,447	12,080	12,852	19,510	14,943	14,085
70%	8,925	10,285	14,281	14,609	18,749	18,218	11,952	10,801	12,416	17,481	12,420	10,798
80%	7,929	8,810	11,676	13,491	16,373	14,863	10,973	10,090	11,154	15,314	10,778	8,930
90%	6,762	7,375	9,424	11,693	14,118	11,304	9,649	8,895	10,025	12,649	8,876	6,907
Long Term												
Full Simulation Period[b]	11,162	15,906	21,787	29,762	36,194	30,679	22,273	18,967	16,192	19,069	14,163	17,840
Water Year Types[c]												
Wet	13,025	20,878	34,118	48,195	55,584	47,715	35,789	31,426	23,216	20,064	16,189	28,338
Above Normal	10,812	16,942	21,418	35,802	43,334	39,678	24,388	20,507	16,244	22,201	16,591	21,896
Below Normal	11,077	14,238	16,605	20,941	29,764	21,549	17,322	14,325	13,728	21,269	16,034	13,745
Dry	10,073	13,341	15,410	16,499	21,833	19,077	13,105	10,876	12,488	18,587	11,714	10,271
Critical	9,206	9,893	11,047	13,970	16,088	12,825	10,401	7,987	9,353	11,935	8,833	7,170

Proposed Action Alternative

	Monthly Flow (cfs)											
Statistic	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Probability of Exceedance[a]												
10%	14,654	24,563	48,476	62,269	68,157	61,865	51,389	42,267	28,298	24,063	17,268	29,531
20%	13,307	19,848	30,613	53,788	58,847	52,050	34,443	29,166	20,022	23,156	16,933	29,118
30%	12,942	18,994	21,591	39,964	49,284	36,000	23,629	19,282	15,386	22,262	16,521	23,776
40%	12,300	16,820	18,131	24,123	42,481	30,550	20,163	15,000	13,845	20,528	15,905	21,671
50%	11,212	15,490	15,576	21,536	31,598	24,475	16,668	13,704	13,489	19,933	15,482	15,323
60%	10,646	13,142	14,976	18,710	24,819	20,588	13,447	12,080	12,852	19,510	14,943	14,085
70%	8,925	10,285	14,281	14,609	18,749	18,218	11,952	10,801	12,416	17,481	12,420	10,798
80%	7,929	8,810	11,676	13,491	16,373	14,863	10,973	10,090	11,154	15,314	10,778	8,930
90%	6,762	7,375	9,424	11,693	14,118	11,304	9,649	8,895	10,025	12,649	8,876	6,907
Long Term												
Full Simulation Period[b]	11,162	15,906	21,787	29,762	36,194	30,679	22,273	18,967	16,192	19,069	14,163	17,840
Water Year Types[c]												
Wet	13,025	20,877	34,118	48,195	55,584	47,715	35,789	31,426	23,216	20,064	16,189	28,338
Above Normal	10,812	16,942	21,418	35,802	43,334	39,678	24,388	20,507	16,244	22,201	16,591	21,896
Below Normal	11,077	14,238	16,605	20,941	29,764	21,549	17,322	14,325	13,728	21,269	16,034	13,744
Dry	10,073	13,340	15,410	16,499	21,833	19,077	13,105	10,876	12,488	18,587	11,714	10,271
Critical	9,205	9,893	11,047	13,970	16,088	12,825	10,401	7,987	9,352	11,935	8,833	7,169

Proposed Action Alternative minus No Action Alternative

	Monthly Flow (cfs)											
Statistic	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Probability of Exceedance[a]												
10%	0	0	0	0	0	0	0	0	0	0	0	0
20%	0	0	0	0	0	0	0	0	0	0	0	0
30%	0	0	0	0	0	0	0	0	0	0	0	0
40%	0	0	0	0	0	0	0	0	0	0	0	0
50%	0	0	0	0	0	0	0	0	0	0	0	0
60%	0	0	0	0	0	0	0	0	0	0	0	0
70%	0	0	0	0	0	0	0	0	0	0	0	0
80%	0	0	0	0	0	0	0	0	0	0	0	0
90%	0	0	0	0	0	0	0	0	0	0	0	0
Long Term												
Full Simulation Period[b]	0	0	0	0	0	0	0	0	0	0	0	0
Water Year Types[c]												
Wet	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	1	0	0	0	0	0	0	0	0	0	0
Critical	0	0	0	0	0	0	0	0	0	0	0	0

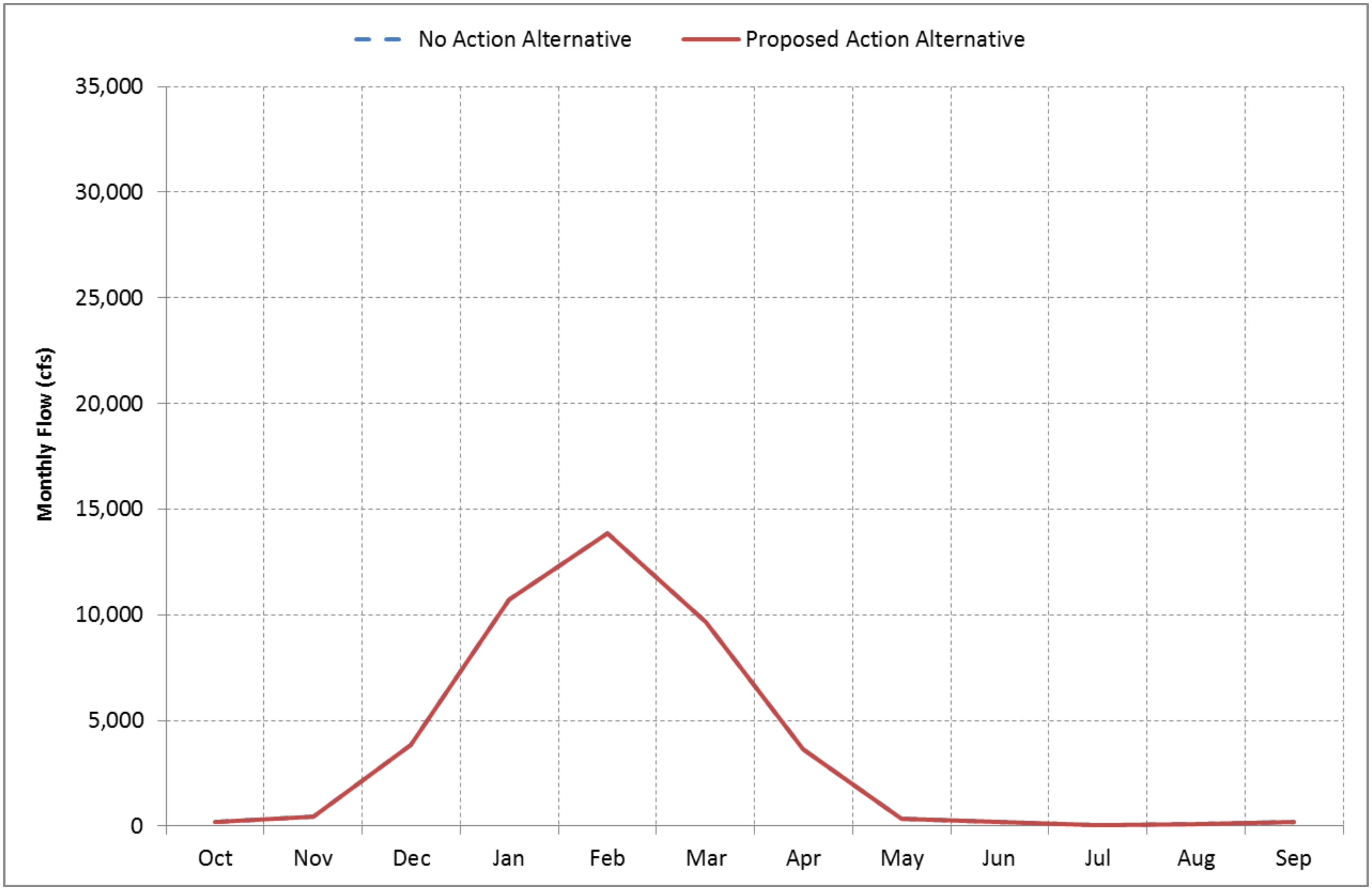
a Exceedance probability is defined as the probability a given value will be exceeded in any one year

b Based on the 82-year simulation period

c As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

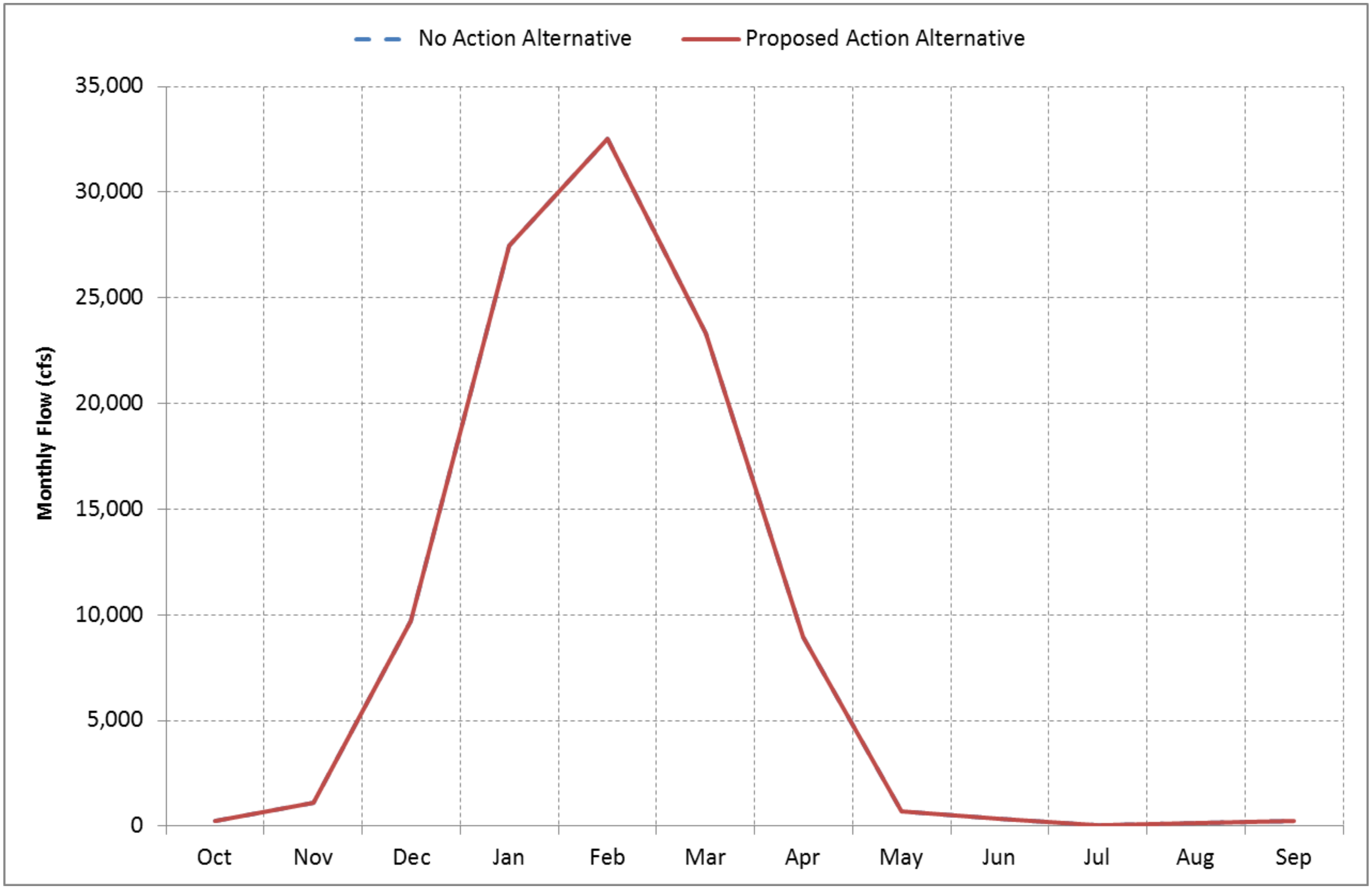
A.3.3.17. Yolo Bypass Flow

Figure A.3.3.17-1. Yolo Bypass, Long-Term* Average Flow



* Based on the 82-year simulation period.

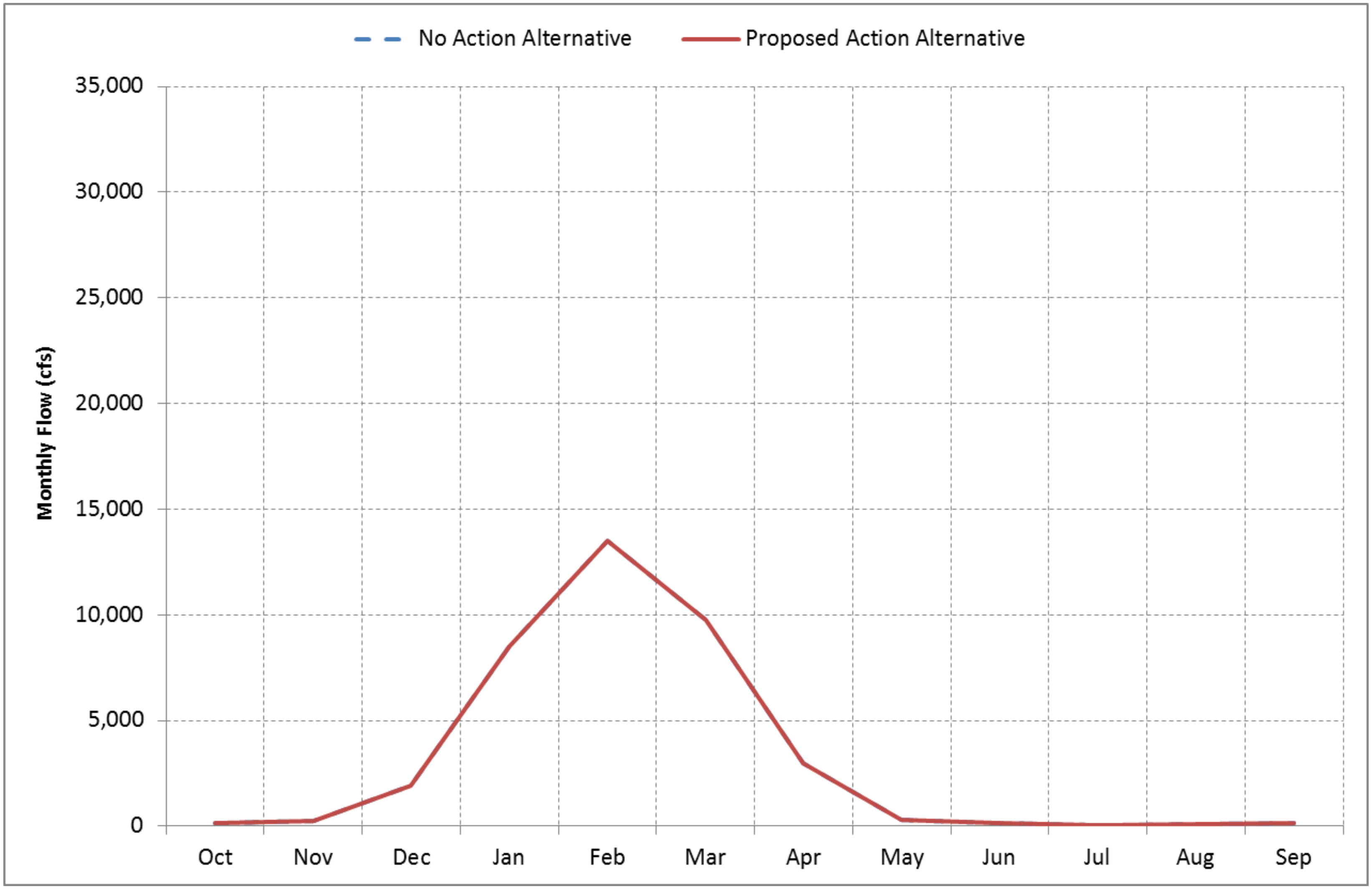
Figure A.3.3.17-2. Yolo Bypass, Wet Year* Long-Term Average Flow**



*As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

** Based on the 82-year simulation period.

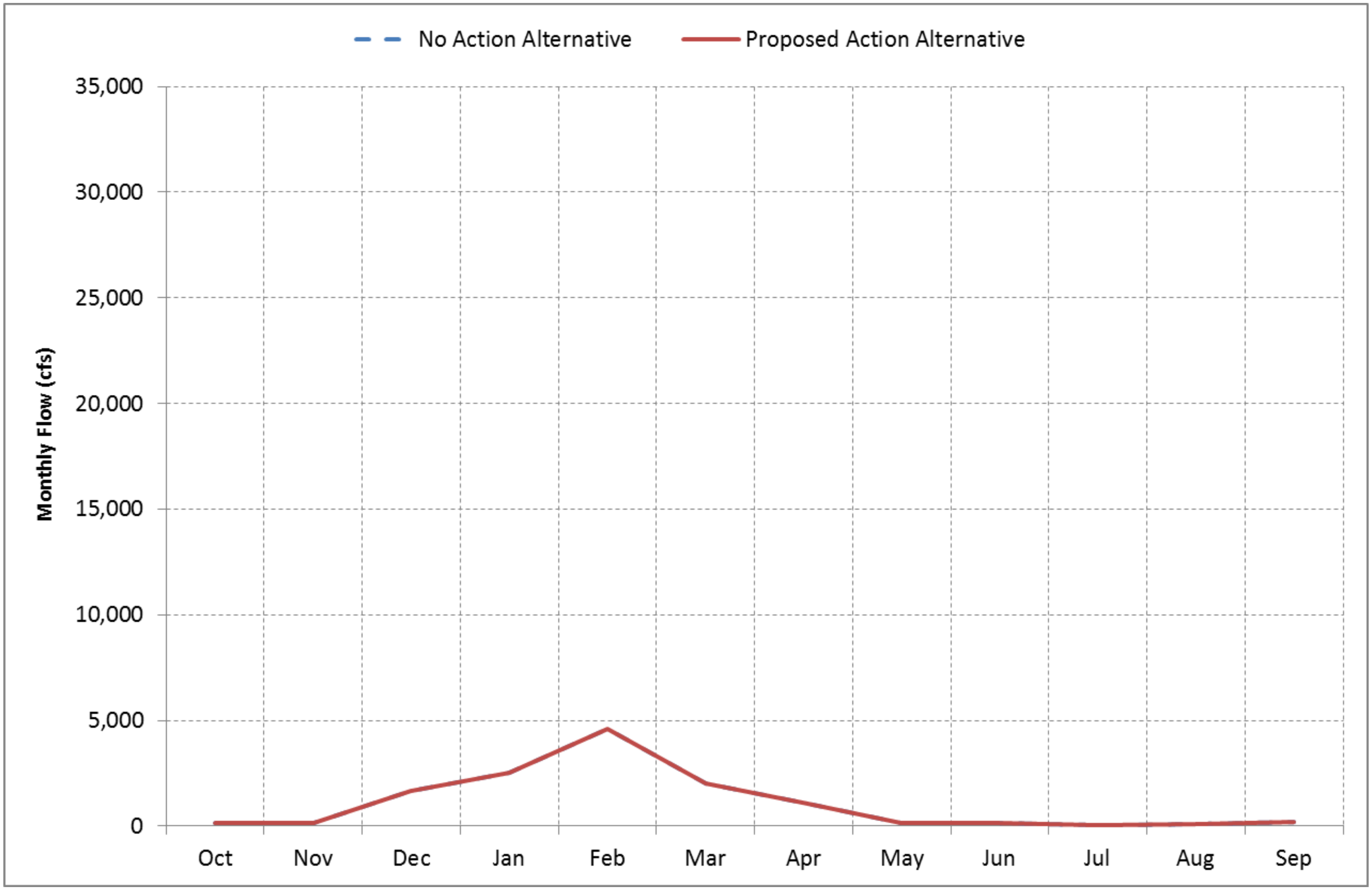
Figure A.3.3.17-3. Yolo Bypass, Above Normal Year* Long-Term Average Flow**



*As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

** Based on the 82-year simulation period.

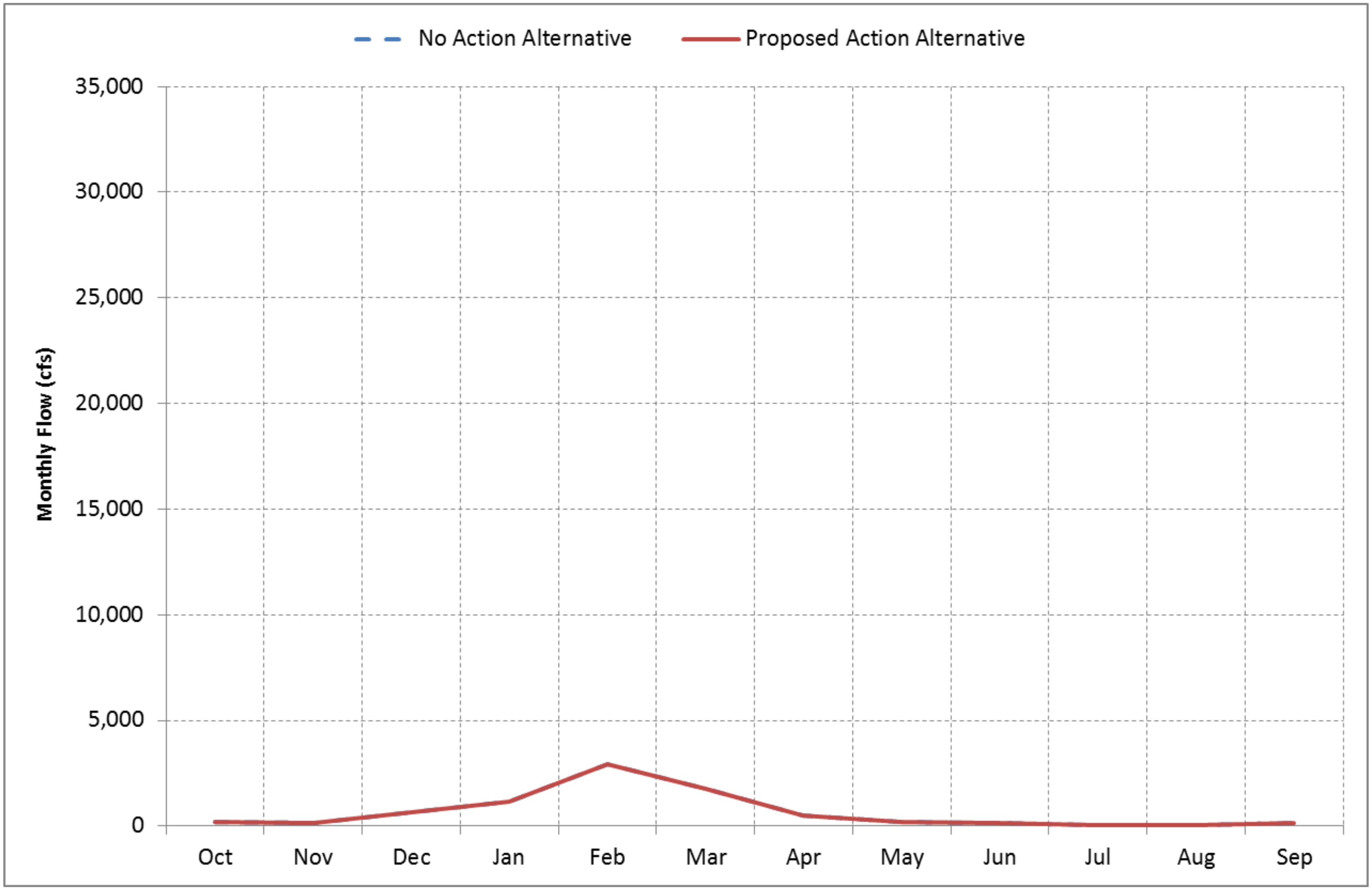
Figure A.3.3.17-4. Yolo Bypass, Below Normal Year* Long-Term Average Flow**



*As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

** Based on the 82-year simulation period.

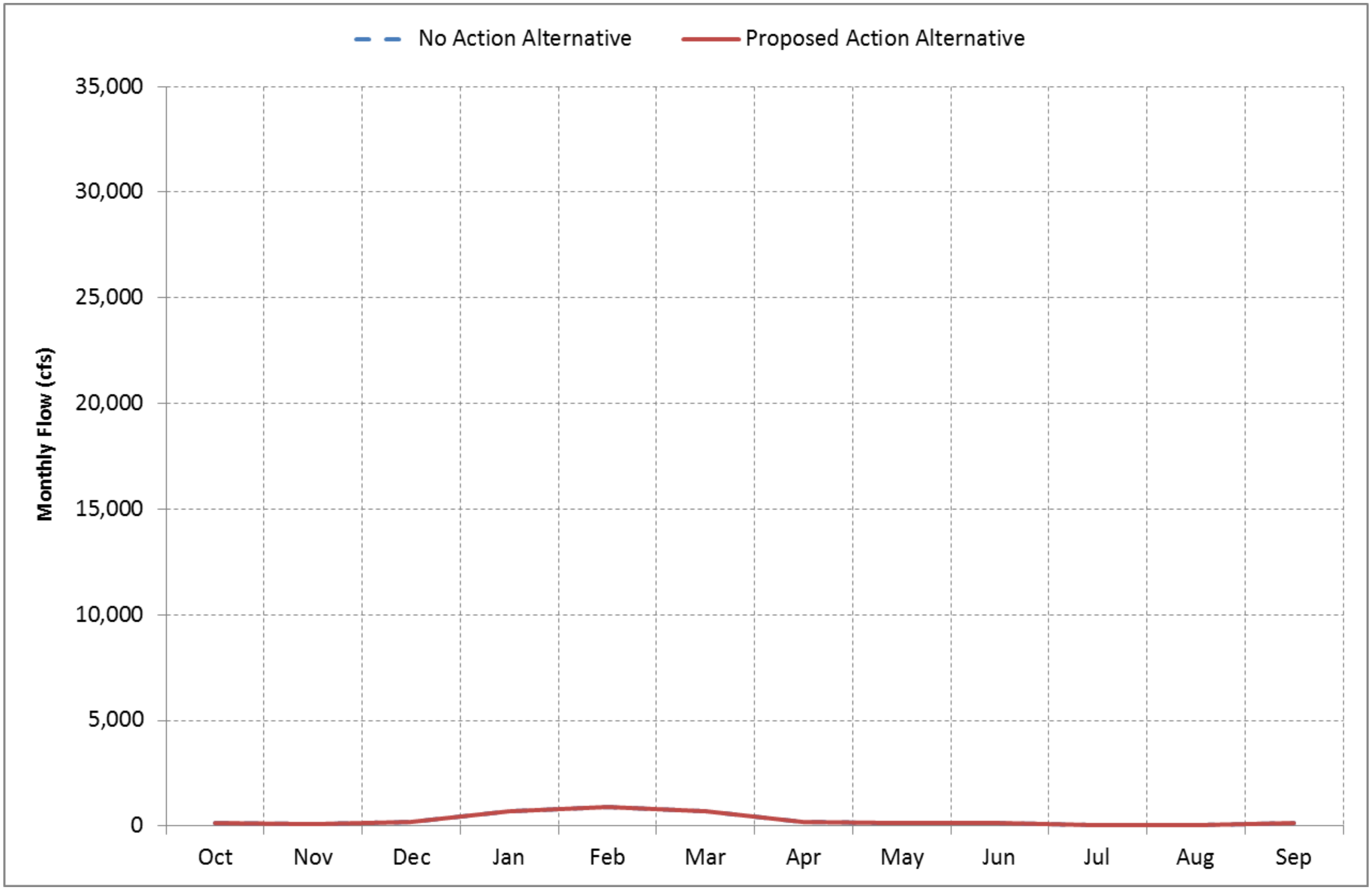
Figure A.3.3.17-5. Yolo Bypass, Dry Year* Long-Term Average Flow**



*As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

** Based on the 82-year simulation period.

Figure A.3.3.17-6. Yolo Bypass, Critical Dry Year* Long-Term Average Flow**



*As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

** Based on the 82-year simulation period.

Table A.3.3.17-1. Yolo Bypass, Monthly Flow

No Action Alternative

Statistic	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
	Monthly Flow (cfs)											
Probability of Exceedance[a]												
10%	163	651	9,848	33,367	43,569	25,067	11,186	426	168	48	302	292
20%	162	256	6,230	17,078	19,707	11,222	8,361	178	168	48	55	196
30%	159	150	2,075	8,183	11,551	8,164	2,621	174	168	48	55	159
40%	153	110	798	5,062	8,045	4,634	604	170	168	48	55	159
50%	145	108	486	1,935	5,070	2,930	276	168	167	48	55	159
60%	140	105	295	930	2,888	1,403	236	165	167	48	55	159
70%	129	100	157	442	917	666	211	163	166	48	55	158
80%	116	100	105	163	319	217	186	158	164	48	55	155
90%	104	100	100	114	141	149	172	153	162	48	54	152
Long Term												
Full Simulation Period[b]	195	463	3,824	10,732	13,853	9,669	3,617	364	224	48	100	188
Water Year Types[c]												
Wet	261	1,106	9,712	27,451	32,542	23,344	8,976	728	349	48	143	228
Above Normal	138	238	1,934	8,482	13,518	9,751	2,984	283	166	48	95	165
Below Normal	142	135	1,664	2,545	4,614	2,015	1,120	167	166	48	114	185
Dry	216	168	658	1,139	2,907	1,787	509	177	167	48	62	165
Critical	141	119	224	696	896	711	213	168	164	48	54	167

Proposed Action Alternative

Statistic	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
	Monthly Flow (cfs)											
Probability of Exceedance[a]												
10%	163	651	9,848	33,367	43,569	25,067	11,186	426	168	48	302	292
20%	162	256	6,230	17,077	19,707	11,222	8,361	178	168	48	55	196
30%	159	150	2,075	8,183	11,551	8,164	2,621	174	168	48	55	159
40%	153	110	798	5,062	8,045	4,634	604	170	168	48	55	159
50%	145	108	486	1,935	5,070	2,930	276	168	167	48	55	159
60%	140	105	295	930	2,888	1,403	236	165	167	48	55	159
70%	129	100	157	442	917	666	211	163	166	48	55	158
80%	116	100	105	163	319	217	186	158	164	48	55	155
90%	104	100	100	114	141	149	172	153	162	48	54	152
Long Term												
Full Simulation Period[b]	195	463	3,824	10,732	13,853	9,669	3,617	364	224	48	100	188
Water Year Types[c]												
Wet	261	1,106	9,712	27,451	32,542	23,344	8,976	728	349	48	143	228
Above Normal	138	238	1,934	8,482	13,518	9,751	2,984	283	166	48	95	165
Below Normal	142	135	1,664	2,545	4,614	2,015	1,120	167	166	48	114	185
Dry	216	168	658	1,139	2,907	1,787	509	177	167	48	62	165
Critical	141	119	224	696	896	711	213	168	164	48	54	167

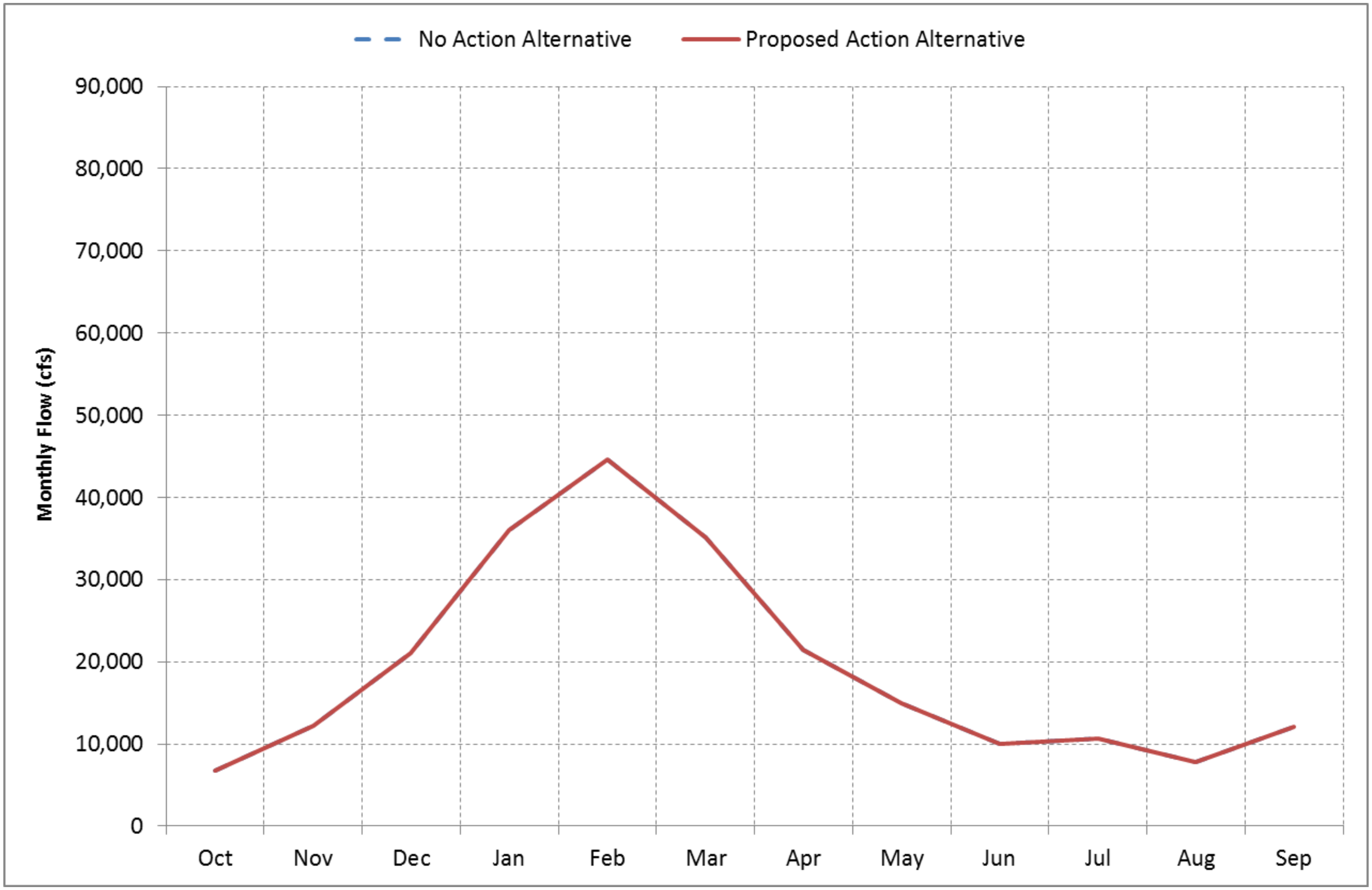
Proposed Action Alternative minus No Action Alternative

Statistic	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
	Monthly Flow (cfs)											
Probability of Exceedance[a]												
10%	0	0	0	0	0	0	0	0	0	0	0	0
20%	0	0	0	0	0	0	0	0	0	0	0	0
30%	0	0	0	0	0	0	0	0	0	0	0	0
40%	0	0	0	0	0	0	0	0	0	0	0	0
50%	0	0	0	0	0	0	0	0	0	0	0	0
60%	0	0	0	0	0	0	0	0	0	0	0	0
70%	0	0	0	0	0	0	0	0	0	0	0	0
80%	0	0	0	0	0	0	0	0	0	0	0	0
90%	0	0	0	0	0	0	0	0	0	0	0	0
Long Term												
Full Simulation Period[b]	0	0	0	0	0	0	0	0	0	0	0	0
Water Year Types[c]												
Wet	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0
Critical	0	0	0	0	0	0	0	0	0	0	0	0

a Exceedance probability is defined as the probability a given value will be exceeded in any one year
b Based on the 82-year simulation period
c As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

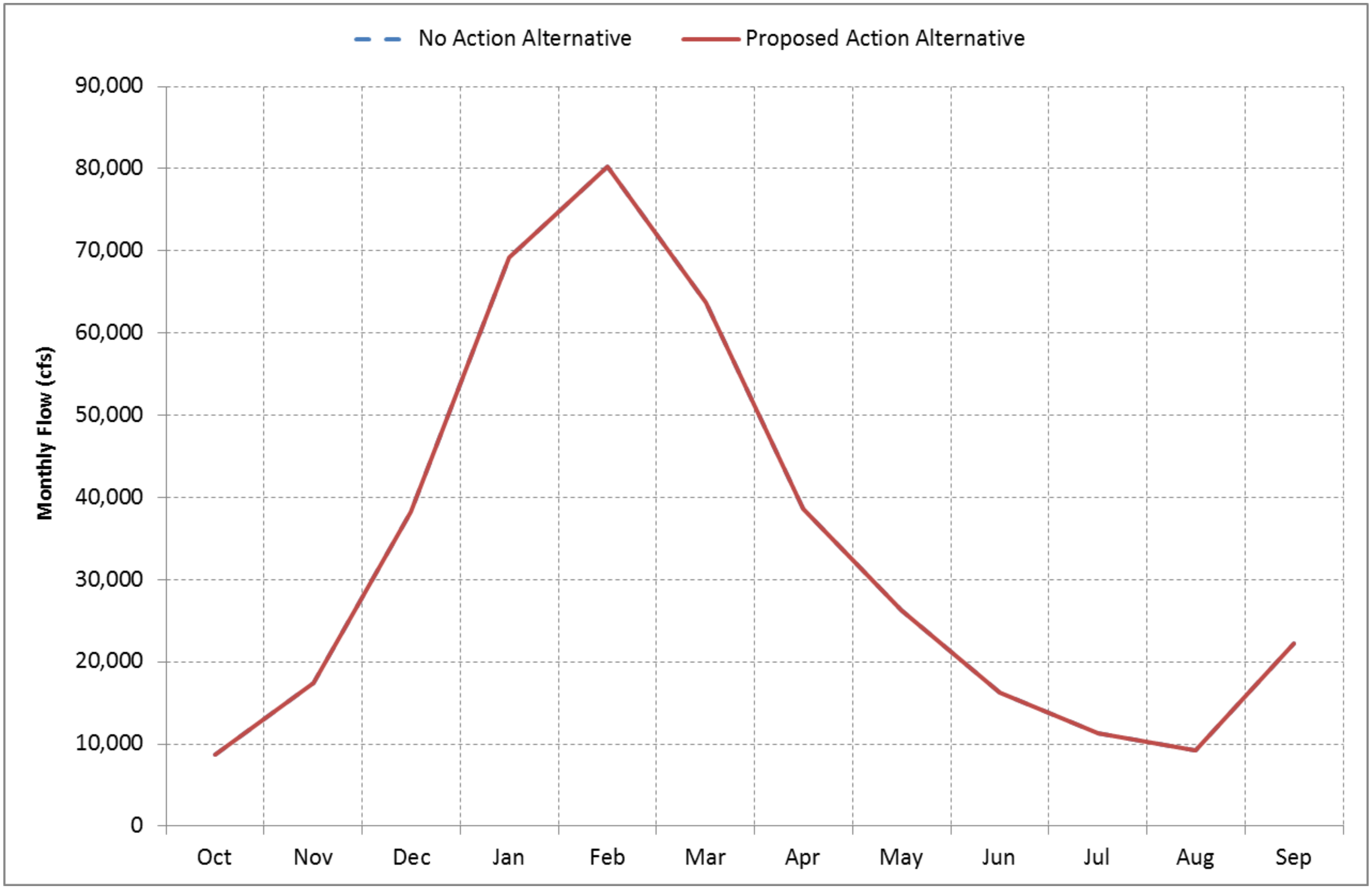
A.3.3.18. Sacramento River Flow at Rio Vista

Figure A.3.3.18-1. Sacramento River at Rio Vista, Long-Term* Average Flow



* Based on the 82-year simulation period.

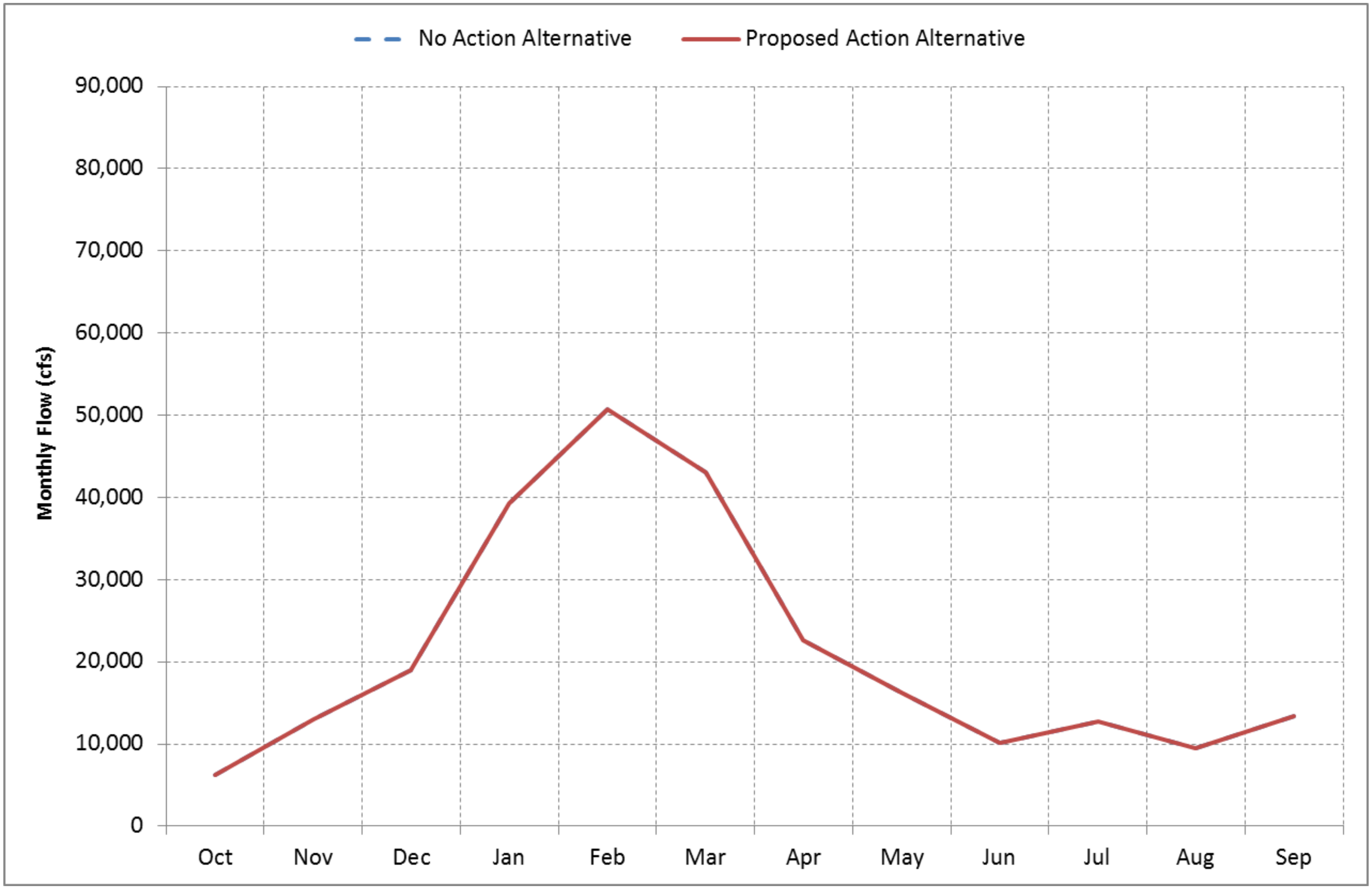
Figure A.3.3.18-2. Sacramento River at Rio Vista, Wet Year* Long-Term Average Flow**



*As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

** Based on the 82-year simulation period.

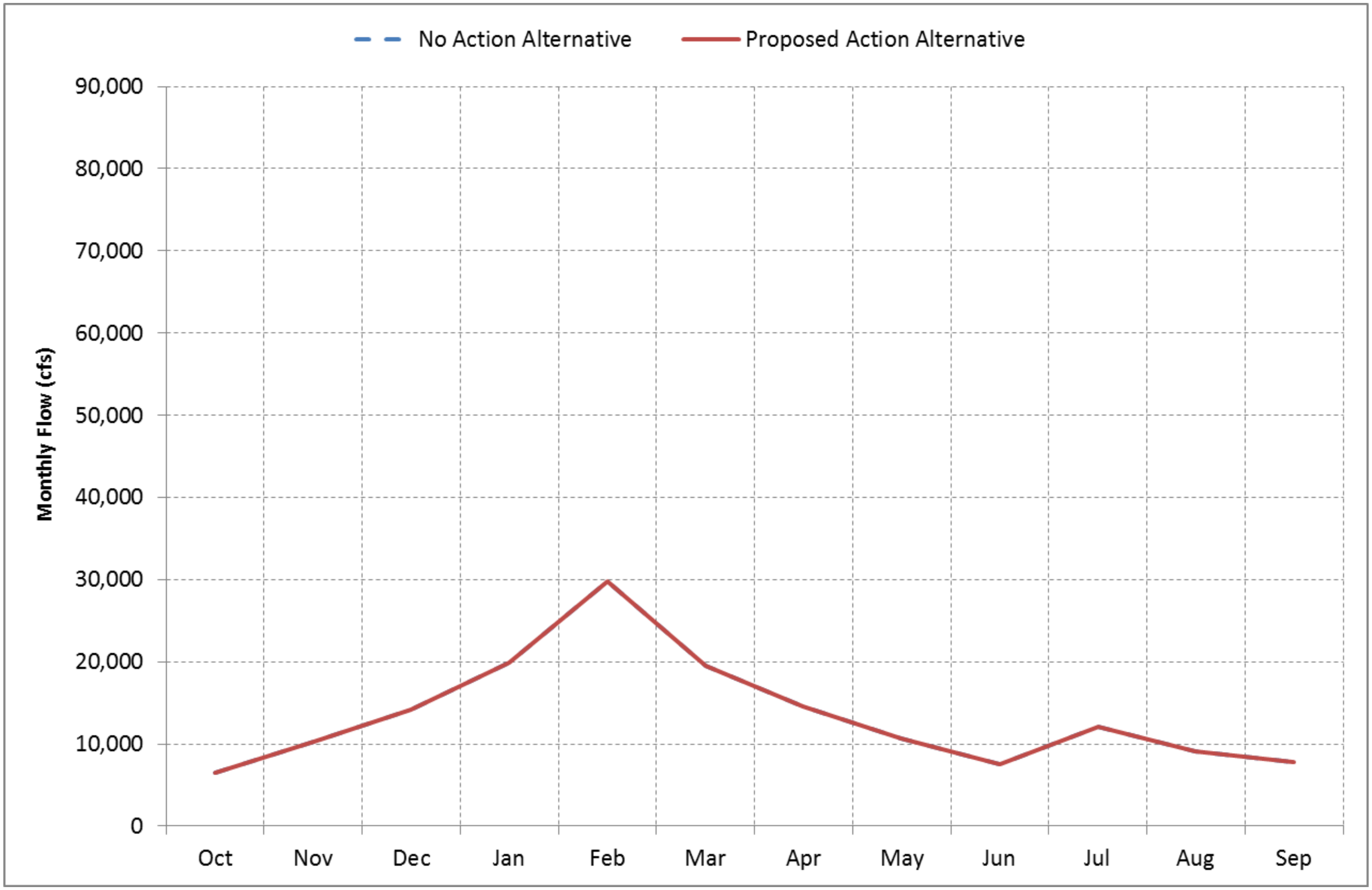
Figure A.3.3.18-3. Sacramento River at Rio Vista, Above Normal Year* Long-Term Average Flow**



*As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

** Based on the 82-year simulation period.

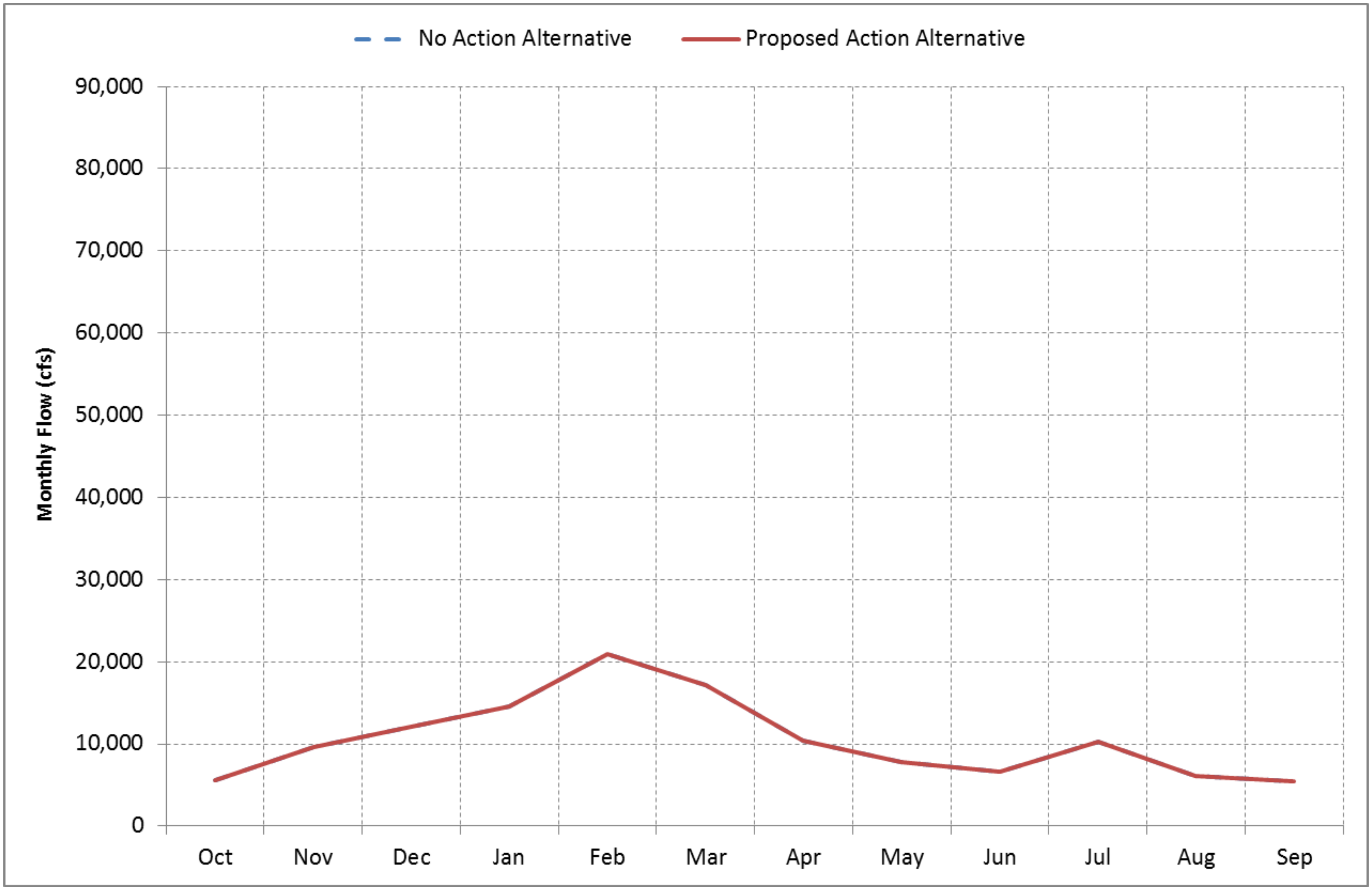
Figure A.3.3.18-4. Sacramento River at Rio Vista, Below Normal Year* Long-Term Average Flow**



*As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

** Based on the 82-year simulation period.

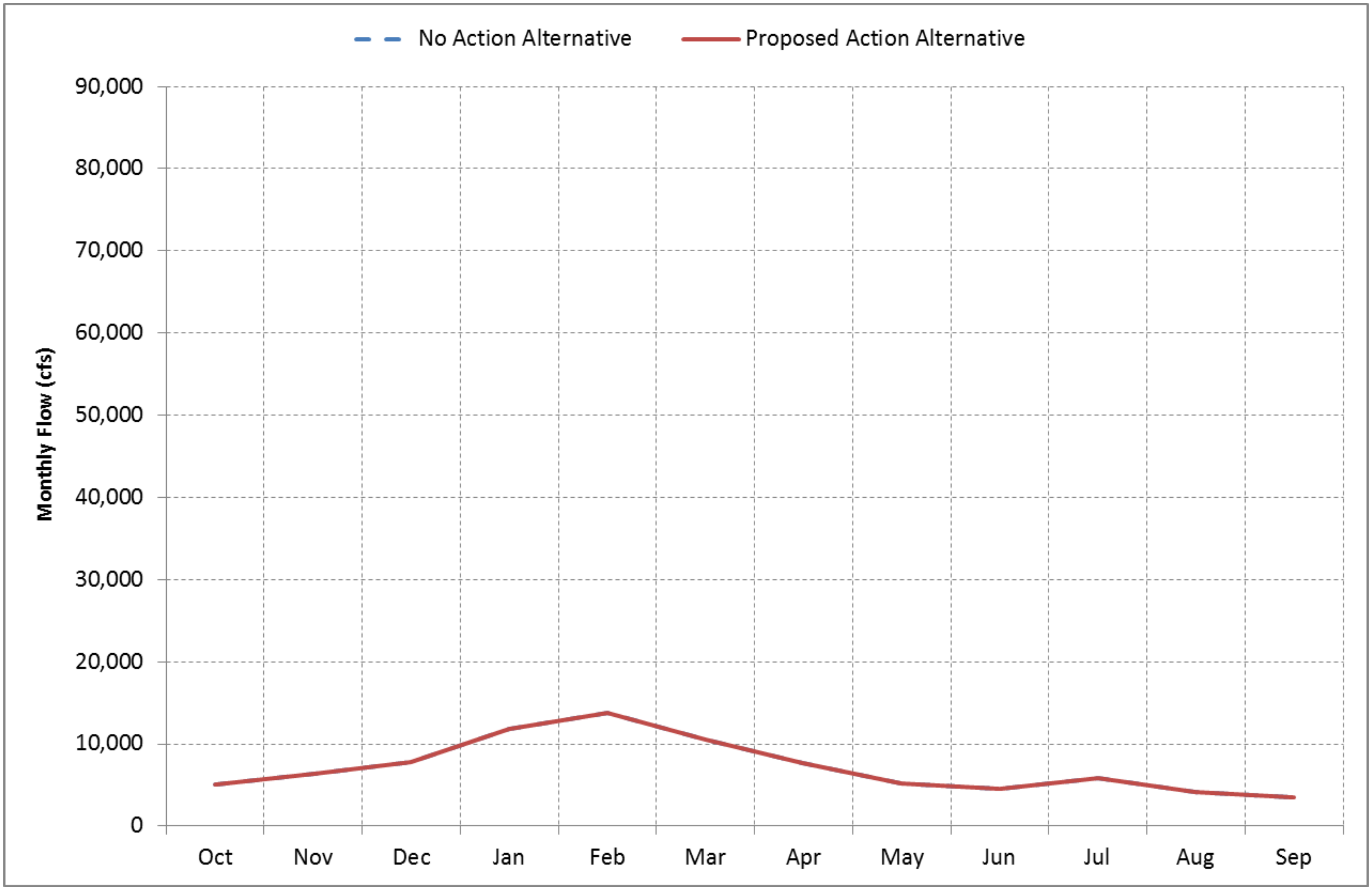
Figure A.3.3.18-5. Sacramento River at Rio Vista, Dry Year* Long-Term Average Flow**



*As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

** Based on the 82-year simulation period.

Figure A.3.3.18-6. Sacramento River at Rio Vista, Critical Dry Year* Long-Term Average Flow**



*As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

** Based on the 82-year simulation period.

Table A.3.3.18-1. Sacramento River at Rio Vista, Monthly Flow

No Action Alternative

Statistic	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
	Monthly Flow (cfs)											
Probability of Exceedance[a]												
10%	9,672	21,120	58,425	87,832	105,104	76,332	53,660	35,320	22,490	13,991	9,961	24,219
20%	8,614	16,042	32,405	58,030	71,653	54,122	37,315	23,863	12,031	13,380	9,621	23,753
30%	7,797	14,907	19,625	42,773	54,387	38,898	21,253	15,102	8,747	12,794	9,360	14,713
40%	7,204	12,532	14,918	27,516	43,040	29,924	16,795	11,348	7,647	11,484	9,007	13,224
50%	6,380	11,417	12,435	19,699	31,307	22,739	13,299	10,172	7,301	11,276	8,611	8,897
60%	5,999	8,859	11,003	16,630	23,386	18,246	10,228	8,744	6,900	10,998	8,234	8,057
70%	4,781	6,682	10,186	12,486	15,819	15,865	8,950	7,649	6,670	9,565	6,530	5,846
80%	4,073	5,474	8,324	10,633	13,353	11,760	8,130	6,944	5,670	8,043	5,430	4,557
90%	3,187	4,130	6,020	9,334	11,141	8,522	6,928	5,969	4,989	6,350	4,252	3,396
Long Term												
Full Simulation Period[b]	6,761	12,235	21,115	35,993	44,553	35,137	21,435	15,001	10,031	10,636	7,782	12,069
Water Year Types[c]												
Wet	8,656	17,442	38,236	69,170	80,262	63,765	38,649	26,209	16,199	11,306	9,184	22,247
Above Normal	6,290	13,045	18,970	39,301	50,684	43,033	22,610	16,286	10,122	12,753	9,443	13,350
Below Normal	6,505	10,287	14,168	19,901	29,740	19,481	14,584	10,722	7,551	12,115	9,071	7,861
Dry	5,643	9,573	12,142	14,514	20,914	17,105	10,334	7,781	6,661	10,324	6,070	5,512
Critical	5,100	6,407	7,732	11,792	13,790	10,530	7,608	5,258	4,524	5,811	4,152	3,478

Proposed Action Alternative

Statistic	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
	Monthly Flow (cfs)											
Probability of Exceedance[a]												
10%	9,672	21,120	58,425	87,832	105,104	76,332	53,660	35,320	22,490	13,991	9,961	24,219
20%	8,614	16,042	32,405	58,029	71,653	54,122	37,315	23,863	12,031	13,379	9,621	23,753
30%	7,797	14,907	19,625	42,773	54,387	38,898	21,253	15,102	8,747	12,794	9,360	14,713
40%	7,204	12,532	14,918	27,516	43,040	29,924	16,795	11,348	7,647	11,484	9,007	13,224
50%	6,380	11,417	12,433	19,699	31,307	22,739	13,299	10,172	7,301	11,276	8,611	8,897
60%	5,999	8,859	11,003	16,630	23,386	18,246	10,228	8,744	6,900	10,998	8,234	8,057
70%	4,781	6,682	10,186	12,486	15,819	15,865	8,950	7,649	6,670	9,565	6,530	5,846
80%	4,073	5,474	8,324	10,633	13,353	11,760	8,130	6,944	5,670	8,043	5,430	4,557
90%	3,187	4,130	6,020	9,334	11,141	8,522	6,928	5,969	4,989	6,350	4,252	3,396
Long Term												
Full Simulation Period[b]	6,761	12,234	21,115	35,993	44,552	35,137	21,435	15,001	10,031	10,636	7,782	12,069
Water Year Types[c]												
Wet	8,656	17,441	38,236	69,170	80,262	63,765	38,649	26,209	16,199	11,306	9,184	22,247
Above Normal	6,290	13,045	18,970	39,300	50,684	43,033	22,610	16,285	10,122	12,753	9,443	13,350
Below Normal	6,505	10,287	14,168	19,901	29,740	19,481	14,584	10,722	7,551	12,115	9,071	7,861
Dry	5,643	9,572	12,142	14,514	20,913	17,104	10,334	7,781	6,661	10,324	6,070	5,512
Critical	5,100	6,407	7,732	11,792	13,790	10,530	7,608	5,258	4,524	5,811	4,152	3,478

Proposed Action Alternative minus No Action Alternative

Statistic	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
	Monthly Flow (cfs)											
Probability of Exceedance[a]												
10%	0	0	0	0	0	0	0	0	0	0	0	0
20%	0	0	0	-1	0	0	0	0	0	0	0	0
30%	0	0	0	0	0	0	0	0	0	0	0	0
40%	0	0	0	0	0	0	0	0	0	0	0	0
50%	0	0	-1	0	0	0	0	0	0	0	0	0
60%	0	0	0	0	0	0	0	0	0	0	0	0
70%	0	0	0	0	0	0	0	0	0	0	0	0
80%	0	0	0	0	0	0	0	0	0	0	0	0
90%	0	0	0	0	0	0	0	0	0	0	0	0
Long Term												
Full Simulation Period[b]	0	0	0	0	0	0	0	0	0	0	0	0
Water Year Types[c]												
Wet	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	-1	0	0	0	0	0	0	0	0	0	0
Critical	0	0	0	0	0	0	0	0	0	0	0	0

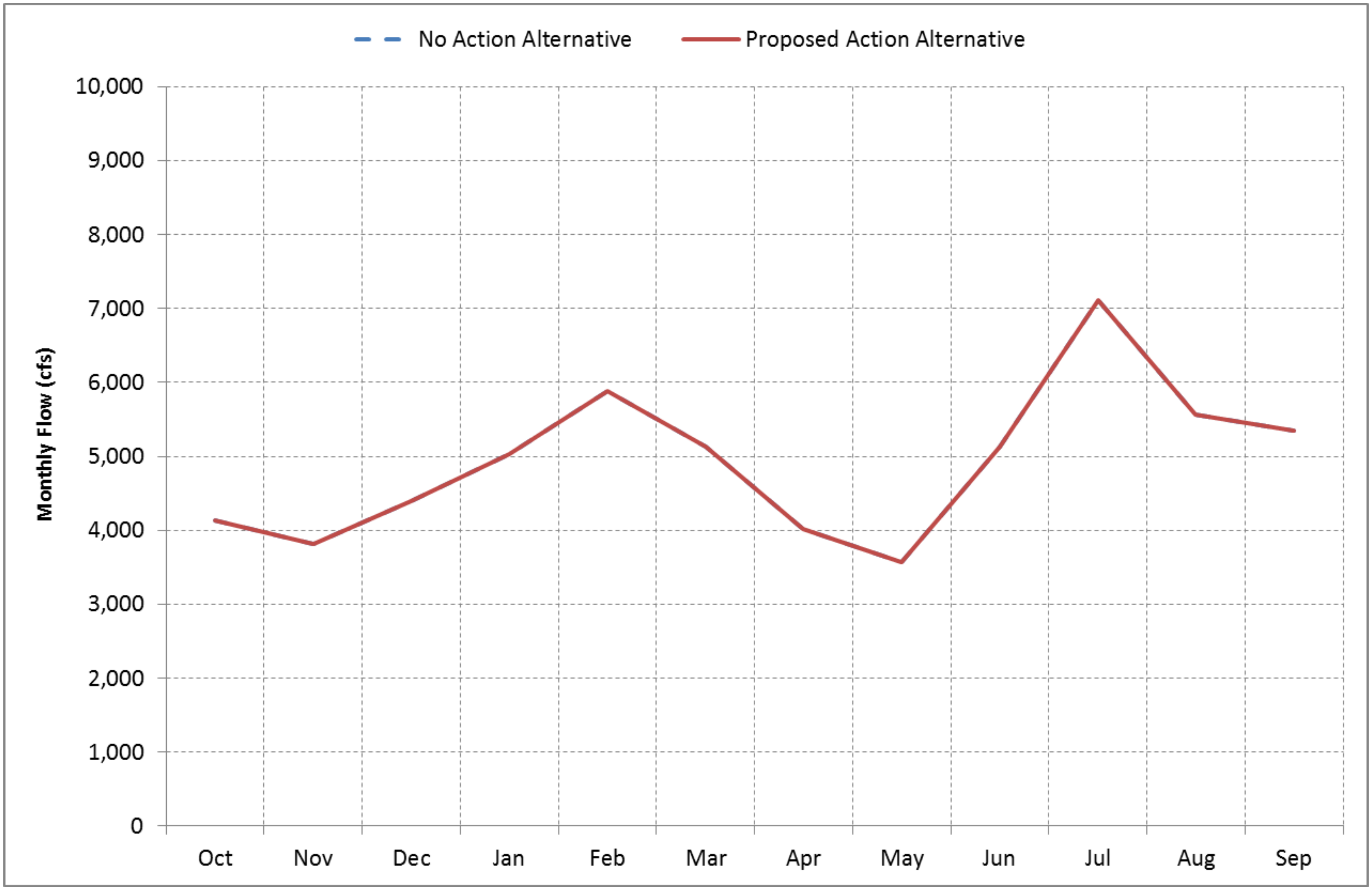
a Exceedance probability is defined as the probability a given value will be exceeded in any one year

b Based on the 82-year simulation period

c As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

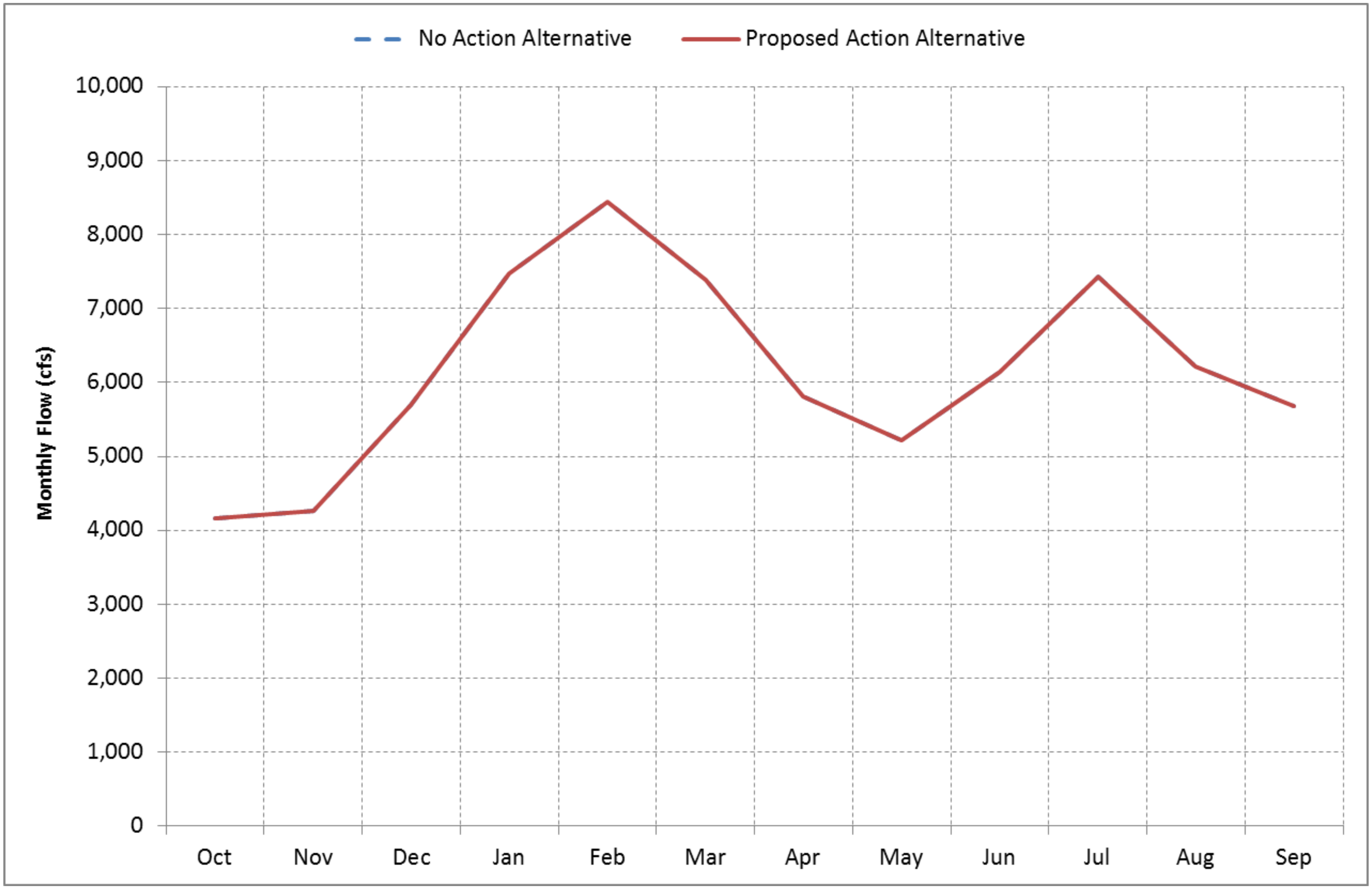
A.3.3.19. Delta Cross Channel Flow

Figure A.3.3.19-1. Delta Cross Channel, Long-Term* Average Flow



* Based on the 82-year simulation period.

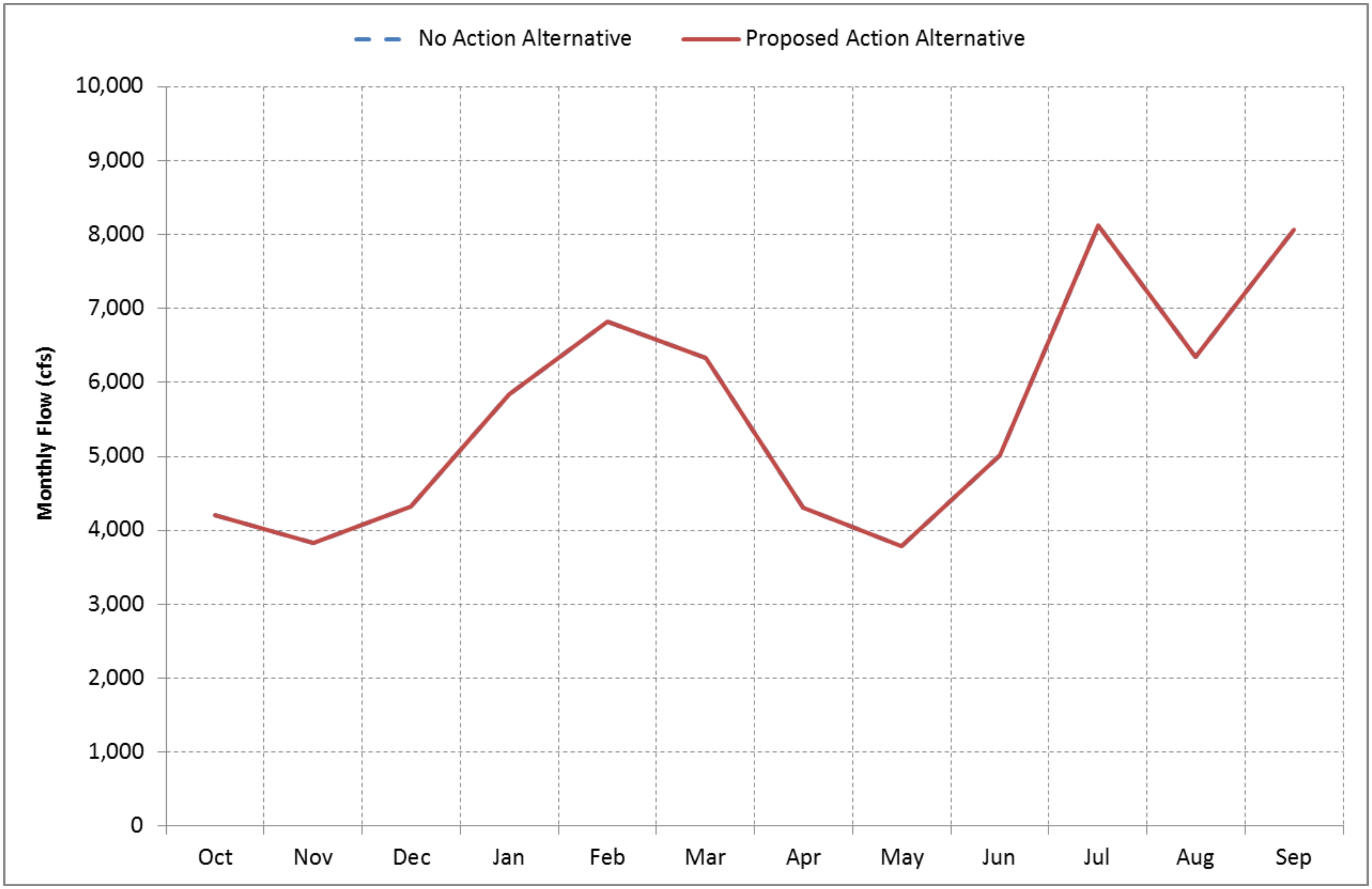
Figure A.3.3.19-2. Delta Cross Channel, Wet Year* Long-Term Average Flow**



*As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

** Based on the 82-year simulation period.

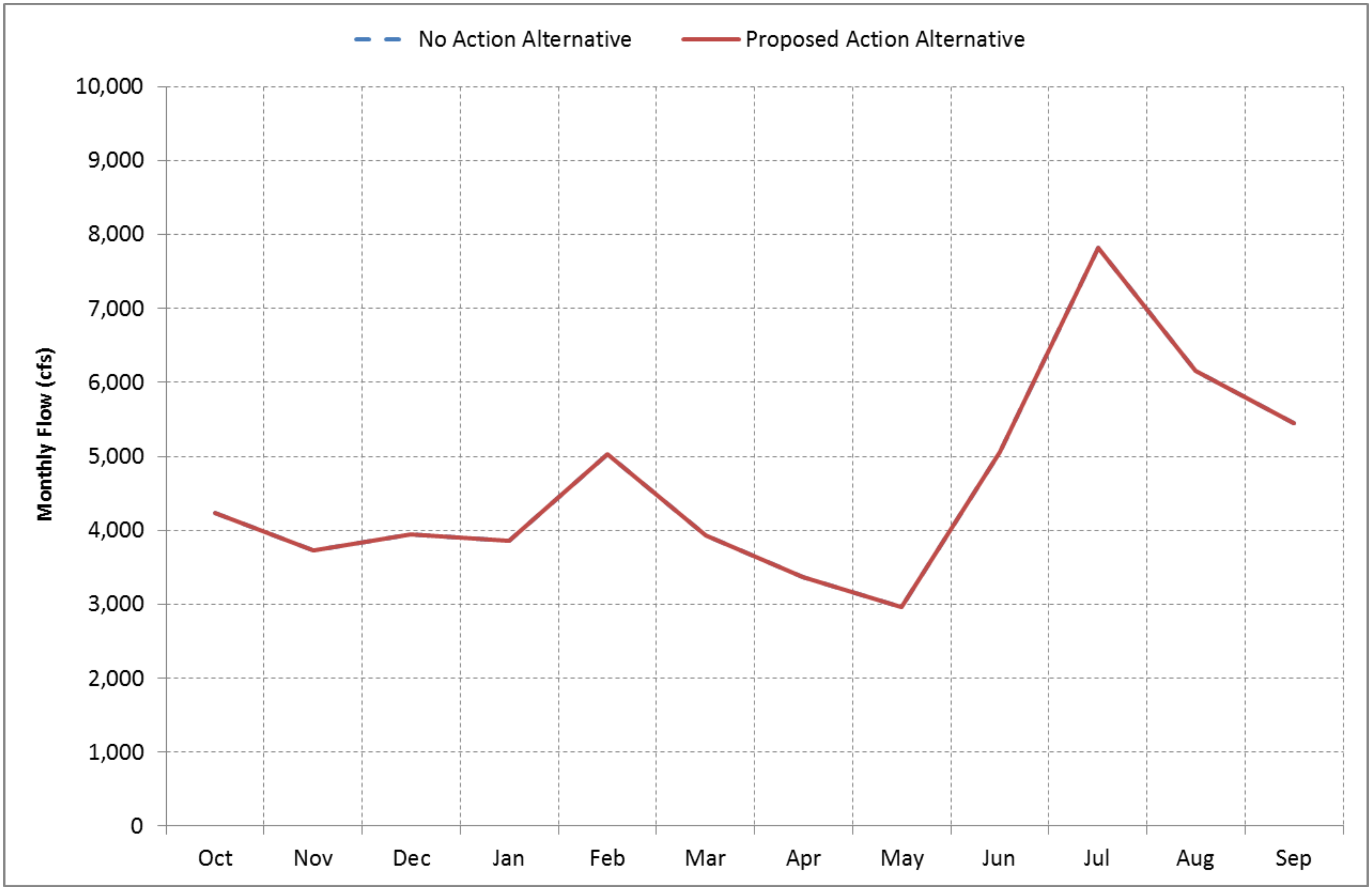
Figure A.3.3.19-3. Delta Cross Channel, Above Normal Year* Long-Term Average Flow**



*As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

** Based on the 82-year simulation period.

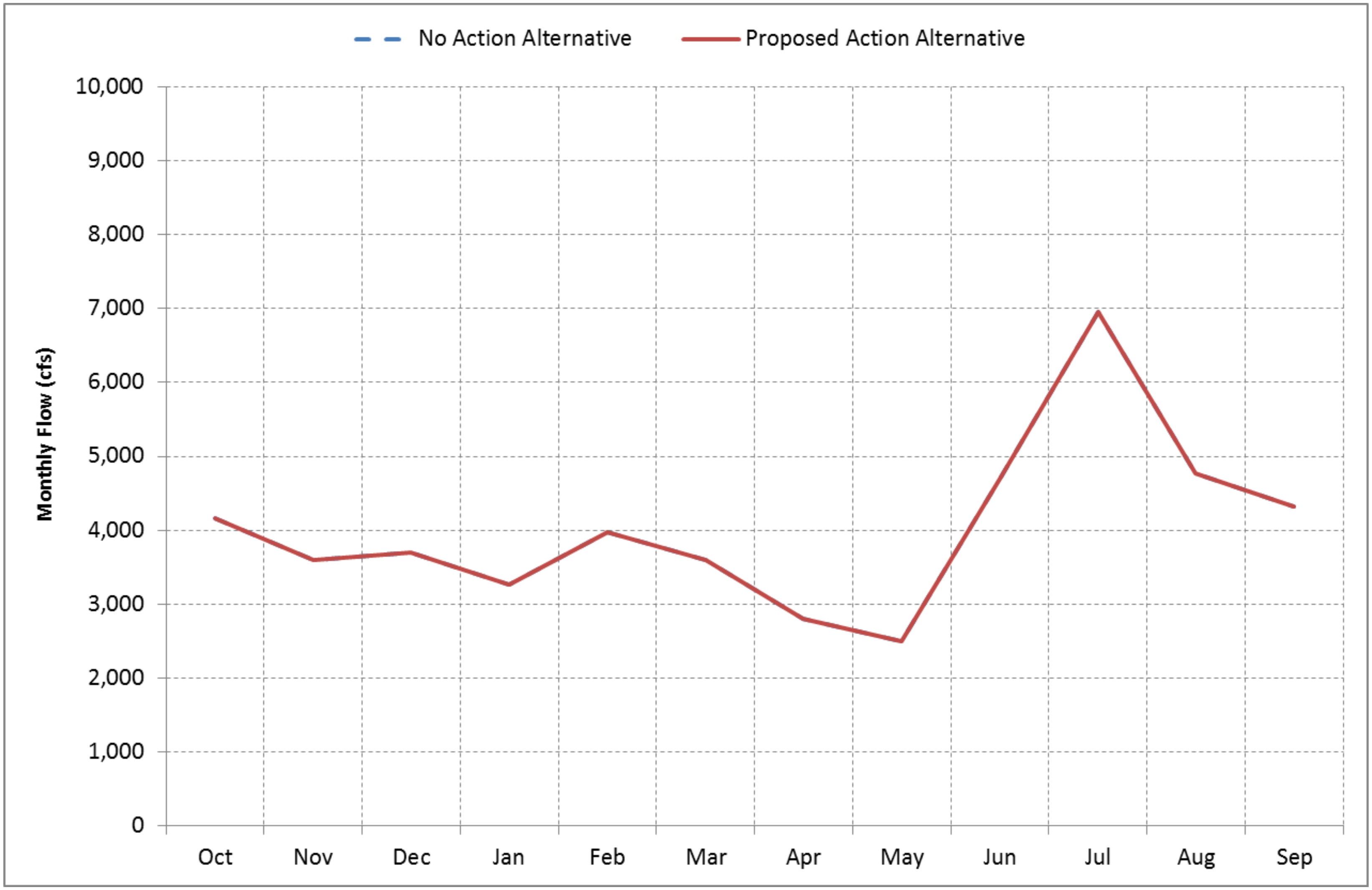
Figure A.3.3.19-4. Delta Cross Channel, Below Normal Year* Long-Term Average Flow**



*As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

** Based on the 82-year simulation period.

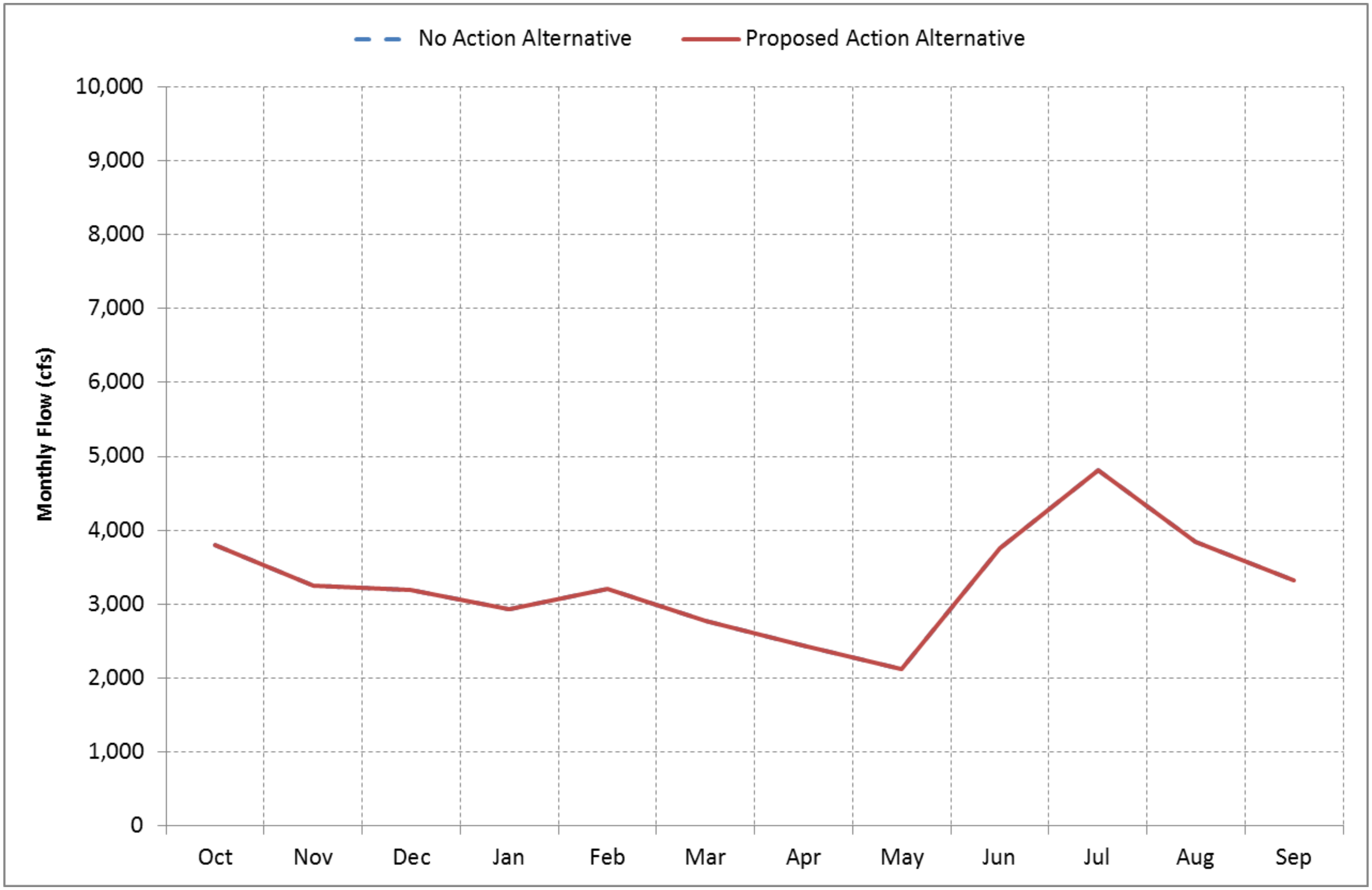
Figure A.3.3.19-5. Delta Cross Channel, Dry Year* Long-Term Average Flow**



*As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

** Based on the 82-year simulation period.

Figure A.3.3.19-6. Delta Cross Channel, Critical Dry Year* Long-Term Average Flow**



*As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

** Based on the 82-year simulation period.

Table A.3.3.19-1. Delta Cross Channel, Monthly Flow

No Action Alternative

Statistic	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
	Monthly Flow (cfs)											
Probability of Exceedance[a]												
10%	5,031	4,516	7,522	9,372	10,146	9,255	7,868	6,655	6,954	8,721	6,558	8,322
20%	4,800	4,203	5,138	8,199	8,883	7,930	5,628	4,932	5,729	8,429	6,450	7,795
30%	4,626	3,963	4,260	6,368	7,618	5,846	4,204	3,619	5,447	8,144	6,317	5,669
40%	4,480	3,843	3,934	4,295	6,719	5,114	3,739	3,053	5,054	7,568	6,122	5,064
50%	4,257	3,726	3,803	3,943	5,283	4,307	3,277	2,879	4,958	7,397	5,982	4,958
60%	3,947	3,633	3,649	3,566	4,368	3,804	2,851	2,665	4,785	7,256	5,808	4,896
70%	3,593	3,417	3,461	3,029	3,562	3,493	2,654	2,495	4,596	6,602	4,996	4,493
80%	3,507	3,190	3,214	2,868	3,247	3,037	2,524	2,397	4,293	5,905	4,471	3,889
90%	3,089	2,944	3,105	2,635	2,944	2,571	2,346	2,243	3,965	5,043	3,872	3,247
Long Term												
Full Simulation Period[b]	4,130	3,818	4,391	5,032	5,876	5,136	4,021	3,576	5,125	7,113	5,560	5,345
Water Year Types[c]												
Wet	4,167	4,269	5,690	7,475	8,442	7,388	5,809	5,223	6,144	7,435	6,211	5,673
Above Normal	4,209	3,836	4,318	5,836	6,826	6,324	4,301	3,781	5,010	8,123	6,342	8,064
Below Normal	4,231	3,729	3,943	3,864	5,028	3,930	3,366	2,961	5,061	7,822	6,161	5,443
Dry	4,168	3,599	3,703	3,273	3,974	3,604	2,808	2,506	4,690	6,958	4,772	4,325
Critical	3,798	3,253	3,200	2,935	3,209	2,774	2,449	2,123	3,755	4,808	3,845	3,327

Proposed Action Alternative

Statistic	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
	Monthly Flow (cfs)											
Probability of Exceedance[a]												
10%	5,031	4,516	7,522	9,372	10,146	9,255	7,868	6,655	6,954	8,721	6,558	8,322
20%	4,800	4,203	5,138	8,199	8,883	7,930	5,628	4,932	5,729	8,429	6,450	7,795
30%	4,626	3,963	4,260	6,368	7,618	5,846	4,204	3,619	5,447	8,144	6,317	5,669
40%	4,480	3,842	3,934	4,295	6,719	5,114	3,739	3,053	5,054	7,569	6,122	5,064
50%	4,257	3,726	3,803	3,943	5,283	4,307	3,277	2,879	4,958	7,397	5,982	4,958
60%	3,947	3,633	3,649	3,566	4,368	3,804	2,851	2,665	4,785	7,256	5,808	4,896
70%	3,593	3,417	3,461	3,029	3,562	3,493	2,654	2,495	4,596	6,602	4,996	4,493
80%	3,507	3,190	3,214	2,868	3,247	3,037	2,524	2,397	4,293	5,905	4,471	3,889
90%	3,089	2,944	3,105	2,635	2,944	2,571	2,346	2,243	3,965	5,043	3,872	3,247
Long Term												
Full Simulation Period[b]	4,130	3,818	4,391	5,032	5,876	5,136	4,021	3,576	5,125	7,113	5,560	5,345
Water Year Types[c]												
Wet	4,167	4,269	5,690	7,475	8,442	7,388	5,809	5,223	6,144	7,435	6,211	5,673
Above Normal	4,209	3,836	4,318	5,836	6,826	6,324	4,301	3,781	5,010	8,123	6,342	8,064
Below Normal	4,231	3,729	3,943	3,864	5,028	3,930	3,366	2,961	5,061	7,822	6,161	5,443
Dry	4,168	3,599	3,703	3,273	3,974	3,603	2,808	2,506	4,690	6,958	4,772	4,325
Critical	3,798	3,253	3,200	2,935	3,209	2,774	2,448	2,123	3,755	4,808	3,845	3,327

Proposed Action Alternative minus No Action Alternative

Statistic	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
	Monthly Flow (cfs)											
Probability of Exceedance[a]												
10%	0	0	0	0	0	0	0	0	0	0	0	0
20%	0	0	0	0	0	0	0	0	0	0	0	0
30%	0	0	0	0	0	0	0	0	0	0	0	0
40%	0	-1	0	0	0	0	0	0	0	0	0	0
50%	0	0	0	0	0	0	0	0	0	0	0	0
60%	0	0	0	0	0	0	0	0	0	0	0	0
70%	0	0	0	0	0	0	0	0	0	0	0	0
80%	0	0	0	0	0	0	0	0	0	0	0	0
90%	0	0	0	0	0	0	0	0	0	0	0	0
Long Term												
Full Simulation Period[b]	0	0	0	0	0	0	0	0	0	0	0	0
Water Year Types[c]												
Wet	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0
Critical	0	0	0	0	0	0	0	0	0	0	0	0

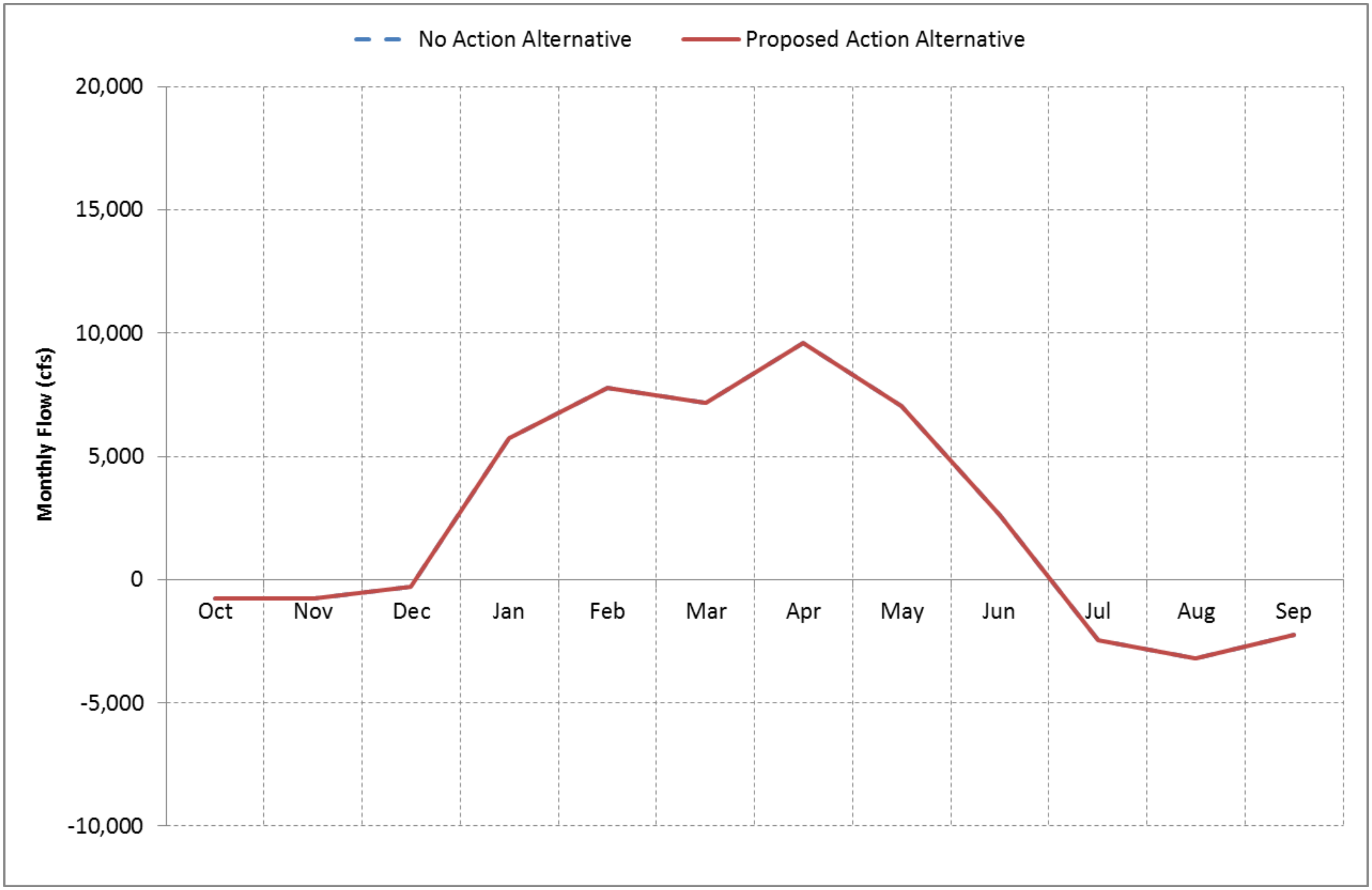
a Exceedance probability is defined as the probability a given value will be exceeded in any one year

b Based on the 82-year simulation period

c As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

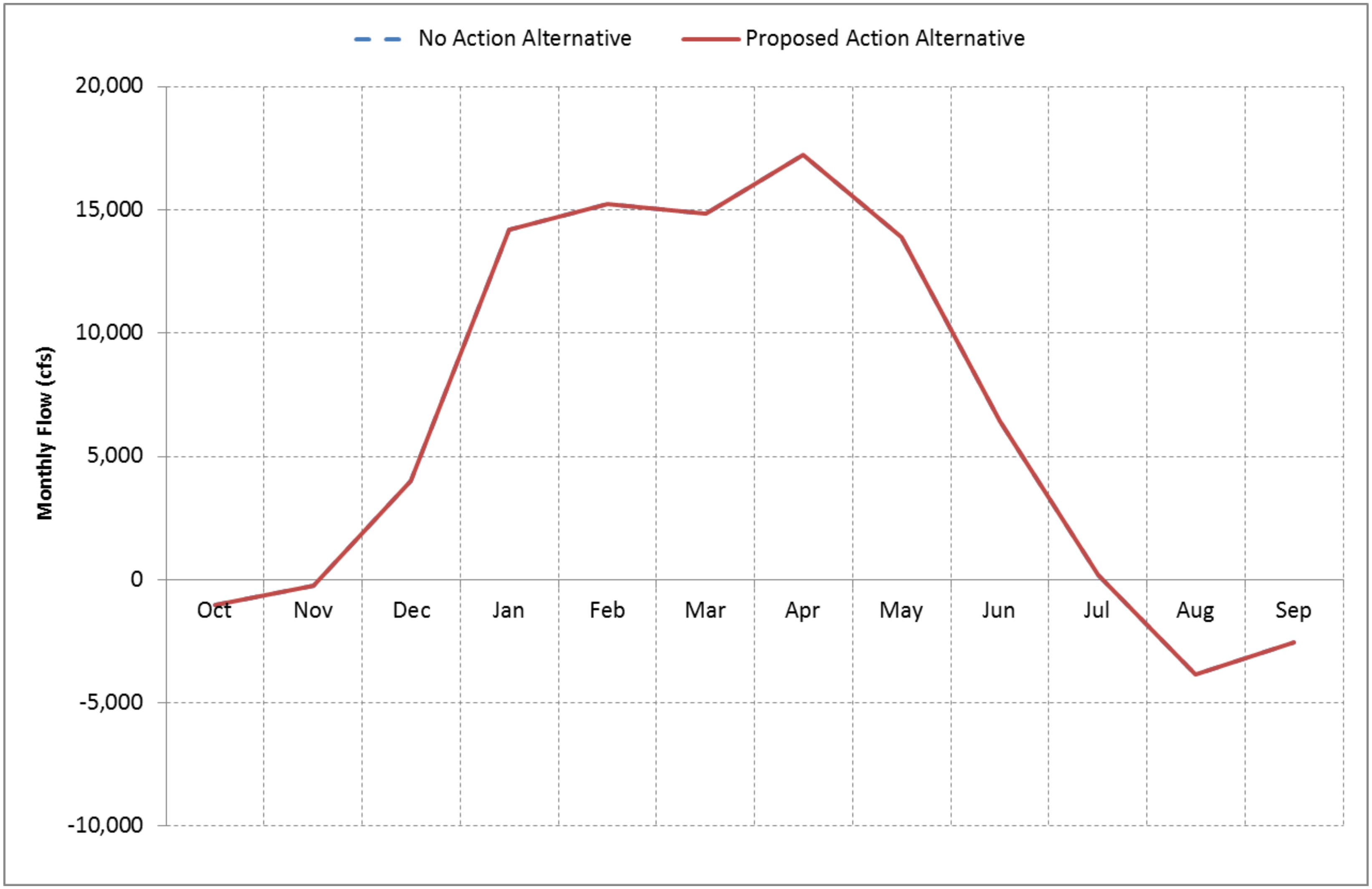
A.3.3.20. Qwest Flow

Figure A.3.3.20-1. Qwest, Long-Term* Average Flow



* Based on the 82-year simulation period.

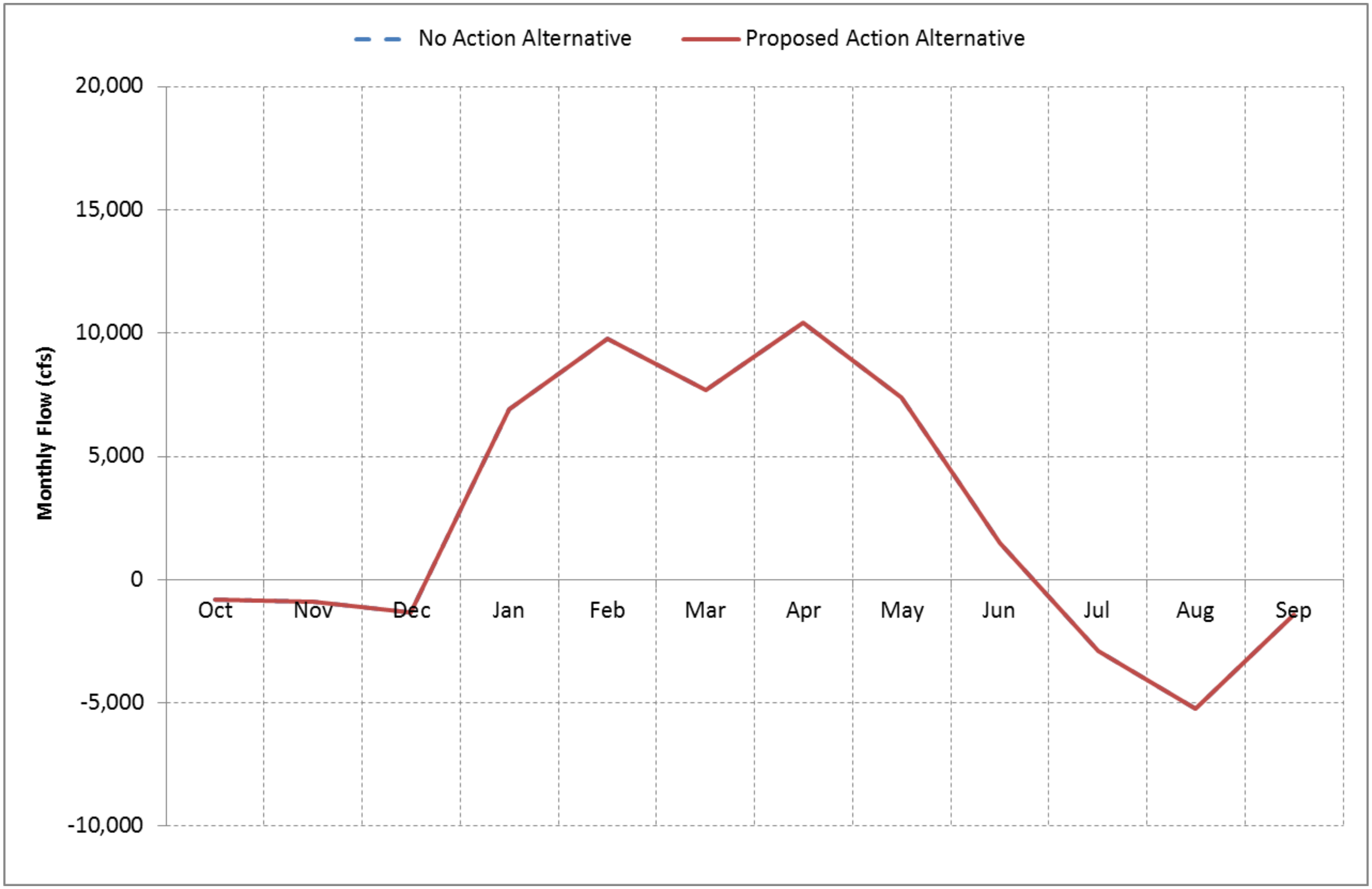
Figure A.3.3.20-2. Qwest, Wet Year* Long-Term Average Flow**



*As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

** Based on the 82-year simulation period.

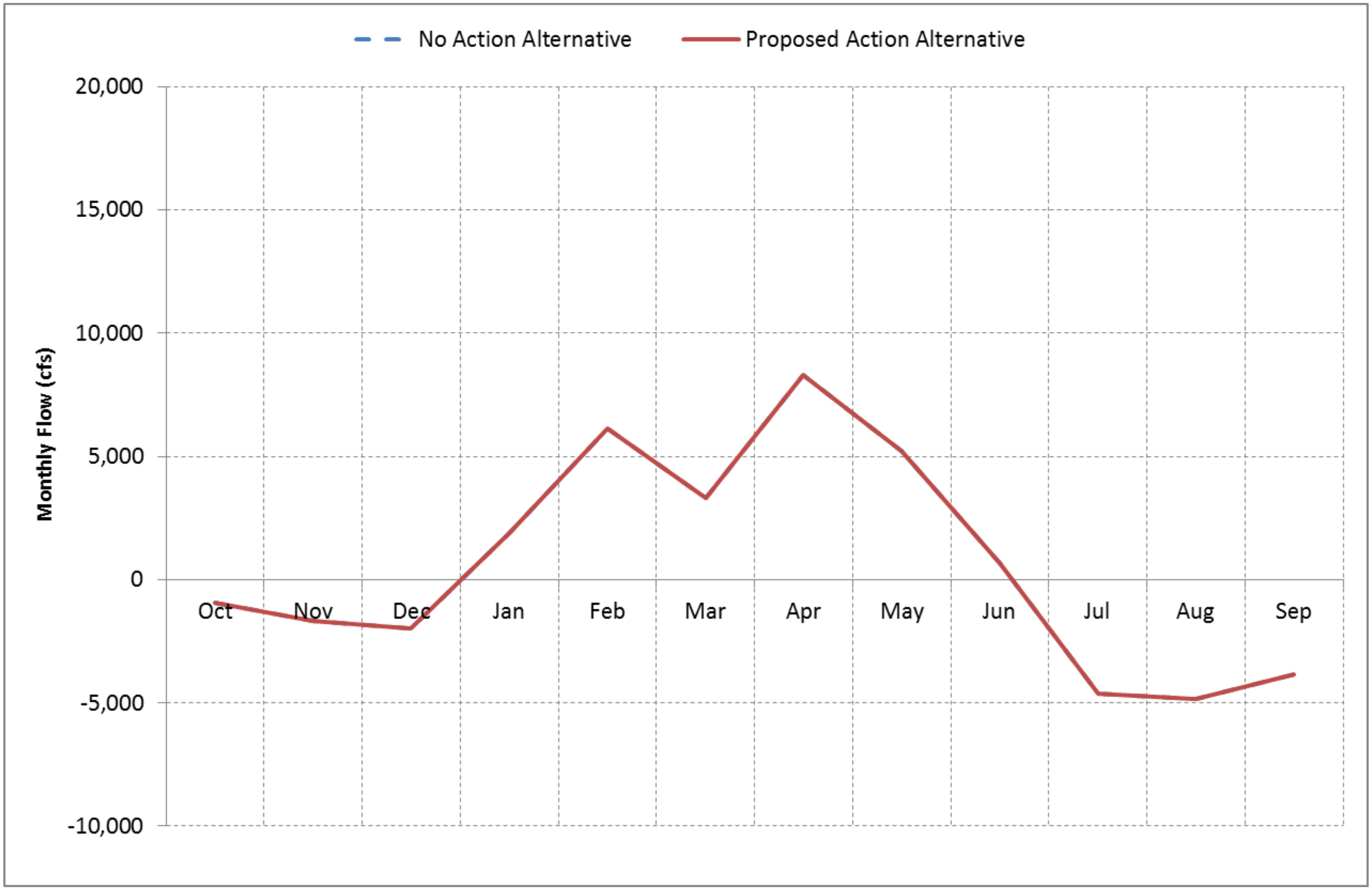
Figure A.3.3.20-3. Qwest, Above Normal Year* Long-Term Average Flow**



*As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

** Based on the 82-year simulation period.

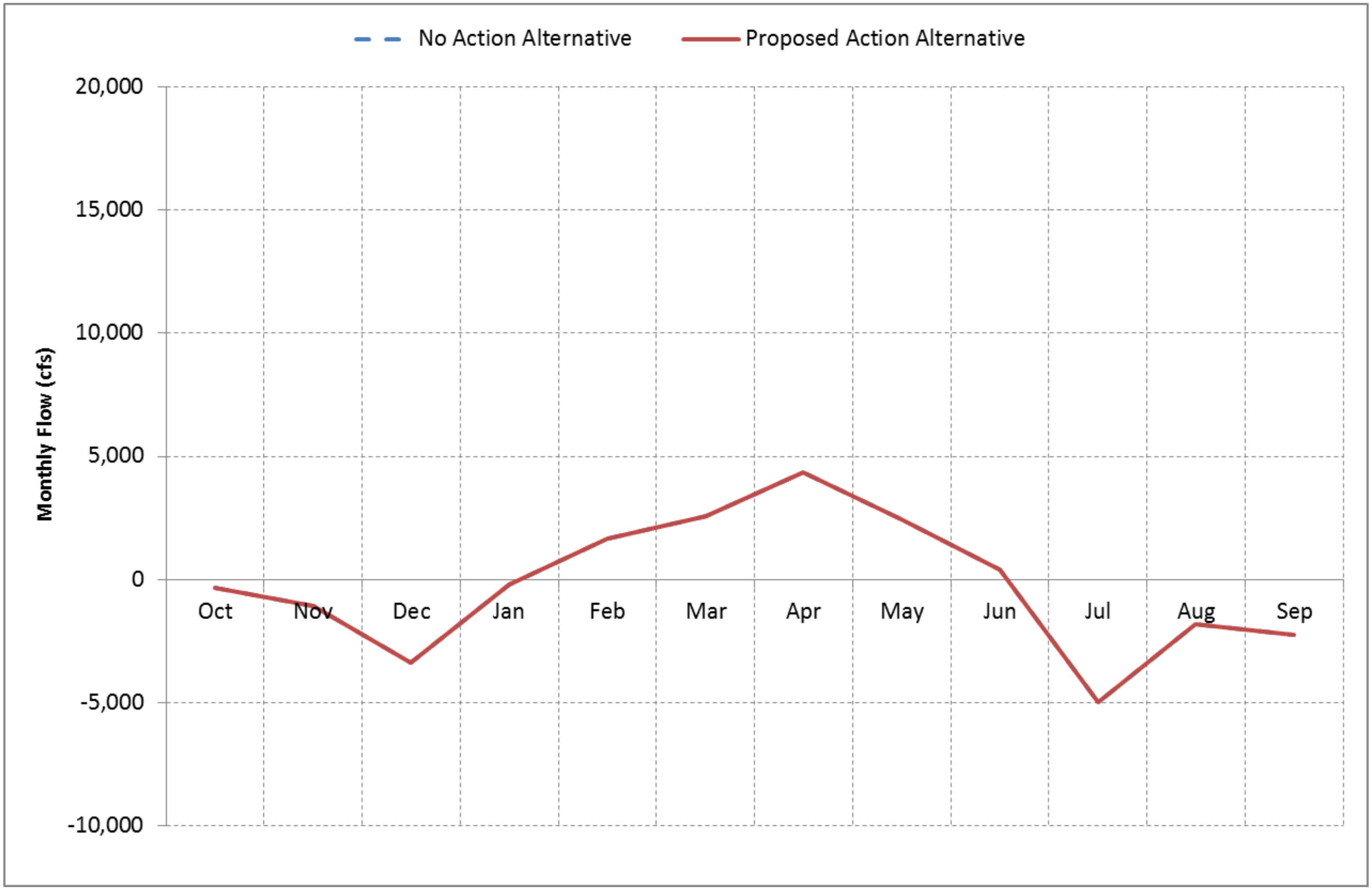
Figure A.3.3.20-4. Qwest, Below Normal Year* Long-Term Average Flow**



*As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

** Based on the 82-year simulation period.

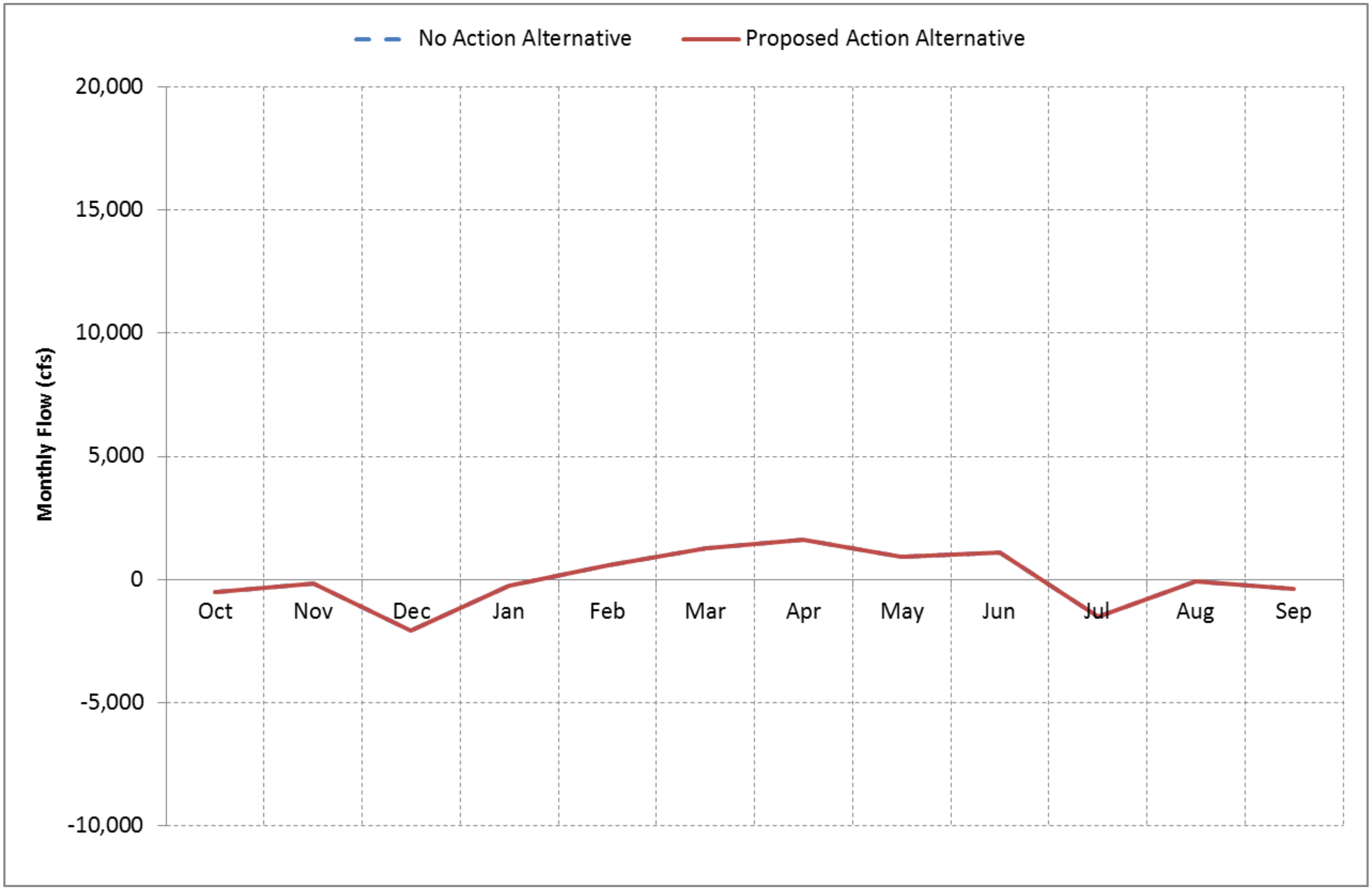
Figure A.3.3.20-5. Qwest, Dry Year* Long-Term Average Flow**



*As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

** Based on the 82-year simulation period.

Figure A.3.3.20-6. Qwest, Critical Dry Year* Long-Term Average Flow**



*As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

** Based on the 82-year simulation period.

Table A.3.3.20-1. Qwest, Monthly Flow

No Action Alternative

Statistic	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
	Monthly Flow (cfs)											
Probability of Exceedance[a]												
10%	889	1,380	7,089	15,382	19,096	19,737	21,828	19,343	8,352	599	640	108
20%	168	66	1,724	11,608	12,188	11,321	15,304	10,222	4,852	-720	-728	-671
30%	46	2	-655	6,345	10,473	7,865	11,702	7,559	2,169	-2,046	-1,994	-1,189
40%	-119	-530	-1,340	3,728	6,571	4,705	9,735	6,612	1,597	-2,777	-2,935	-1,650
50%	-458	-915	-1,747	2,183	4,589	3,498	8,044	5,972	1,242	-3,446	-4,056	-2,550
60%	-746	-1,428	-2,258	1,089	2,915	2,942	6,404	3,807	856	-4,048	-4,440	-3,321
70%	-1,202	-1,976	-4,124	-259	1,362	1,826	4,215	2,372	196	-4,640	-4,992	-3,729
80%	-1,907	-2,552	-5,147	-961	329	1,168	2,954	1,666	102	-5,051	-5,281	-4,018
90%	-2,723	-4,216	-5,579	-1,235	-503	-98	1,741	1,025	-325	-5,926	-5,606	-4,530
Long Term												
Full Simulation Period[b]	-752	-766	-299	5,744	7,756	7,148	9,606	7,051	2,620	-2,459	-3,213	-2,223
Water Year Types[c]												
Wet	-1,042	-267	3,994	14,175	15,230	14,853	17,238	13,901	6,443	188	-3,856	-2,562
Above Normal	-802	-915	-1,313	6,894	9,772	7,683	10,440	7,396	1,472	-2,871	-5,217	-1,420
Below Normal	-938	-1,687	-1,979	1,864	6,139	3,330	8,301	5,228	671	-4,621	-4,822	-3,854
Dry	-330	-1,074	-3,348	-187	1,667	2,552	4,358	2,442	398	-4,965	-1,786	-2,242
Critical	-488	-159	-2,054	-249	569	1,268	1,631	903	1,091	-1,502	-78	-362

Proposed Action Alternative

Statistic	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
	Monthly Flow (cfs)											
Probability of Exceedance[a]												
10%	889	1,380	7,089	15,382	19,096	19,736	21,828	19,343	8,352	599	639	108
20%	168	66	1,724	11,608	12,188	11,321	15,304	10,222	4,852	-720	-728	-671
30%	46	2	-655	6,345	10,473	7,865	11,702	7,558	2,169	-2,046	-1,994	-1,189
40%	-119	-530	-1,340	3,728	6,571	4,705	9,735	6,612	1,597	-2,777	-2,935	-1,650
50%	-458	-915	-1,747	2,183	4,589	3,498	8,044	5,972	1,242	-3,446	-4,056	-2,550
60%	-746	-1,427	-2,258	1,089	2,915	2,942	6,404	3,807	856	-4,048	-4,440	-3,321
70%	-1,202	-1,976	-4,124	-259	1,362	1,826	4,215	2,372	196	-4,640	-4,992	-3,729
80%	-1,907	-2,552	-5,147	-961	329	1,168	2,954	1,666	102	-5,051	-5,281	-4,018
90%	-2,723	-4,216	-5,579	-1,235	-503	-98	1,741	1,025	-325	-5,926	-5,606	-4,530
Long Term												
Full Simulation Period[b]	-752	-766	-299	5,744	7,756	7,148	9,606	7,051	2,620	-2,459	-3,213	-2,223
Water Year Types[c]												
Wet	-1,042	-267	3,994	14,175	15,230	14,853	17,238	13,901	6,443	188	-3,856	-2,562
Above Normal	-802	-915	-1,313	6,894	9,772	7,683	10,440	7,396	1,472	-2,871	-5,217	-1,420
Below Normal	-938	-1,687	-1,979	1,864	6,139	3,330	8,301	5,228	671	-4,620	-4,822	-3,853
Dry	-330	-1,074	-3,348	-187	1,667	2,552	4,358	2,442	398	-4,965	-1,786	-2,242
Critical	-488	-159	-2,053	-249	569	1,268	1,631	903	1,091	-1,502	-78	-362

Proposed Action Alternative minus No Action Alternative

Statistic	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
	Monthly Flow (cfs)											
Probability of Exceedance[a]												
10%	0	0	0	0	0	0	0	0	0	0	0	0
20%	0	0	0	0	0	0	0	0	0	0	0	0
30%	0	0	0	0	0	0	0	0	0	0	0	0
40%	0	0	0	0	0	0	0	0	0	0	0	0
50%	0	0	0	0	0	0	0	0	0	0	0	0
60%	0	0	0	0	0	0	0	0	0	0	0	0
70%	0	0	0	0	0	0	0	0	0	0	0	0
80%	0	0	0	0	0	0	0	0	0	0	0	0
90%	0	0	0	0	0	0	0	0	0	0	0	0
Long Term												
Full Simulation Period[b]	0	0	0	0	0	0	0	0	0	0	0	0
Water Year Types[c]												
Wet	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0
Critical	0	0	0	0	0	0	0	0	0	0	0	0

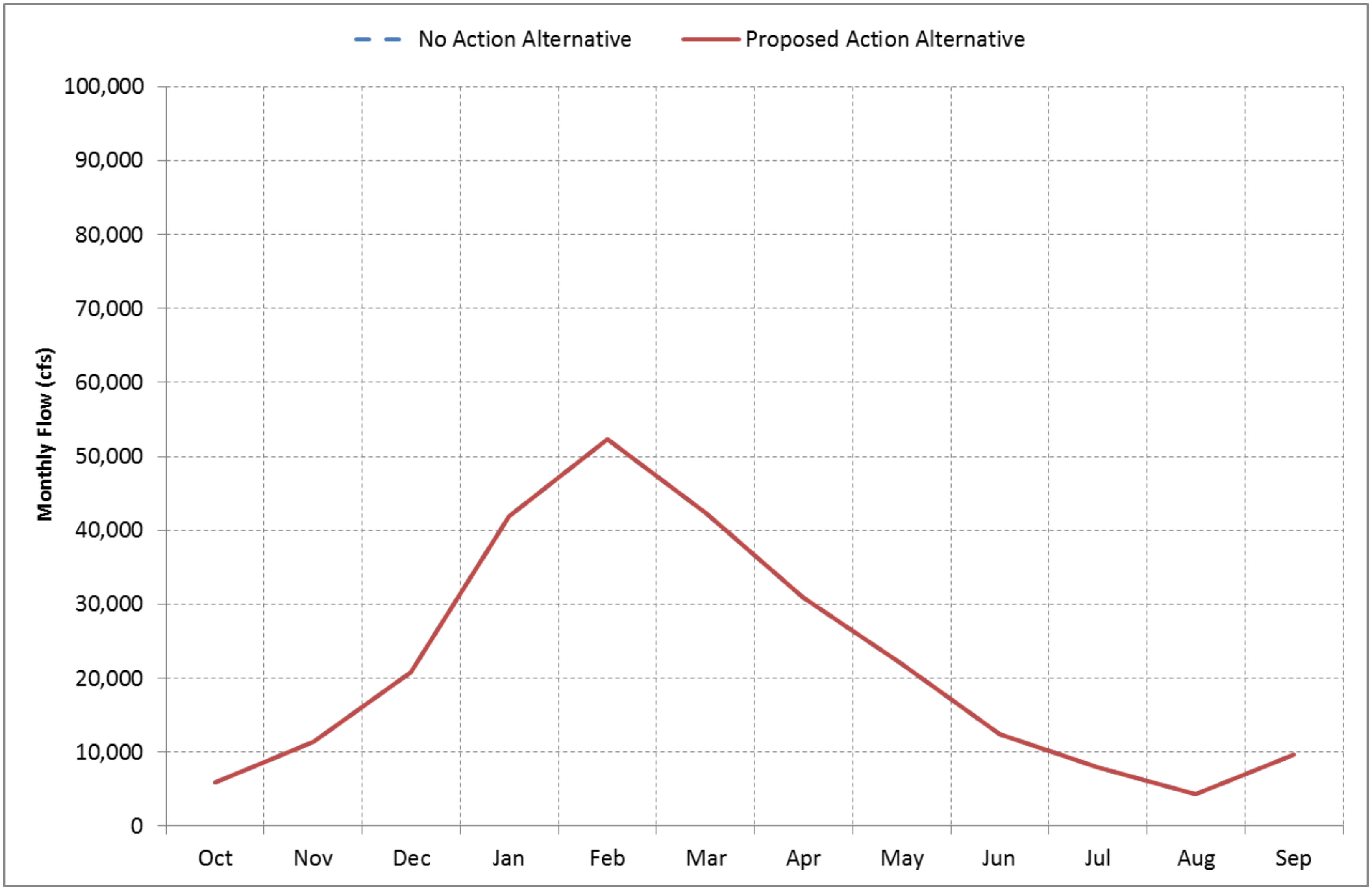
a Exceedance probability is defined as the probability a given value will be exceeded in any one year

b Based on the 82-year simulation period

c As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

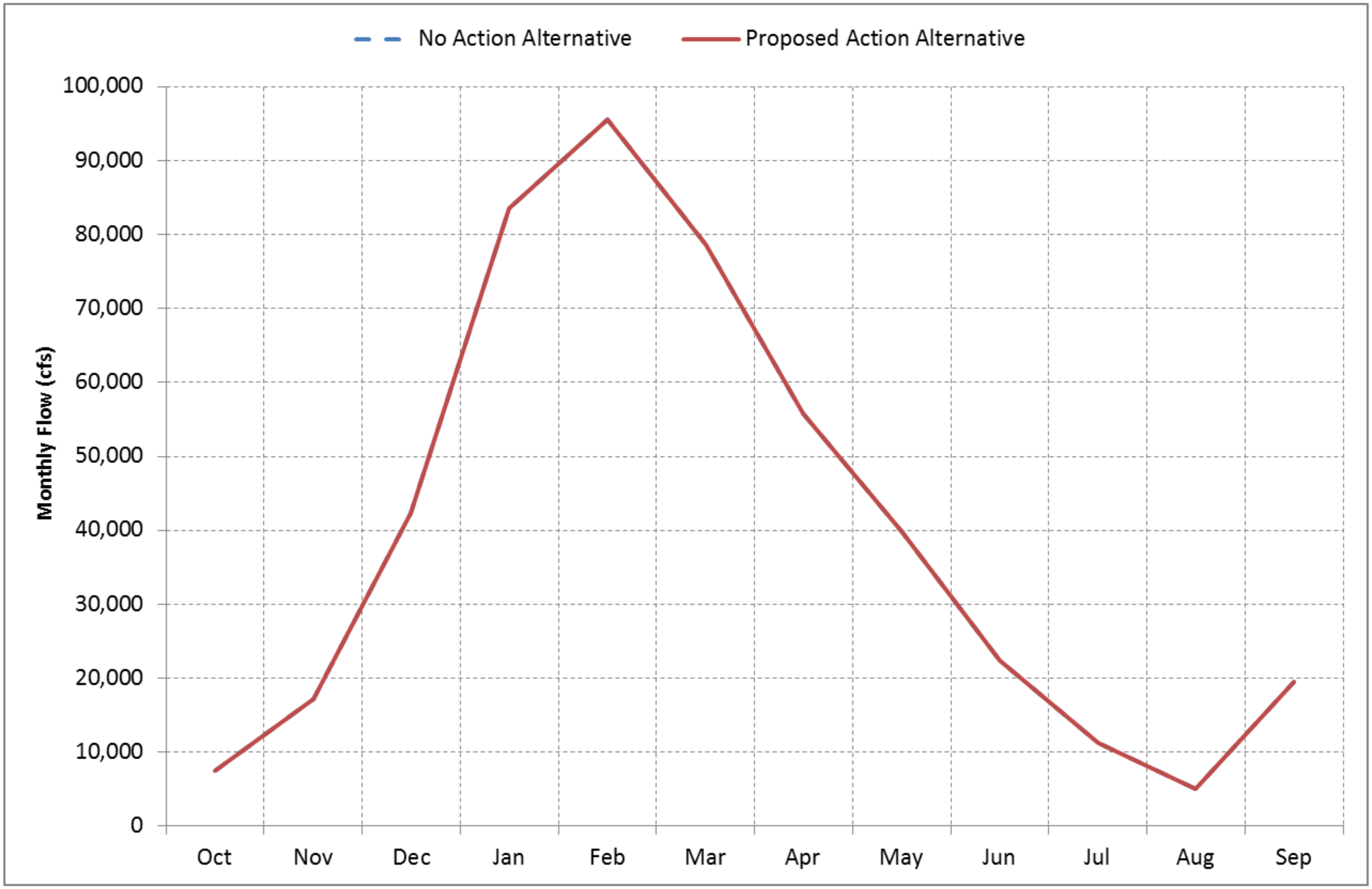
A.3.3.21. Delta Outflow

Figure A.3.3.21-1. Delta Outflow, Long-Term* Average Flow



* Based on the 82-year simulation period.

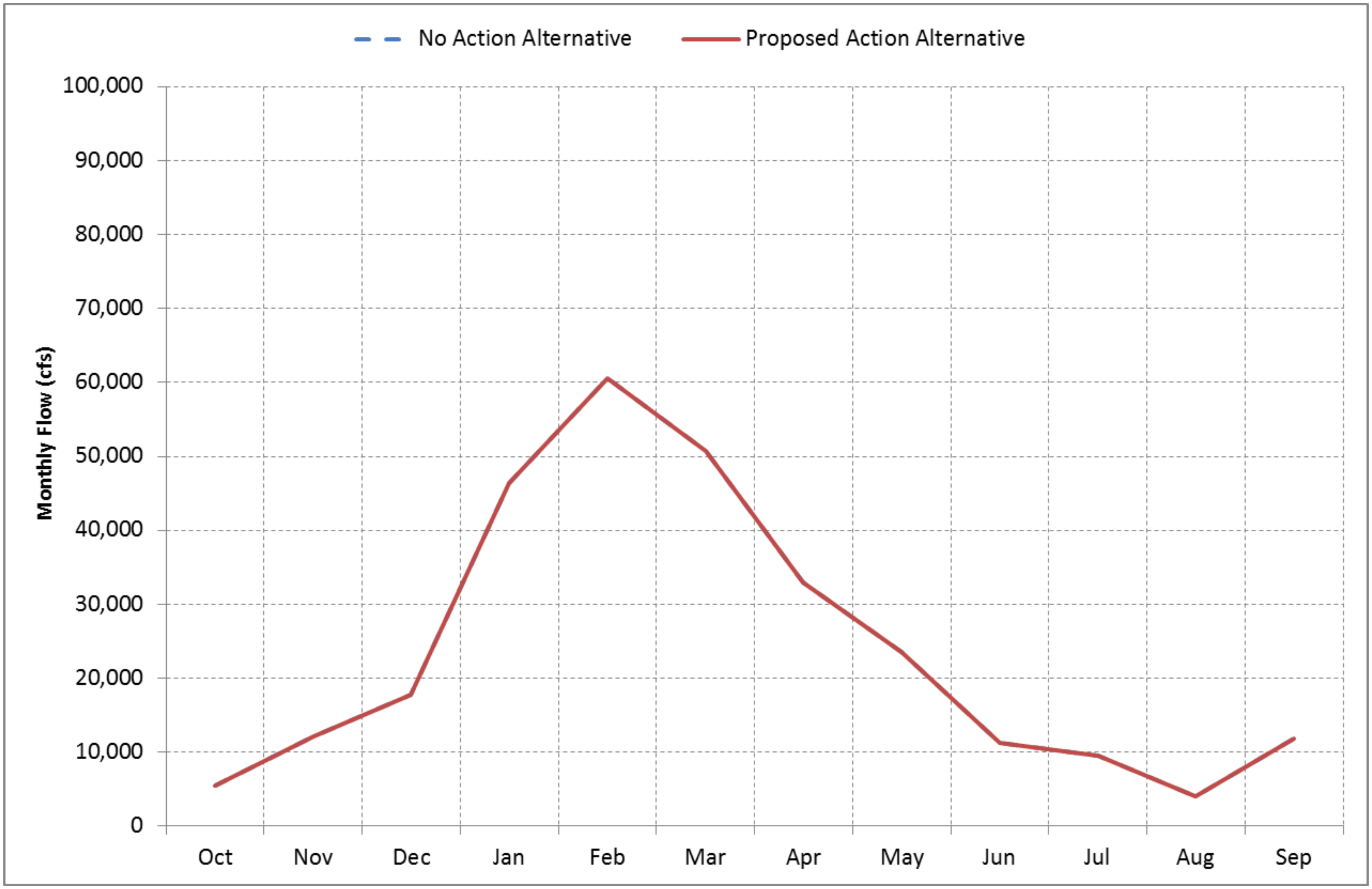
Figure A.3.3.21-2. Delta Outflow, Wet Year* Long-Term** Average Flow



*As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

** Based on the 82-year simulation period.

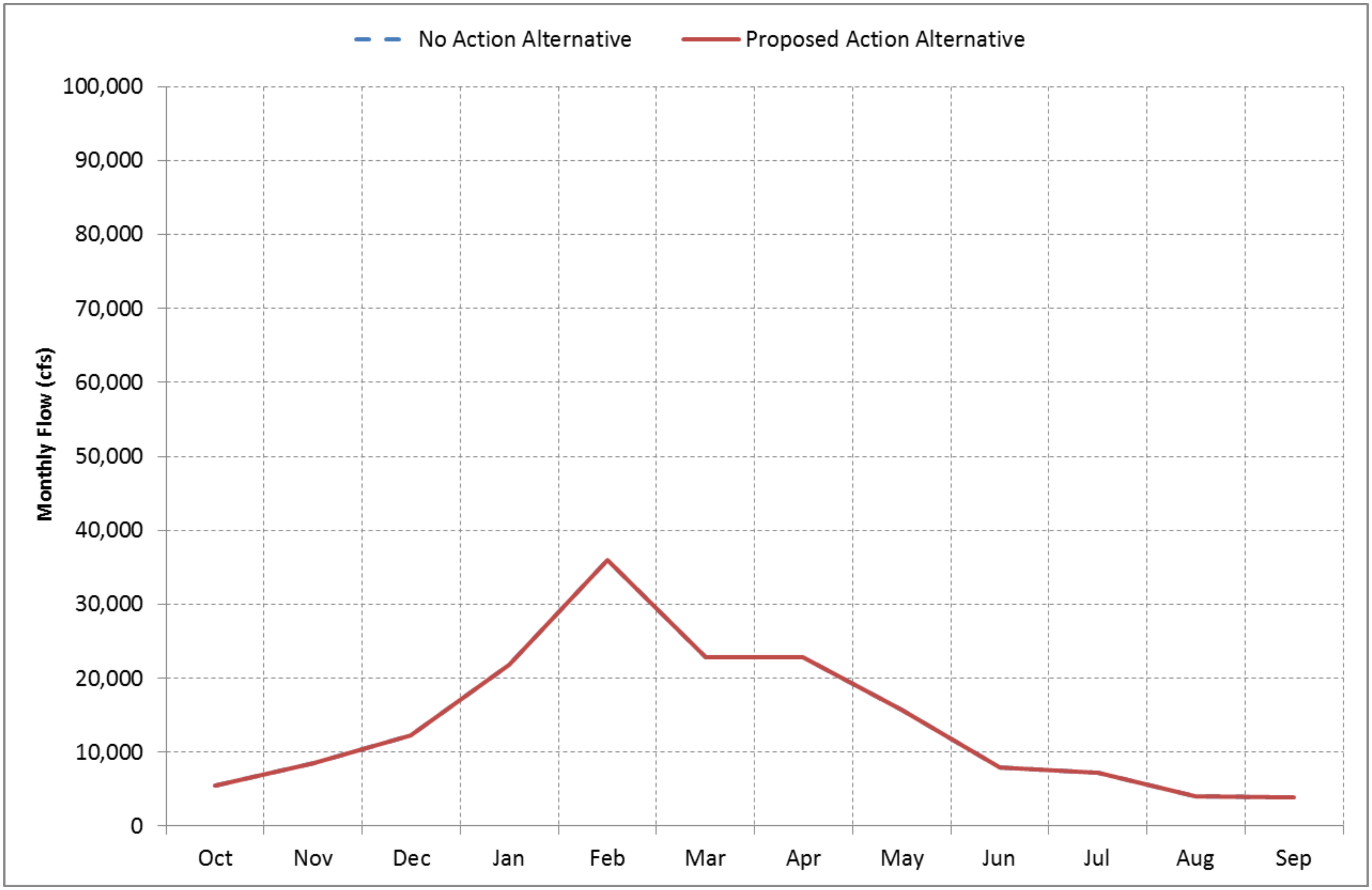
Figure A.3.3.21-3. Delta Outflow, Above Normal Year* Long-Term Average Flow**



*As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

** Based on the 82-year simulation period.

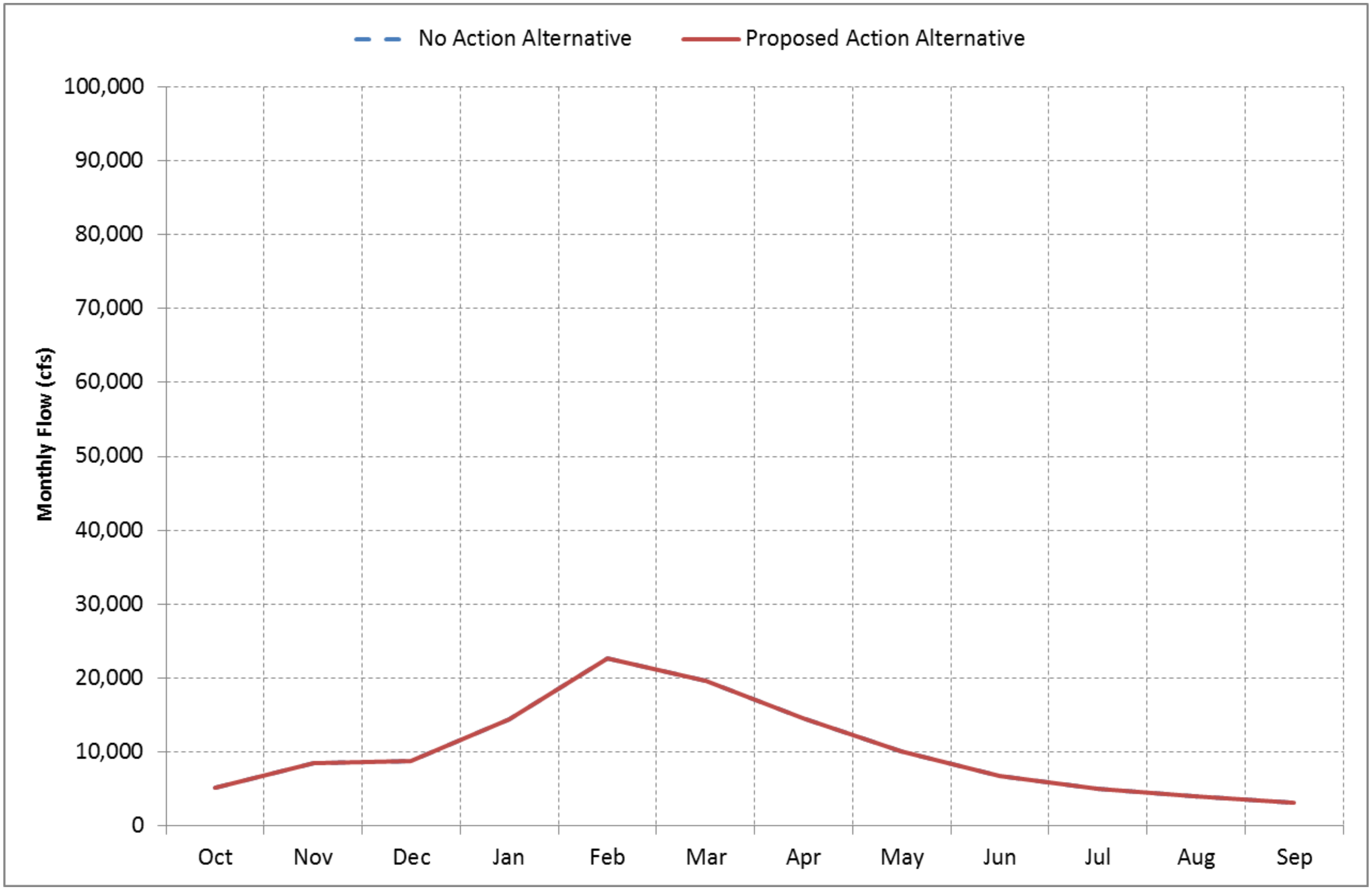
Figure A.3.3.21-4. Delta Outflow, Below Normal Year* Long-Term Average Flow**



*As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

** Based on the 82-year simulation period.

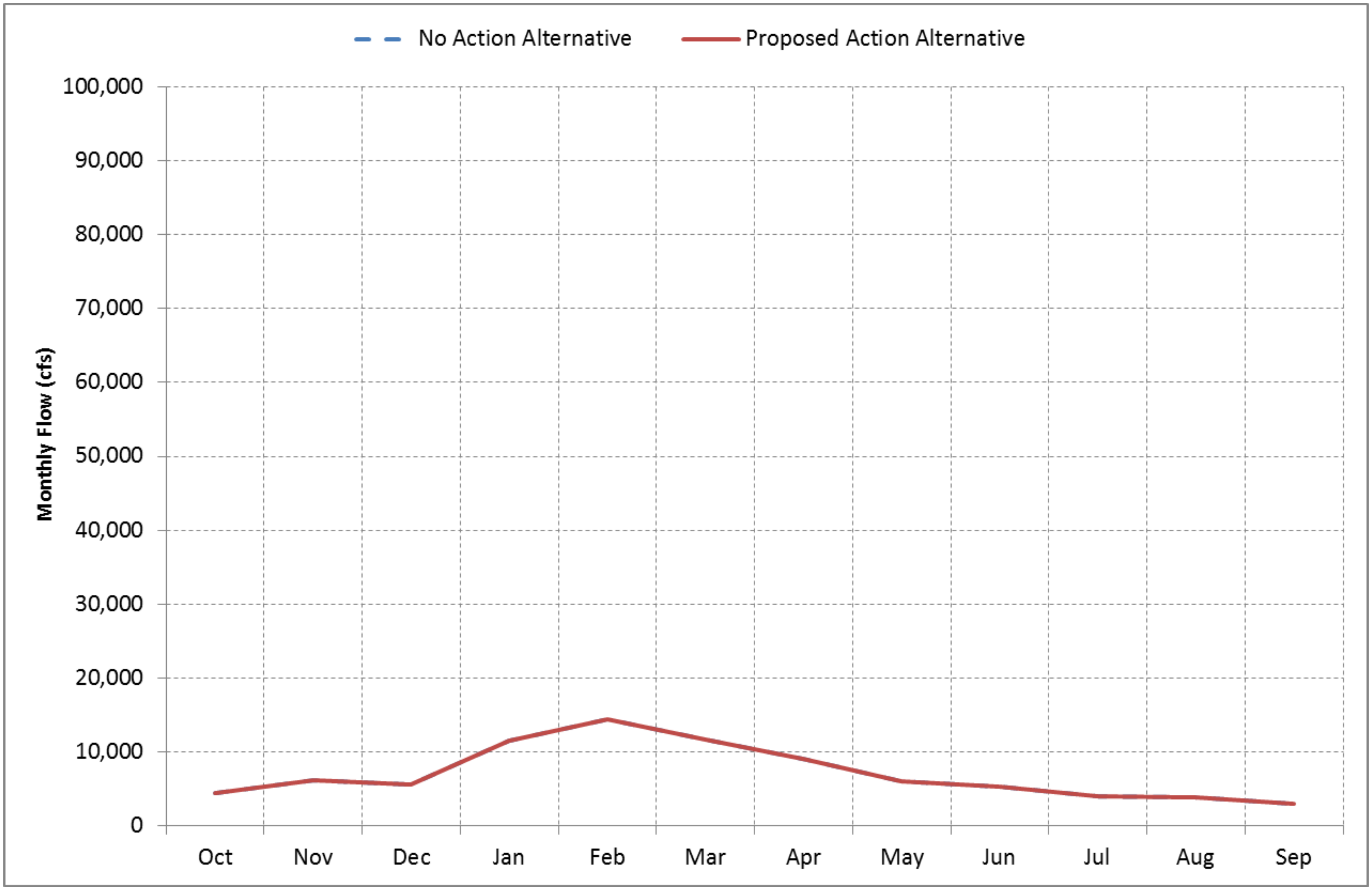
Figure A.3.3.21-5. Delta Outflow, Dry Year* Long-Term Average Flow**



*As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

** Based on the 82-year simulation period.

Figure A.3.3.21-6. Delta Outflow, Critical Dry Year* Long-Term Average Flow**



*As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

** Based on the 82-year simulation period.

Table A.3.3.21-1. Delta Outflow, Monthly Flow

No Action Alternative

Statistic	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
	Monthly Flow (cfs)											
Probability of Exceedance[a]												
10%	8,438	16,785	68,678	104,854	132,490	89,043	73,854	54,477	31,693	11,015	4,676	20,156
20%	7,813	15,469	34,082	70,024	83,757	67,185	53,984	30,918	14,834	10,050	4,196	19,375
30%	7,500	14,087	16,523	48,385	66,796	47,186	30,187	23,440	10,800	8,000	4,000	18,594
40%	6,094	11,250	12,669	29,285	52,053	34,769	27,587	18,801	8,134	8,000	4,000	11,563
50%	4,984	10,313	9,967	21,589	36,518	25,591	20,819	14,838	7,243	8,000	4,000	4,488
60%	4,154	5,997	6,444	17,306	25,478	20,236	17,252	12,524	7,100	6,500	4,000	3,906
70%	4,000	4,500	4,973	12,005	17,935	16,746	13,224	9,910	6,875	5,085	4,000	3,000
80%	4,000	4,500	4,526	9,746	14,500	12,516	10,762	8,537	6,344	5,000	3,981	3,000
90%	4,000	3,911	4,500	8,654	10,895	8,773	9,541	7,031	5,469	4,000	3,769	3,000
Long Term												
Full Simulation Period[b]	5,937	11,468	20,864	41,837	52,385	42,286	30,936	21,890	12,373	7,884	4,351	9,716
Water Year Types[c]												
Wet	7,540	17,210	42,312	83,485	95,591	78,669	55,821	39,946	22,365	11,194	5,098	19,537
Above Normal	5,428	12,119	17,728	46,346	60,584	50,730	32,926	23,526	11,304	9,582	4,000	11,784
Below Normal	5,490	8,590	12,225	21,850	35,958	22,784	22,767	15,784	7,936	7,188	4,018	3,891
Dry	5,240	8,484	8,819	14,381	22,626	19,626	14,572	10,060	6,773	5,067	4,076	3,159
Critical	4,542	6,206	5,676	11,593	14,377	11,754	9,102	6,004	5,370	4,050	3,887	3,000

Proposed Action Alternative

Statistic	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
	Monthly Flow (cfs)											
Probability of Exceedance[a]												
10%	8,438	16,785	68,678	104,853	132,496	89,043	73,854	54,477	31,693	11,015	4,676	20,156
20%	7,813	15,469	34,082	70,024	83,757	67,185	53,984	30,918	14,834	10,050	4,196	19,375
30%	7,500	14,087	16,523	48,385	66,796	47,186	30,187	23,440	10,800	8,000	4,000	18,594
40%	6,094	11,250	12,668	29,285	52,052	34,769	27,587	18,801	8,134	8,000	4,000	11,563
50%	4,984	10,313	9,967	21,589	36,518	25,591	20,818	14,838	7,243	8,000	4,000	4,488
60%	4,154	5,997	6,444	17,306	25,478	20,236	17,252	12,524	7,100	6,500	4,000	3,906
70%	4,000	4,500	4,973	12,005	17,935	16,746	13,224	9,910	6,875	5,085	4,000	3,000
80%	4,000	4,500	4,526	9,746	14,500	12,516	10,762	8,537	6,344	5,000	3,981	3,000
90%	4,000	3,911	4,500	8,653	10,895	8,773	9,541	7,031	5,469	4,000	3,769	3,000
Long Term												
Full Simulation Period[b]	5,937	11,467	20,864	41,837	52,385	42,286	30,936	21,890	12,373	7,884	4,351	9,716
Water Year Types[c]												
Wet	7,540	17,210	42,312	83,485	95,591	78,669	55,821	39,946	22,365	11,194	5,098	19,537
Above Normal	5,428	12,119	17,728	46,346	60,585	50,730	32,926	23,525	11,304	9,582	4,000	11,784
Below Normal	5,490	8,590	12,225	21,850	35,958	22,784	22,767	15,784	7,936	7,188	4,018	3,891
Dry	5,240	8,484	8,819	14,381	22,626	19,626	14,572	10,060	6,773	5,067	4,076	3,159
Critical	4,542	6,206	5,676	11,593	14,377	11,754	9,102	6,004	5,370	4,050	3,887	3,000

Proposed Action Alternative minus No Action Alternative

Statistic	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
	Monthly Flow (cfs)											
Probability of Exceedance[a]												
10%	0	0	0	-1	6	0	0	0	0	0	0	0
20%	0	0	0	0	0	0	0	0	0	0	0	0
30%	0	0	0	0	0	0	0	0	0	0	0	0
40%	0	0	0	0	-1	0	0	0	0	0	0	0
50%	0	0	0	0	0	0	-1	0	0	0	0	0
60%	0	0	0	0	0	0	0	0	0	0	0	0
70%	0	0	0	0	0	0	0	0	0	0	0	0
80%	0	0	0	0	0	0	0	0	0	0	0	0
90%	0	0	0	0	0	0	0	0	0	0	0	0
Long Term												
Full Simulation Period[b]	0	0	0	0	0	0	0	0	0	0	0	0
Water Year Types[c]												
Wet	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0
Critical	0	0	0	0	0	0	0	0	0	0	0	0

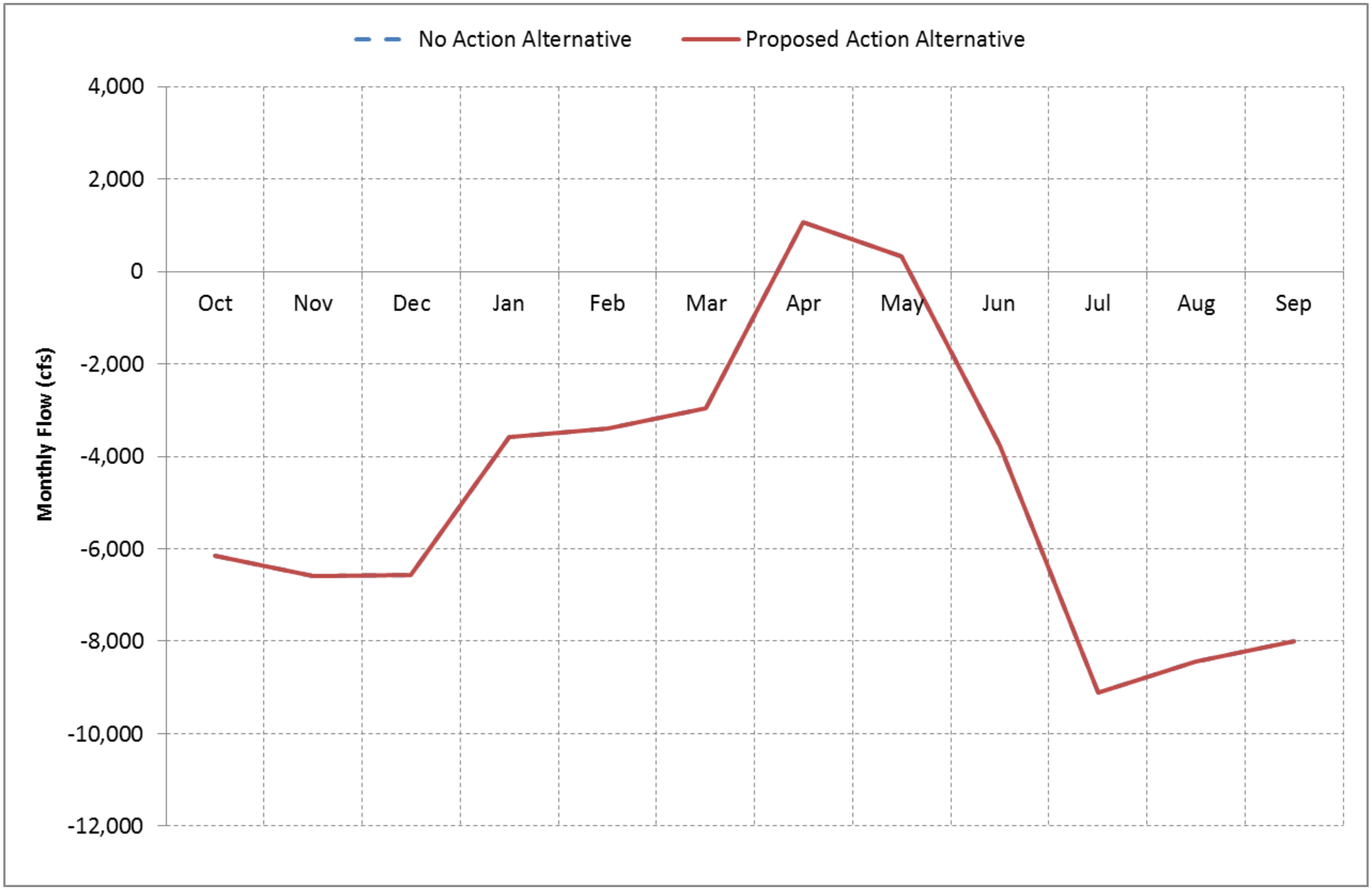
a Exceedance probability is defined as the probability a given value will be exceeded in any one year

b Based on the 82-year simulation period

c As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

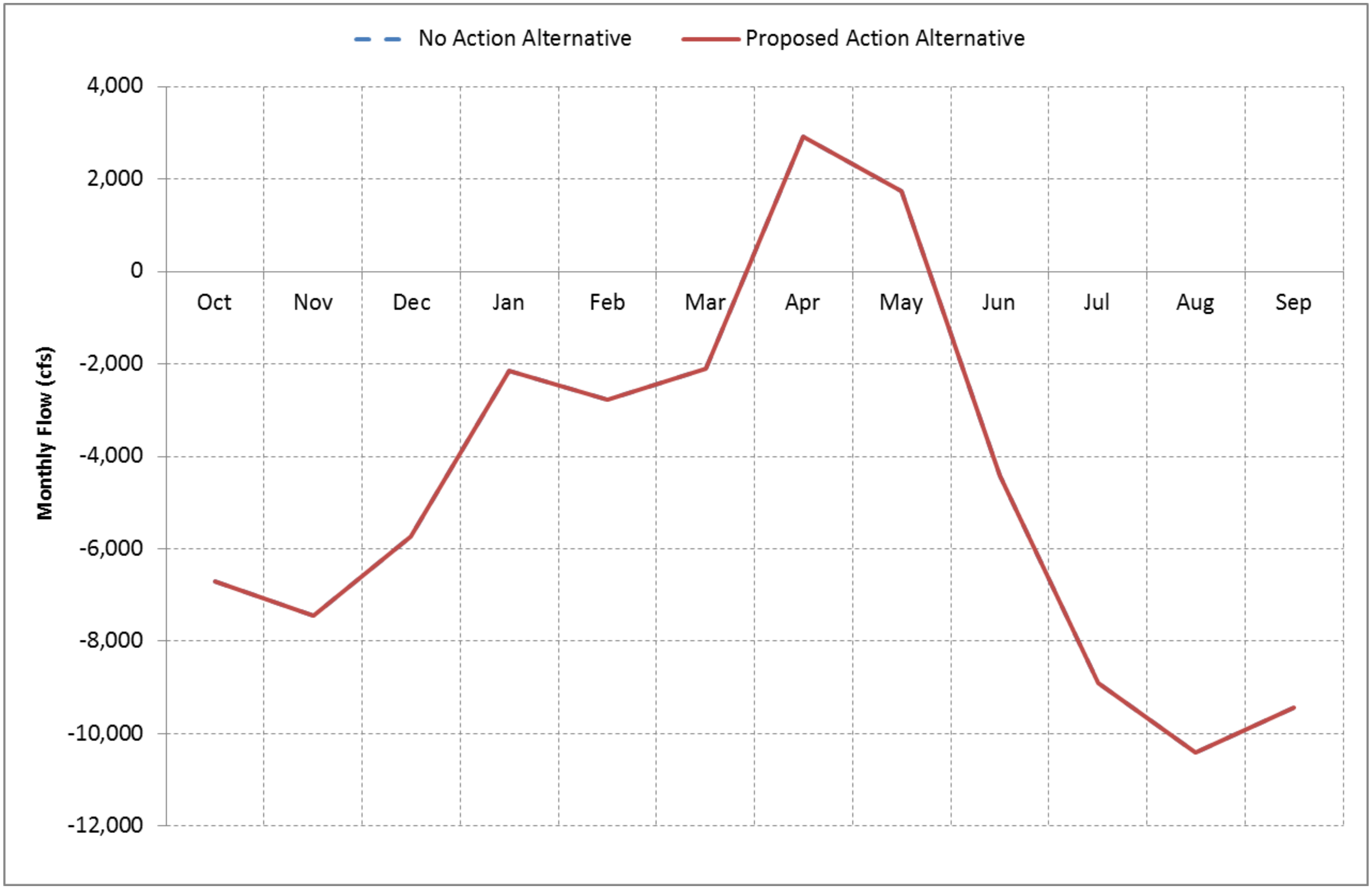
A.3.3.22. Old and Middle River Flow

Figure A.3.3.22-1. Old and Middle River, Long-Term* Average Flow



* Based on the 82-year simulation period.

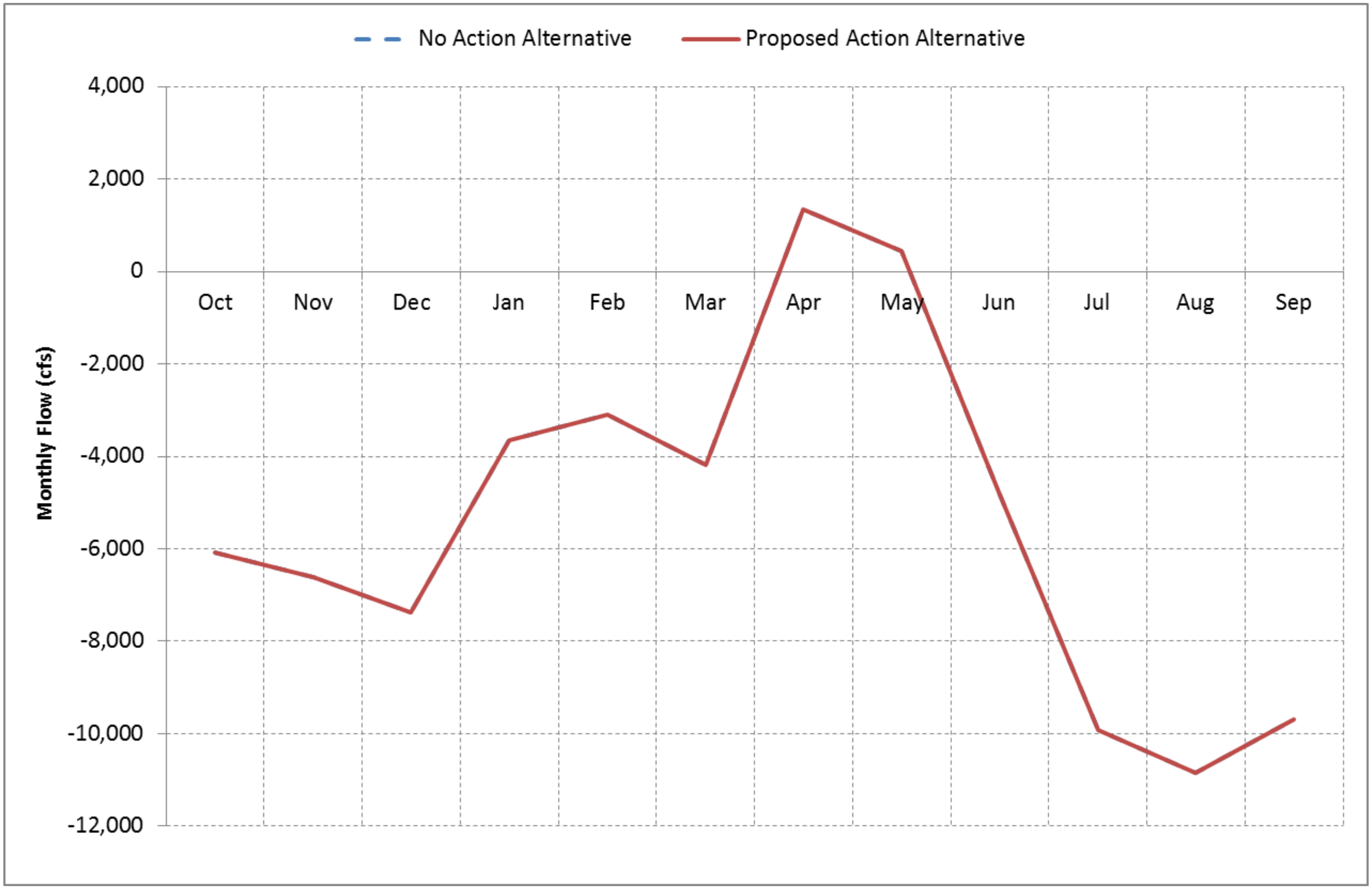
Figure A.3.3.22-2. Old and Middle River, Wet Year* Long-Term Average Flow**



*As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

** Based on the 82-year simulation period.

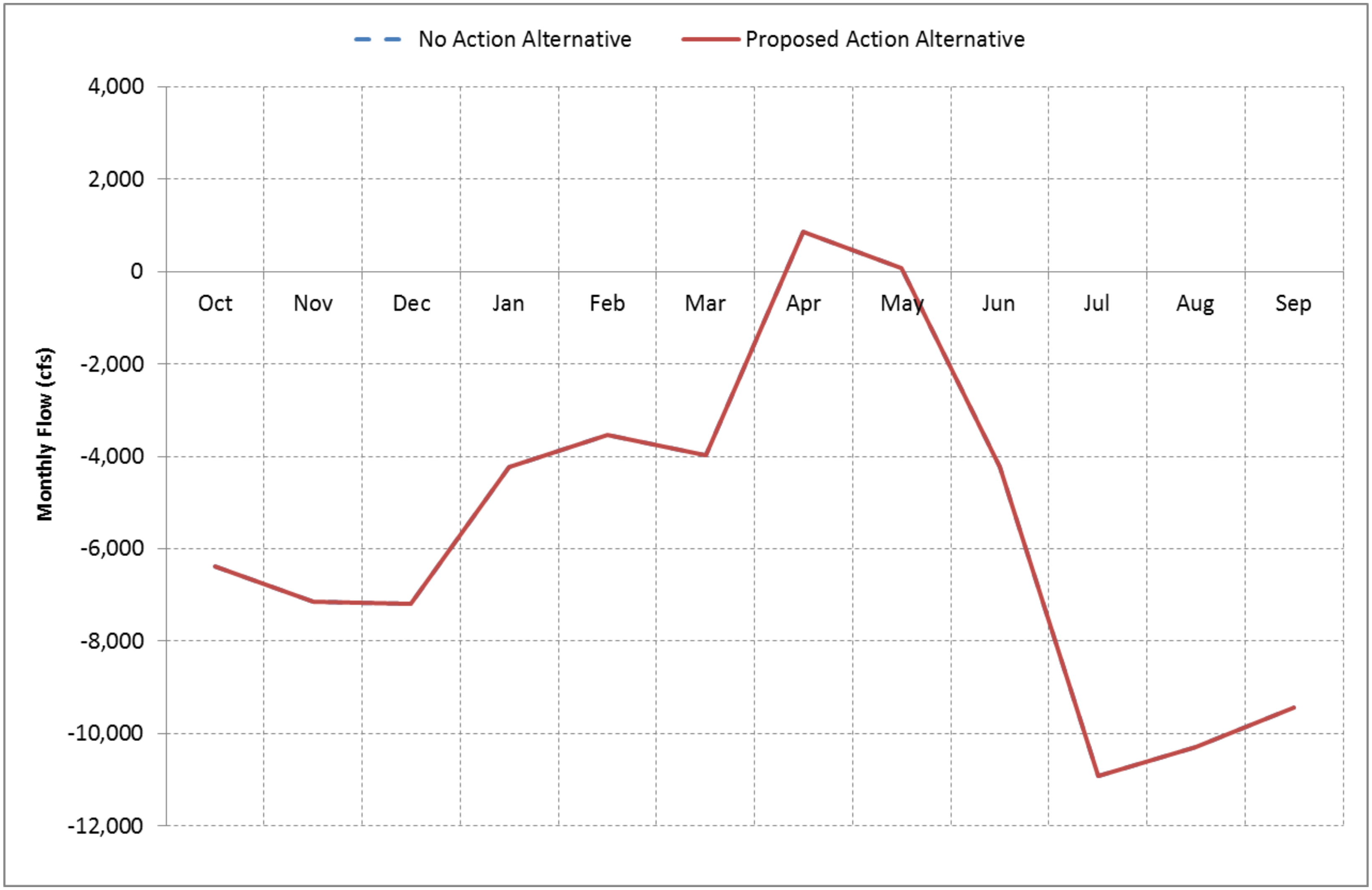
Figure A.3.3.22-3. Old and Middle River, Above Normal Year* Long-Term Average Flow**



*As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

** Based on the 82-year simulation period.

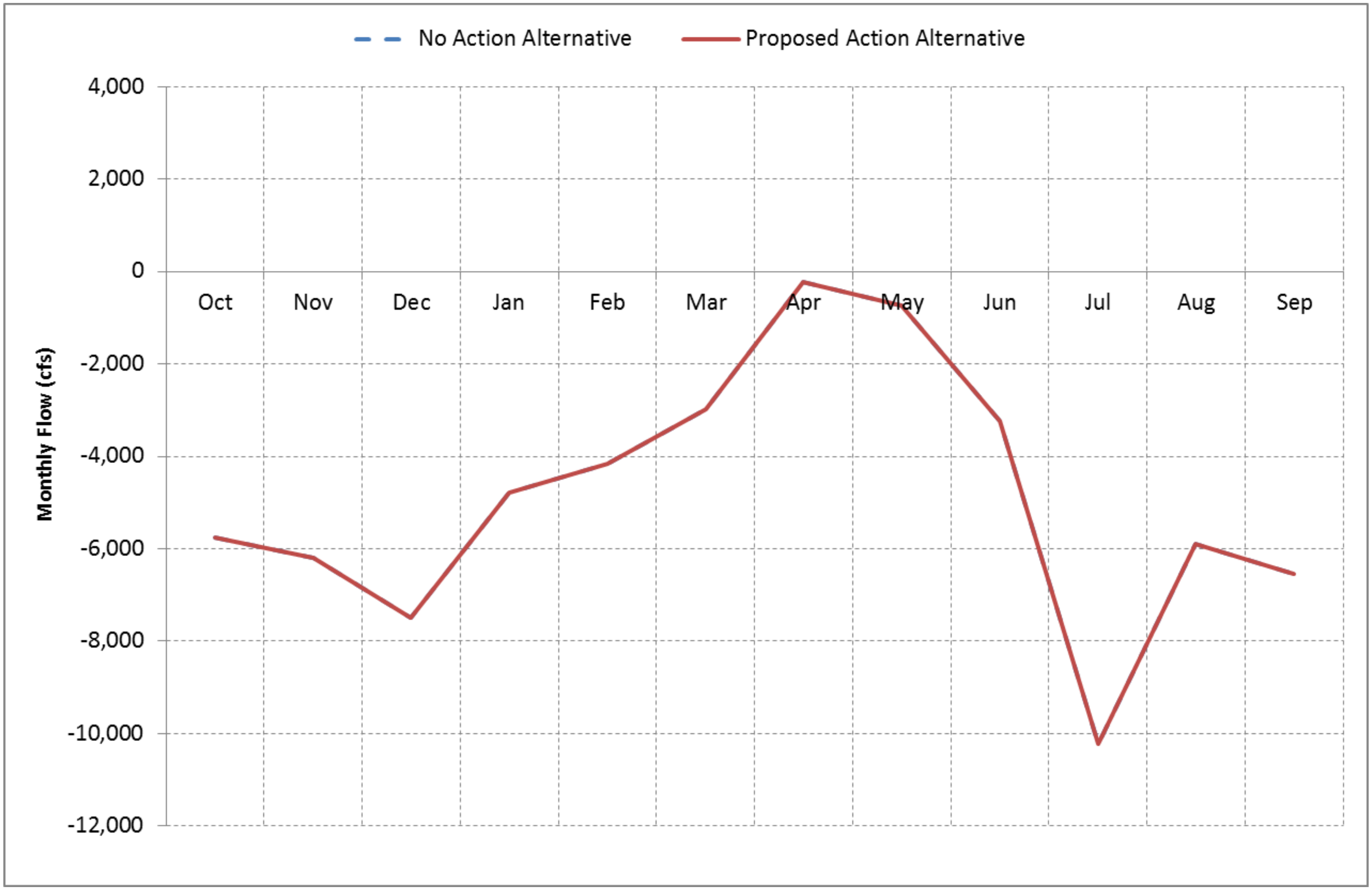
Figure A.3.3.22-4. Old and Middle River, Below Normal Year* Long-Term Average Flow**



*As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

** Based on the 82-year simulation period.

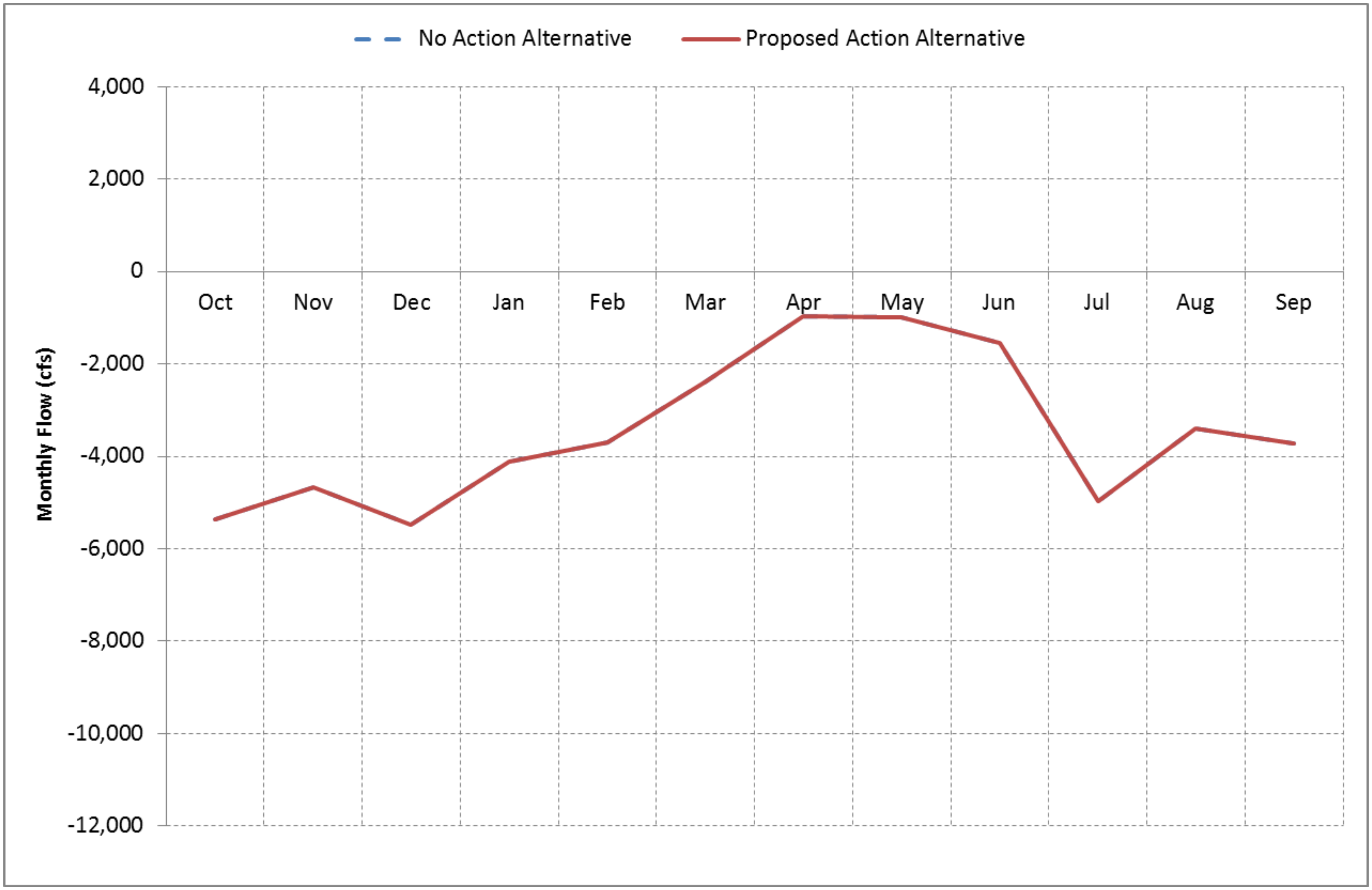
Figure A.3.3.22-5. Old and Middle River, Dry Year* Long-Term Average Flow**



*As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

** Based on the 82-year simulation period.

Figure A.3.3.22-6. Old and Middle River, Critical Dry Year* Long-Term Average Flow**



*As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

** Based on the 82-year simulation period.

Table A.3.3.22-1. Old and Middle River, Monthly Flow

No Action Alternative

	Monthly Flow (cfs)											
Statistic	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Probability of Exceedance[a]												
10%	-3,799	-3,528	-3,588	-2,823	-712	-576	3,156	2,576	-1,150	-3,272	-2,662	-3,379
20%	-4,592	-4,195	-5,193	-2,823	-2,268	-1,566	2,211	1,246	-1,578	-6,348	-5,236	-5,190
30%	-4,976	-5,395	-5,871	-3,355	-2,776	-3,113	1,711	562	-3,500	-8,886	-6,647	-6,587
40%	-5,491	-5,895	-5,871	-3,355	-3,500	-3,500	1,438	176	-3,500	-9,750	-9,313	-8,258
50%	-5,975	-6,239	-5,871	-4,710	-4,844	-3,855	908	-77	-4,183	-10,149	-10,202	-9,246
60%	-6,364	-6,779	-6,408	-5,000	-5,000	-4,581	444	-382	-5,000	-10,527	-10,589	-9,592
70%	-7,097	-7,426	-8,540	-5,000	-5,000	-5,000	-198	-563	-5,000	-10,974	-10,724	-9,893
80%	-7,826	-9,403	-9,492	-5,000	-5,000	-5,000	-352	-699	-5,000	-11,329	-10,859	-9,973
90%	-8,783	-10,029	-9,684	-5,000	-5,000	-5,000	-1,033	-1,150	-5,000	-11,478	-11,083	-10,127
Long Term												
Full Simulation Period[b]	-6,155	-6,592	-6,572	-3,594	-3,390	-2,964	1,076	318	-3,766	-9,104	-8,439	-7,998
Water Year Types[c]												
Wet	-6,700	-7,449	-5,737	-2,153	-2,775	-2,106	2,916	1,727	-4,425	-8,899	-10,417	-9,424
Above Normal	-6,072	-6,621	-7,373	-3,657	-3,092	-4,182	1,332	445	-4,839	-9,914	-10,841	-9,691
Below Normal	-6,389	-7,142	-7,192	-4,240	-3,531	-3,976	863	76	-4,226	-10,908	-10,300	-9,443
Dry	-5,763	-6,193	-7,494	-4,789	-4,156	-2,983	-225	-735	-3,227	-10,218	-5,892	-6,534
Critical	-5,373	-4,660	-5,475	-4,106	-3,705	-2,392	-970	-1,004	-1,539	-4,960	-3,400	-3,723

Proposed Action Alternative

	Monthly Flow (cfs)											
Statistic	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Probability of Exceedance[a]												
10%	-3,799	-3,528	-3,588	-2,823	-712	-576	3,156	2,576	-1,150	-3,272	-2,662	-3,379
20%	-4,592	-4,195	-5,193	-2,823	-2,268	-1,566	2,211	1,246	-1,578	-6,348	-5,236	-5,190
30%	-4,976	-5,395	-5,871	-3,355	-2,776	-3,113	1,711	562	-3,500	-8,886	-6,647	-6,587
40%	-5,491	-5,895	-5,871	-3,355	-3,500	-3,500	1,438	176	-3,500	-9,750	-9,313	-8,258
50%	-5,975	-6,239	-5,871	-4,710	-4,844	-3,855	908	-77	-4,183	-10,149	-10,202	-9,246
60%	-6,364	-6,779	-6,408	-5,000	-5,000	-4,581	444	-382	-5,000	-10,527	-10,589	-9,592
70%	-7,097	-7,426	-8,540	-5,000	-5,000	-5,000	-198	-563	-5,000	-10,974	-10,724	-9,893
80%	-7,826	-9,403	-9,492	-5,000	-5,000	-5,000	-352	-699	-5,000	-11,329	-10,859	-9,973
90%	-8,783	-10,029	-9,684	-5,000	-5,000	-5,000	-1,033	-1,150	-5,000	-11,478	-11,083	-10,127
Long Term												
Full Simulation Period[b]	-6,155	-6,592	-6,572	-3,594	-3,390	-2,964	1,076	318	-3,766	-9,104	-8,439	-7,998
Water Year Types[c]												
Wet	-6,700	-7,449	-5,737	-2,153	-2,775	-2,106	2,916	1,727	-4,425	-8,899	-10,417	-9,424
Above Normal	-6,072	-6,621	-7,373	-3,657	-3,091	-4,182	1,332	445	-4,839	-9,914	-10,841	-9,691
Below Normal	-6,389	-7,142	-7,192	-4,240	-3,531	-3,976	863	76	-4,226	-10,908	-10,300	-9,443
Dry	-5,763	-6,193	-7,494	-4,789	-4,156	-2,983	-225	-735	-3,227	-10,218	-5,892	-6,534
Critical	-5,372	-4,660	-5,475	-4,106	-3,705	-2,392	-970	-1,004	-1,539	-4,960	-3,400	-3,722

Proposed Action Alternative minus No Action Alternative

	Monthly Flow (cfs)											
Statistic	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Probability of Exceedance[a]												
10%	0	0	0	0	0	0	0	0	0	0	0	0
20%	0	0	0	0	0	0	0	0	0	0	0	0
30%	0	0	0	0	0	0	0	0	0	0	0	0
40%	0	0	0	0	0	0	0	0	0	0	0	0
50%	0	0	0	0	0	0	0	0	0	0	0	0
60%	0	0	0	0	0	0	0	0	0	0	0	0
70%	0	0	0	0	0	0	0	0	0	0	0	0
80%	0	0	0	0	0	0	0	0	0	0	0	0
90%	0	0	0	0	0	0	0	0	0	0	0	0
Long Term												
Full Simulation Period[b]	0	0	0	0	0	0	0	0	0	0	0	0
Water Year Types[c]												
Wet	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0
Critical	0	0	0	0	0	0	0	0	0	0	0	0

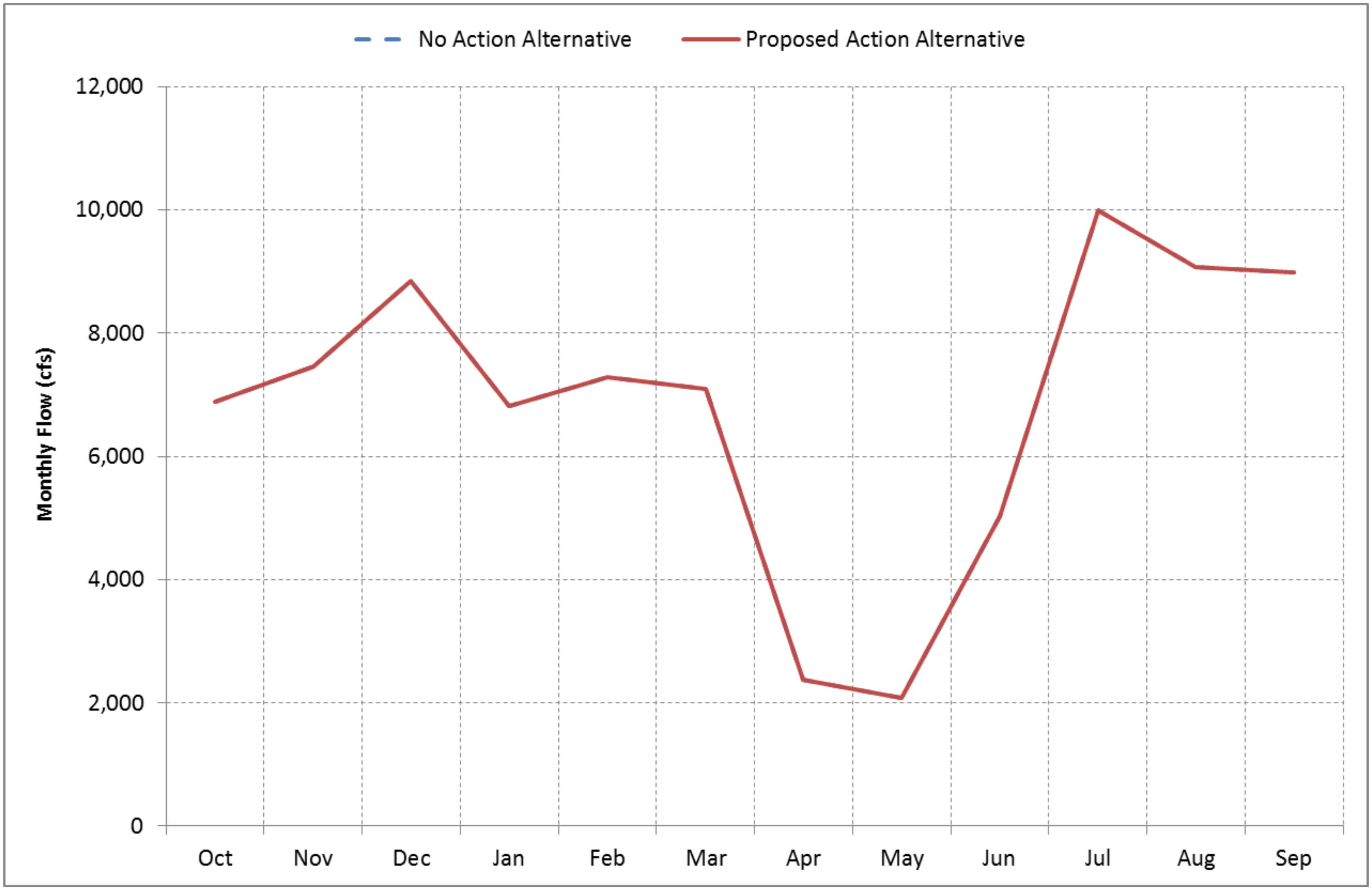
a Exceedance probability is defined as the probability a given value will be exceeded in any one year

b Based on the 82-year simulation period

c As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

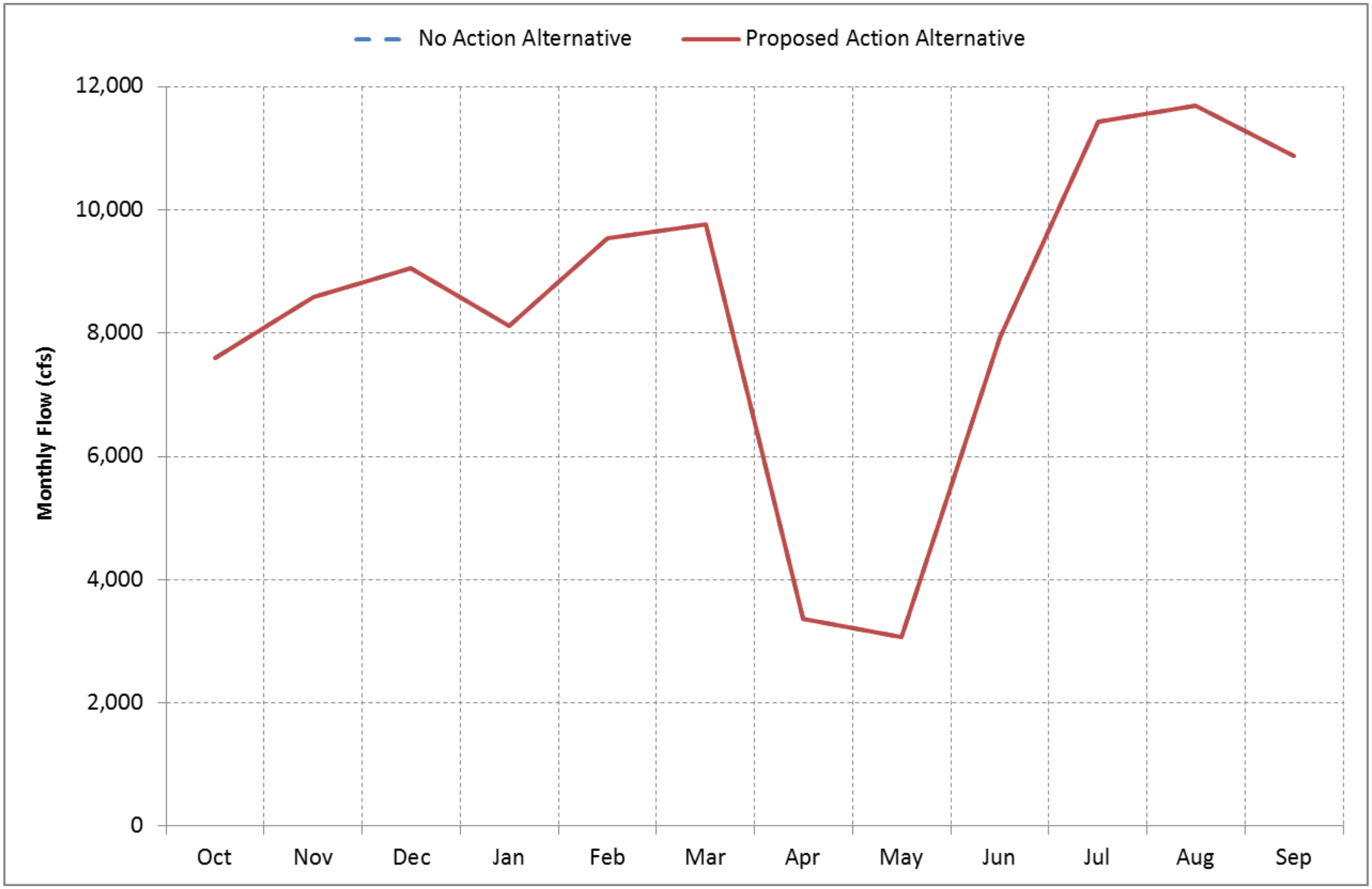
A.3.3.23. Exports through Jones and Banks Pumping Plants

Figure A.3.3.23-1. Exports through Jones and Banks Pumping Plants, Long-Term* Average Flow



* Based on the 82-year simulation period.

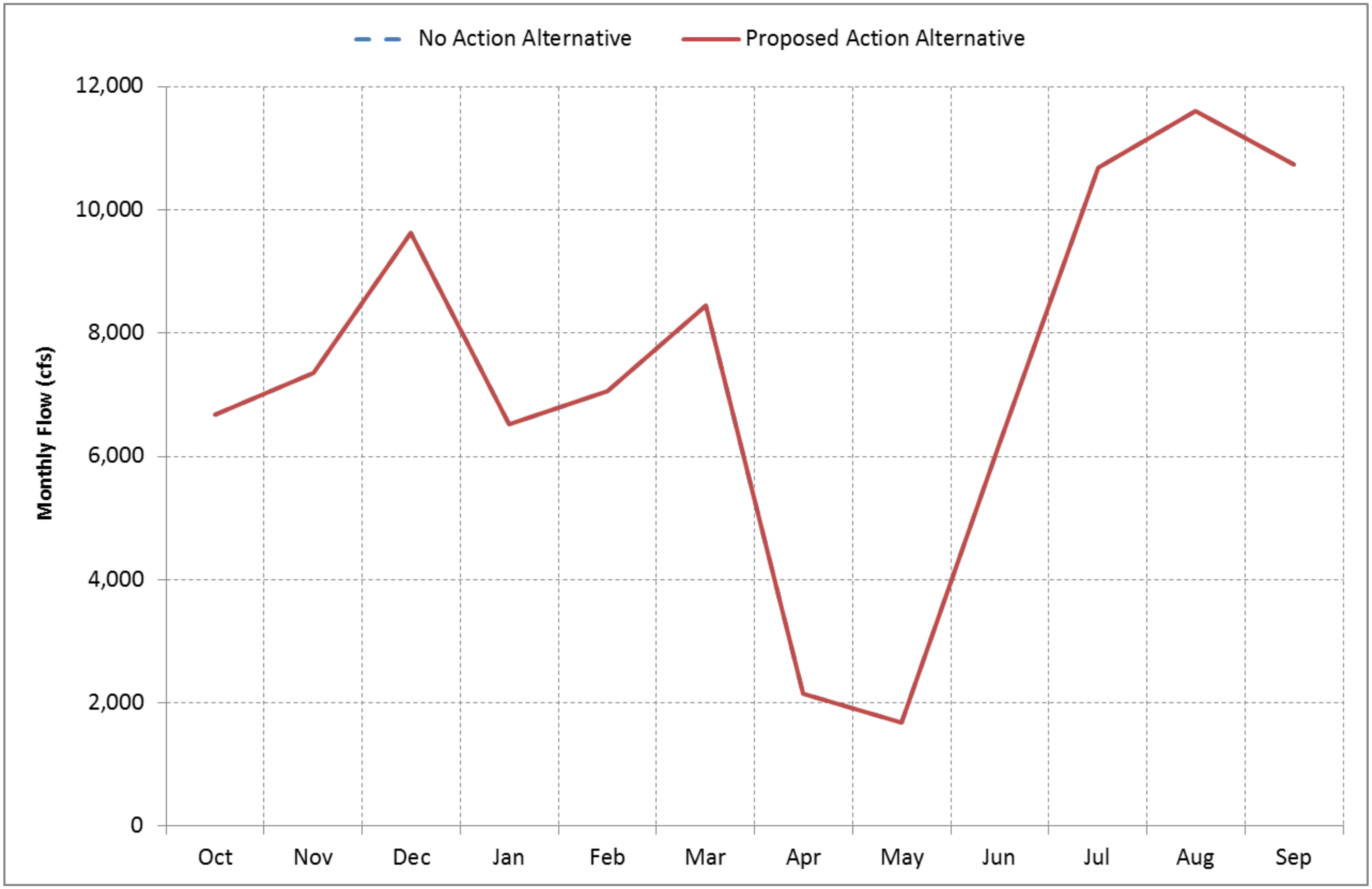
Figure A.3.3.23-2. Exports through Jones and Banks Pumping Plants, Wet Year* Long-Term Average Flow**



*As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

** Based on the 82-year simulation period.

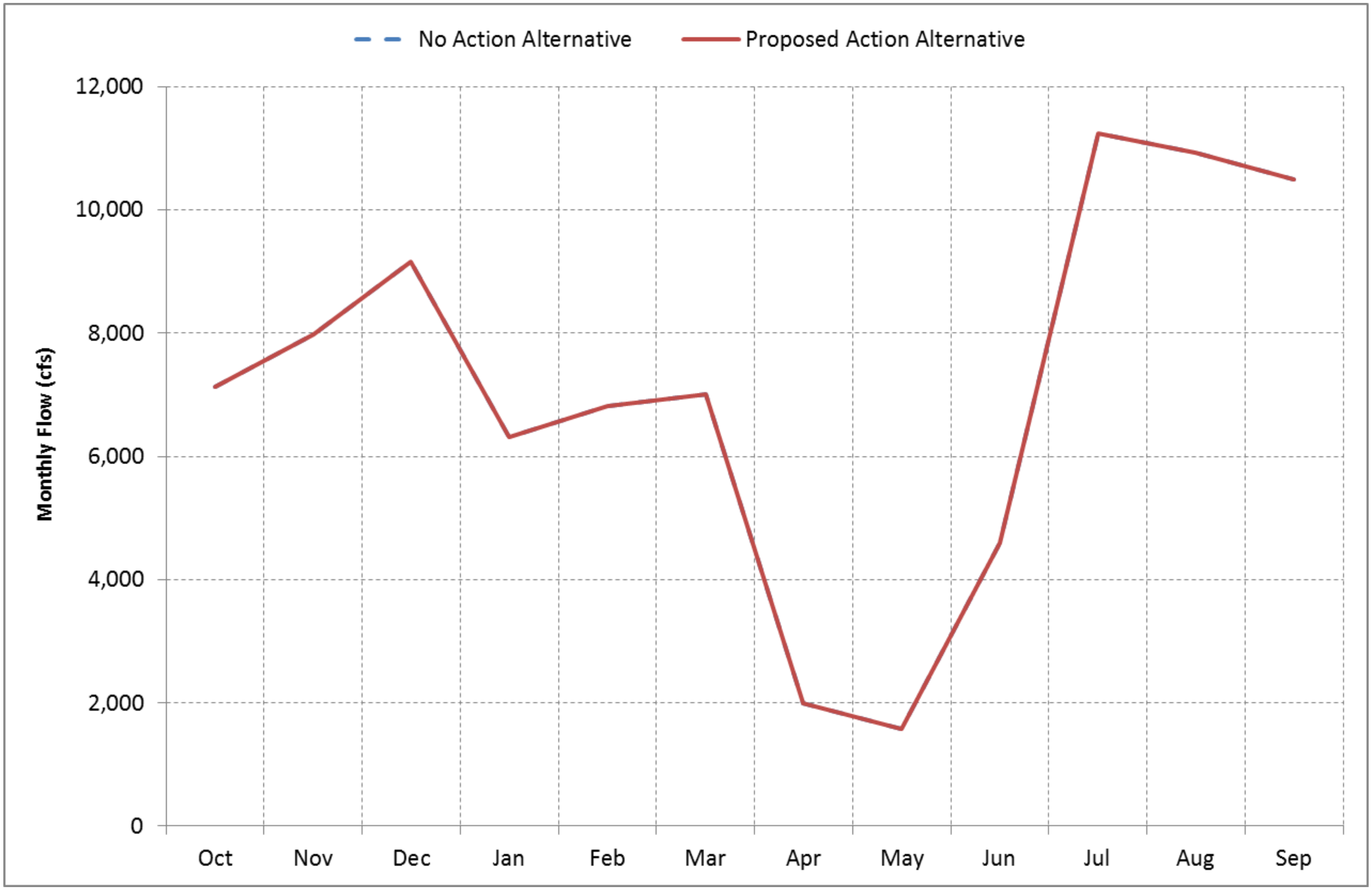
Figure A.3.3.23-3. Exports through Jones and Banks Pumping Plants, Above Normal Year* Long-Term Average Flow**



*As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

** Based on the 82-year simulation period.

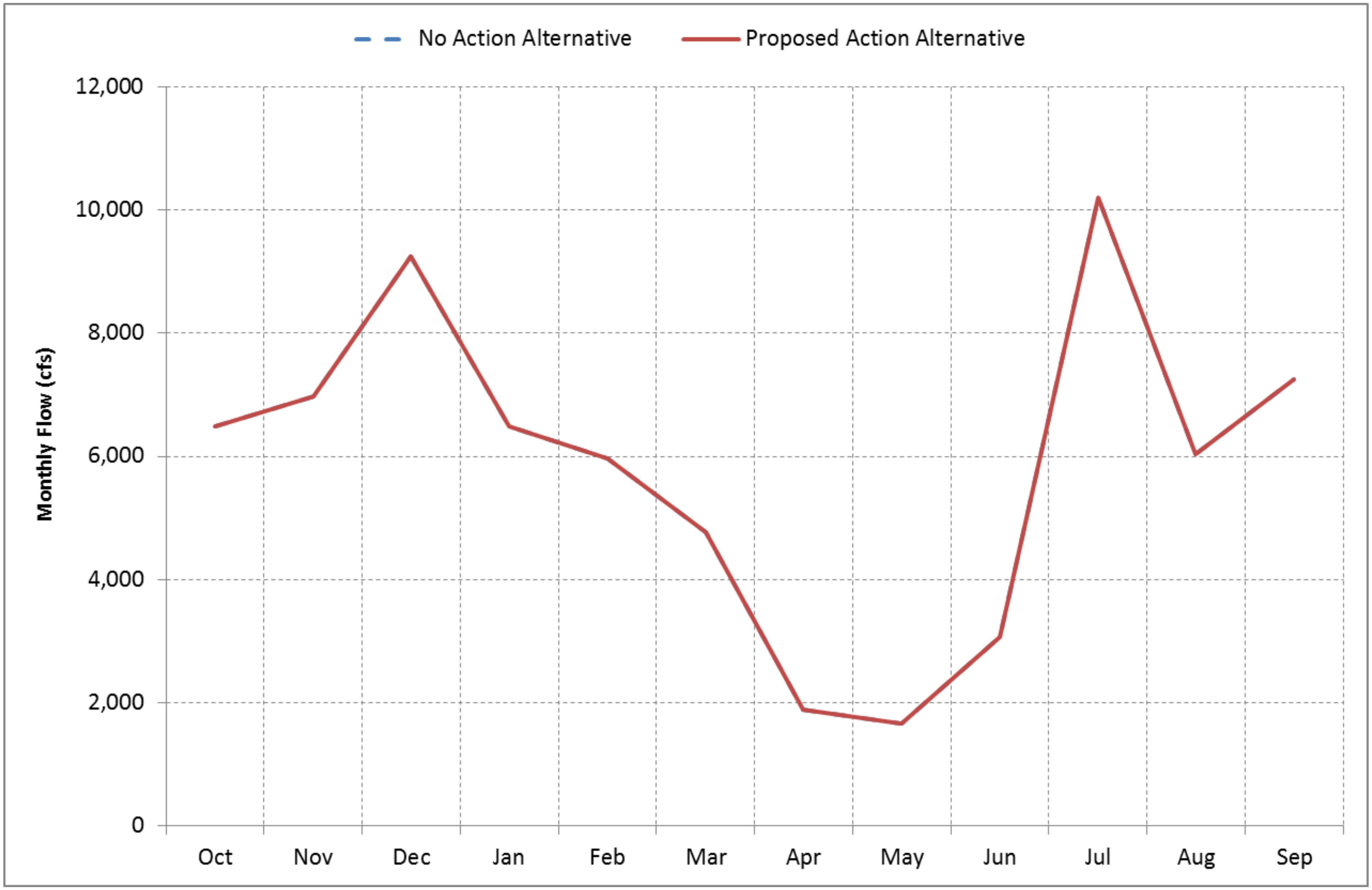
Figure A.3.3.23-4. Exports through Jones and Banks Pumping Plants, Below Normal Year* Long-Term Average Flow**



*As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

** Based on the 82-year simulation period.

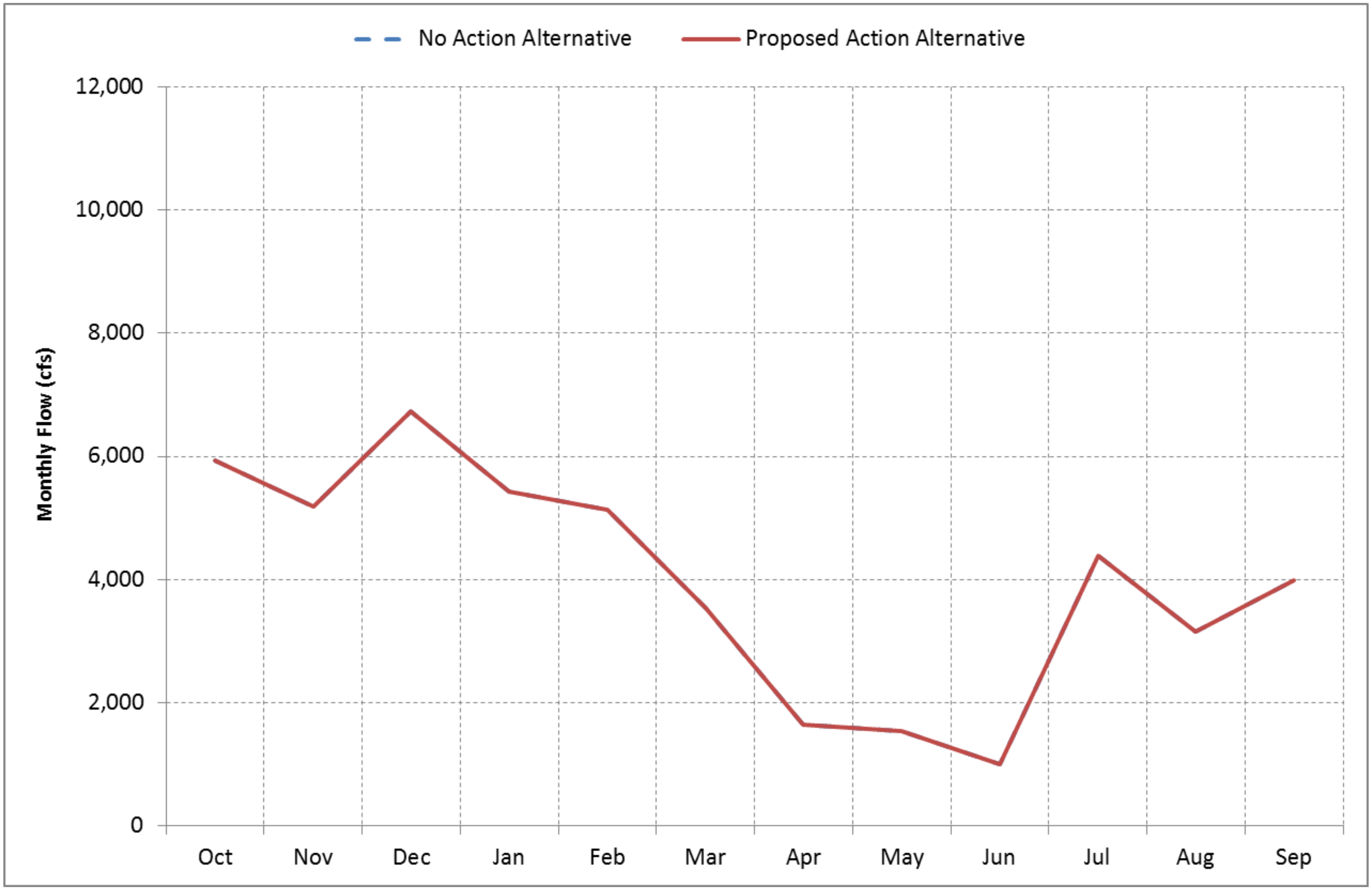
Figure A.3.3.23-5. Exports through Jones and Banks Pumping Plants, Dry Year* Long-Term Average Flow**



*As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

** Based on the 82-year simulation period.

Figure A.3.3.23-6. Exports through Jones and Banks Pumping Plants, Critical Dry Year* Long-Term Average Flow**



*As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

** Based on the 82-year simulation period.

Table A.3.3.23-1. Exports through Jones and Banks Pumping Plants, Monthly Flow

No Action Alternative

	Monthly Flow (cfs)											
Statistic	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Probability of Exceedance[a]												
10%	10,099	11,280	11,725	9,954	11,603	11,657	3,705	3,190	10,197	11,605	11,780	11,280
20%	8,818	10,587	11,661	8,092	9,469	9,930	2,755	2,056	7,921	11,605	11,780	11,280
30%	8,117	8,832	11,227	7,157	8,325	9,407	2,339	1,854	5,844	11,570	11,780	11,212
40%	7,242	7,951	9,470	6,825	7,360	7,870	2,193	1,586	5,686	11,513	11,534	10,976
50%	6,949	7,234	8,382	6,603	6,851	6,890	2,064	1,500	5,227	11,411	11,291	10,591
60%	6,246	6,775	7,863	6,470	6,622	6,417	1,977	1,500	3,861	11,280	11,111	9,733
70%	5,577	6,275	7,406	6,042	6,137	5,099	1,848	1,500	3,335	10,399	7,373	7,434
80%	5,027	4,793	6,713	5,251	5,132	4,854	1,540	1,500	3,170	9,679	5,150	5,955
90%	4,271	4,157	6,003	4,569	4,017	3,018	1,500	1,500	727	5,026	2,968	4,405
Long Term												
Full Simulation Period[b]	6,890	7,450	8,852	6,823	7,281	7,094	2,379	2,075	5,028	9,986	9,062	8,986
Water Year Types[c]												
Wet	7,594	8,593	9,047	8,115	9,538	9,768	3,362	3,064	7,921	11,430	11,697	10,869
Above Normal	6,671	7,351	9,618	6,524	7,061	8,445	2,156	1,679	6,232	10,681	11,603	10,740
Below Normal	7,120	7,976	9,162	6,304	6,810	7,004	1,998	1,572	4,591	11,236	10,929	10,500
Dry	6,479	6,971	9,239	6,494	5,966	4,774	1,893	1,660	3,067	10,202	6,042	7,247
Critical	5,928	5,176	6,725	5,421	5,131	3,533	1,644	1,537	1,009	4,381	3,164	3,996

Proposed Action Alternative

	Monthly Flow (cfs)											
Statistic	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Probability of Exceedance[a]												
10%	10,099	11,280	11,725	9,954	11,603	11,657	3,705	3,190	10,197	11,605	11,780	11,280
20%	8,818	10,587	11,661	8,092	9,469	9,930	2,755	2,056	7,921	11,605	11,780	11,280
30%	8,117	8,832	11,227	7,157	8,325	9,407	2,339	1,854	5,844	11,570	11,780	11,212
40%	7,242	7,951	9,470	6,825	7,360	7,870	2,193	1,586	5,686	11,513	11,534	10,976
50%	6,949	7,234	8,382	6,603	6,851	6,890	2,064	1,500	5,227	11,411	11,291	10,591
60%	6,246	6,775	7,863	6,470	6,622	6,417	1,977	1,500	3,861	11,280	11,111	9,733
70%	5,577	6,275	7,406	6,042	6,137	5,099	1,848	1,500	3,335	10,399	7,373	7,434
80%	5,027	4,793	6,713	5,251	5,132	4,854	1,540	1,500	3,170	9,679	5,150	5,955
90%	4,271	4,157	6,003	4,569	4,017	3,018	1,500	1,500	727	5,026	2,968	4,405
Long Term												
Full Simulation Period[b]	6,890	7,450	8,852	6,823	7,281	7,094	2,379	2,075	5,028	9,986	9,062	8,986
Water Year Types[c]												
Wet	7,594	8,593	9,047	8,115	9,538	9,768	3,362	3,064	7,921	11,430	11,697	10,869
Above Normal	6,671	7,351	9,617	6,524	7,060	8,445	2,156	1,679	6,232	10,681	11,603	10,740
Below Normal	7,120	7,976	9,162	6,304	6,810	7,004	1,998	1,572	4,591	11,236	10,929	10,500
Dry	6,479	6,971	9,239	6,494	5,966	4,774	1,893	1,660	3,067	10,202	6,042	7,247
Critical	5,928	5,176	6,725	5,421	5,131	3,533	1,644	1,537	1,009	4,381	3,164	3,996

Proposed Action Alternative minus No Action Alternative

	Monthly Flow (cfs)											
Statistic	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Probability of Exceedance[a]												
10%	0	0	0	0	0	0	0	0	0	0	0	0
20%	0	0	0	0	0	0	0	0	0	0	0	0
30%	0	0	0	0	0	0	0	0	0	0	0	0
40%	0	0	0	0	0	0	0	0	0	0	0	0
50%	0	0	0	0	0	0	0	0	0	0	0	0
60%	0	0	0	0	0	0	0	0	0	0	0	0
70%	0	0	0	0	0	0	0	0	0	0	0	0
80%	0	0	0	0	0	0	0	0	0	0	0	0
90%	0	0	0	0	0	0	0	0	0	0	0	0
Long Term												
Full Simulation Period[b]	0	0	0	0	0	0	0	0	0	0	0	0
Water Year Types[c]												
Wet	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	-1	0	0	0	0	0	0	0	0	0	0
Critical	0	0	0	0	0	0	0	0	0	0	0	0

a Exceedance probability is defined as the probability a given value will be exceeded in any one year

b Based on the 82-year simulation period

c As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

A.3.4 - Reservoir and River Temperature HEC-5Q Model Results

Reservoir and river temperature HEC-5Q model results are presented in the tables and figures in this section as follows:

- American River below Nimbus Temperature
- American River at Watt Avenue Temperature
- American River at Mouth Temperature

A.3.4.1. American River below Nimbus Temperature

Figure A.3.4.1-1. American River below Nimbus Dam, October

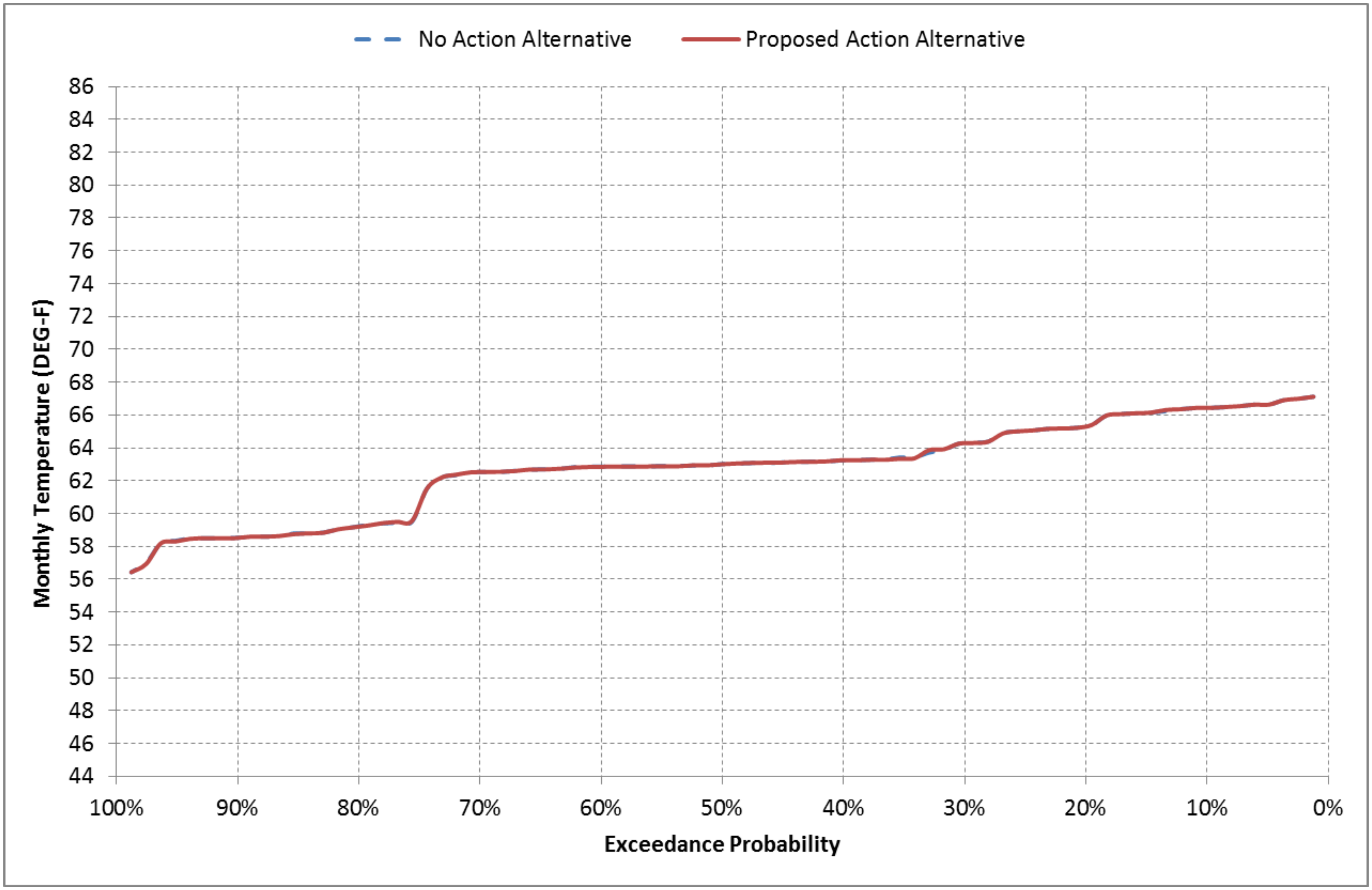


Figure A.3.4.1-2. American River below Nimbus Dam, November

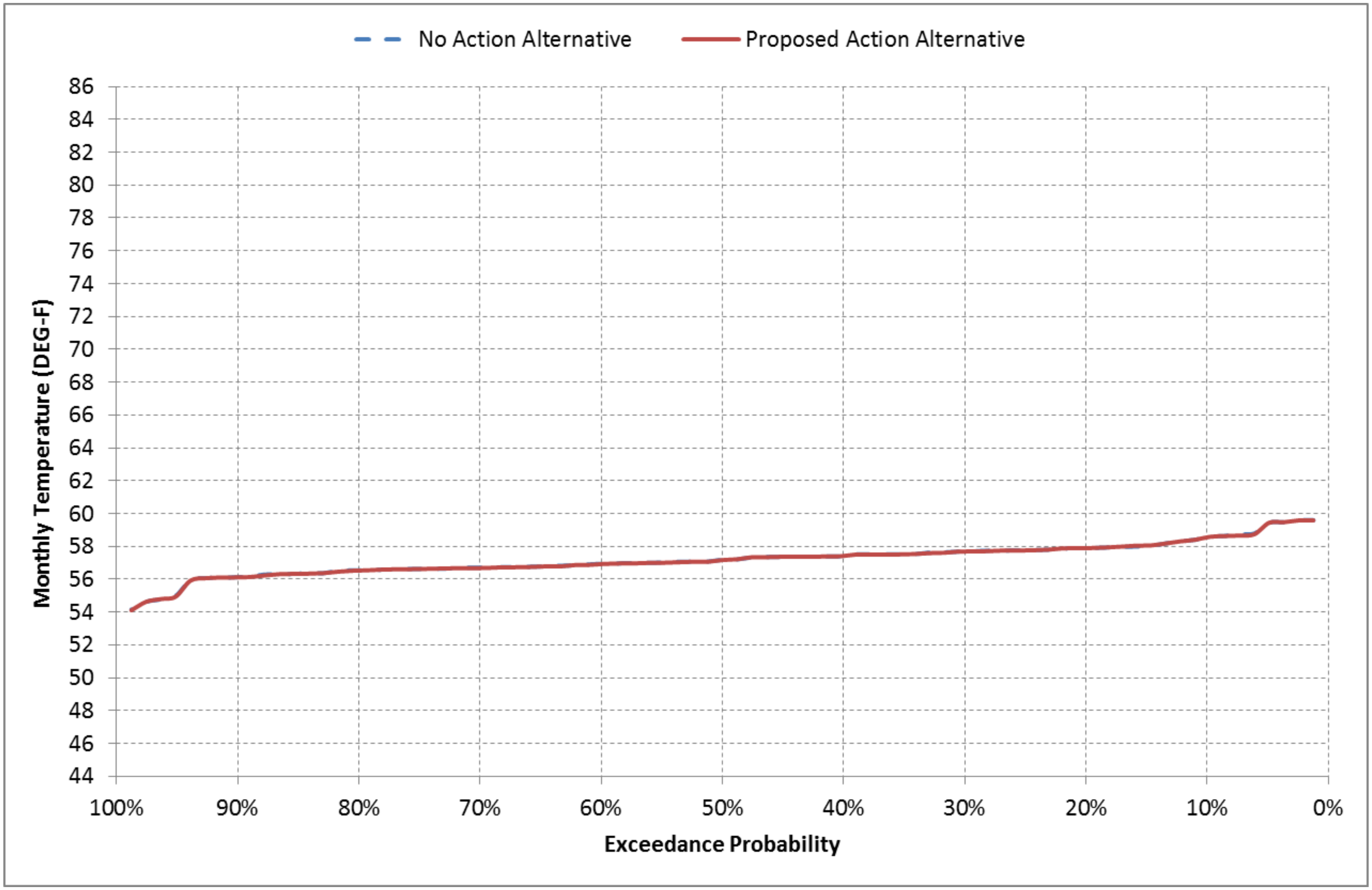


Figure A.3.4.1-3. American River below Nimbus Dam, December

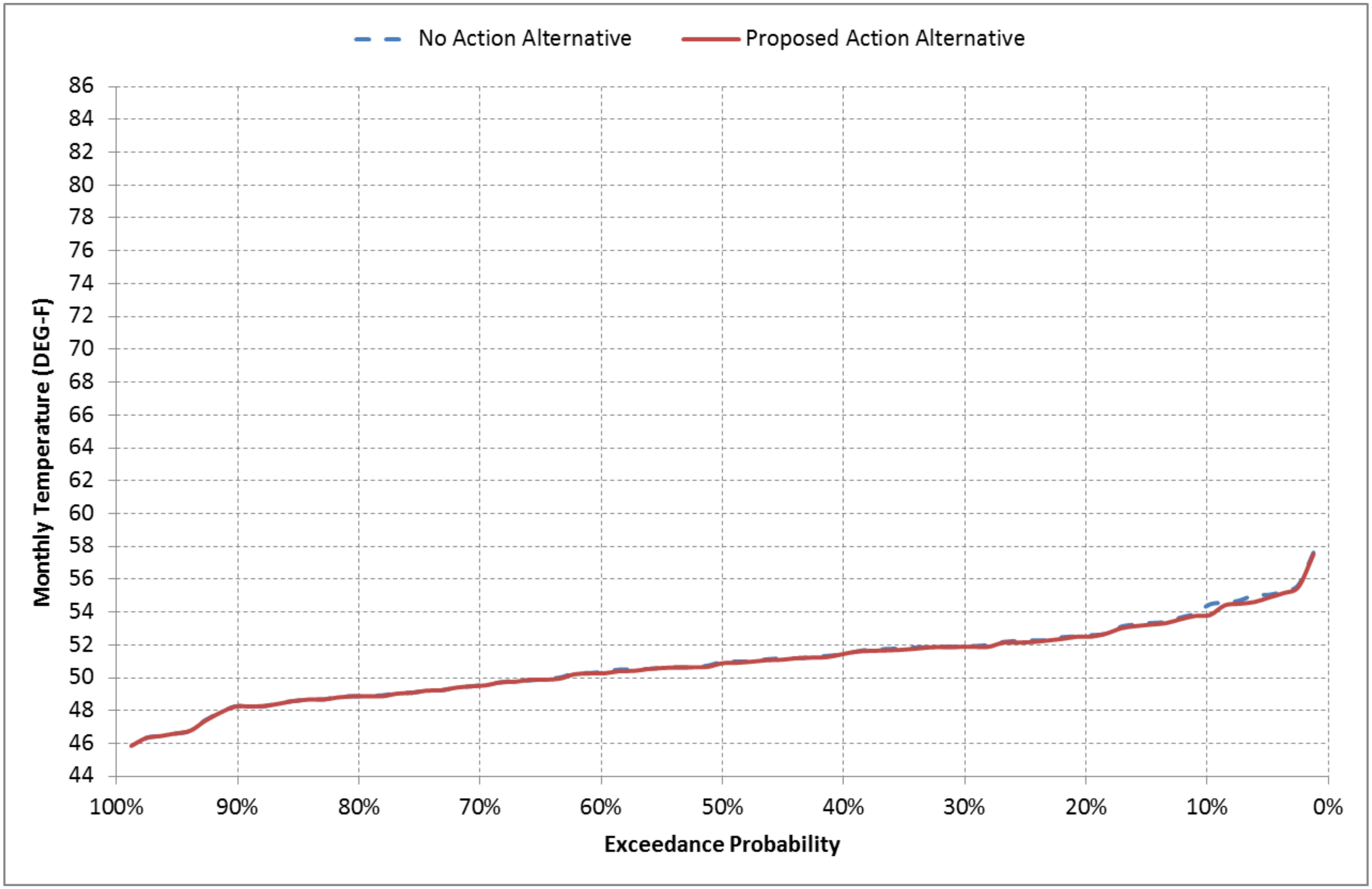


Figure A.3.4.1-4. American River below Nimbus Dam, January

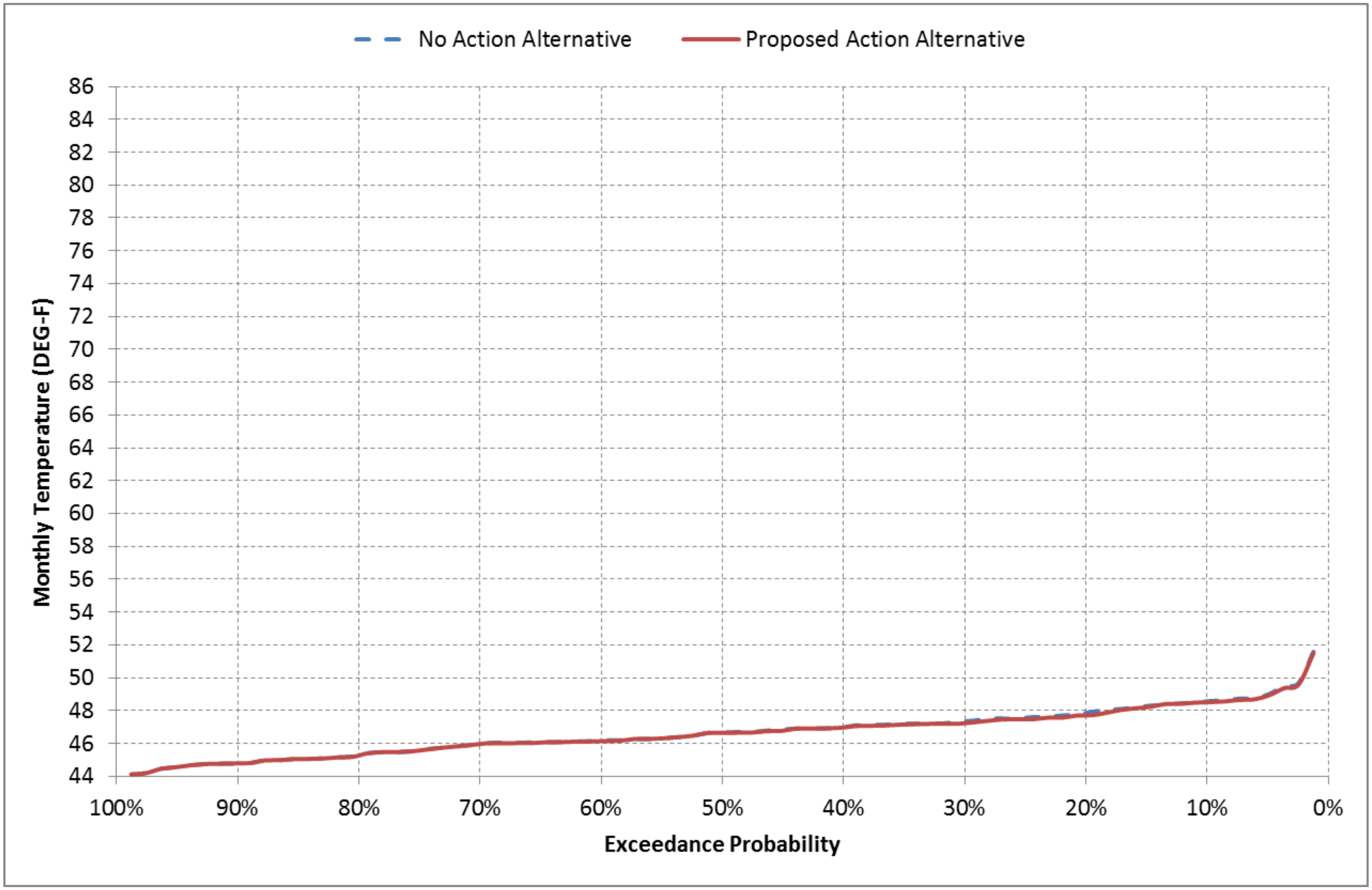


Figure A.3.4.1-5. American River below Nimbus Dam, February

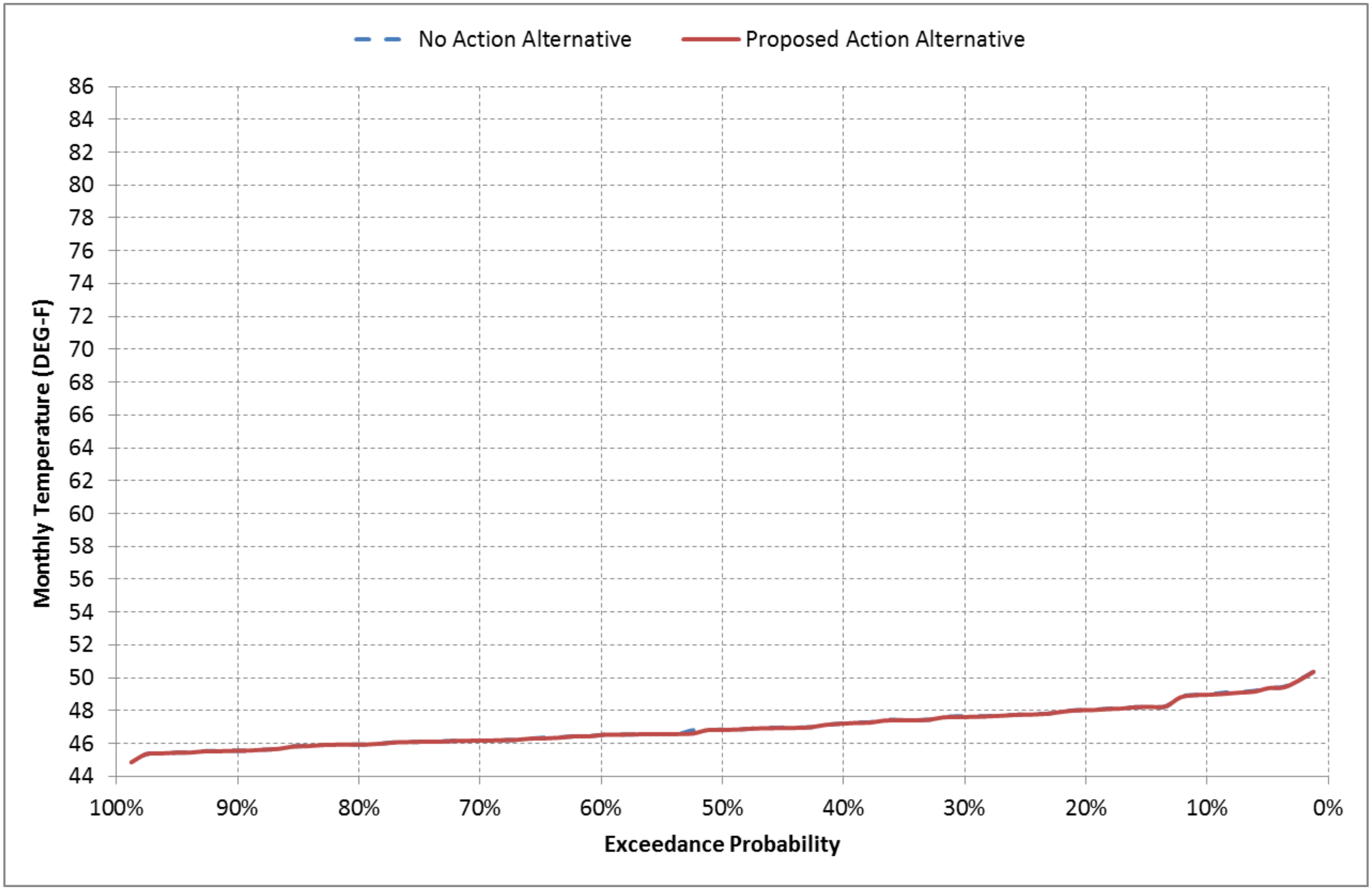


Figure A.3.4.1-6. American River below Nimbus Dam, March

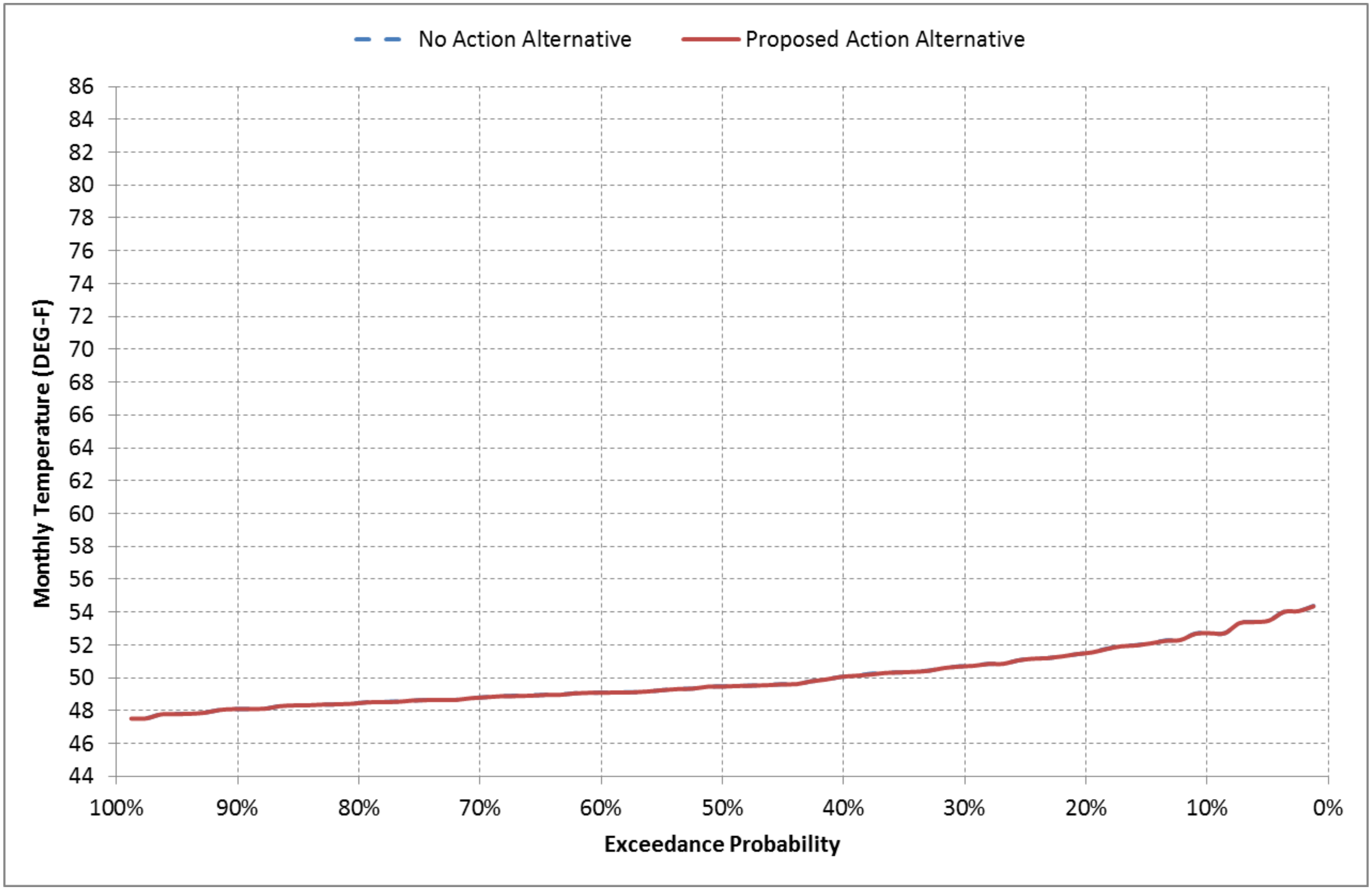


Figure A.3.4.1-7. American River below Nimbus Dam, April

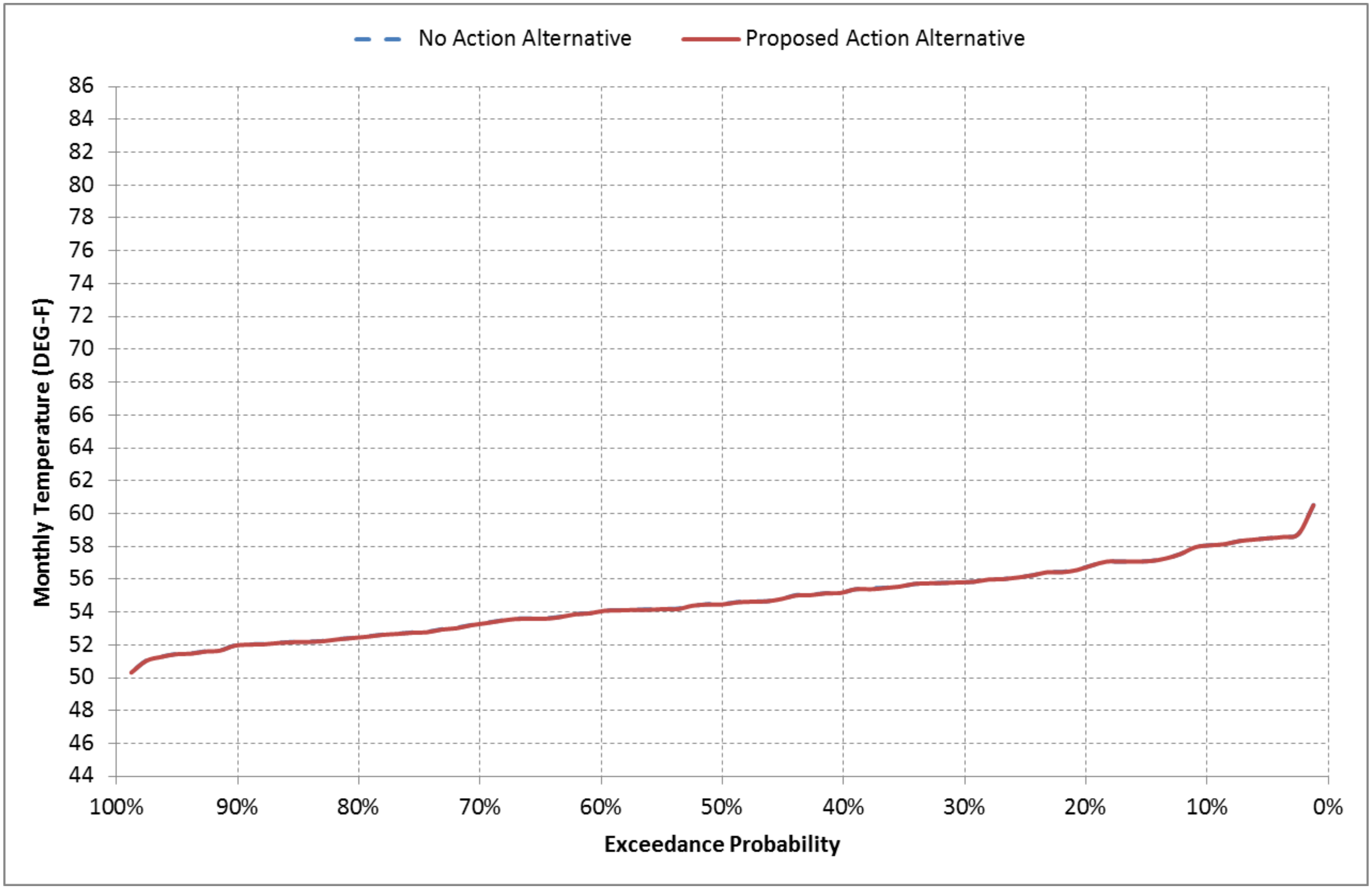


Figure A.3.4.1-8. American River below Nimbus Dam, May

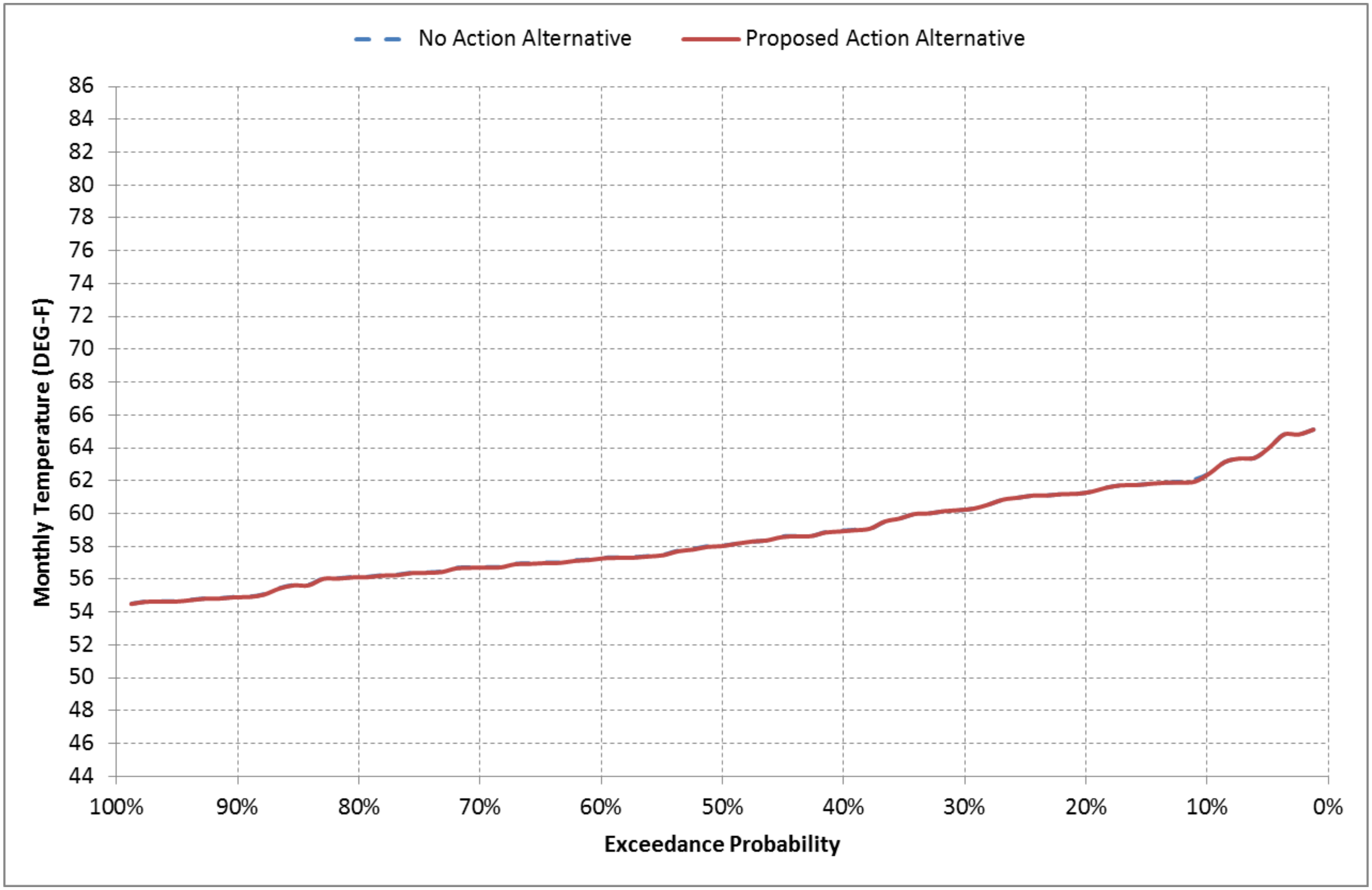


Figure A.3.4.1-9. American River below Nimbus Dam, June

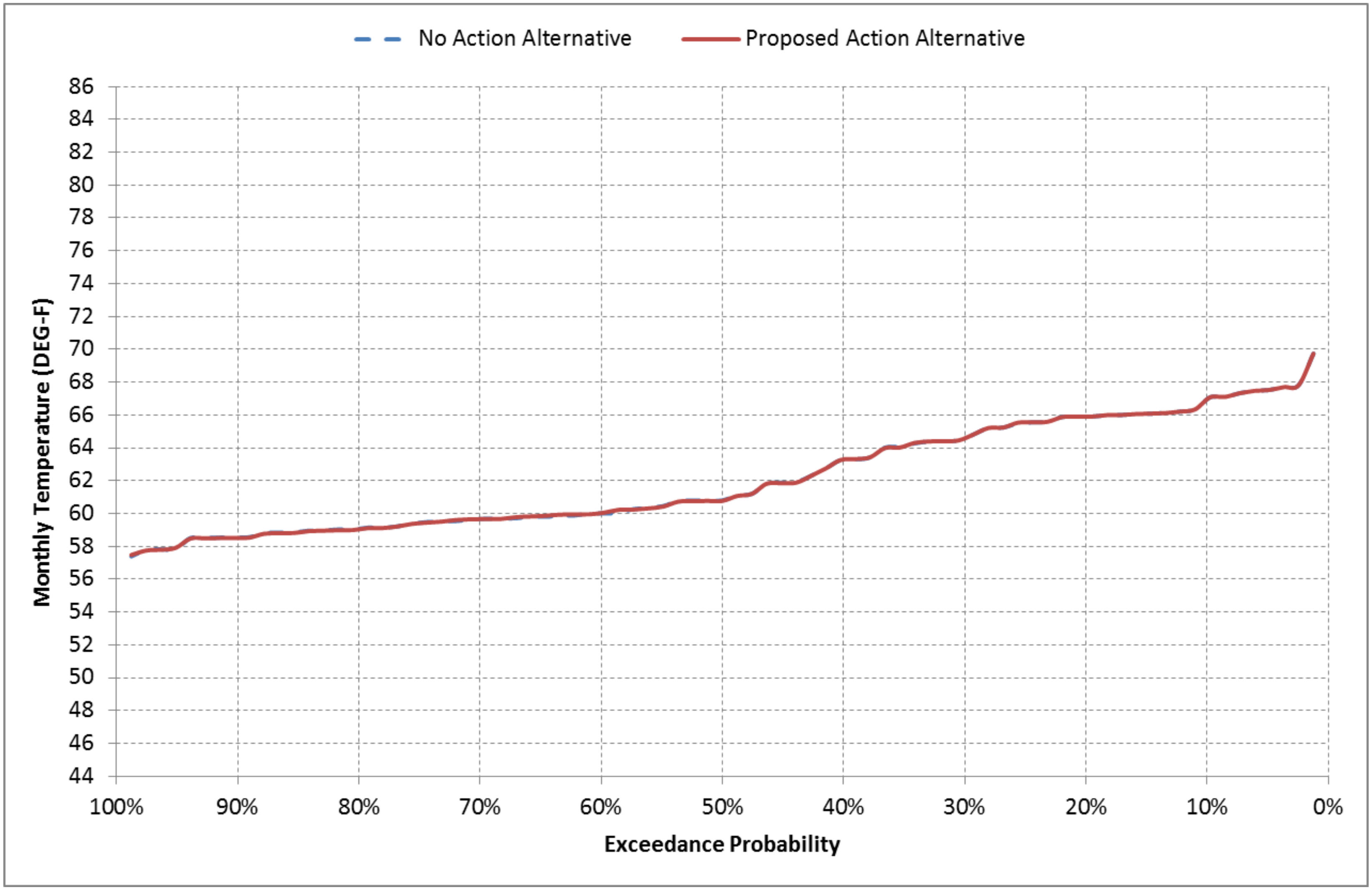


Figure A.3.4.1-10. American River below Nimbus Dam, July

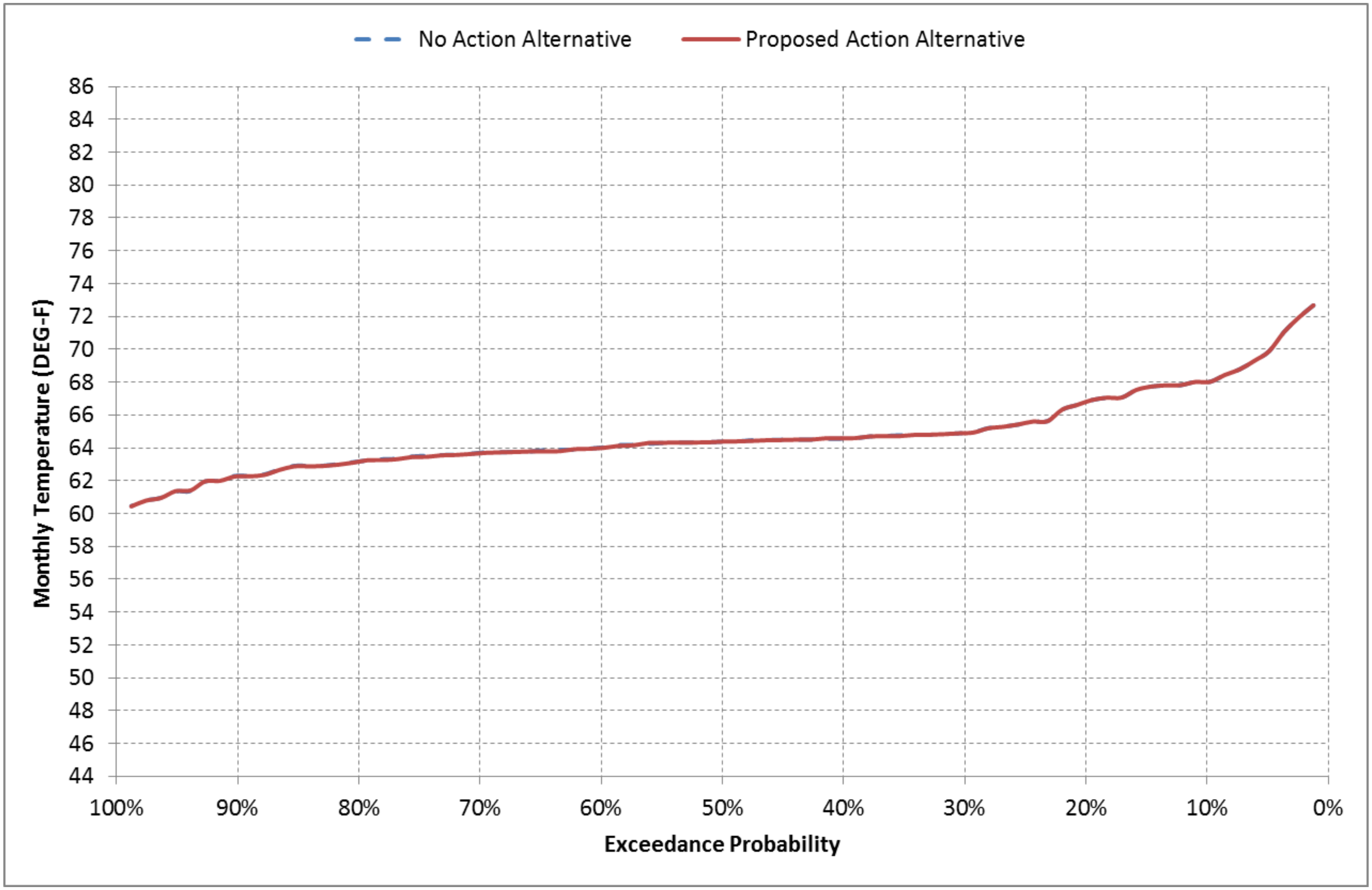


Figure A.3.4.1-11. American River below Nimbus Dam, August

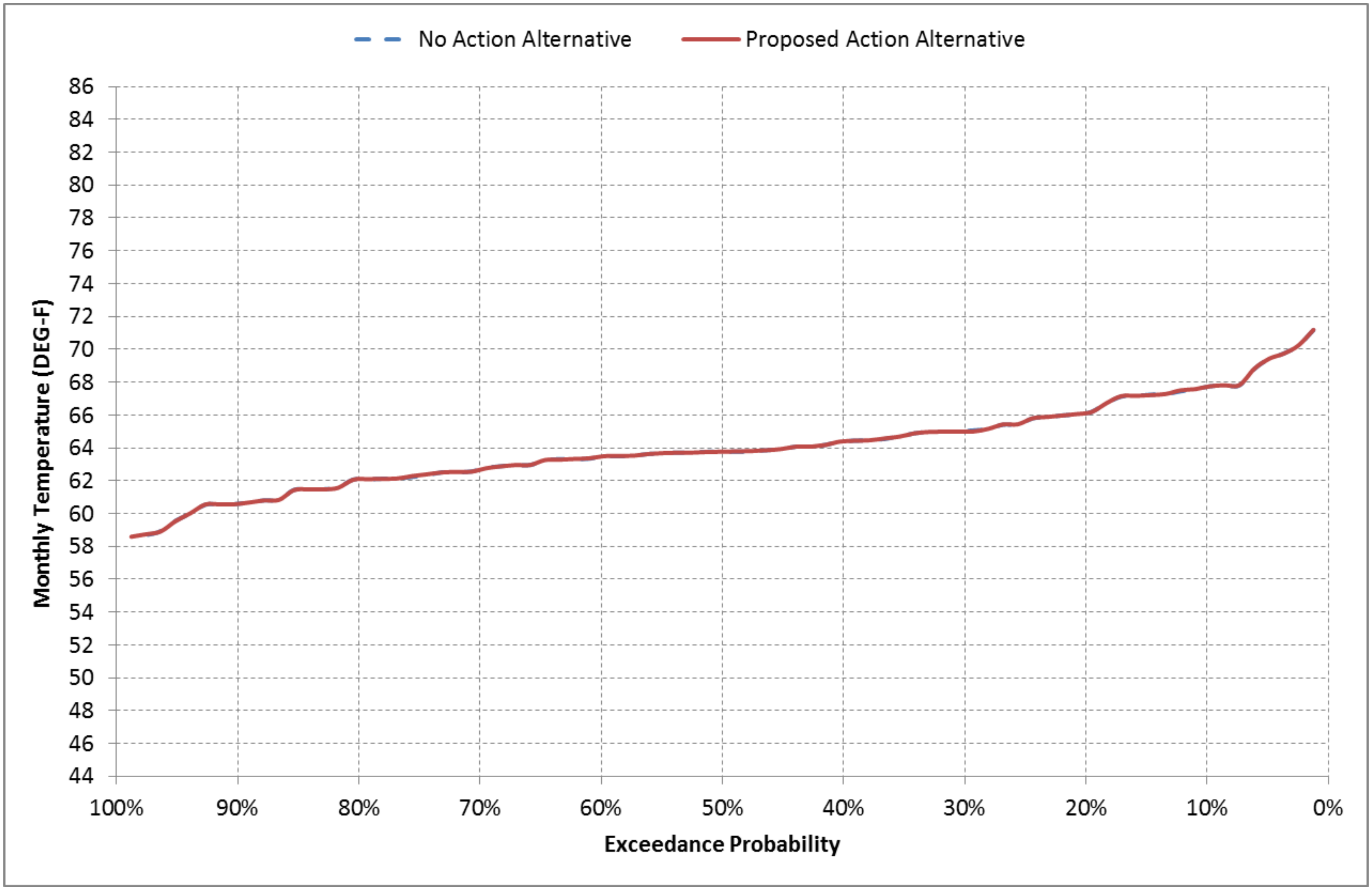


Figure A.3.4.1-12. American River below Nimbus Dam, September

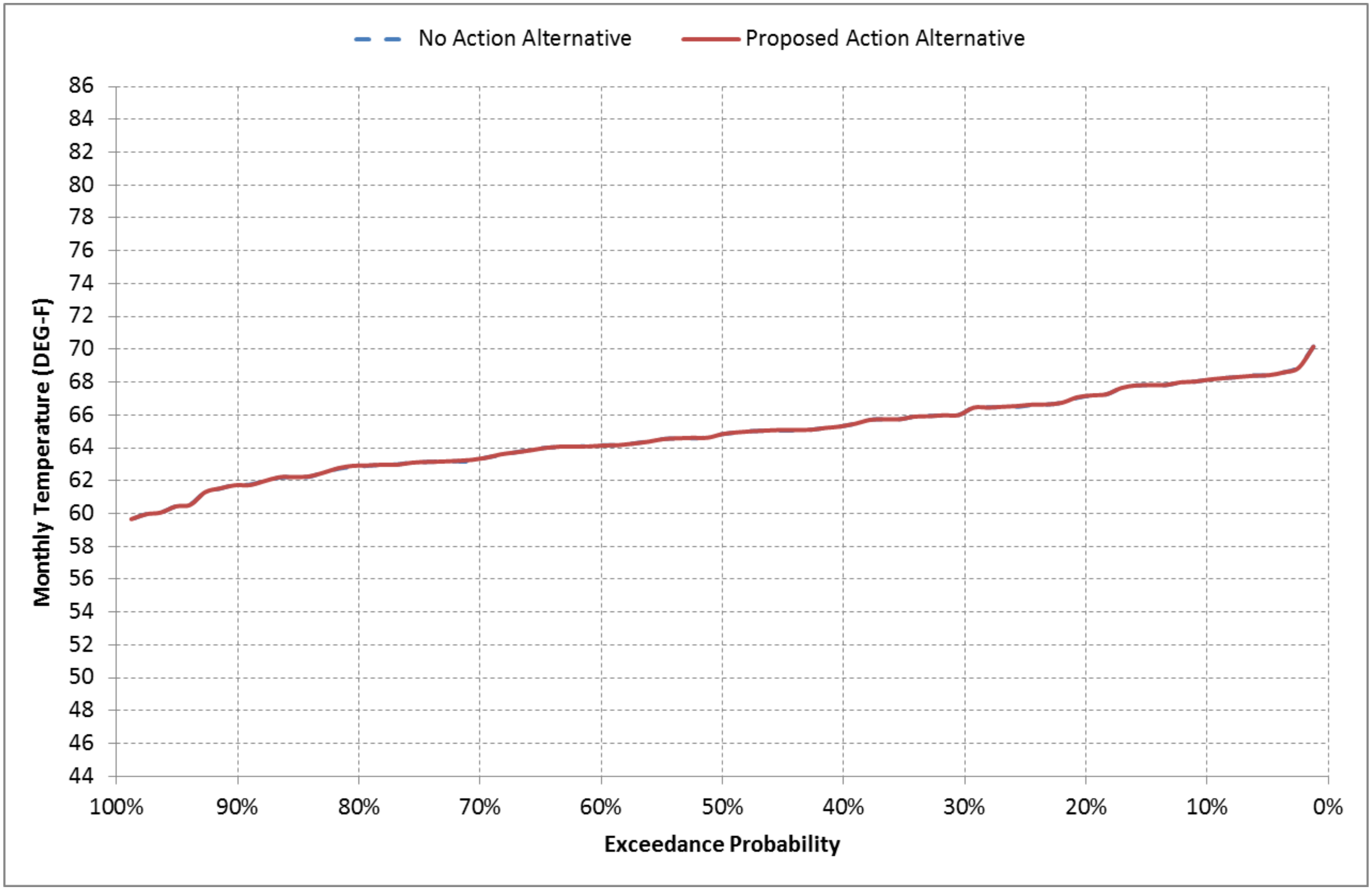


Table A.3.4.1-1. American River below Nimbus Dam, Monthly Temperature

No Action Alternative

Statistic	Monthly Temperature (DEG-F)											
Statistic	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Probability of Exceedance[a]												
10%	66	59	54	49	49	53	58	62	67	68	68	68
20%	65	58	53	48	48	52	57	61	66	67	66	67
30%	64	58	52	47	48	51	56	60	65	65	65	66
40%	63	58	52	47	47	50	55	59	63	65	64	65
50%	63	57	51	47	47	49	54	58	61	64	64	65
60%	63	57	50	46	47	49	54	57	60	64	63	64
70%	63	57	50	46	46	49	53	57	60	64	63	63
80%	59	57	49	45	46	49	53	56	59	63	62	63
90%	59	56	48	45	46	48	52	55	59	62	61	62
Long Term												
Full Simulation Period[b]	62	57	50	47	47	50	55	59	62	65	64	65
Water Year Types[c]												
Wet	60	57	52	46	46	49	53	56	60	63	62	63
Above Normal	57	52	47	47	47	49	54	58	61	64	63	64
Below Normal	63	57	51	47	47	50	55	59	62	64	64	65
Dry	65	57	50	47	48	51	56	60	64	65	65	66
Critical	66	58	50	47	49	53	57	61	66	69	68	68

Proposed Action Alternative

Statistic	Monthly Temperature (DEG-F)											
Statistic	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Probability of Exceedance[a]												
10%	66	59	54	49	49	53	58	62	67	68	68	68
20%	65	58	53	48	48	52	57	61	66	67	66	67
30%	64	58	52	47	48	51	56	60	65	65	65	66
40%	63	57	52	47	47	50	55	59	63	65	64	65
50%	63	57	51	47	47	49	54	58	61	64	64	65
60%	63	57	50	46	47	49	54	57	60	64	63	64
70%	63	57	50	46	46	49	53	57	60	64	63	63
80%	59	57	49	45	46	49	53	56	59	63	62	63
90%	59	56	48	45	46	48	52	55	59	62	61	62
Long Term												
Full Simulation Period[b]	62	56	50	47	47	50	55	59	62	65	64	65
Water Year Types[c]												
Wet	60	57	52	46	46	49	53	56	60	63	62	63
Above Normal	57	52	47	47	47	49	54	58	61	64	63	64
Below Normal	63	57	51	47	47	50	55	59	62	64	64	65
Dry	65	57	50	47	48	51	56	60	64	65	65	66
Critical	66	58	50	47	49	53	57	61	66	69	68	68

Proposed Action Alternative minus No Action Alternative

Statistic	Monthly Temperature (DEG-F)											
Statistic	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Probability of Exceedance[a]												
10%	0.0	0.0	-0.6	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20%	0.0	0.0	-0.1	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
30%	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0
40%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
50%	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
60%	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
70%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
80%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
90%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Long Term												
Full Simulation Period[b]	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Water Year Types[c]												
Wet	0.0	0.0	-0.1	-0.1	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0
Above Normal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0
Below Normal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0
Critical	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

a Exceedance probability is defined as the probability a given value will be exceeded in any one year
b Based on the 81-year simulation period
c As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

A.3.4.2. American River at Watt Avenue Temperature

Figure A.3.4.2-1. American River at Watt Avenue, October

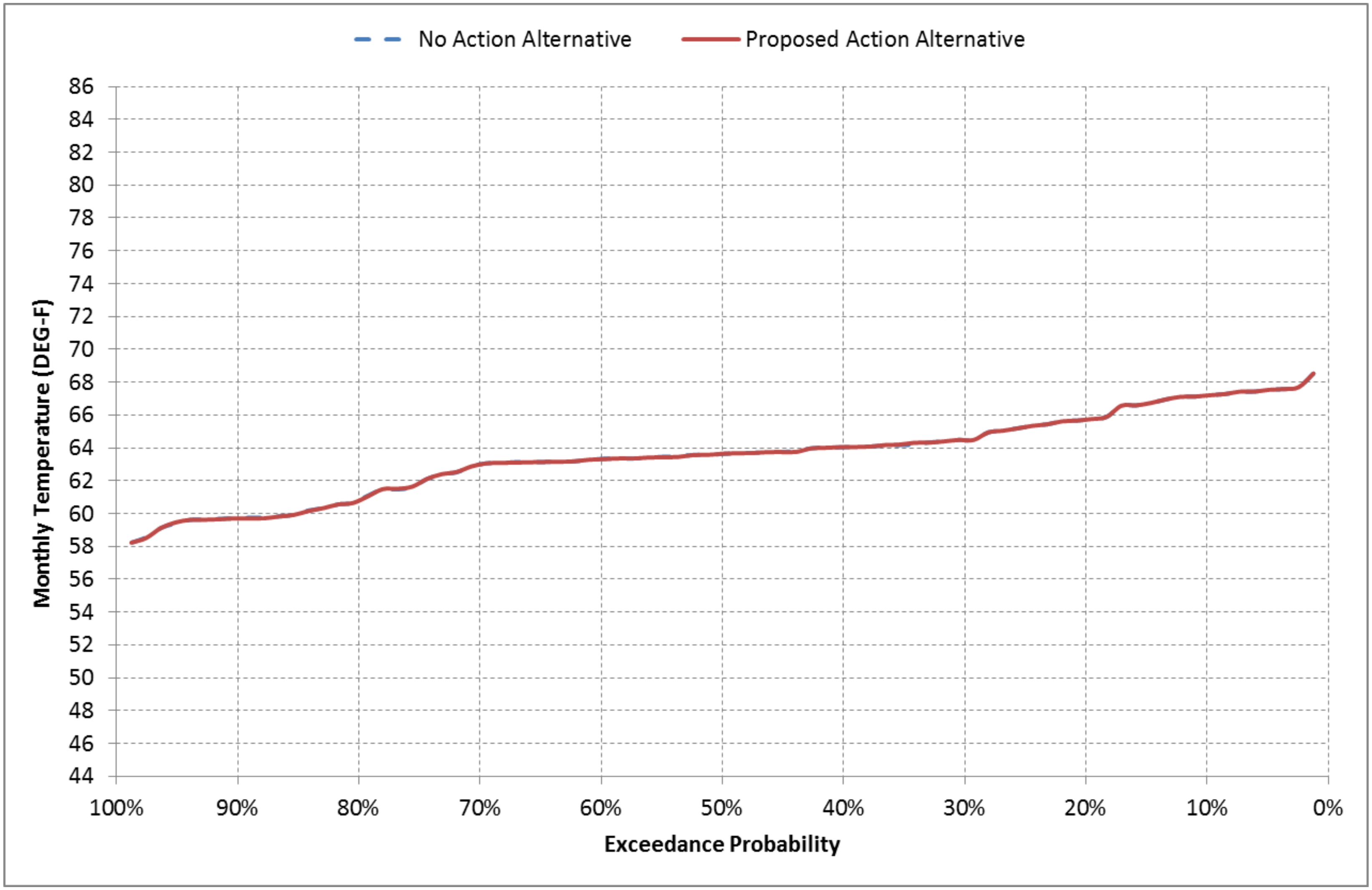


Figure A.3.4.2-2. American River at Watt Avenue, November

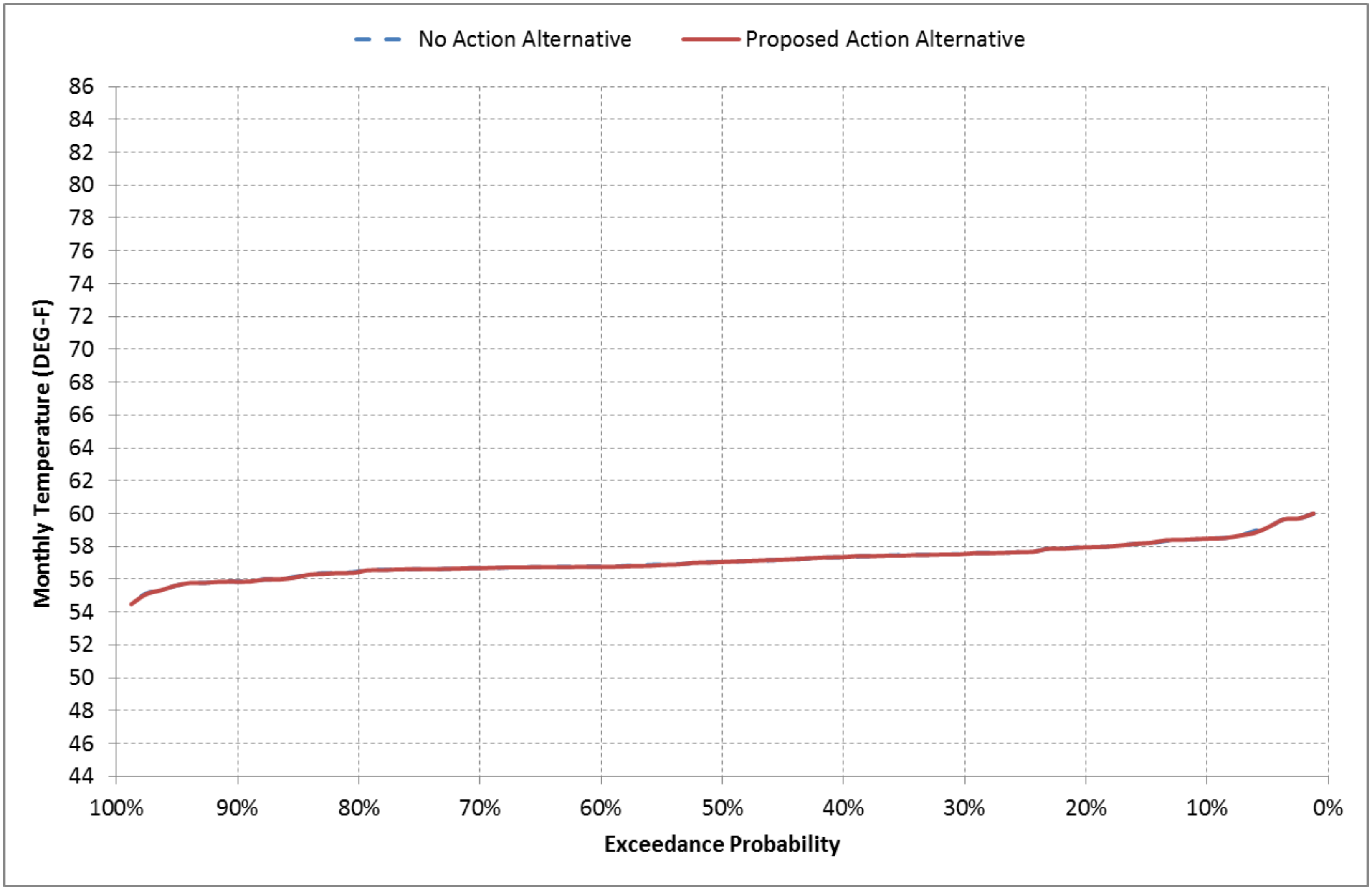


Figure A.3.4.2-3. American River at Watt Avenue, December

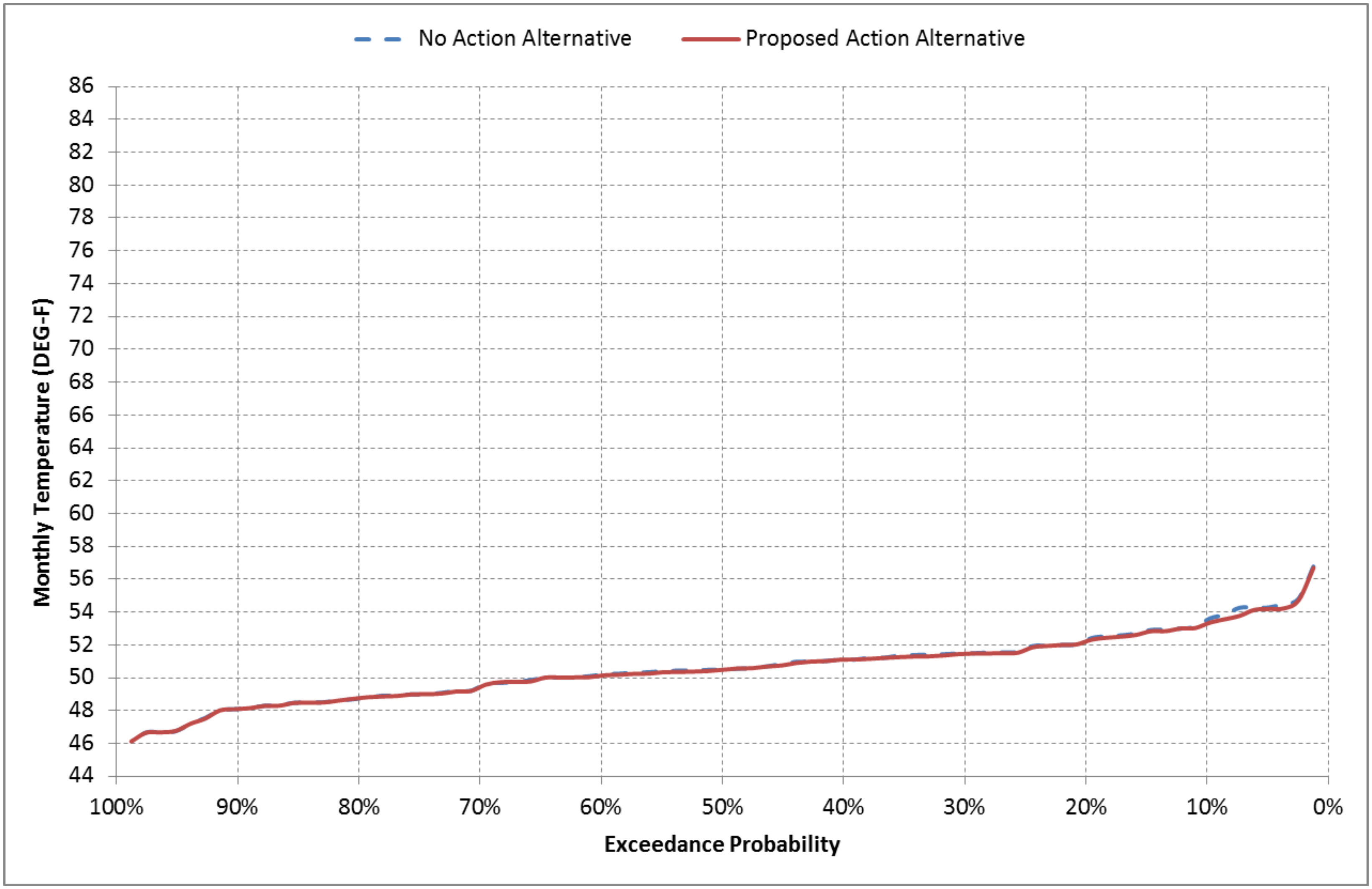


Figure A.3.4.2-4. American River at Watt Avenue, January

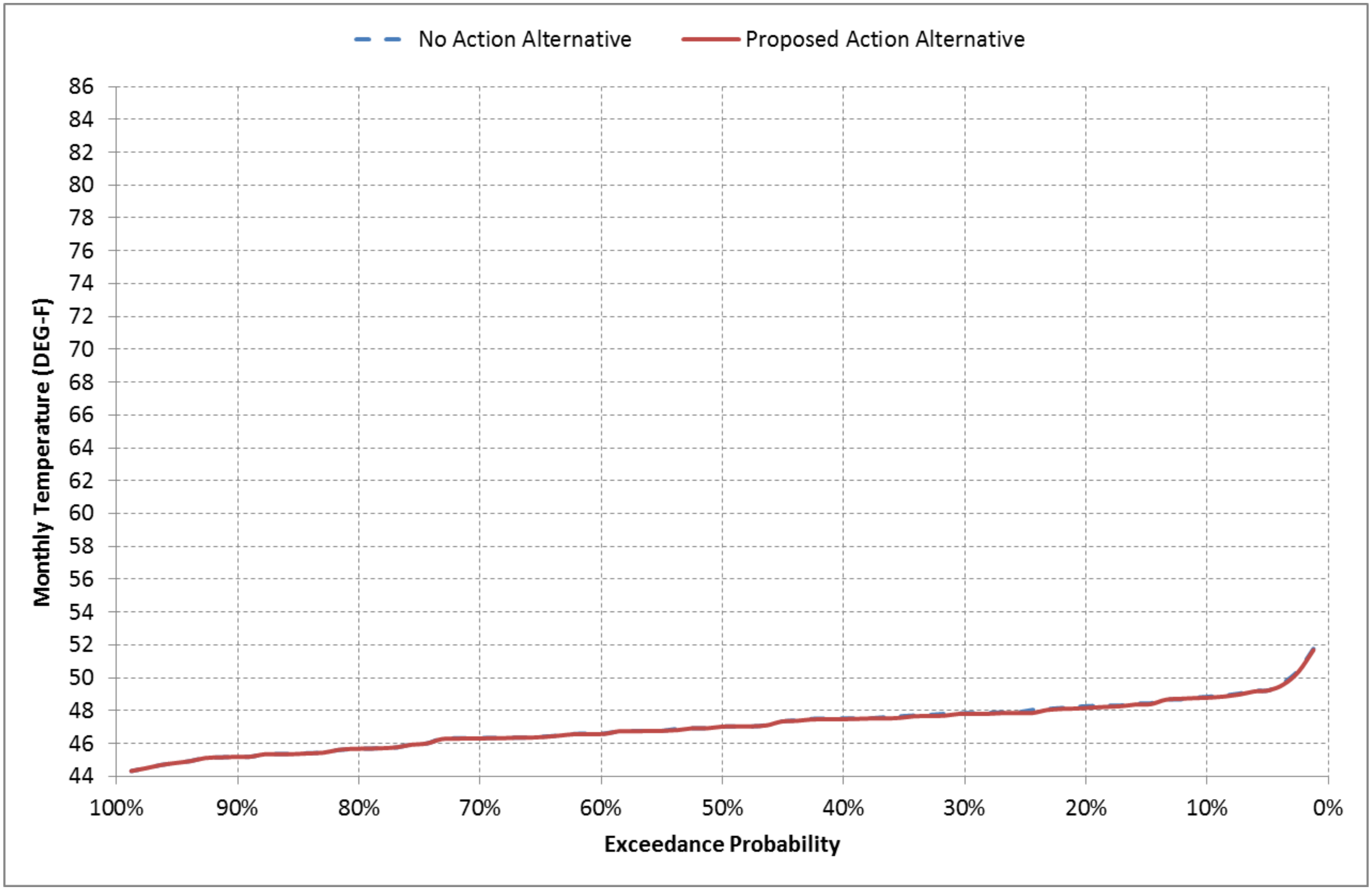


Figure A.3.4.2-5. American River at Watt Avenue, February

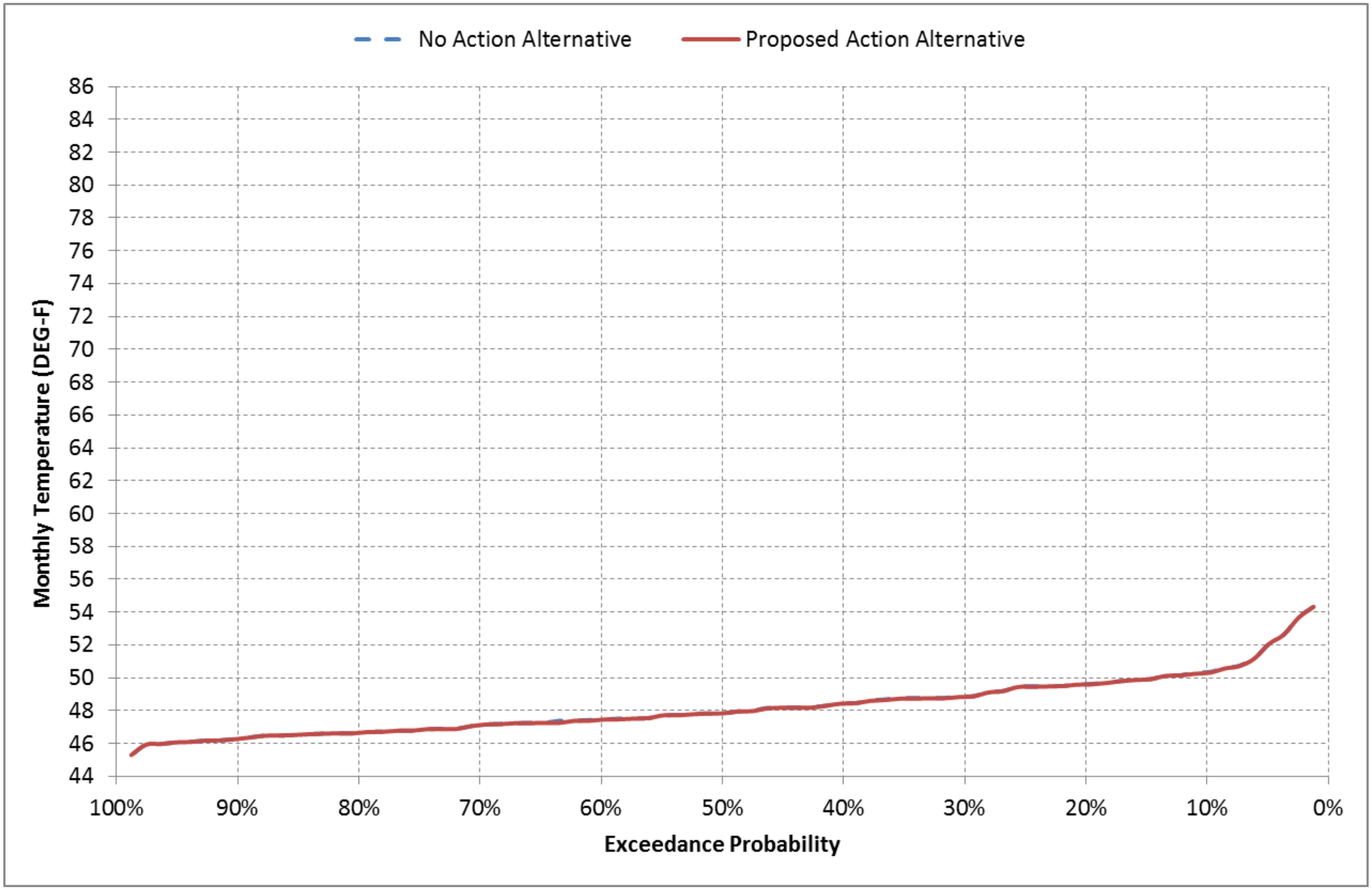


Figure A.3.4.2-6. American River at Watt Avenue, March

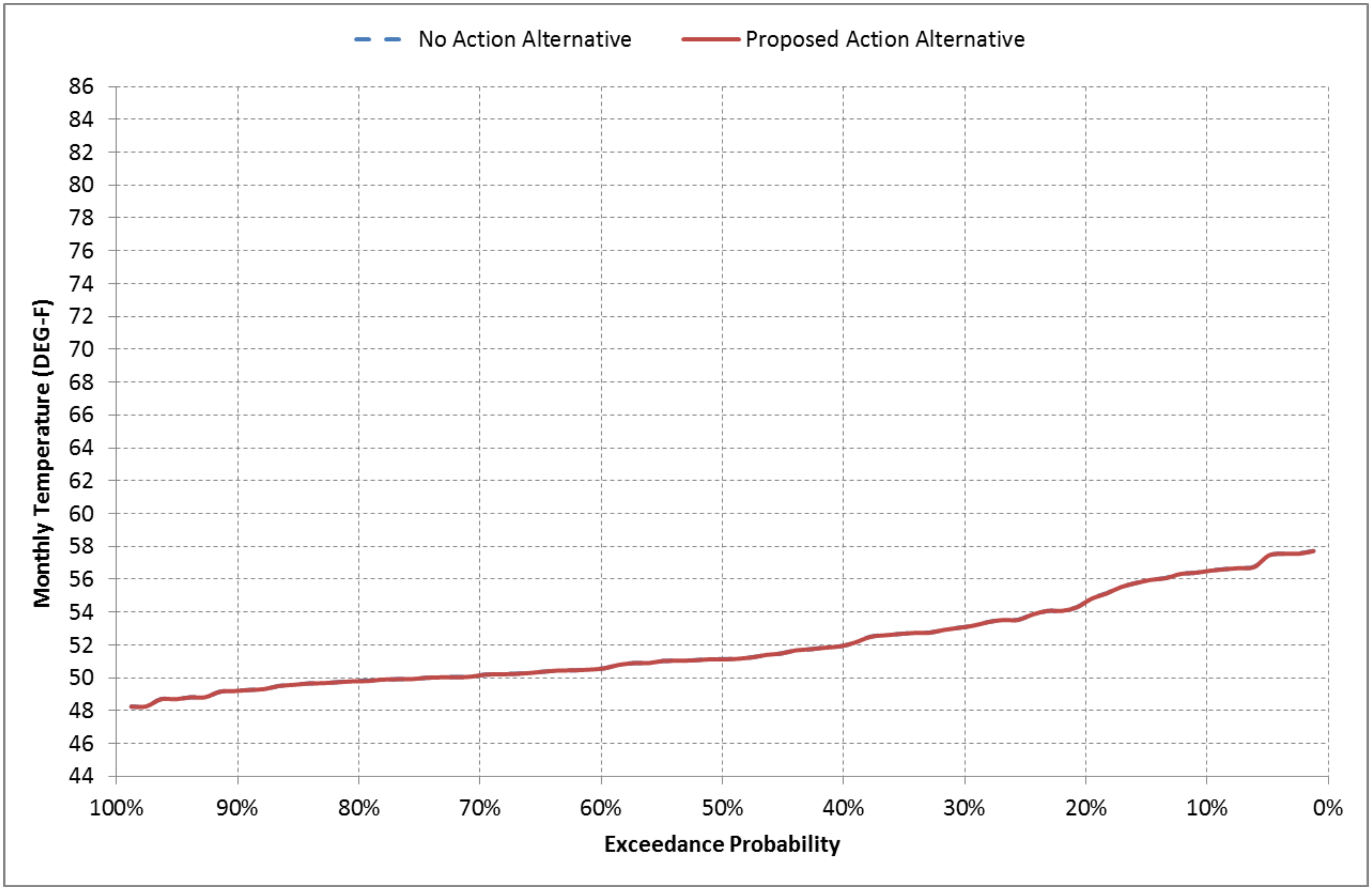


Figure A.3.4.2-7. American River at Watt Avenue, April

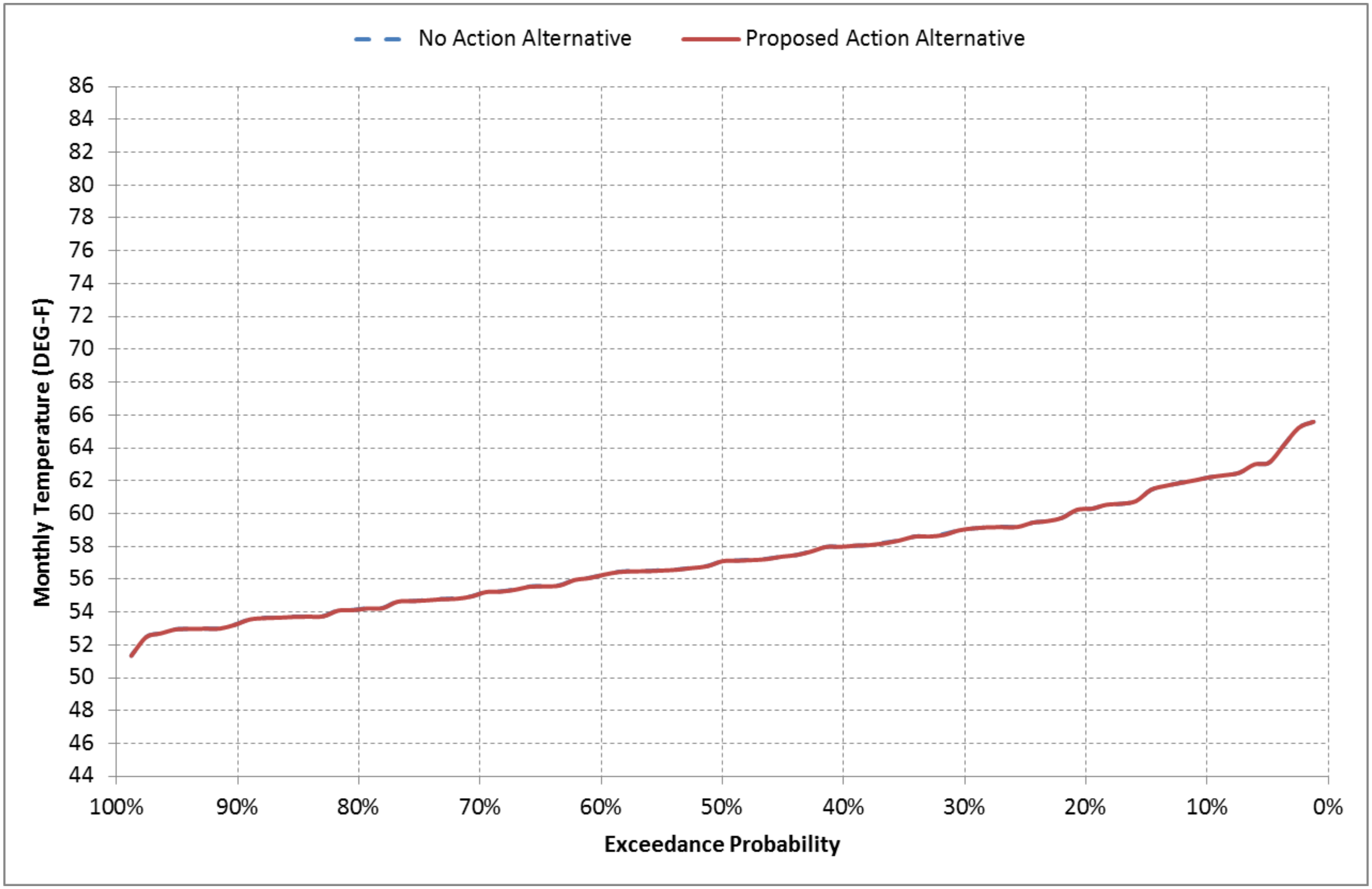


Figure A.3.4.2-8. American River at Watt Avenue, May

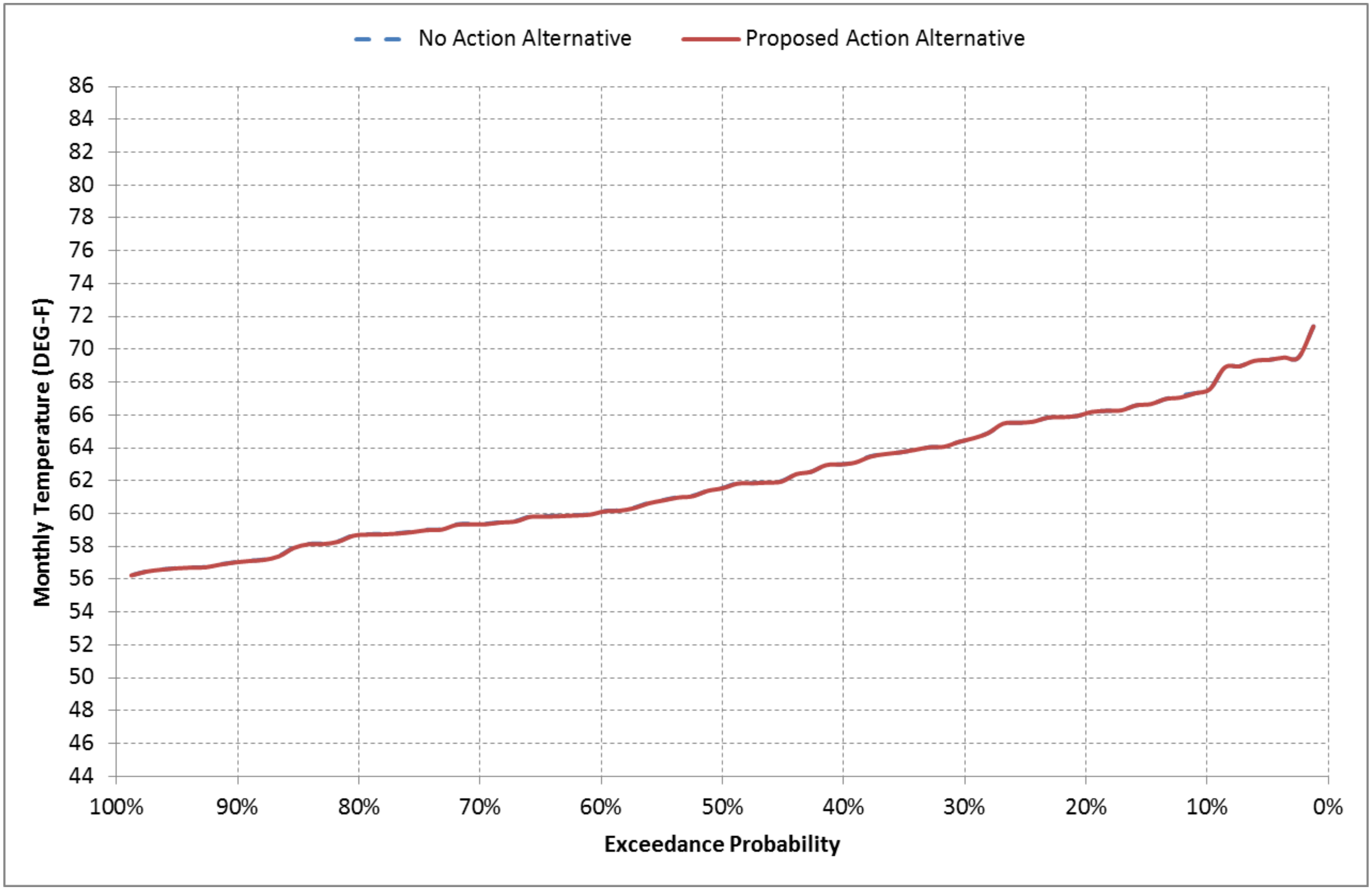


Figure A.3.4.2-9. American River at Watt Avenue, June

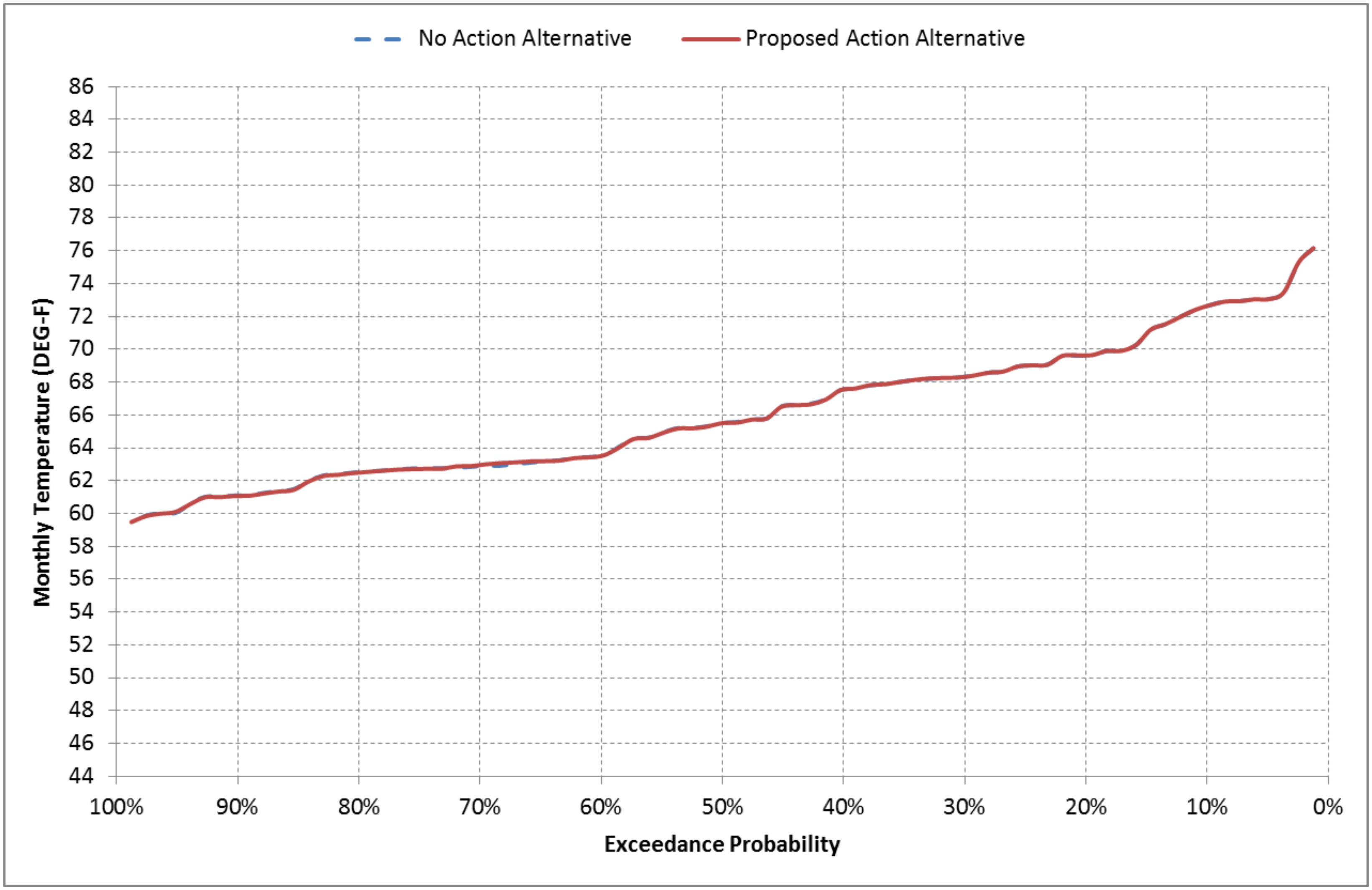


Figure A.3.4.2-10. American River at Watt Avenue, July

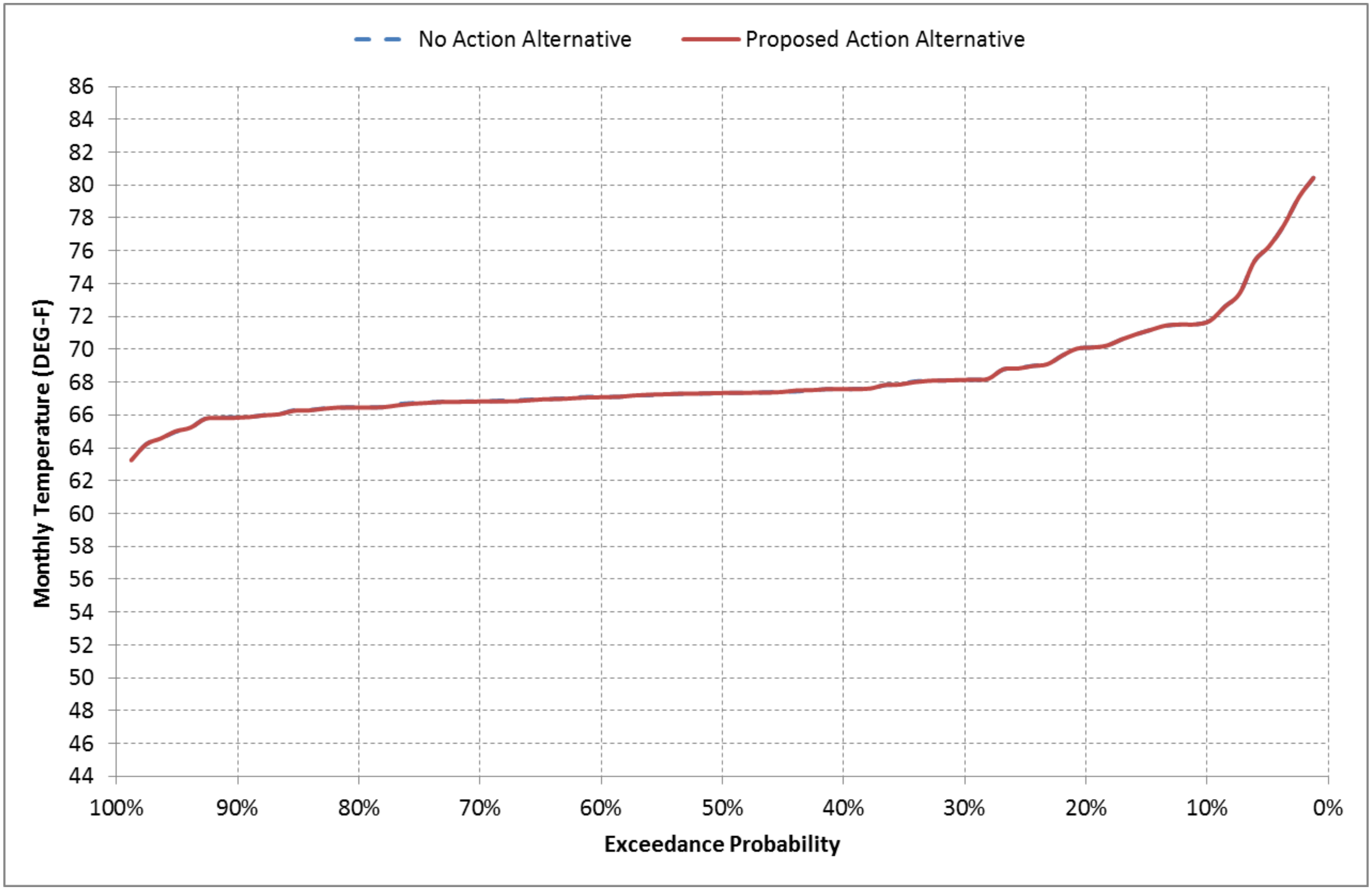


Figure A.3.4.2-11. American River at Watt Avenue, August

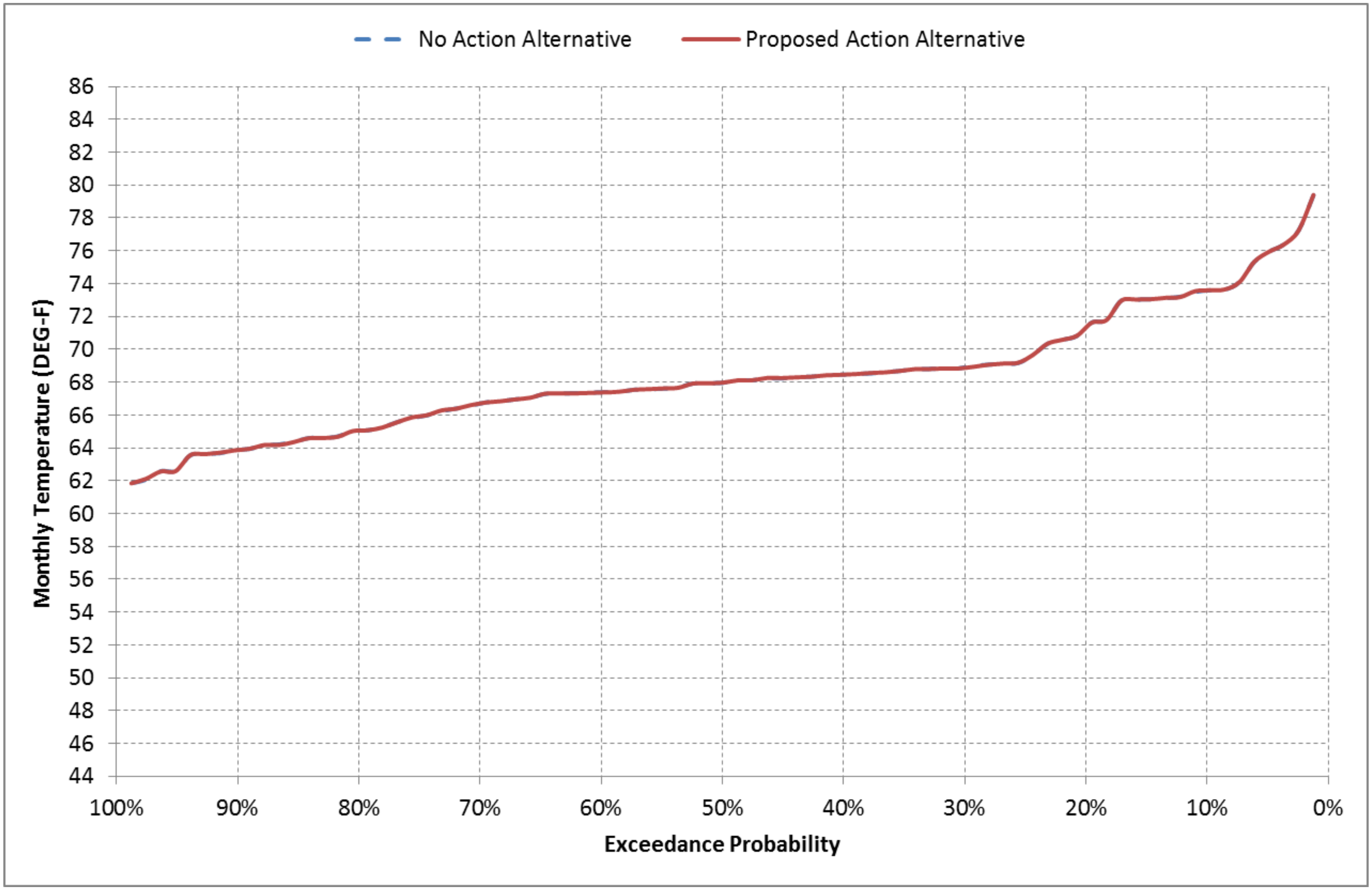


Figure A.3.4.2-12. American River at Watt Avenue, September

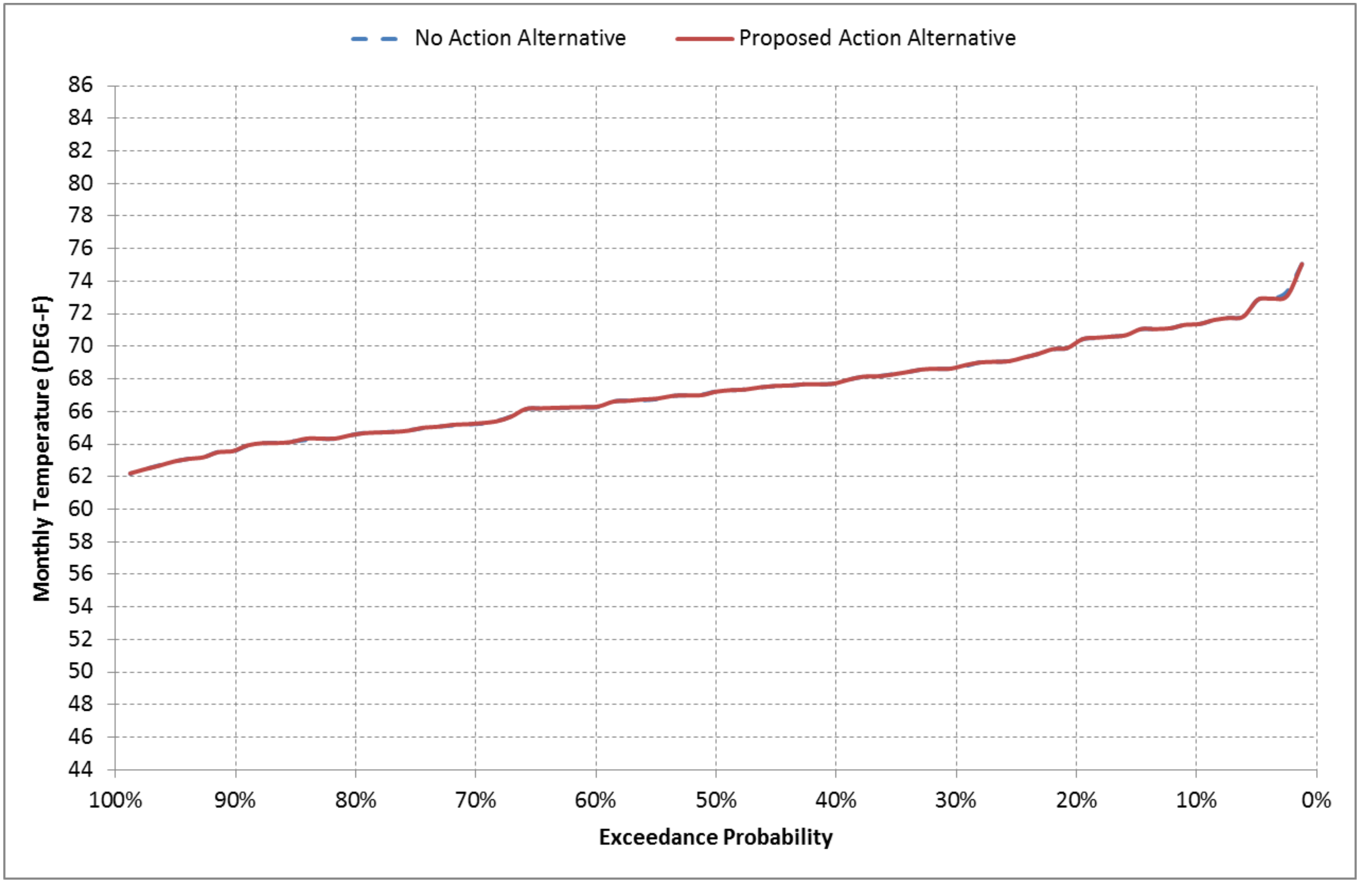


Table A.3.4.2-1. American River at Watt Avenue, Monthly Temperature

No Action Alternative

	Monthly Temperature (DEG-F)											
Statistic	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Probability of Exceedance[a]												
10%	67	58	54	49	50	57	62	68	73	72	74	71
20%	66	58	52	48	50	55	60	66	70	70	72	70
30%	64	58	51	48	49	53	59	65	68	68	69	69
40%	64	57	51	48	48	52	58	63	68	68	68	68
50%	64	57	50	47	48	51	57	62	66	67	68	67
60%	63	57	50	47	47	51	56	60	64	67	67	66
70%	63	57	50	46	47	50	55	59	63	67	67	65
80%	61	57	49	46	47	50	54	59	63	66	65	65
90%	60	56	48	45	46	49	54	57	61	66	64	64
Long Term												
Full Simulation Period[b]	63	56	50	47	48	52	57	62	66	68	68	67
Water Year Types[c]												
Wet	61	57	52	46	47	50	55	59	63	67	65	65
Above Normal	58	52	46	47	48	51	56	61	65	67	67	66
Below Normal	64	57	50	47	48	52	58	62	66	67	69	68
Dry	65	57	50	47	49	54	59	65	68	69	70	69
Critical	67	58	50	48	51	56	61	66	71	74	74	72

Proposed Action Alternative

	Monthly Temperature (DEG-F)											
Statistic	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Probability of Exceedance[a]												
10%	67	58	53	49	50	57	62	68	73	72	74	71
20%	66	58	52	48	50	55	60	66	70	70	72	70
30%	64	58	51	48	49	53	59	65	68	68	69	69
40%	64	57	51	47	48	52	58	63	68	68	68	68
50%	64	57	50	47	48	51	57	62	66	67	68	67
60%	63	57	50	47	47	51	56	60	64	67	67	66
70%	63	57	50	46	47	50	55	59	63	67	67	65
80%	61	57	49	46	47	50	54	59	63	66	65	65
90%	60	56	48	45	46	49	54	57	61	66	64	64
Long Term												
Full Simulation Period[b]	63	56	50	47	48	52	57	62	66	68	68	67
Water Year Types[c]												
Wet	61	57	52	46	47	50	55	59	63	67	65	65
Above Normal	58	52	46	47	48	51	56	61	65	67	67	66
Below Normal	64	57	50	47	48	52	58	62	66	67	69	68
Dry	65	57	50	47	49	54	59	65	68	69	70	69
Critical	67	58	50	48	51	56	61	66	71	74	74	72

Proposed Action Alternative minus No Action Alternative

	Monthly Temperature (DEG-F)											
Statistic	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Probability of Exceedance[a]												
10%	0.0	0.0	-0.3	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20%	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
30%	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.1
40%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
50%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
60%	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
70%	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0
80%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
90%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Long Term												
Full Simulation Period[b]	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Water Year Types[c]												
Wet	0.0	0.0	-0.1	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Above Normal	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Below Normal	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Critical	0.0	0.1	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0

a Exceedance probability is defined as the probability a given value will be exceeded in any one year
b Based on the 81-year simulation period
c As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

A.3.4.3. American River at Mouth Temperature

Figure A.3.4.3-1. American River at Mouth, October

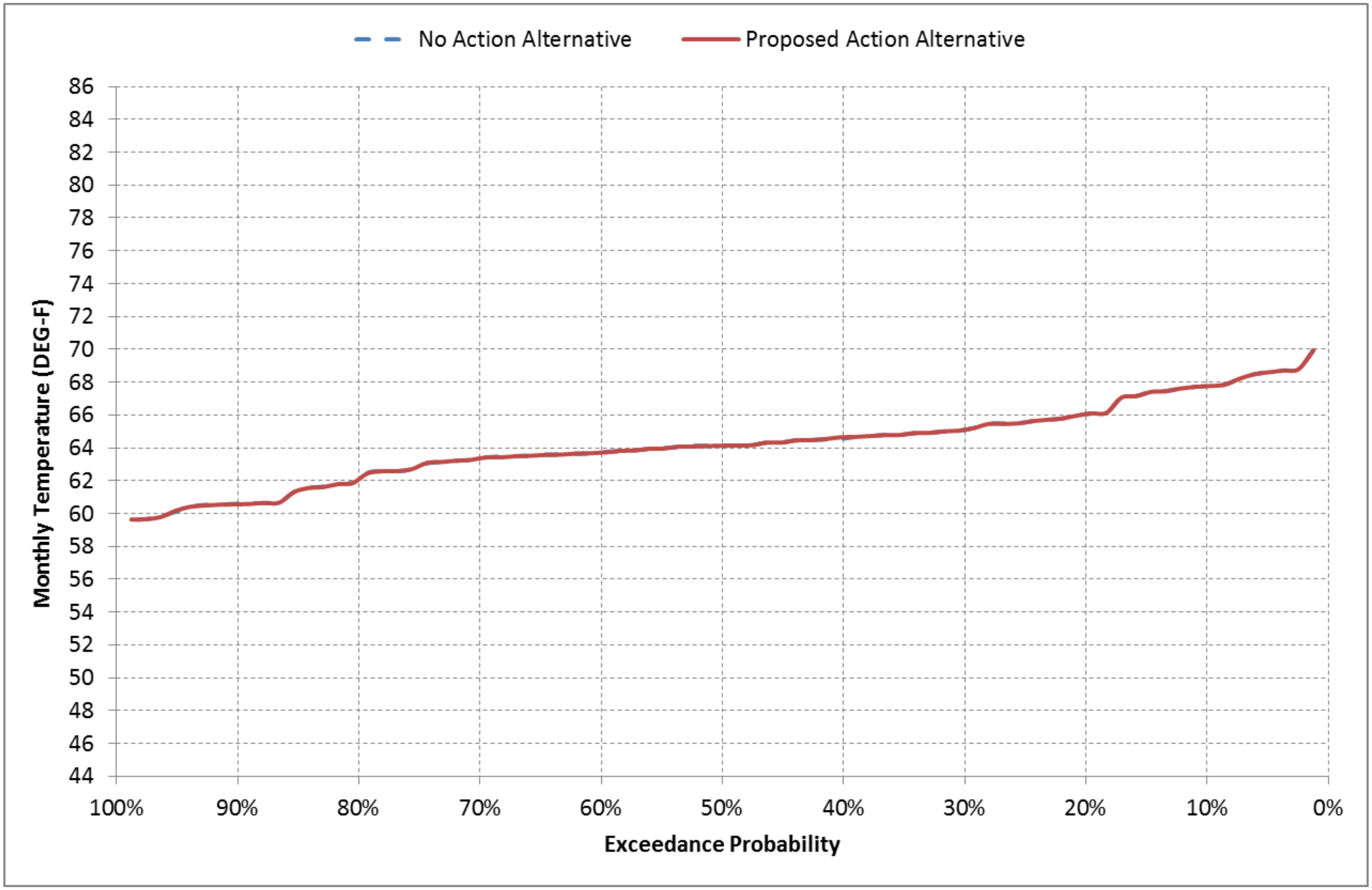


Figure A.3.4.3-2. American River at Mouth, November

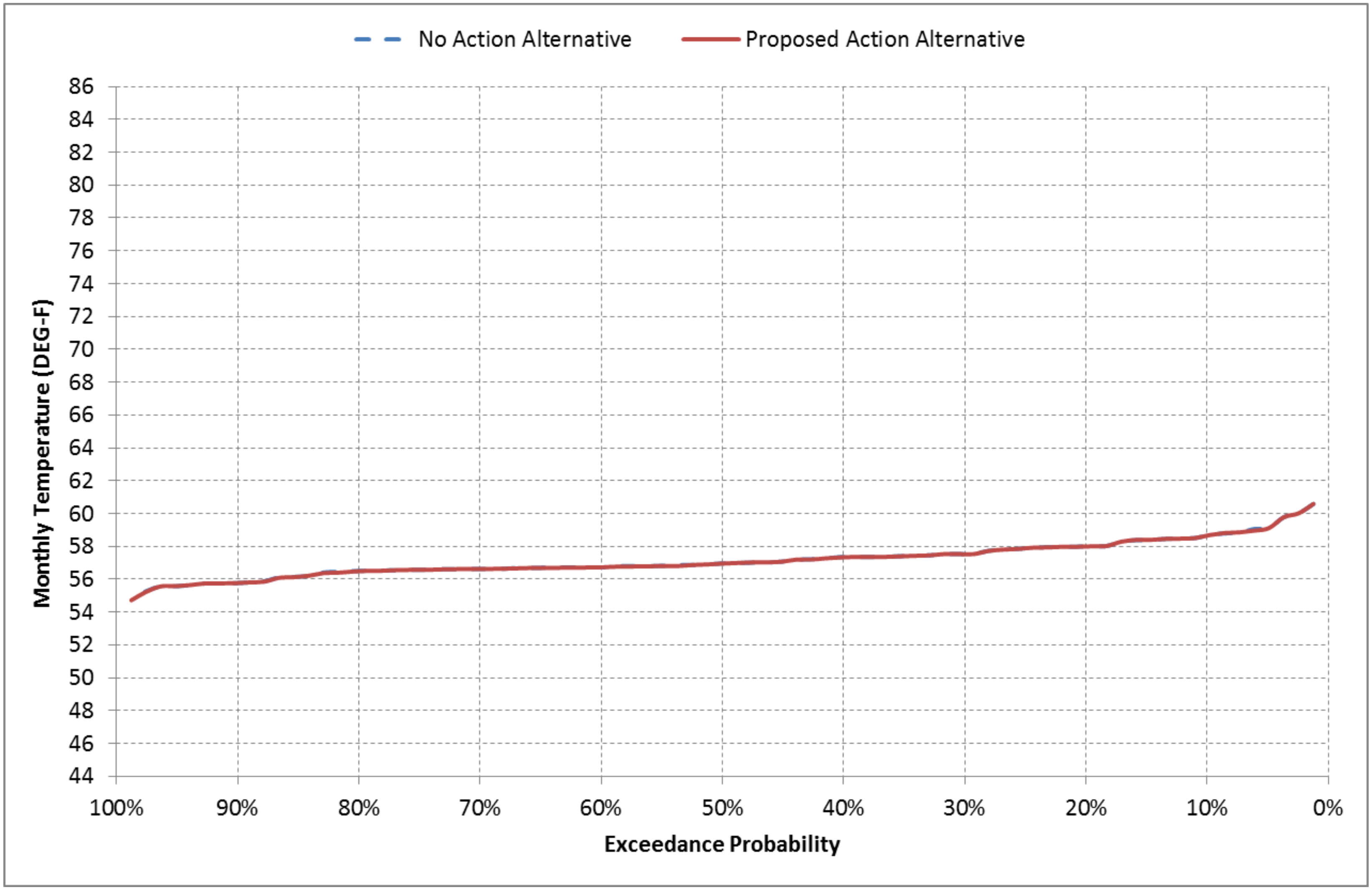


Figure A.3.4.3-3. American River at Mouth, December

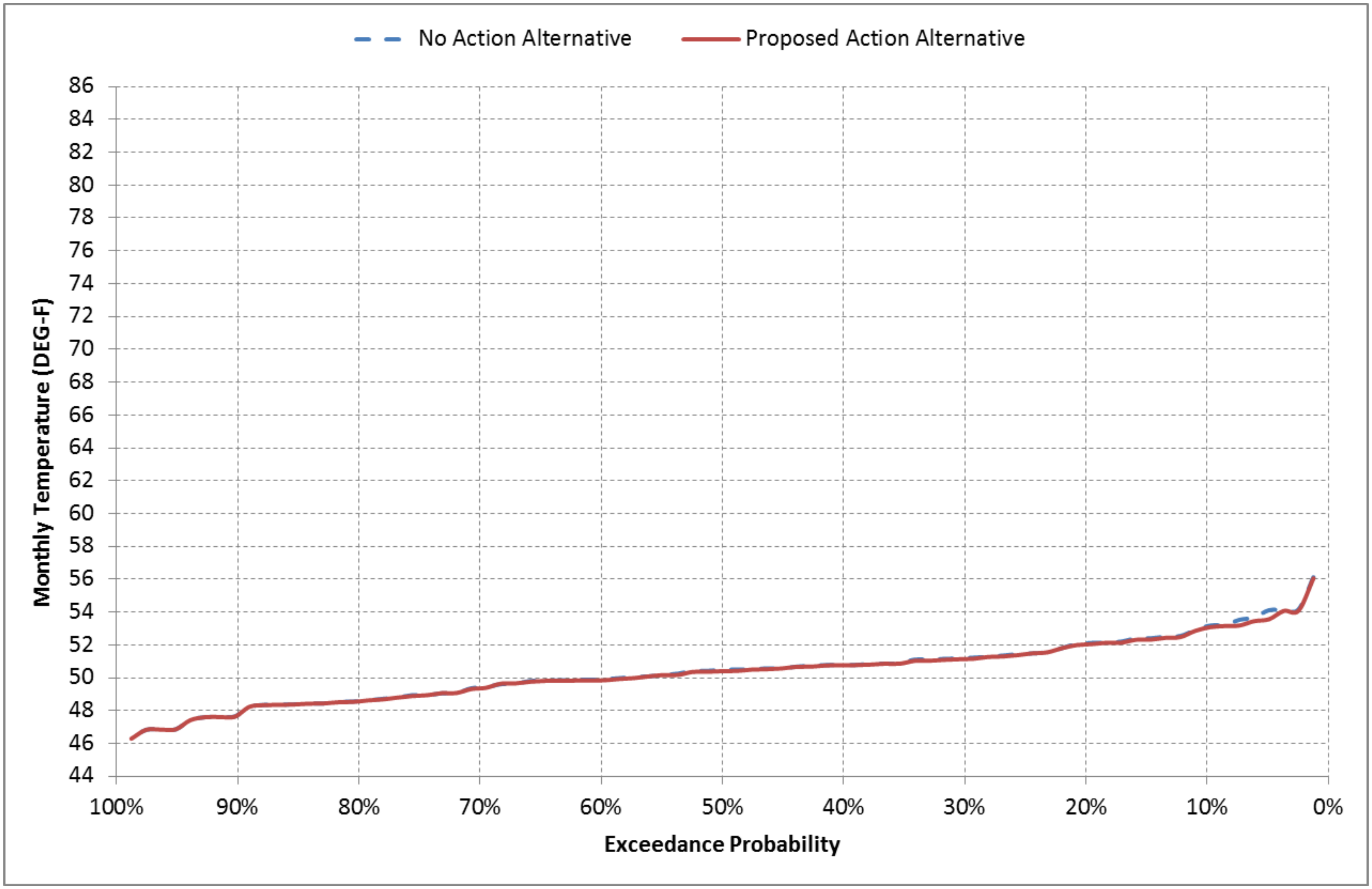


Figure A.3.4.3-4. American River at Mouth, January

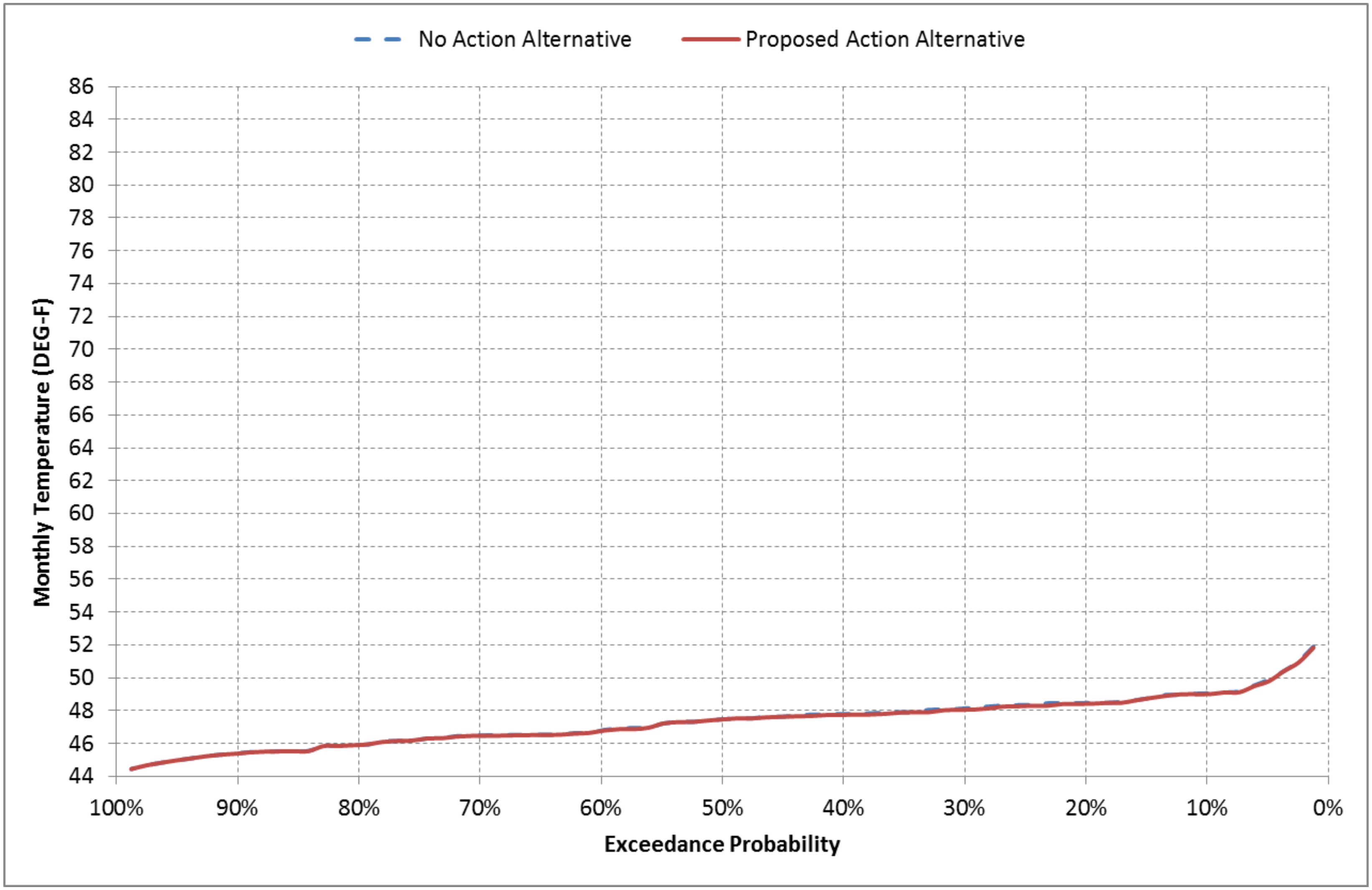


Figure A.3.4.3-5. American River at Mouth, February

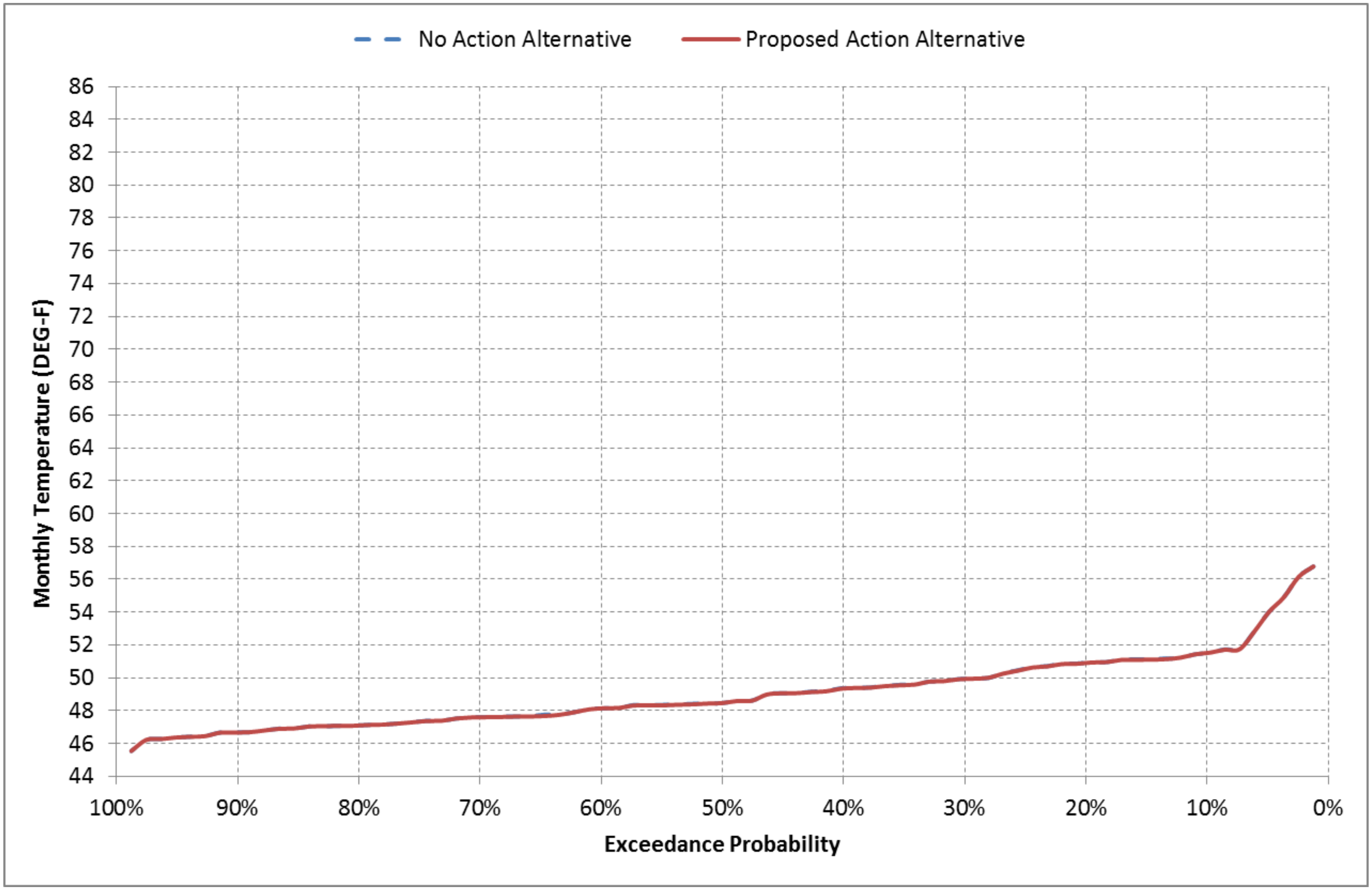


Figure A.3.4.3-6. American River at Mouth, March

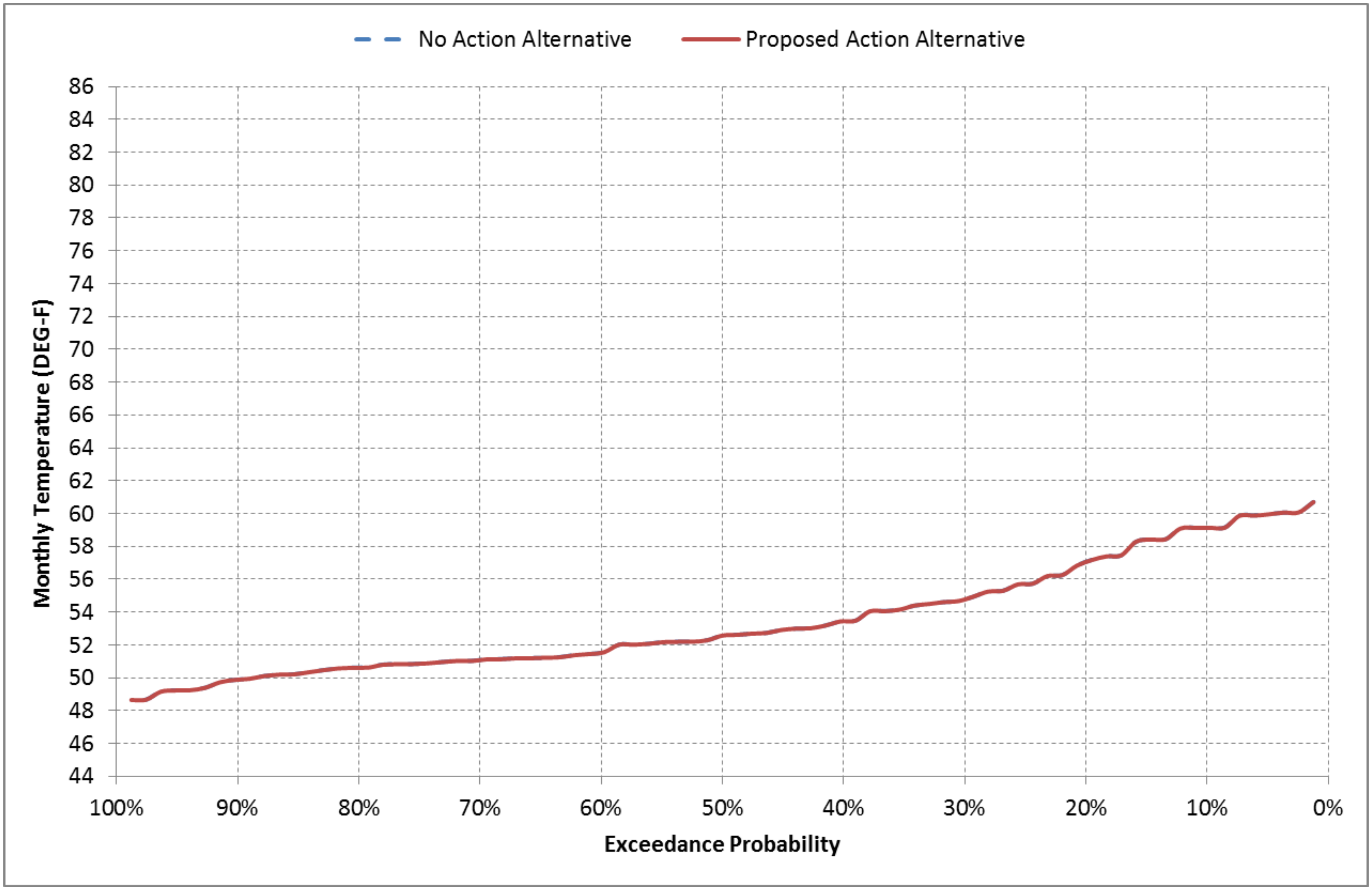


Figure A.3.4.3-7. American River at Mouth, April

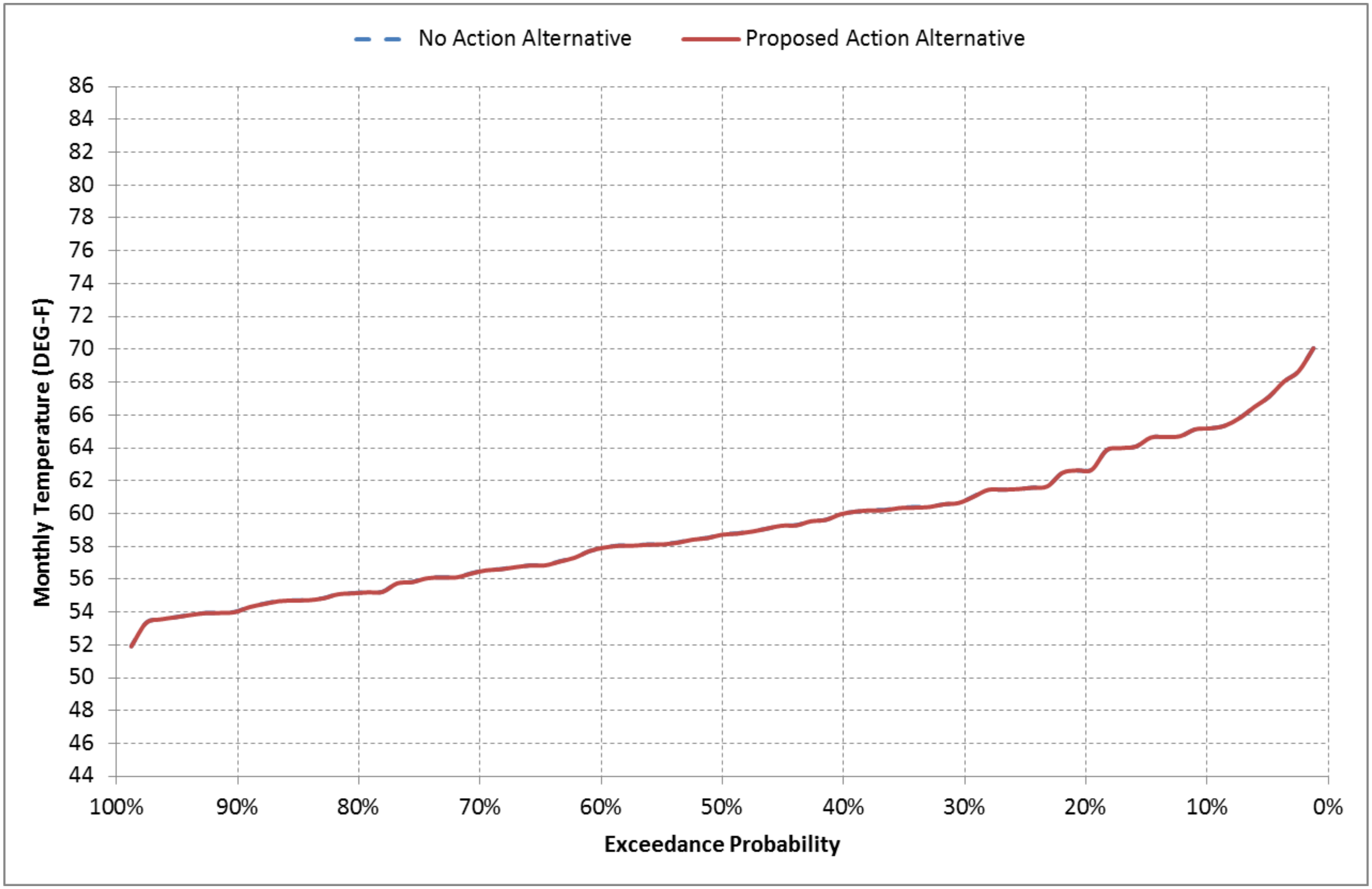


Figure A.3.4.3-8. American River at Mouth, May

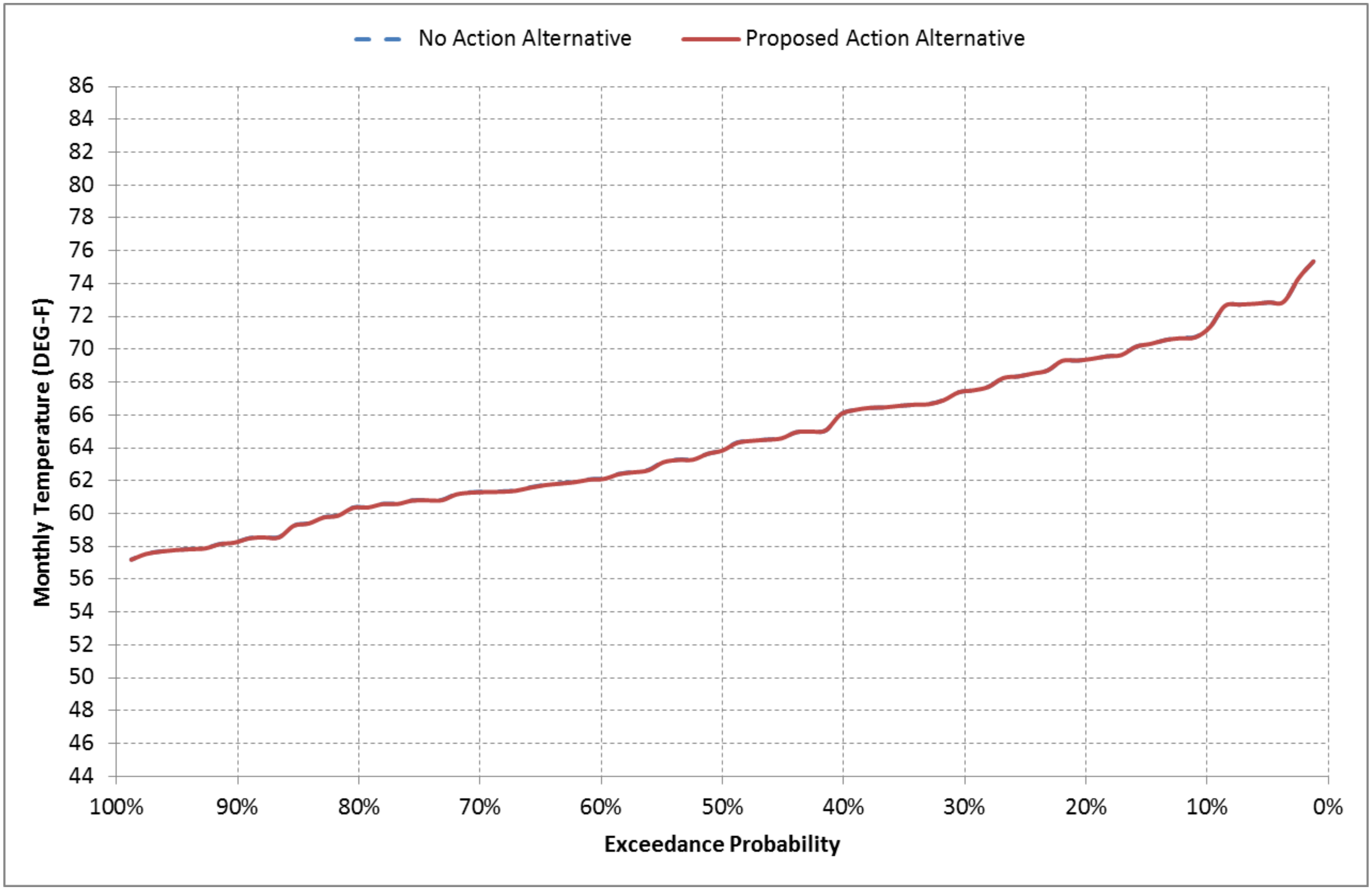


Figure A.3.4.3-9. American River at Mouth, June

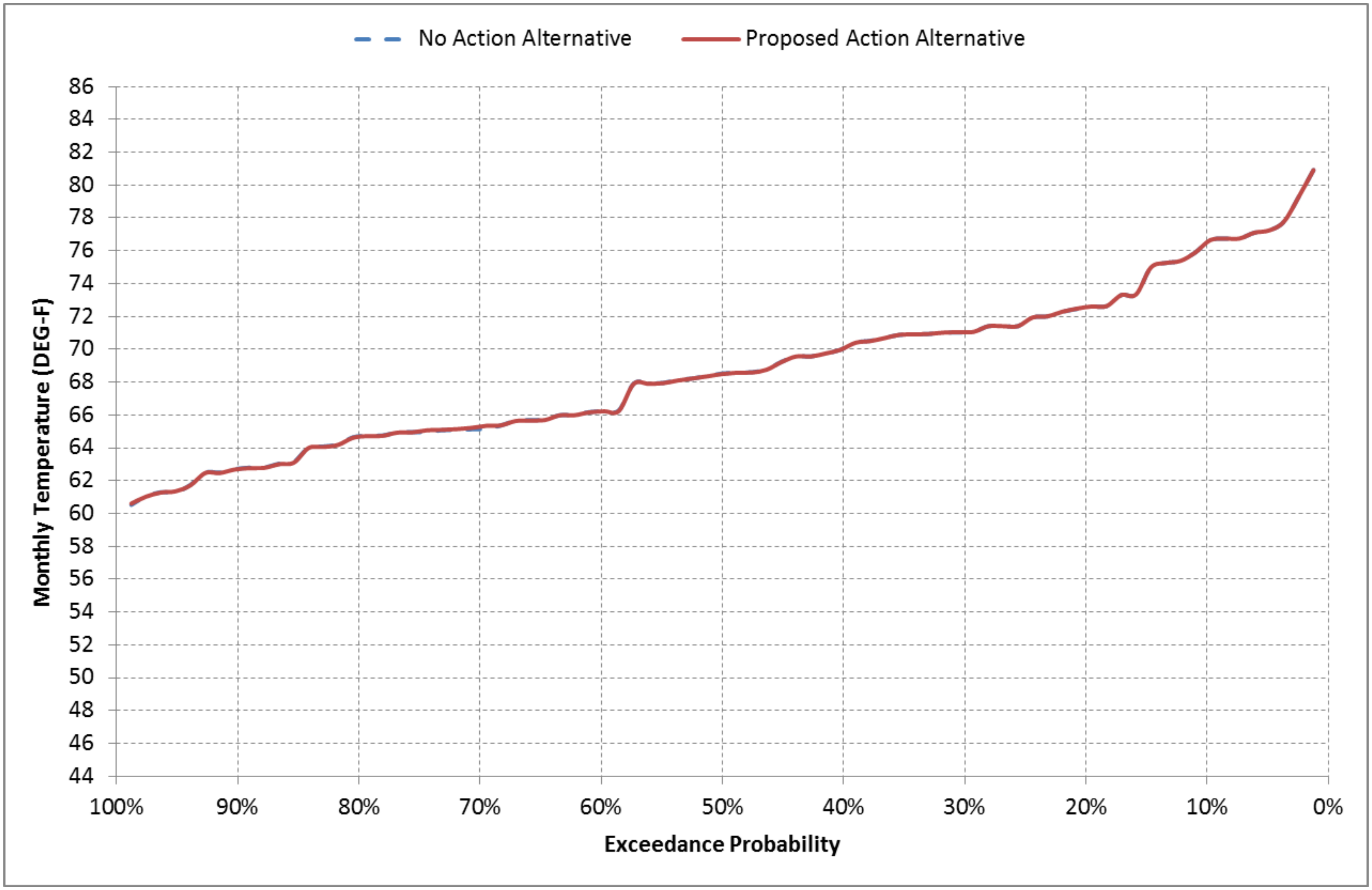


Figure A.3.4.3-10. American River at Mouth, July

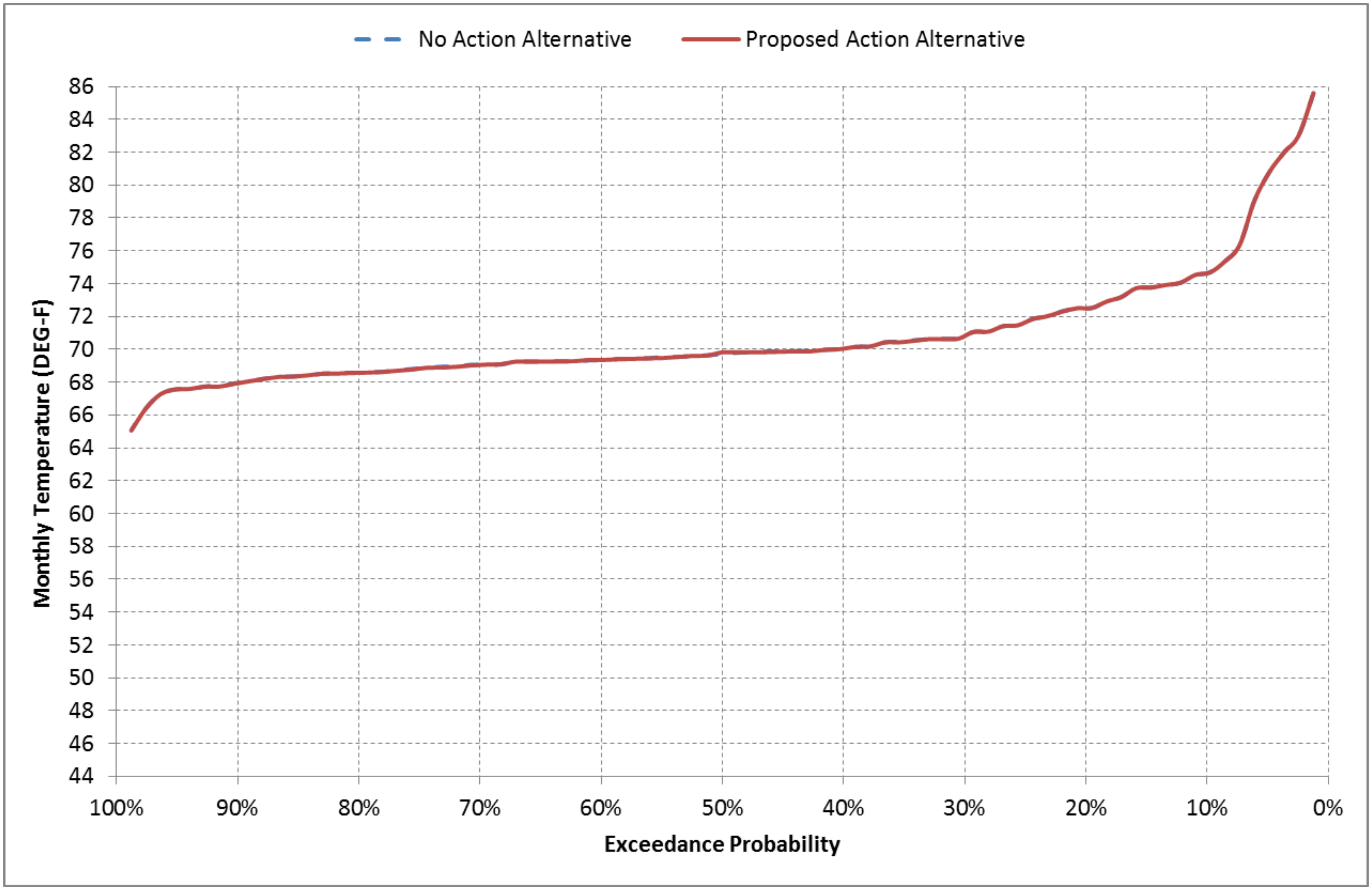


Figure A.3.4.3-11. American River at Mouth, August

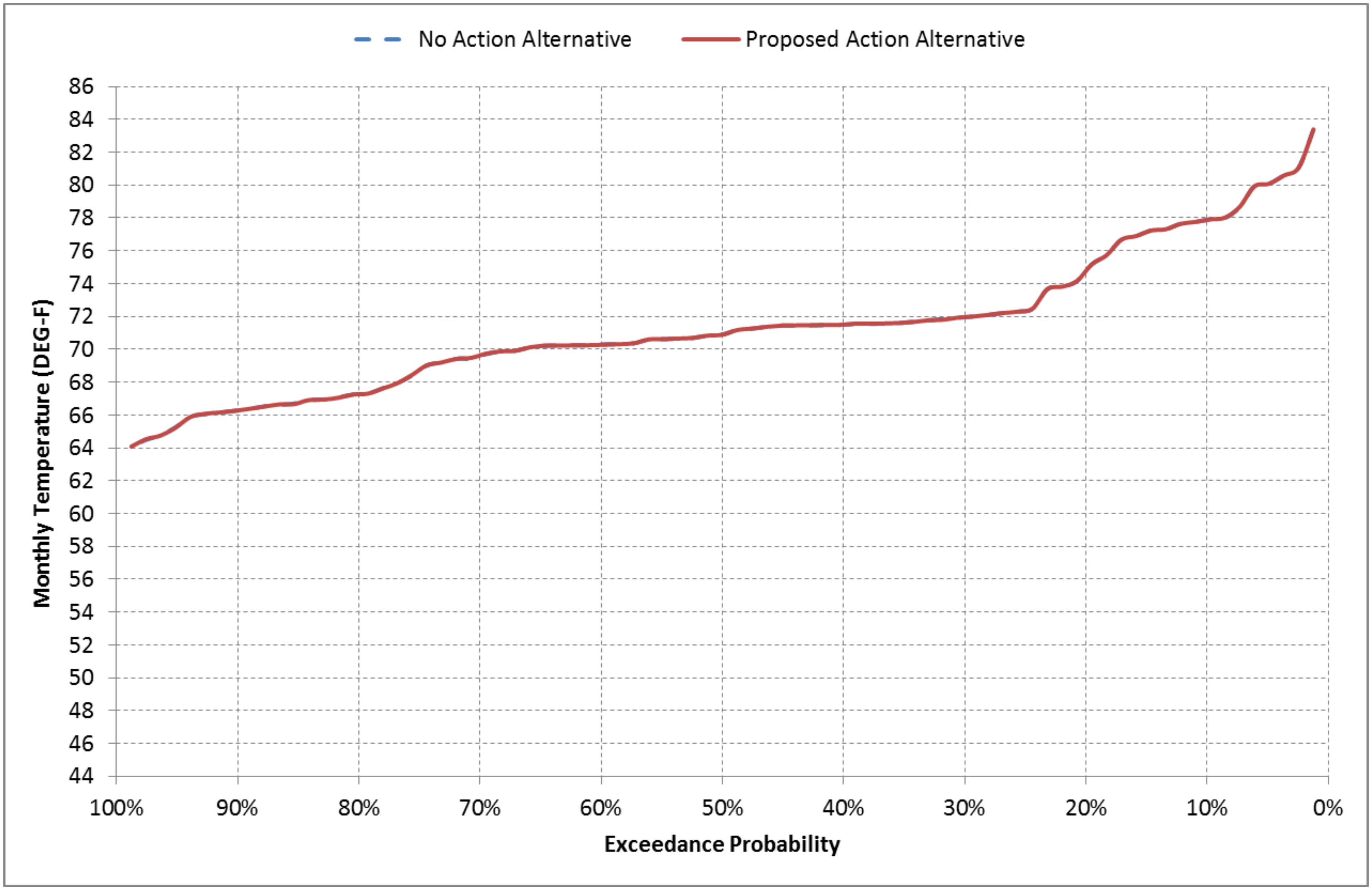


Figure A.3.4.3-12. American River at Mouth, September

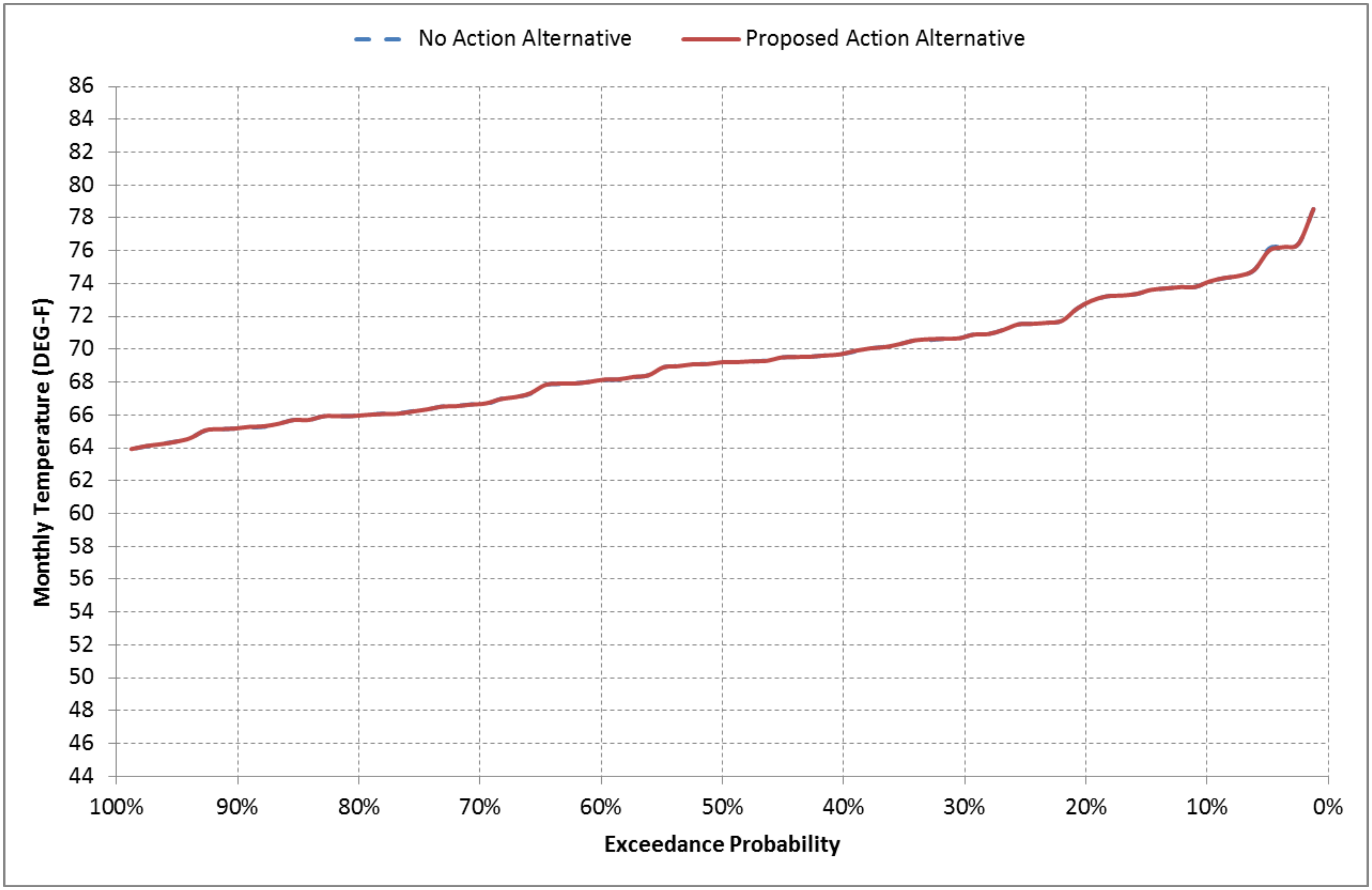


Table A.3.4.3-1. American River at the Mouth, Monthly Temperature

No Action Alternative

	Monthly Temperature (DEG-F)											
Statistic	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Probability of Exceedance[a]												
10%	68	59	53	49	52	59	65	71	77	75	78	74
20%	66	58	52	48	51	57	63	69	73	73	75	73
30%	65	58	51	48	50	55	61	68	71	71	72	71
40%	65	57	51	48	49	53	60	66	70	70	72	70
50%	64	57	50	47	48	53	59	64	69	70	71	69
60%	64	57	50	47	48	52	58	62	66	69	70	68
70%	63	57	49	46	48	51	57	61	65	69	70	67
80%	62	57	49	46	47	51	55	60	65	69	67	66
90%	61	56	48	45	47	50	54	59	63	68	66	65
Long Term												
Full Simulation Period[b]	63	56	50	47	49	54	59	65	69	71	71	69
Water Year Types[c]												
Wet	62	57	51	47	47	51	56	61	65	69	68	66
Above Normal	58	52	46	48	49	52	58	63	68	69	70	68
Below Normal	64	57	50	48	49	53	59	64	69	69	72	70
Dry	66	57	50	48	50	56	61	68	71	71	73	71
Critical	67	58	50	48	52	58	64	70	74	77	78	74

Proposed Action Alternative

	Monthly Temperature (DEG-F)											
Statistic	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Probability of Exceedance[a]												
10%	68	59	53	49	52	59	65	71	77	75	78	74
20%	66	58	52	48	51	57	63	69	73	73	75	73
30%	65	58	51	48	50	55	61	68	71	71	72	71
40%	65	57	51	48	49	53	60	66	70	70	72	70
50%	64	57	50	47	48	53	59	64	68	70	71	69
60%	64	57	50	47	48	52	58	62	66	69	70	68
70%	63	57	49	46	48	51	57	61	65	69	70	67
80%	62	57	49	46	47	51	55	60	65	69	67	66
90%	61	56	48	45	47	50	54	58	63	68	66	65
Long Term												
Full Simulation Period[b]	63	56	50	47	49	54	59	65	69	71	71	69
Water Year Types[c]												
Wet	62	57	51	47	47	51	56	61	65	69	68	66
Above Normal	58	52	46	48	49	52	58	63	68	69	70	68
Below Normal	64	57	50	48	49	53	59	64	69	69	72	70
Dry	66	57	50	48	50	56	61	68	71	71	73	71
Critical	67	58	50	48	52	58	64	70	74	77	78	74

Proposed Action Alternative minus No Action Alternative

	Monthly Temperature (DEG-F)											
Statistic	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Probability of Exceedance[a]												
10%	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20%	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
30%	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
40%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
50%	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
60%	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
70%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.1
80%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
90%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Long Term												
Full Simulation Period[b]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Water Year Types[c]												
Wet	0.0	-0.1	-0.1	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0
Above Normal	0.0	0.0	-0.1	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.1	0.0
Below Normal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Critical	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

a Exceedance probability is defined as the probability a given value will be exceeded in any one year
b Based on the 81-year simulation period
c As defined by the Sacramento Valley 40-30-30 Index Water Year Hydrologic Classification (SWRCB D-1641, 1999); projected to Year 2030

A.4 - References

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