3.6 HYDROLOGY AND WATER QUALITY

This section identifies the regulatory context and policies related to hydrology and water quality, describes the existing hydrologic conditions in the project area, and evaluates potential hydrology and receiving water quality impacts of the proposed Meeks Bay Restoration Project.

3.6.1 Regulatory Setting

FEDERAL

Federal Antidegradation Policy

The U.S. Environmental Protection Agency (EPA) has designated Lake Tahoe an Outstanding National Resource Water (ONRW). ONRWs are provided the highest level of protection under the EPA Antidegradation Policy, stipulating that states may allow temporary and short-term changes to water quality but that such changes should not adversely affect existing uses or alter the essential character or special uses for which the water was designated an ONRW. EPA interprets this provision to mean that no new or increased discharges to ONRWs shall be permitted if that discharge would result in lower or poorer long-term water quality.

Clean Water Act

EPA is the lead federal agency responsible for water quality management. The Clean Water Act (CWA) is the primary federal law that governs and authorizes water quality control activities by EPA as well as the states. Various elements of the CWA address water quality. These are discussed below.

<u>CWA Section 303(d) Impaired Waters List</u>

Section 303(d) of the CWA requires states to develop lists of water bodies that do not attain water quality objectives after implementation of required levels of treatment by point source dischargers (municipalities and industries). Section 303(d) requires that the state develop a total maximum daily load (TMDL) for each of the listed pollutants. The TMDL is the amount of the pollutant that the water body can receive and still comply with water quality objectives. The TMDL is also a plan to reduce loading of a specific pollutant from various sources to achieve compliance with water quality objectives. In California, implementation of TMDLs is achieved through water quality control plans, known as Basin Plans, of the Regional Water Quality Control Boards (RWQCBs).

<u>Section 404</u>

Section 404 of the CWA prohibits the discharge of fill material into waters of the United States, including wetlands, except as permitted under separate regulations by the U.S. Army Corps of Engineers (USACE) and EPA. To discharge dredged or fill material into waters of the United States, including wetlands, Section 404 requires projects to receive authorization from the Secretary of the Army, acting through USACE. Waters of the United States are generally defined as “waters which are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide; territorial seas and tributaries to such waters.” Under Section 404 of the CWA, Lake Tahoe and Meeks Creek are considered waters of the United States.

<u>Section 401</u>

Section 401 of the CWA requires certification of activities through a federal license or permit for discharges of a pollutant into waters of the United States. The certification must be obtained from the state in which the discharge would originate or, if appropriate, from the interstate water pollution control agency with jurisdiction over the affected waters at the point where the discharge would originate. Therefore, all projects that have a federal component and may affect state water quality (including projects that require federal agency approval, such as issuance of a Section 404 permit) must also comply with Section 401. Water quality certification requires evaluation of potential impacts considering water quality standards and CWA Section 404 criteria governing discharge of dredged and fill materials into waters of the United States. EPA delegates water pollution control authority under Section 401 to the states.

Section 402

Section 402 of the CWA establishes the National Pollutant Discharge Elimination System (NPDES) permit program to regulate discharges of pollutants into waters of the United States. An NPDES permit sets specific discharge limits for point source discharges of pollutants into waters of the United States and establishes monitoring and reporting requirements, as well as special conditions. EPA delegates water pollution control authority under Section 402 to the states.

Rivers and Harbors Act of 1899

The Rivers and Harbors Appropriation Act of 1899 is the oldest federal environmental law in the United States. The Act is the initial authority for the USACE regulatory permit program to protect navigable waters and prohibiting the unauthorized obstruction or alteration of any navigable water of the United States.

Section 10

Section 10 requires authorization from the Secretary of the Army, acting through USACE, for the construction of any structure in or over any navigable water of the United States. This includes bank protection and pilings.

TAHOE REGIONAL PLANNING AGENCY

The Tahoe Regional Planning Agency (TRPA) was designated as an areawide planning agency under Section 208 of the CWA in 1974. Under the Tahoe Regional Planning Compact, TRPA has established environmental threshold standards, goals and policies, and ordinances directed at protecting and improving water quality in Lake Tahoe and the Tahoe region. The focus of water quality enhancement and protection is to minimize the effects of human-made disturbances to the watershed and reduce or eliminate pollutants that result from existing and proposed development.

Thresholds

The TRPA Governing Board adopted Resolution 82-11, which established water quality threshold standards for six indicator categories: (1) Lake Tahoe pelagic (deep) waters, (2) Lake Tahoe littoral (nearshore) waters, (3) tributaries, (4) direct surface runoff and stormwater discharge to surface waters, (5) stormwater discharge to groundwater, and (6) other lakes (i.e., lakes in the Tahoe basin other than Lake Tahoe). Resolution 82-11 sets numerical and management standards for water quality. Some of these threshold standards are referenced to state standards, and in other cases, target reference conditions related to specific time periods are noted. The following value statements are used in setting the threshold standards and targets for water quality:

- Attain levels of water quality in the lakes and streams within the Tahoe Region suitable to maintain the identified beneficial uses of Lake Tahoe.
- Restrict algal productivity (rate of growth) to levels that do not impair beneficial uses or deteriorate existing water quality conditions in the Tahoe Region.
- Prevent degradation of the water quality of Lake Tahoe and its tributaries to preserve the lake for future generations.
- Restore all watersheds in the Tahoe Region so that they respond to runoff in a natural hydrologic function.

Goals and Policies

TRPA has established goals and policies related to water quality. Goals include the reduction of sediment and nutrients to Lake Tahoe and the elimination or reduction of other pollutants. The existing goals and policies for water quality protection and shorezone conservation encompass the following regulatory framework (TRPA 2012):

- Support the Lake Tahoe TMDL program (see Section 6.2.5) and local government pollutant/stormwater load reduction planning and implementation.
- Regulate developed properties to install and maintain best management practices (BMPs) that reduce erosion and control stormwater runoff.
- Prohibit the discharge of wastewater, toxic waste, and solid waste into Lake Tahoe, its tributaries, and groundwater resources.
- Regulate the placement and design of shorezone structures to avoid degradation of fish habitat and interference with littoral drift.

Code of Ordinances

The TRPA Code of Ordinances (TRPA Code) contains the requirements and standards intended to achieve water quality thresholds, and the goals and policies of the TRPA Regional Plan Chapter 60 of the TRPA Code is directed specifically at water quality protection (TRPA 2021). Chapters 80–85 of the TRPA Code contain provisions related to permissible uses, activities, and placement of structures within the shorezone (Table 3.6-1).

Table 3.6-1 Code Requirements Related to Water Quality Protection and Shorezone Structures

Code Section	Requirements
Chapter 33	Sets standards for grading and excavation.
Chapter 60.1	Sets discharge standards for runoff to surface water and groundwater.
Chapter 60.2	Sets requirements that new residential, commercial, and public projects completely offset their water quality impacts.
Chapter 60.3	Contains regulations pertaining to recognition of source water, prevention of contamination to source water, and protection of public health relating to drinking water.
Chapter 60.4	Sets standards for installation of BMPs for the protection or restoration of water quality.
Chapter 80	Sets forth findings that must be made by TRPA before approving a project in the shorezone.
Chapter 81	Identifies permissible uses and accessory structures in the shorezone.
Chapter 82	Sets requirements for maintenance, repair, or expansion of existing structures in the shorezone.
Chapter 84	Regulates the placement of new piers, buoys, and other structures in the shorezone to avoid interference with littoral drift; sets BMP compliance standards for new marinas or marina expansions; sets conditions for permittable filling and dredging activities; and sets standards for operation of motorized watercraft.
Chapter 85	Sets standards and policies for projects and activities in the backshore.

Note: BMP = best management practice

Source: TRPA 2021.

STATE

California Porter-Cologne Act

California’s primary statute governing water quality and water pollution issues with respect to both surface waters and groundwater is the Porter-Cologne Water Quality Control Act of 1970 (Porter-Cologne Act). The Porter-Cologne Act grants the State Water Resources Control Board (State Water Board) and each of the nine RWQCBs power to protect water quality and is the primary vehicle for implementation of California’s responsibilities under the Clean Water Act. The applicable RWQCB for the proposed project is the Lahontan RWQCB. The State Water Board and the Lahontan RWQCB have the authority and responsibility to adopt plans and policies, regulate discharges to surface and groundwater, regulate waste disposal sites, and require cleanup of discharges of hazardous materials and other pollutants. Under the Porter-Cologne Act, each RWQCB must formulate and adopt a water quality control plan (known as a “Basin Plan”) for its region.

Water Quality Control Plan for the Lahontan Region

Water quality standards and control measures for surface water and groundwater within the Lahontan Region are contained in the Water Quality Control Plan for the Lahontan Region (Basin Plan). The Basin Plan designates beneficial uses for water bodies. It establishes water quality objectives, waste discharge prohibitions, and other implementation measures to protect those beneficial uses. Chapter 5 of the Basin Plan, "Water Quality Standards and Control Measures for the Tahoe Region," summarizes a variety of control measures for the protection and enhancement of Lake Tahoe.

The Basin Plan was first adopted in 1975 and was most recently updated in 2019. It contains both narrative and numeric water quality objectives for the region. The Basin Plan amendments include additional language related to "mixing zones" for dilution of discharged water, compliance schedules for NPDES permits, discharge prohibition exemptions, simplification of existing prohibition exemptions, and the removal of the prohibition on new pier construction in sensitive areas along the California side of Lake Tahoe (Lahontan RWQCB 2019).

Lake Tahoe TMDL

The Lake Tahoe TMDL was developed in a partnership between the Lahontan RWQCB and Nevada Department of Environmental Protection to address the declining transparency and clarity of Lake Tahoe, which results from light scatter from fine sediment particles (primarily particles less than 16 micrometers in diameter) and light absorption by phytoplankton (algae). The addition of phosphorus and nitrogen to Lake Tahoe contribute to phytoplankton growth. Because fine sediment particles, phosphorus, and nitrogen are responsible for the decline in lake transparency and clarity, Lake Tahoe is listed under Section 303(d) of the CWA as impaired by the input of these three pollutants of concern. Based on California law, the Lahontan RWQCB has the obligation to implement and enforce the California Lake Tahoe TMDL through NPDES discharge permits (over which EPA has jurisdiction).

California's Lake Tahoe TMDL requires attainment of the California transparency objective for Lake Tahoe over a 65-year implementation period. California has identified Lake Tahoe's lack of transparency as the primary basis for its impaired status under its Section 303(d) impaired water listings filed with EPA. To comply with California's Lake Tahoe transparency standard, a Secchi disk would need to be visible 29.7 meters (97.4 feet) below the surface of Lake Tahoe on an average annual basis.

NPDES Construction General Permit for Stormwater Discharges Associated with Construction Activity in the Lake Tahoe Hydrologic Unit

The State Water Board adopted the statewide NPDES General Permit in August 1999. The state requires that projects disturbing more than one acre of land during construction file a Notice of Intent with the RWQCB to be covered under this permit. Construction activities subject to the General Permit include clearing, grading, stockpiling, and excavation. Dischargers are required to eliminate or reduce non stormwater discharges to storm sewer systems and other waters. A stormwater pollution prevention plan (SWPPP) must be developed and implemented for each site covered by the permit. The SWPPP must include best management practices (BMPs) designed to prevent construction pollutants from contacting stormwater and keep products of erosion from moving off-site into receiving waters throughout the construction and life of the project; the BMPs must address source control and, if necessary, pollutant control.

3.6.2 Environmental Setting

HYDROLOGY AND DRAINAGE

Regional Hydrology

The Tahoe Basin was formed approximately 2–3 million years ago by geologic faulting and volcanic activity. Faults running in a north-south direction formed a valley between the uplifting Sierra Nevada and the Carson Range. The northern portion of the valley was blocked and dammed by volcanic activity that created the 506-square-mile basin.

Precipitation and runoff eventually filled a portion of the basin to create Lake Tahoe, which has a water surface area covering nearly two-fifths of the total Basin area.

Lake Tahoe is fed by 63 tributary streams and intervening zones that drain directly to the lake. The largest tributary is the Upper Truckee River on the south side of the lake, which accounts for 25 percent of the annual inflow to Lake Tahoe. The Truckee River, on the northwest side of the lake, is the lake's only outlet, flowing to Pyramid Lake in Nevada. A dam constructed at Tahoe City in the early 1900s regulates water flow to the Truckee River from the natural rim at 6,223.0 feet above sea level to the maximum legal lake level of 6,229.1 feet (Lake Tahoe Datum).

Regional topography is characterized by steep mountain slopes at higher elevations, transitioning to more moderately sloped terrain near the lakeshore. A precipitation gradient exists from the western boundary of the Tahoe Region along the crest of the Sierra Nevada to the eastern boundary at the crest of the Carson Range. The west shore of Lake Tahoe averages about 35 inches per year of precipitation, while the east shore averages about 20 inches per year. Most precipitation in the Tahoe Basin falls between October and May as snow at higher elevations and as a mixture of snow and rain at lake level. In the higher elevations, peak stream runoff from snowmelt typically occurs in May or June, while the snowpack near lake level melts a few weeks earlier.

Local Hydrology

The Meeks Creek watershed originates at over 9,000 feet in elevation along the eastern crest of the Sierra Nevada (Swanson 2008) (Figure 3.6-1). The Creek runs 7.5 miles through high mountain lakes in Desolation Wilderness and steep alpine terrain. It then flows into Meeks Meadow before flowing under SR 89 and into the Meeks Bay Marina and into Lake Tahoe. Hydrology and geomorphic processes of the shoreline such as in the project area are highly influenced by the water level of Lake Tahoe (Swanson 2006). The hydrology of Meeks Creek has been significantly altered by many human disturbances including Comstock era logging, grazing of the meadow, road and bridge construction, cessation of the natural and indigenous fire regimes, and climate change (Swanson 2008). Meeks Creek is constricted by two 8-foot by 10-foot box culverts as it flows under SR 89 and then flows through a highly developed campground and marina which was created by dredging the natural lagoon near the mouth of Meeks Creek. There is an approximately 4-foot drop on the downstream end of the culvert to the creek bed. A fixed embayment structure at the mouth of the Creek is surrounded by elevated fill areas and has contributed to a deeply incised creek channel. The creek incision has lowered local groundwater levels, decreased floodplain connectivity, destabilized streambanks, and altered complex sediment transport dynamics that are typical of deltaic environments. The impaired geomorphic and hydrologic processes have led to impaired riparian functions and ecological communities. Development of the marina decreased or eliminated overbank flooding and minimized other important geomorphic and hydrologic processes that once supported a thriving riparian vegetation and aquatic habitat (Swanson 2006). When in use, the marina required dredging to accommodate boat use.

The climate of the project area is characterized by temperate, dry summers and cold, snowy winters. Based on weather data from the nearby Tahoe City weather station, the mean annual precipitation is 16.27 inches (the majority delivered as snow between November and April), and the average annual maximum air temperature is 56.0 ºF and the annual minimum average temperature is 30.5 ºF (WRCC 2020). Sediment transport in Meeks Creek has been characterized as entirely suspended sediment (Balance Hydrologics 2021). The average hydrograph shows that there is little runoff during the dry summer months, but runoff increases in November and December with the onset of winter rain. Through the cold winter months precipitation is stored in the snowpack, and then with rising temperatures the majority of Meeks Creek runoff is generated during spring snowmelt (Swanson 2006). A more recent study by Simon (2008) estimated fine sediment loading for all subwatersheds within the Tahoe basin. Meeks Creek ranked 15th highest in sediment transport among all 63 of the subwatersheds and ranked third within the west shore creeks subgroup (behind Blackwood Creek and Ward Creek). Simon (2008) estimated fine sediment loading from Meeks Creek as 81.4 tons per year, or about 1.42 percent of the total sediment load of 5,739 tons per year for the entire Tahoe Basin.

Source: Data received from TRPA in 2012 and adapted by Ascent Environmental in 2020.

Figure 3.6-1 Meeks Creek Watershed

Present day discharge of Meeks Creek is too low to be correlated with its existing channel characteristics (e.g., meander radium, channel width). It only generates a fraction of the hydraulic force of the prior glacial period responsible for the formation of the present valley floor landforms. The scale of modern Meeks Creek is primarily the result of the drier climate of the late Holocene compared to those of early Holocene and late Pleistocene Epochs (Swanson 2006).

Lake Tahoe

The TRPA Code defines Lake Tahoe's nearshore as the low-water elevation of 6,223 feet to a lake bottom elevation of 6,193 feet (Lake Tahoe Datum), with a minimum lateral distance of 350 feet measured from the shoreline and is thus located within the project area. The scientific approaches and long-term data sets for investigating and understanding the factors that influence Lake Tahoe's nearshore conditions are still being studied and developed. Adjacent land uses and urban stormwater inputs, nonpoint pollutant inputs, boat activity, proximity to stream inputs, water movement and wave action, water depth, substrate type, and localized features of the lake bottom are all factors that influence nearshore conditions (Heyvaert et al. 2013). The quality of water in the nearshore area is tracked by measuring turbidity, which is an indication of the cloudiness of water expressed in Nephelometric Turbidity Units (NTUs). Higher turbidity measurements indicate cloudier water. TRPA maintains standards for nearshore turbidity of 3 NTU in areas influenced by stream discharge such as in the Meeks Bay area.

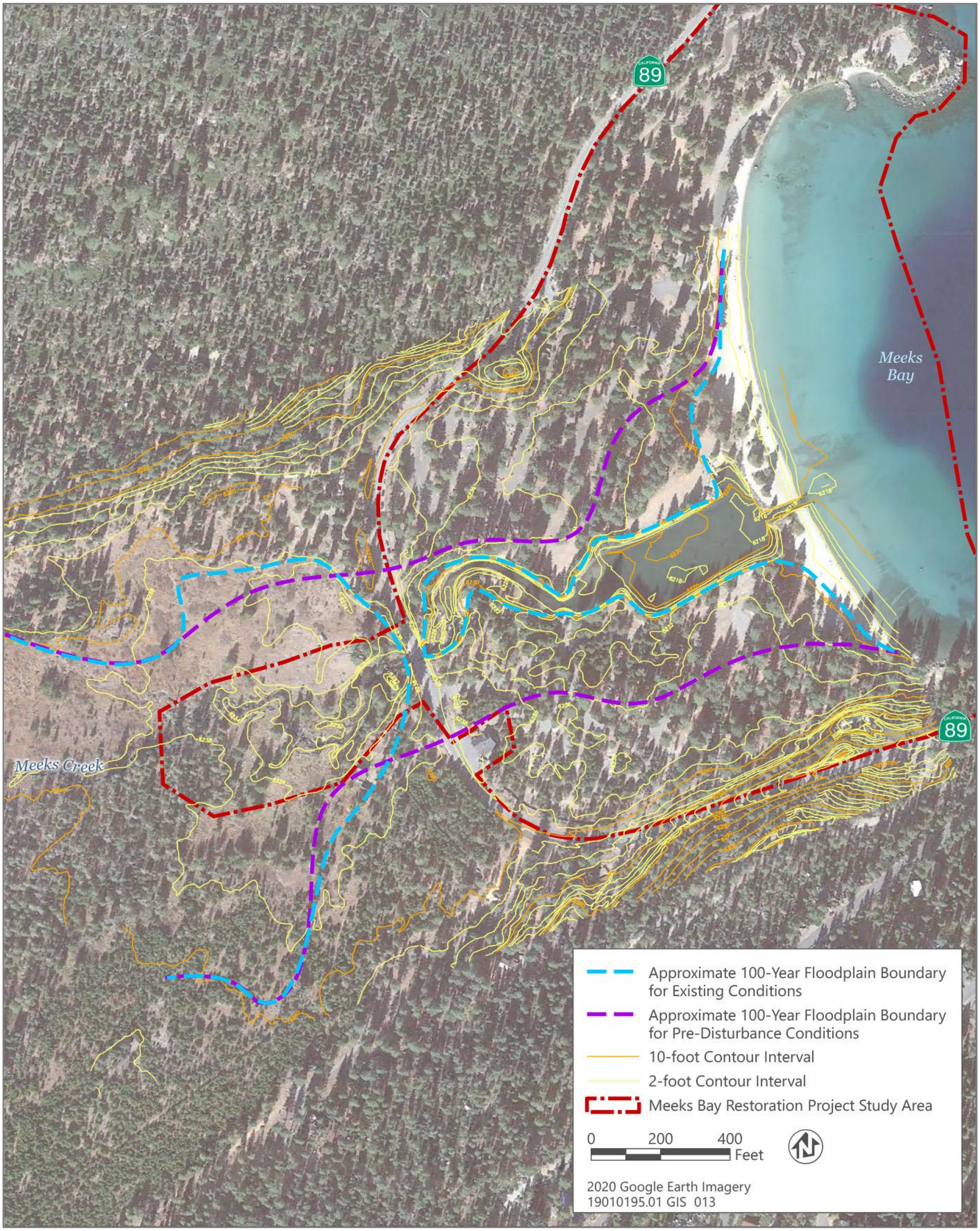
The 2019 TRPA Threshold Evaluation reports the status of turbidity as at or somewhat better than the target, with insufficient data to determine a trend attributable to a lack of a long-term monitoring program and associated data (LT Info 2022a). In 2012, the TRPA Governing Board adopted a new standard in the nearshore environment to address attached algae (periphyton) growing to submerged surfaces in the lake such as lake substrate, rocks, buoys, and piers. The adopted TRPA standard for nearshore attached algae is qualitive and focuses on supporting policy and management actions to reduce the areal extent and density of attached algae in the nearshore. The 2019 TRPA Threshold Evaluation reports the status and trend for attached algae could not be assessed because of insufficient data given the lack of defined numerical targets (LT Info 2022b).

Stormwater Drainage

The developed portions of the project area consist of campsites, roads, and buildings associated with Meeks Bay Resort. There is no formalized storm drain infrastructure in the project area. Stormwater generally moves as sheetflow from roads and campground into native soils where it infiltrates. Some impervious areas are rock lined to aid in reduction of erosion and infiltration.

Flood Conditions

A computer simulation of lower Meeks Creek in peak flood (using the USACE Hydraulic Engineering Center River Analysis System [HEC-RAS]) is shown in Figure 3.6-2. This shows a map of inundation before and after the installation of SR 89, the dredging of Meeks Bay Marina, and the incision of Meeks Creek. Under a projected 100-year flood peak of 1000 cfs, floodplain inundation in the modeled reach was reduced from 38.6 acres to 28.3 acres or by 26 percent. The area of annual inundation as the result of snowmelt runoff is estimated to be 7.5 acres [in 2006], but about 16 acres before development, a 47 percent reduction (Swanson 2006). With climate change, more extreme hydrologic events are predicted, with increasing intensity of storms, rain on snow events and floods. The precipitation from larger storms will be increasing by 5–30 percent, leading to higher flow runoff events and corresponding impacts on erosion, pollutant transport and damage to infrastructure, which will require design specification review and modification by highway engineers and floodplain managers (Hayvaert 2019).



Source: Adapted by Ascent Environmental in 2021 from Swanson 2006.

Figure 3.6-2 100-Year Floodplain

Groundwater Hydrology

Groundwater in the Lake Tahoe basin is the primary source of domestic and municipal water supply in California and an important source of inflow to Lake Tahoe. The Tahoe City/West Shore aquifer, where the project is located, extends from Dollar Point on the north to Rubicon Point on the south, a shoreline distance of about 18 miles (Plume et al. 2009). In the West Shore area, glacial processes separated the area into eight watersheds, each underlain by glacial outwash and fluvial deposits (mostly sands and gravels). Ridges separating the watersheds consist of intrusive igneous rocks that in places are capped by glacial moraines or volcanic rocks. Groundwater containing aquifer materials are penetrated by 31 wells and consist of clay, silt, sand, gravel, and boulders, in places interbedded with volcanic rocks, to depths of 56–805 feet. The specific capacity of these wells range from 0.1 to 30 gallons per minute per foot (Plume et al. 2009).

WATER QUALITY

Surface Water Quality

Meeks Creek upstream of SR 89 discharges some of the cleanest water measured in the Lake Tahoe Basin (Swanson 2006). Measurements taken at SR 89 have led many researchers to cite Meeks Creek as the baseline of pre-disturbance water quality. Below SR 89, human disturbance has increased fine sediment production through bank erosion and has eliminated floodplain fine sediment deposition. Detection of metals and some hydrocarbons in the Meeks Bay Marina, while generally low, indicate pollution directly related to marina use. Leaching of organic carbon from natural drift matter (e.g., leaves and woody debris) trapped and decomposing in Meeks Bay Marina results in discoloration of the water discharged into Lake Tahoe (Swanson 2006).

Normal biological activity in a creek system shows diurnal fluctuations in water temperature and in dissolved oxygen. Water quality sampling found that Meeks Creek demonstrated static conditions in terms of water temperature and very little fluctuation in dissolved oxygen. A large portion of Meeks Creek's macroinvertebrate population consist of species that adapted to degraded environments (Swanson 2006).

Water quality monitoring of Meeks Creek took place during the 2004 water year to investigate the influence of the marina operations on the lagoon system and to compare the Meeks system to water quality of other Lake Tahoe watersheds (Swanson 2006). The highest turbidity values were observed (149 NTU) during the peak of the spring snowmelt, though a greater volume of particulates appear to have been transported through the system during early winter rainstorms and the summer thunderstorms than the entire spring melt (Swanson 2006). The same conditions have been observed in stream monitoring from the Upper Truckee River by the City of South Lake Tahoe. This is likely because of the greater and widespread contributing areas of sediment sources during rainstorms versus the limited areas of spring snowmelt runoff and increased infiltration to shallow groundwater (Swanson 2006).

Total organic carbon (TOC) and dissolved organic carbon (DOC) levels were measured in surface water samples collected from four Lake Tahoe Basin lagoons (i.e., Meeks, Trout, Tallac, and Taylor Creek locations) and their respective inflowing waters. All comparative lagoons (Taylor, Tallac, and Trout Creeks) appeared to sequester organic carbon relative to the inflowing waters, which is typical of naturally functioning lagoon system. Samples collected from the Meeks Creek Watershed indicate a disruption of this natural function. The Meeks Creek inflowing TOC and DOC values are the highest observed in all lagoons that were measured, most likely because of the backwater conditions caused by persistent beaver activity in the SR 89 culvert. As water moves through the Meeks marina, there is very little change observed in the biologically available nutrient levels. If the marina were a functional and productive lagoon system, changes in nutrient levels over time would be expected; however, no seasonal component of biogeochemical cycling is apparent at Meeks Bay Marina (Swanson 2006).

Groundwater Quality

Groundwater quality can be affected by many things, but the main controls on the characteristics of groundwater quality are the source and chemical composition of recharge water, properties of the host sediment, and history of discharge or leakage of pollutants. Due to the relatively undeveloped nature of the project area, very few groundwater impairments exist and groundwater quality is anticipated to be good. The State Water Resources

Control Board lists one leaking underground gasoline storage tank in the project area which was closed in 1996 (SWRCB 2021).

Source Water Protection

One active drinking water well is located near the project area. The well is located south of the project area on the Meeks Bay Fire Protection District property. The TRPA 600-foot source water protection zone is located within the project area. No project work is proposed in the vicinity of the well and no additional protections for the well are proposed.

3.6.3 Environmental Impacts and Mitigation Measures

METHODOLOGY

Evaluation of potential hydrologic and water quality impacts is based on a review of existing documents and studies that address water resources in the vicinity of the project. Information obtained from these sources was reviewed and summarized to describe existing conditions and to identify potential environmental effects, based on the standards of significance presented in this section. In determining the level of significance, the analysis assumes that the project would comply with relevant federal, state, and local laws, ordinances, and regulations.

THRESHOLDS OF SIGNIFICANCE

The thresholds of significance were developed in consideration of the State CEQA Guidelines, TRPA Thresholds, TRPA Initial Environmental Checklist, LTBMU Forest Plan, and other applicable policies and regulations. Under NEPA the significance of an effect must consider the context and intensity of the environmental effect. The factors that are considered under NEPA to determine the context and intensity of its effects are encompassed by the thresholds of significance. An alternative would have a significant effect on hydrology and water quality if it would:

- substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river in a manner that would result in substantial erosion, siltation or flooding on- or off-site;
- create or contribute runoff or alter surface drainage in a manner that would exceed stormwater drainage facilities such that surface water runoff could not be contained on site;
- cause substantial short-term accelerated soil erosion and/or release of pollutants to water bodies associated with construction or maintenance activities;
- substantially degrade water quality in Lake Tahoe from fine sediment resuspension and turbidity, atmospheric deposition of pollutants onto the surface of Lake Tahoe, or pollutant discharges of hydrocarbons or other contaminants from boating activities;
- cause substantial interference with, or adverse effects on, littoral processes;
- adversely alter the course or flow of 100-year flood waters or place people or structures within the 100-year floodplain; or
- substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management of the basin.

ISSUES NOT DISCUSSED FURTHER

Risk of seiche and tsunami are discussed in Section 3.7, "Geology and Soils," and are not discussed further in this section.

ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Impact 3.6-1: Degradation of Lake Tahoe and Meeks Creek Water Quality from Restoration Activities and Facility Construction and Maintenance

Implementation of erosion and sediment controls, maintenance of temporary construction BMPs, waste control measures, and management controls for stormwater runoff would be required by regulatory agencies including TRPA and the Lahontan RWQCB for both construction and maintenance activities. Because regulatory protections are in place to minimize erosion and transport of sediment and other pollutants during construction, construction related impacts on water quality for the action alternatives would be reduced to a less-than-significant level.

The No Action Alternative would require continued dredging of accumulated sediment and plant matter in the marina which could adversely affect water quality by disturbing and resuspending sediment as well as the operation of heavy equipment in the marina. BMPs would be required by TRPA and the Lahontan RWQCB. The continued degradation of Meeks Creek and lack of permanent BMPs make this impact to water quality potentially significant for the No Action Alternative.

<u>No Action Alternative</u>

Though no construction activities would occur with the No Action Alternative, continued maintenance of the marina would require ongoing dredging to remove accumulated sediment and aquatic invasive plant species. This would disturb and resuspend sediments in the marina and would involve the use of heavy equipment in Meeks Creek where fuel or oil leaks could impair water quality. BMPs such as turbidity curtains or other measures to contain pollutants would be required by TRPA Code Section 60.4 and the Lahontan RWQCB in the 401 Water Quality Certification to implement dredging activities. These factors, along with the continued degradation of Meeks Creek and lack of permanent BMPs make this impact potentially significant.

<u>Alternative 1: Restoration with Boating Pier</u>

Alternative 1 would involve complete restoration of Meeks Creek and lagoon and removal of the marina and related infrastructure which would result in several periods of high-intensity disturbance during restoration activities. The primary threat to water quality during these periods would be sedimentation from physical disturbance associated with the removal of the marina and fill placement in the creek channel to restore the wetland. This alternative would also replace the SR 89 bridge over Meeks Creek to provide a wider opening for Meeks Creek to restore natural flow patterns and sediment transport dynamics by reducing the severity of the hydraulic bottleneck created by the existing box culverts (Balance Hydrologics 2021). The bridge replacement would decrease bank and bed erosion in Meeks Creek and improve channel stability and aquatic habitat conditions. The proposed bridge would include a 10-foot-wide multi-use path and would span the floodplain. An additional multi-use path bridge would be constructed downstream to connect both campgrounds. As described in Chapter 2, "Description of the Proposed Action and Alternatives," the proposed bridges would span over the entire Meeks Creek channel (i.e., no abutments on the bank or support piers in channel) and be above the FEMA 100-year flood elevation. The hydraulics of the flow area under the bridge would have velocities that do not exceed those in adjacent reaches upstream or downstream. Biotechnical bank protection would be used as a preference to exposed rip rap rock wherever possible. This would eliminate the deep fill found along the current alignment, allow for better overbank flow conveyance, and increase meadow area. Various design options including boardwalks, multiple bridge spans and/or multiple culvert openings could be used to provide for floodplain flow conveyance.

The construction activities associated with implementation of the Meeks Bay Restoration Project may involve vegetation removal, grading, excavation, and temporary stockpiling of soils, all of which could expose soils to wind and water erosion and potentially transport pollutants into Meeks Creek and Lake Tahoe during storm events. Heavy-duty equipment would be used in the floodplain, channel, and lagoon during construction of restoration components. In addition, construction activities would involve on-site staging of construction equipment and vehicles, and construction-related vehicle trips. Fuels and other chemicals could be accidentally spilled or leaked or could otherwise be discharged into Meeks Creek or to Lake Tahoe.

Water quality impacts could also occur when Meeks Creek is rerouted to construct the restoration project, bridge replacement, marina removal, fish management structure, and multi-use path bridge construction. Meeks Creek would be captured upstream of the planned activities and diverted around the construction area in a pipe to discharge at a point that eventually drains to Lake Tahoe, a total distance of approximately 1,300 feet for the channel and lagoon restoration component (Balance Hydrologics 2021).

A dewatering system would be operated to manage water during the restoration activities to drain the work area in the lagoon and in Meeks Creek and to remove ongoing groundwater and lake seepage into the work area since surface water within the work area would contain high levels of suspended fine sediment and could therefore affect water quality.

Alternative 1 would include construction activities to remove and replace the motel-style cabins and reconfigure the campgrounds. These activities would include demolition of existing cabins, excavation of foundations, and repair and minor realignment of existing roads and parking areas. Reconfiguration or improvements would be made to the existing parking areas for resource protection and to achieve more efficient use of the area, but the overall number of parking spaces would remain the same. Ground disturbance during construction could affect water quality through exposed sediment and potential fuel and other chemical spills. The resource protection measures described in Appendix A would be implemented to protect water quality. These include best management practices to control erosion, minimizing soil disturbance, winterization requirements, stockpile protection, spill prevention plans, diversion and dewatering plans, testing of fill for chemical contamination, surface water protections, equipment monitoring, and turbidity control measures.

Although the construction activities described above have the potential to adversely affect surface and groundwater quality, the project would be required to comply with stringent TRPA and Lahontan RWQCB water quality protections. Chapters 33 and 60 of the TRPA Code of Ordinances require the installation of temporary construction BMPs as a condition of project approval. BMPs would be required to meet the installation and use standards described in the TRPA Best Management Practices Handbook (TRPA 2014). BMPs would include temporary erosion control BMPs (e.g., silt fencing, fiber rolls, drain inlet protection); requirements to limit the area and extent of all excavation to avoid unnecessary soil disturbance; winterize construction sites by October 15; dust control measures to prevent transport of materials from a project site into any surface water or drainage course; remove surplus or waste earthen materials from project sites, as well as requirements to stabilize and protect stockpiled material; spill prevention plans to capture and contain pollutants from fueling operations; stream diversions with coffer dams to route clean water around construction areas for each phase of in-channel disturbance; a dewatering approach that could include a sediment filter bag or equally protective measures to collect sediment from being released back into Meeks Creek; fuel storage areas; tracking control and sweeping operations; regular inspection and maintenance of temporary BMPs. Lahontan RWQCB also requires the development of a project-specific stormwater pollution prevention plan (SWPPP) before the start of any project involving ground disturbance that is greater than 1 acre. The SWPPP would describe the site, construction activities, proposed erosion and sediment controls, means of waste disposal, maintenance requirements for temporary BMPs, and management controls for potential pollutant sources other than stormwater runoff. In addition, the SWPPP would require the implementation of a hazardous materials spill response plan, which would reduce the potential of directly and indirectly effecting water quality through construction-related hazardous material spills. Water quality controls outlined in a SWPPP must be consistent with TRPA requirements, the federal antidegradation policy, and maintain designated beneficial uses of Lake Tahoe.

Pier Construction

Construction activity associated with the approximately 300-foot-long fixed boating pier under Alternative 1 could adversely affect water quality in the shorezone by accelerating soil erosion and sedimentation, increasing turbidity, and releasing pollutants. Use of heavy equipment in and adjacent to the water's edge during construction could produce dust and temporarily disturb and resuspend lake sediments in the water column, thus increasing turbidity in the immediate vicinity of the construction site. Additionally, operating heavy equipment such as pile drivers and their associated barges could cause sediment plumes during in-water construction. Sediment levels could exceed TRPA and Lahontan RWQCB pollutant concentration limits for surface waters (a limit of 250 milligrams per liter for suspended sediment). This temporary impact to water quality would be minimized through project design and the water quality protections required through the Clean Water Act Section 401 certification process administered by the Lahontan RWQCB and through the incorporation of marine construction BMPs and described in the TRPA BMP Handbook (TRPA 2014), and adherence to TRPA's Standard Conditions of Approval for Shorezone Projects. These BMPs and any others that Lahontan RWQCB determines to be necessary would be included as conditions of the 401 Water Quality Certification. Applicable BMPs are included in Appendix A, "Resource Protection Measures," and are related to using sediment control measures during placement of pilings, avoiding construction during periods of high wind, avoiding the potential for hazardous materials or contaminated water to runoff into surface waters, monitoring construction equipment for leaks, and retaining an emergency spill kit on-site during construction.

An increase in localized motorized boat traffic in the area could increase the potential for a fuel spill or leak, however the potential localized increased watercraft activity at the pier would be partially offset by the closure and removal of the existing marina. No fueling facilities would be included in the alternative.

The project would be required to comply with Section 10 of the Rivers and Harbors Act and Section 404 of the CWA. Under the terms of Section 10 and 404, USACE is charged with reviewing applications for barriers to navigation and dredging to determine that steps have been taken to avoid or minimize impacts on waters of the United States. The implementation of the RPMs described above, would avoid or minimize suspended sediment and turbidity-related impacts near construction areas, and construction associated with any project in the shorezone would be required to conform to all applicable state, federal, and TRPA regulations pertaining to protection of water quality from construction-related discharges.

Conclusion

For the reasons described above, implementation of the resource protection measures listed in Appendix A and regulatory requirements of the TRPA, USACE, and the Lahontan RWQCB would avoid or minimize the potential for construction of the project to degrade water quality. In addition, one of the objectives of the Meeks Creek Restoration Project is to improve long-term water quality due to stabilization of the channel bed and banks, as well as through enhanced floodplain connectivity and re-establishment of a transitional delta lagoon wetland system. The design of the bed and banks of Meeks Creek would improve water quality by stabilizing soils, thereby decreasing fine sediment loading from bank erosion. Increased floodplain inundation frequency is anticipated to improve water quality by increasing the frequency and duration of overbank flows with greater opportunity for fine sediment deposition (Balance Hydrologics 2021). Permanent BMPs would be installed for the entire project area resulting in a long-term benefit to water quality. The proposed shoreline features would be engineered to provide an increased level of erosion prevention, thereby decreasing sediment loading, which would improve water quality (Balance Hydrologics 2021). For the reasons described above, this impact would be less than significant.

Alternative 2: Restoration with Pedestrian Pier

Restoration and construction activities associated with Alternative 2 would be similar to those discussed in Alternative 1, except that Alternative 2 would not include demolition and reconstruction of the motel style cabins and would include two multi-use path bridges that would span or minimize impacts to the reconstructed floodplain and connect the campgrounds. Impacts related to construction and maintenance of other upland facilities would be the same as those discussed under Alternative 1.

Alternative 2 includes the construction of an approximately 100-foot-long floating pedestrian pier which would not allow motorized boat access. This would be a floating pier with fixed steel pilings and a floating deck that slides up and down on the pilings as lake levels change. The same construction impacts as discussed under Alternative 2 would occur and the same regulatory requirements would be followed. Removing motorboat traffic from the marina/former lagoon would eliminate a mechanism for sediment resuspension (propeller wash and boat wakes) and a source of hydrocarbons which would improve water quality. This alternative would not increase the potential for boat fuel and oil spills because boats would not be increased in the area, therefore the potential for these pollutants to enter Lake Tahoe would be less than Alternative 1. For the same reasons discussed under Alternative 1, this impact associated with Alternative 2 would be less than significant.

<u>Alternative 3: Restoration with No Pier</u>

Restoration activities and construction associated with Alternative 3 would be similar to those discussed for Alternative 1 except Alternative 3 would include two multi-use path bridges that would span or minimize impacts to the reconstructed floodplain and connect the campground. Campground construction impacts would be slightly greater under this alternative because the number of campgrounds would be expanded and overall parking capacity would be increased by 14 spaces. However, this alternative would not include demolition and reconstruction of cabins. The same regulatory requirements from the TRPA, USACE, and the Lahontan RWQCB to minimize construction and maintenance related impacts as discussed under Alternative 1 would be imposed. Alternative 3 would not include a pier but would include a non-motorized paddlecraft launch platform or ramp up to 30 feet in length that would move with lake level fluctuations. This would not involve any direct lakebed disturbance because of the floating nature of the platform but regulatory requirements from the TRPA and the Lahontan RWQCB discussed under Alternative 1 would still be required to minimize any impacts to water quality. For the same reasons discussed under Alternative 1, this impact associated with Alternative 3 would be less than significant.

<u>Alternative 4: Preferred Alternative</u>

Restoration and construction activities associated with Alternative 4 would be very similar to those discussed in Alternative 1, except that Alternative 4 would not include construction of a pier. Upland construction impacts would be slightly greater under this alternative because the number of parking spaces would be expanded by up to 14 spaces. The same regulatory requirements to minimize construction and maintenance related impacts as discussed under Alternative 1 would be followed. Alternative 4 would not include a pier but would include a non-motorized paddlecraft launch platform or ramp as discussed under Alterative 3. This would not involve any direct lakebed disturbance because of the floating nature of the platform but regulatory requirements from the TRPA and the Lahontan RWQCB discussed under Alternative 1 would still be required to minimize any impacts to water quality. For the same reasons discussed under Alternative 1, this impact associated with Alternative 4 would be less than significant.

Mitigation Measures

No mitigation is required for this impact.

Impact 3.6-2: Alteration of Lake Currents, Littoral Processes, and Shoreline Erosion

Alternatives 1 through 4 would include the construction of piers or a paddlecraft launch platform that could disrupt existing wave and current circulation patterns near the shoreline. As part of conditions of approval for a TRPA permit, all action alternatives would be required to comply with the design standards in TRPA Code Chapter 80.3.2.A, which requires analyses demonstrating that a proposed structure will not adversely impact littoral processes and backshore stability. All action alternatives also propose the replacement of shoreline stabilization structures that would improve natural littoral processes and beach sand movement. The impact of shoreline stabilization, and pier or floating launch construction associated with Alternatives 1, 2, 3, and 4 on the alteration of lake currents, littoral processes, and shoreline erosion would be less than significant.

The No Action Alternative would not change existing conditions and would therefore have no impact on lake currents, littoral drift, or shoreline erosion beyond what already occurs.

<u>No Action Alternative</u>

Under the No Action Alternative, there would be no change in the function of Meeks Creek mouth or the nearshore currents because the existing marina, creek channel, and rock wall would remain. The marina and existing sheet pile creek mouth would continue to alter littoral processes and shoreline erosion, but no change from existing conditions would occur. Therefore, there would be no impact.

<u>Alternative 1: Restoration with Boating Pier</u>

Alternative 1 would include complete restoration of Meeks Creek and lagoon, which would allow natural geomorphic processes to occur, resulting in modulated sediment supply to the littoral zone (Balance Hydrologics 2021) and the formation of a barrier beach at the mouth of Meeks Creek. Adams and Minor (2002) estimated that between 1938 and 1998, about 1.7 acres shoreline eroded from Meeks Bay, amounting to approximately 9,150 cubic yards (or 11,500 tons) of sand. Sediment aggradation in the marina and subsequent dredging are likely main causes of erosion. Restoration of the lagoon would allow more sand-size sediment important to littoral processes to reach the shorezone. Under current conditions, a large fraction of the sand transported by Meeks Creek is thought to settle within the marina (Balance Hydrologics 2021). After restoration, during times of low flow when Meeks Creek is transporting fine sediment but not sand, there would be increased opportunity for the fine sediment to settle within the lagoon due to emergent riparian vegetation, increased complexity in flow paths, or a physical barrier when the mouth closes (Balance Hydrologics 2021). The restoration would have a beneficial effect on littoral processes and decrease shoreline erosion.

A portion of the shoreline in the northern part of the project area is currently protected by rock gabions and concrete revetments. This area is not able to supply sediment into the littoral sediment balance. Improvements along the shoreline at the north end of the project area, including removal of the two motel-style cabins and associated revetments, would result in more natural littoral drift conditions and beach morphology, although these changes would not substantially affect sand supply or lake currents. Because the dimensions of the proposed shoreline protection features would be similar to the existing features, impacts to littoral processes from replacement of the shoreline protection features would be negligible (Balance Hydrologics 2021).

Alternative 1 would include the construction of a 300-foot-long fixed boating pier that could alter littoral processes. The 2004 Lake Tahoe Shorezone Ordinance Amendments Draft EIS study concluded that open pile piers constructed to TRPA design standards, such as the one proposed under Alternative 1, have no significant adverse impacts on littoral transport or backshore stability (TRPA 2004). Additionally, new shorezone structures are required to comply with TRPA Code Chapter 80.3.2.A, which requires documentation demonstrating that a proposed structure will not adversely impact littoral processes and backshore stability. The creek and lagoon restoration would result in a beneficial effect on littoral processes and decrease shoreline erosion, and the impact associated with the boating pier would be less than significant.

Alternative 2: Restoration with Pedestrian Pier

Restoration and construction activities associated with Alternative 2 would have similar effects on lake currents, littoral processes, and shoreline erosion as those discussed in Alternative 1. For the same reasons discussed under Alternative 1, the effects of these changes would be less than significant.

Alternative 2 proposes an approximately 100-foot-long floating pier. The 2004 Lake Tahoe Shorezone Ordinance Amendments Draft EIS evaluated the effects of floating piers on littoral drift processes by reviewing other studies on wave attenuation and floating piers, as well as through review of field observations of effects at three Lake Tahoe locations with existing floating piers: Camp Richardson; Tahoe Vista; and the Hyatt Pier in Incline Village, NV (TRPA 2004). The study concluded that floating piers could affect littoral transport if the floating section of the pier is at least 50 percent the length of a wavelength sufficient in size to cause littoral drift. The 2004 TRPA littoral drift study further concluded that floating piers rigidly moored to the lake bottom have greater impacts than floating piers allowed to move with wave action (TRPA 2004). Floating piers allowed to move with the wave heave, as is proposed in this alternative, reduced wave heights much less. TRPA Code Section 80.3.2.A requires documentation that the project will not adversely impact littoral processes and backshore stability. The analysis must assess the dimensions of the proposed pier and the ability of waves to initiate and sustain the movement of sediment along the lake bottom under conditions of low lake level (6,223 feet), mid-lake level (6,226 feet), and high lake level (6,229 feet). The lake level condition with the greatest effect on littoral transport and backshore stability shall be used to design the floating pier section. Floating piers may only be approved if they are designed so that wave heights are not reduced by more than 50 percent and the floating pier section is no greater than 50 percent of the length of the site-specific design wavelength. The creek and lagoon restoration would result in a beneficial effect on littoral processes and decrease shoreline erosion, and the impact of the pedestrian pier under Alternative 2 would be less than significant through compliance with the TRPA Code.

<u>Alternative 3: Restoration with No Pier</u>

Restoration and upland construction activities associated with Alternative 3 would have very similar effects on lake currents, littoral processes, and shoreline as those discussed in Alternative 1. Alternative 3 does not propose a pier but would include a non-motorized launch platform or ramp that would include a floating platform or dock of up to 30 feet that could move with lake level fluctuations. The littoral drift study supporting the 2004 Lake Tahoe Shorezone Ordinance Amendments Draft EIS (TRPA 2004) concluded that floating piers could affect littoral transport if the floating section of the pier is at least 50 percent the length of a wavelength sufficient in size to cause littoral drift. Based on the 2004 TRPA study findings, the shortest wavelength that could cause littoral drift in Lake Tahoe is 50 feet, so a floating pier greater than 25 feet could affect littoral drift. While the 2004 analysis was focused on floating piers, the floating nonmotorized launch platform proposed in Alternative 3 would affect littoral drift in the same way as a floating pier.

TRPA Code Section 80.3.2.A requires documentation that the project would not adversely impact littoral processes and backshore stability. Final design of the proposed non-motorized launch has not been completed. The propose nonmotorized launch could be up to 30 feet in length, although it could be shorter. If the final design of the proposed launch is less than 25 feet in total length, it would have no effect on littoral drift and no additional analysis would be necessary to comply with Code Section 80.3.2.A. If the final design of the launch exceeds 25 feet in total length, an additional analysis, similar to the one described for the floating pier in Alternative 2, above, would be required. A nonmotorized launch greater than 25 feet in length could only be approved if the analysis demonstrates that the final design would not adversely impact littoral processes and backshore stability. The creek and lagoon restoration would result in a beneficial effect on littoral processes and decrease shoreline erosion. Because this alternative would comply with TRPA Code provisions that prevent adverse effects on littoral drift and backshore stability, the impact of the launch platform or ramp on lake currents, littoral processes, and shoreline erosion, would be less than significant.

<u>Alternative 4: Preferred Alternative</u>

Restoration and upland construction activities associated with Alternative 4 would have the same effects on lake currents, littoral processes, and shoreline as those discussed in Alternative 1. Alternative 4 would also include a non-motorized launch platform identical to the one proposed in Alternative 3. The creek and lagoon restoration would result in a beneficial effect on littoral processes and decrease shoreline erosion. For the same reasons as discussed under Alternative 3, the impact of Alternative 4 on lake currents, littoral processes, and shoreline erosion, would be less than significant.

Mitigation Measures

No mitigation is required for this impact.

Impact 3.6-3: Water Quality Effects of Motorized Boating

Alternative 1 would likely decrease boating activity in Meeks Bay from current conditions due to the removal of the marina and would result in boating activity in deeper waters where the effects of wake and propeller wash are minimal. Therefore, the impact of propeller wash and boat wake caused by motorized boating would be less than significant.

The No Action Alternative would not change the frequency or intensity of boating in Meeks Bay and there would therefore be no impact on water quality from motorized boating. Additionally, Alternatives 2, 3, and 4 would decrease boating activity in Meeks Bay because no structures that support boating are proposed and the marina would be removed. Consequently, Alternatives 2, 3, and 4 would have a beneficial effect on sediment resuspension and turbidity affects from motorized boating.

<u>No Action Alternative</u>

There would be no change in the frequency or intensity of boating in Meeks Bay under the No Action Alternative then under current conditions; therefore, sediment resuspension and turbidity from motorized boats utilizing the Marina would remain the same. The Marina would remain operational, and Meeks Bay would experience the same water quality effects from boating as it currently experiences. Therefore, since there would be no action under this alternative, there would be no impact on water quality.

<u>Alternative 1: Restoration with Boating Pier</u>

When a propeller is operating at a high speed in shallow waters, the turbulence created can interact with the lakebed and scour and resuspend sediments. Lab and field tests have found that the energy from propeller wash for recreational watercraft has limited impacts greater than 7 feet and generally no effects for water depths greater than 10 feet (Beachler and Hill 2003). The proposed boating pier would reach a lakebed elevation of 6,217 feet LTD which would allow for motorized boat access during typical low water conditions. The low water elevation of Lake Tahoe is 6,223. Therefore, propellor wash could affect water depths shallower than 7 feet and cause water quality impacts. This affect would primarily occur during daytime hours during the summer when recreational boating takes place on Lake Tahoe.

Alternative 1 would remove the existing marina and would therefore result in fewer motorized boats in Meeks Bay than under existing conditions. Currently, boats are launched from the Meeks Bay Marina. As described in Table 3.1-3 in Section 3.1, "Recreation," approximately 1,750 boats are launched from the Meeks Bay Marina per year, which equates to approximately 3,500 boat trips through Meeks Bay per year, assuming two trips per launch (i.e., one trip leaving the marina and one returning). Under this alternative, a boat pier for launching motorized boats would be constructed. Even though it is not possible to know how many boats would access the new boating pier, based on anecdotal observations at other public piers around Lake Tahoe, it is assumed that an average of five to 10 boats would access the pier per day during the approximately 100-day boating season that generally lasts from Memorial Day weekend through Labor Day weekend. This would result in approximately 500–1,000 boats accessing the pier over the season and a total of 1,000–2,000 boat trips (assuming one trip to the pier and one trip from the pier for each boat accessing the pier).

Compared to baseline conditions, implementing Alternative 1 would produce an estimated reduction of 1,500–2,500 boat trips per year. To be conservative, this analysis assumes that implementing Alternative 1 would result in approximately 2,000 boat trips per year, which is 1,500 fewer trips than under baseline conditions with the operation of the marina. Other incidental boat trips, such as boats beaching outside of swim areas or boats anchoring in Meeks Bay, would be unchanged under all the alternatives.

Additionally, Hoverson and McGinley (2007), in their experiments on marl-dominated sediments, found that propellor wash impacts from recreational boats operated at no-wake speeds were undetectable. The pier would be located well within the TRPA mandated no-wake zone. Therefore, the impact of propellor wash associated with Alternative 1 on water quality would be negligible.

Boat wake is the pattern of waves generated as a boat moves and displaces surrounding water. The size and associated energy of boat wake depend on boat dimensions, motor power, and boat speed. Effects from boat wake are limited to shallower areas of a lake, such as the nearshore of Meeks Bay, where boat wake can either contribute to the resuspension of lakebed sediment or contribute to shoreline erosion. TRPA Code Section 84.17.1 requires a no-wake zone within 600 feet of the shore with a 5-mph speed limit. Under Alternative 1, the boating pier would be 300-feet long and therefore entirely within the no-wake zone. Therefore, the impact of wave action caused by motorized boating would be less than significant.

Boating activity could result in elevated levels of hydrocarbons or other contaminants in Meeks Bay through motor exhaust which contains hydrocarbons and accidental leaks which could affect water quality. Exhaust from motorboat engines typically contacts or passes through the surface of the water. While most exhausted hydrocarbons volatize quickly and leave solution, some fraction of both soluble and insoluble components remains in the water column (Balloffett and Quinn 2004). Direct discharge of contaminants from boating activities in Meeks Bay could occur from accidental leaks, bilge water discharges, and illicit sewage discharges. Given the reduced level of boating activity under Alternative 1, rapid rate of biodegradation of hydrocarbon compounds in the lake (Miller et al. 2003) and lack of fueling facilities proposed; the boating activity that would occur in Meeks Bay due to the construction of a boating pier and associated with hydrocarbon and contaminant discharge would create a less-than-significant impact.

As described above, Alternative 1 would result in less boating activity than under existing conditions when the marina is operational. It would have minimal effects on water quality related to propeller wash, wake, and hydrocarbon contamination. Therefore, this impact would be less than significant.

Alternative 2: Restoration with Pedestrian Pier

Alternative 2 would reduce the amount of motorized boating in Meeks Bay because it would remove the existing marina and would not provide additional motorized boating facilities. Alternative 2 would have a beneficial effect on water quality due to the removal and restoration of the marina which would decrease water quality effects from motorized boating.

Alternative 3: Restoration with No Pier

For the same reasons discussed under Alternative 2, Alternative 3 would have a beneficial effect on water quality from the reduction in motorized boating.

Alternative 4: Preferred Alternative

For the same reasons discussed under Alternative 2, Alternative 4 would have a beneficial effect on water quality from the reduction in motorized boating.

Mitigation Measures

No mitigation is required for this impact.

Impact 3.6-4: Potential for Increase in Stormwater Runoff, Impacts to Existing Drainage Systems, or Alteration of Drainage Patterns

All impervious areas would be required to meet TRPA Code Section 60.4.6 which require permanent BMPs to infiltrate stormwater runoff equivalent to the 20-year, one-inch-per-hour storm event. Additionally, the restoration project proposed under all action alternatives would result in the restoration of Meeks Creek and lagoon which would restore floodplain and filtration opportunities resulting in improved drainage patterns. Therefore, all alternatives would improve existing stormwater runoff and drainage conditions and the impact would be less than significant. The No Action Alternative would not alter existing conditions and would therefore have a less-than-significant impact on stormwater runoff or drainage systems.

No Action Alternative

Under the No Action Alternative, no construction would occur and there would be no changes to existing conditions. The functionality of the marina could be limited under future lake level fluctuations associated with future climate change scenarios. In addition, the marina would continue to not support natural hydrologic and biological processes that could provide resilience to climate change. However, this would be the same as under existing conditions and the impact would be less than significant.

Alternative 1: Restoration with Boating Pier

Implementation of Alternative 1 would result in restoration of Meeks Creek and lagoon, which would increase connection to floodplain surfaces and enhance riparian vegetation that would help to treat stormwater runoff in the floodplain by natural filtration and could offer a modest amount of stormwater attenuation (Balance Hydrologics 2021). Floodplain and wetland depressions offer opportunities to capture and treat stormwater before discharging to Meeks Lagoon and ultimately Lake Tahoe. The channel itself would be sized to convey a range of design flows, which would include stormwater run on from adjacent areas. Additionally, restoration activities associated with the project are intended to increase climate resiliency of Meeks Creek to changes in temperature and precipitation patterns, and lake level fluctuations due to climate change. There would be a beneficial effect to storm water and drainage conditions related to restoration of the creek and lagoon.

The peak flow and volume of stormwater runoff generated from an area is affected by development through conversion of vegetated, natural areas to impervious surfaces and by the development of drainage systems that connect these impervious surfaces to streams or other water bodies. Per the resource protection measures listed in Appendix A, "Resource Protection Measures," the new SR 89 bridge and multi-use path bridge would span over the entire Meeks Creek channel (i.e., no abutments on the bank or support piers in channel) and be above the FEMA 100-year flood elevation. The hydraulics of the flow area under the bridges would have velocities that do not exceed those in adjacent reaches upstream or downstream. Biotechnical bank protection would be used in preference to exposed rip rap rock wherever possible. This would eliminate the deep fill found along the current alignment, allow for better overbank flow conveyance, and increase meadow area. Various design options including boardwalks, multiple bridge spans and/or multiple culvert openings could be used to provide for floodplain flow conveyance. The boating pier would not adversely affect stormwater or drainage conditions as it is pervious, and stormwater would flow directly to the lake. Construction of impervious surfaces such as roads, parking areas, and campsites would require the construction of stormwater treatment and infiltration BMPs capable of infiltrating the 20-year, one-inch-per-hour storm event per TRPA Code Chapter 60.4. This would improve stormwater runoff conditions. Therefore, the impact of Alternative 1 on stormwater runoff and drainage conditions would be less than significant.

Alternative 2: Restoration with Pedestrian Pier

Alternative 2 would involve construction of an additional multi-use path bridge across the newly restored Meeks Creek channel and floodplain. This bridge would also span over the entire Meeks Creek channel (i.e., no abutments on the bank or support piers in channel) and be above the FEMA 100-year flood elevation. For the same reasons discussed under Alternative 1, Alternative 2 would have a less-than-significant impact on stormwater runoff and drainage patterns.

Alternative 3: Restoration with No Pier

Although Alternative 3 proposes more impervious area in the form of parking and campsites, all areas would be required to have associated stormwater treatment and infiltration BMPs as discussed under Alternative 1. In addition, Alternative 3 would involve construction of an additional multi-use path bridge across the newly restored Meeks Creek channel and floodplain, which would span over the entire Meeks Creek channel and be above the FEMA 100-year flood elevation. For the same reasons discussed under Alternative 1, Alternative 3 would have a less-than-significant impact on stormwater runoff and drainage patterns.

Alternative 4: Preferred Alternative

Alternative 4 proposes slightly more impervious area than Alternative 1, in the form of 14 parking spaces. All impervious areas would be required to have associated stormwater treatment and infiltration BMPs as discussed under Alternative 1. For the same reasons discussed under Alternative 1, Alternative 4 would have a less-than-significant impact on stormwater runoff and drainage patterns.

Mitigation Measures

No mitigation is required for this impact.

Impact 3.6-5: Groundwater Impacts

Effects on groundwater quantity and quality as a result of the restoration project would be beneficial. Best management practices required by TRPA and the Lahontan RWQCB would minimize the potential for sediment and pollutants to enter groundwater during construction. All impervious areas would be required to implement BMPs to treat and infiltrate stormwater in the vicinity of the impervious area; therefore, the net impact to groundwater quantity and quality would be less than significant. The No Action Alternative would not affect groundwater quantity or quality. This alternative would have no impact.

No Action Alternative

No activities would take place under the No Action Alternative and therefore the groundwater volume and quality would remain unchanged from degraded existing conditions. Therefore, there would be no impact.

Alternative 1: Restoration with Boating Pier

The restoration activities proposed in Meeks Creek and lagoon would have a beneficial effect on groundwater volume and quality. A rise in shallow groundwater levels is anticipated as a result of raising the streambed, which would enhance hydrologic support for riparian plants that are effective in nutrient uptake (Balance Hydrologics 2021). Grading of the Meeks Creek channel would consist of fill placement to raise the channel bed which is expected to raise groundwater levels and increase groundwater storage (Balance Hydrologics 2021). The increased groundwater levels adjacent to the channel would likely decrease the lateral groundwater gradient and the rise is anticipated to extend into the riparian zone. Groundwater levels would also be enhanced by increased frequency of overbank flooding, which would infiltrate into the floodplain and recharge shallow groundwater (Balance Hydrologics 2021). Fill placement to raise the bottom of the lagoon alone would not appreciably affect groundwater levels since the lagoon is adjacent to Lake Tahoe and lake levels are the primary control on the lagoon stage and surrounding groundwater elevations (Balance Hydrologics 2021). At times when the barrier beach is closed and the lagoon is filling, there also would be a slight local increase in groundwater levels (Balance Hydrologics 2021). After the barrier beach breaches, however, groundwater levels would likely equilibrate to near lake levels. Wetland and other surfaces graded around the perimeter of the lagoon would enhance groundwater storage and provide some recharge for shallow groundwater (Balance Hydrologics 2021). This would have a beneficial effect on groundwater quantity.

During construction of the restoration project, exposed soil, diverting water around Meeks Creek and the lagoon, and dewatering have the potential to introduce turbid water that could affect groundwater quality. The diversion and dewatering systems would be designed to minimize the risk of exposure to disturbed soils within the work area. The temporary surface water and groundwater BMPs required by TRPA and Lahontan RWQCB are intended to minimize impacts to groundwater quality.

Construction of the boating pier would not adversely affect groundwater volume because construction would take place within the lake. There is a possibility that there could be temporary, construction related impact to groundwater quality similar to the impacts to surface water quality discussed in Impact 3.6-1. This impact would be minimized through the water quality protections required through the Clean Water Act Section 401 certification process administered by Lahontan RWQCB, through the incorporation of marine construction BMPs and described in the TRPA BMP Handbook (TRPA 2014), and adherence to TRPA's Standard Conditions of Approval for Shorezone Projects.

Development of the campground, roads, and parking areas would create impervious areas, which would prevent snowmelt and stormwater infiltration and groundwater recharge. Under Alternative 1, there would be approximately 3 acres less coverage compared to existing conditions (see Tables 3.7-5 and 3.7-6 in Section 3.7, "Geology and Soils"). This alternative would result in approximately 10.3 acres of impervious coverage. All impervious areas would be required to comply with TRPA Code Chapter 60.4 and would be required to implement temporary BMPs during construction and permanent BMPs, which would treat and infiltrate the equivalent of the 20-year, one-inch-per-hour storm event. Implementation of these BMPs would recharge groundwater. The TRPA would also require a Land Capability District Verification to determine the sensitivity of the land in which coverage is proposed. For the reasons described above, the net impact would be less than significant.

Alternative 2: Restoration with Pedestrian Pier

For the same reasons discussed under Alternative 1, restoration of Meeks Creek and lagoon would have a beneficial effect on groundwater quality and volume. The same construction related impacts during restoration would also occur under Alternative 2 as under Alternative 1. It is estimated construction/re-construction of roads, campgrounds, and parking that Alternative 2 would result in slightly less impervious coverage than Alternative 1 (10.8 acres of impervious coverage) (see Tables 3.7-6 and 3.7-7 in Section 3.7, "Geology and Soils"). Alternative 2 would result in 1.95 acres less coverage than compared to existing conditions (Table 3.7-7). The pedestrian pier would have the same construction related impacts as the boating pier discussed under Alternative 1, though they would occur to a lesser extent. Implementation of the regulatory BMPs discussed under Alternative 1 would also apply to Alternative 2 and the impact would therefore be less than significant.

Alternative 3: Restoration with No Pier

For the same reasons discussed under Alternative 1, restoration of Meeks Creek and lagoon would have a beneficial effect on groundwater quality and volume. The same construction related impacts during restoration would also occur under Alternative 3 as under Alternative 1. The launch facility would have no impact on groundwater because of its location on the water and no construction related impacts. It is estimated that construction/re-construction of roads, campgrounds, and parking under Alternative 3 would result in an estimated total of 12.4 acres of coverage because of the increase in campgrounds and expansion of parking. However, overall implementation of Alternative 3 would result in 0.45 acres less than the existing amount of coverage (see Tables 3.7-5 and 3.7-8 in Section 3.7, "Geology and Soils"). This impact would be less than significant for the same reasons discussed under Alternative 1.

Alternative 4: Preferred Alternative

For the same reasons discussed under Alternative 1, restoration of Meeks Creek and lagoon would have a beneficial effect on groundwater quality and volume. The same construction related impacts during restoration would also occur under Alternative 4 as under Alternative 1. The launch facility would have no impact on groundwater because of its location on the water and no construction related impacts. The additional parking spaces under Alternative 4 would result in slightly more acres of coverage than coverage associated with Alternative 1 (10.5 acres of impervious coverage) (see Tables 3.7-6, 3.7-7, and 3.7-9 in Section 3.7, "Geology and Soils"). Alternative 4 would result in 2.27 acres less coverage than compared to existing conditions (Table 3.7-9). This impact would be less than significant for the same reasons discussed under Alternative 1.

Mitigation Measures

No mitigation is required for this impact.

3.6.4 Cumulative Impacts

Cumulative impacts to hydrology and water quality are considered in the context of the Meeks Creek watershed with implications for the Lake Tahoe Basin. Development in the Basin has altered the natural hydrologic regimes of many of the Basin's watersheds, including the Meeks Creek watershed. These changes, combined with runoff from urban and recreational development, have degraded the water quality of the watershed, resulting in an existing cumulative adverse condition. Many restoration projects, including the Meeks Creek Restoration Project, have been implemented and are being planned to address this situation. Cumulative projects, including those listed in Table 3-2 have the potential to affect hydrology and water quality in the Meeks Creek watershed. However, proactive restoration efforts under the Environmental Improvement Program (which is implemented consistent with the Tahoe Regional Plan and the Lahontan RWQCB Basin Plan), best construction practices and other environmental programs would prevent or avoid further adverse effects on water quality and hydrology in the watershed as well as in the context of the Lake Tahoe Basin (TRPA 2018). Cumulative forest management and restoration projects as well as all grading projects would be required to comply with TRPA and Lahontan RWQCB regulatory requirements that would prevent significant effects on hydrology and water quality in the watershed and in the context of the Lake Tahoe Basin. Furthermore, the cumulative forest management and restoration projects would result in a net beneficial effect on water quality by restoring hydrologic processes and reducing the potential for erosion associated with high-intensity wildfire.

All action alternatives would require active construction adjacent to and in Meeks Creek and Lake Tahoe. Although temporary BMPs would be implemented, short-term risk of water quality degradation during construction could occur in the Meeks Creek watershed. Implementation of BMPs to protect disturbed areas and minimize soil erosion, prevent interaction of surface runoff with disturbed surfaces, and limit the potential for release of sediment, nutrient, or otherwise contaminated water from entering water bodies in the watershed would minimize potential short-term water quality degradation. BMPs would be implemented for all projects adjacent to and in tributaries in the watershed, therefore the project's contribution would not make a considerable contribution to a cumulative adverse condition related to construction and maintenance impacts to water quality.

Alternatives 1 through 4 propose structures adjacent to Meeks Creek and within Lake Tahoe that have the potential to affect lake currents, littoral processes, and shoreline erosion. The cumulative projects would not include project components that would affect lake currents, littoral processes, and shoreline erosion in the Meeks Creek watershed. Cumulative impacts in Lake Tahoe could result from other structures proposed within and adjacent to Lake Tahoe. All structures would be required to comply with the design standards in TRPA Code Chapter 80.3.2.A, which require analyses demonstrating that a proposed structure will not adversely affect littoral processes and backshore stability. Permanent BMPs would be installed for the entire project area resulting in a long-term benefit to water quality. The proposed shoreline features would be engineered to provide an increased level of erosion prevention, thereby decreasing sediment loading, which would improve water quality (Balance Hydrologics 2021) (see Impact 3.6-1). Restoration of Meeks Creek and lagoon would have a beneficial effect on littoral processes and decrease shoreline erosion (see Impact 3.6-2). For this reason, the project would not cumulatively combine with the cumulative projects to make a considerable contribution to a cumulative adverse condition related to the alteration of lake currents, littoral processes, and shoreline erosion.

For Alternative 1, cumulative impacts could also result from the hydrodynamic effects of motorized boating, which can disturb and resuspend lakebed sediment through propeller wash and boat wake, potentially leading to increased turbidity and reductions in nearshore clarity. Water quality effects from propeller wash and boat wake are generally limited to shallower areas, with no effects for water depths greater than 10 feet (Beachler and Hill 2003). TRPA Code Section 84.17.1 requires a no-wake zone within 600 feet of the shore with 5-mile-per-hour (mph) speed limit. The Meeks Creek Restoration Project is located within the existing no-wake zone. Alternative 1 would result in less boating activity that under existing conditions when the marina is operational; thus, this alternative would have minimal effects on water quality related to propeller wash, wake, and hydrocarbon contamination (see Impact 3.6-3). Alternatives 2, 3, and 4 would have a beneficial effect on sediment resuspension and turbidity affects from motorized boating (see Impact 3.6-3). Thus, the Meeks Creek Restoration Project would not make a considerable contribution to a cumulative adverse condition related to the hydrodynamic effects of motorized boating.

As described above, the Meeks Creek Restoration Project action alternatives would have a beneficial effect on stormwater runoff due to the implementation of BMPs and restoration of Meeks Creek and lagoon. The restored creek and lagoon would reduce sources of sedimentation by revegetating banks and reducing active erosion, and it would restore natural floodplain processes that would promote deposition of sediment prior to reaching Lake Tahoe. Also, as described above the action alternatives would improve the quantity and quality of groundwater. Cumulative projects, in particular the Mayala Wata Restoration at Meeks Creek project, would also implement project components that would restore ecological function of the meadow containing Meeks Creek upstream of the project area and would result in reducing sources of sedimentation and erosion and restoring floodplain processes. Thus, the project and cumulative projects would not result in a cumulative adverse impact on groundwater.

For these reasons, the alternatives would have a less than cumulatively considerable impact related to hydrology and water quality in the Meeks Creek watershed.