7.21 Habitat Restoration and Other Ecosystem Projects

The State Water Board's Bay-Delta planning and implementation efforts are part of a multifaceted approach needed to address the systemic ecological and water supply concerns in the Bay-Delta and reconcile an altered ecosystem. The benefits of flows are enhanced when implemented in concert with physical habitat restoration, control of waste discharges, control of invasive species, fisheries management, and other efforts. (See, generally, Chapter 4, *Other Aquatic Ecosystem Stressors.*) This section evaluates the potential environmental impacts of physical habitat restoration and other complementary ecosystem projects that entities may undertake toward achieving the overall goal of improving conditions for fish and wildlife in the Sacramento/Delta.

The proposed program of implementation identifies actions that other entities should take to address other ecosystem stressors and provides a framework to incorporate both flow and complementary ecosystem projects such as physical habitat restoration into voluntary implementation plans. In addition, some complementary ecosystem projects may also serve as an implementation mechanism for the proposed cold water habitat objective. These actions collectively include physical habitat restoration (in-Delta and upstream tributary), fish passage improvements (screens, fishways, water temperature control devices [TCDs], dam removal), predatory fish control, and aquatic invasive species control.

Note that some other complementary ecosystem actions are not evaluated here because they are already incorporated into the Bay-Delta Plan program of implementation or are too speculative to adequately analyze at this time. The existing program of implementation includes provisions related to hatchery programs for special-status species and reducing illegal harvest. In addition, the water boards have existing regulatory programs that control discharges of wastes from wastewater treatment facilities, industrial facilities, urban areas, irrigated agricultural lands, and other sources of wastewater to the Bay-Delta and tributaries. These programs are expected to continue to improve water quality conditions in the Delta. These programs are subject to CEQA in their separate processes, and the environmental effects of these types of water quality control actions are not analyzed here.

Before a habitat restoration or other complementary ecosystem project can be implemented, permit approval may be required from one or more local, state, federal, or tribal agencies, such as the State Water Board, regional water quality control boards (regional water board), California Department of Fish and Wildlife (CDFW), California Coastal Commission, U.S. Army Corps of Engineers (USACE), National Marine Fisheries Service (NMFS), U.S. Fish and Wildlife Service (USFWS), State Lands Commission, federally recognized tribes, and various city or county agencies. State and local agency approvals require compliance with the applicable CEQA requirements (Pub. Resources Code, § 21000 et seq.).

Water Code section 13260(a) requires that any person discharging waste or proposing to discharge waste within any region that could affect the quality of the waters of the state, other than into a community sewer system, will file with the regional water board a report of waste discharge containing such information and data as may be required by the regional water board, unless such requirement is waived. Waste discharge requirements prescribe requirements, such as limitations

on temperature, toxicity, or pollutant levels, as to the nature of any discharge. (Wat. Code, § 13260, subd. (a).) Waste discharge requirements may also specify conditions where no discharge will be permitted. (*Id.*, § 13243.) Waste discharge requirements may also include monitoring and reporting requirements. (See *id.* § 13267; Cal. Code Regs., tit. 23, § 2230.) Waste discharge requirements implement the basin plan, taking into consideration the beneficial uses to be protected, and water quality objectives reasonably required for that purpose, other waste discharges, and the need to prevent nuisance. (Wat. Code, § 13263, subd. (a).)

Under federal law, section 401 of the Clean Water Act (33 U.S.C. § 1341) requires every applicant for a federal license or permit that may result in a discharge into navigable waters to obtain water quality certification from the state that the project or activity will comply with water quality standards and any other appropriate requirement of state law (33 U.S.C. §§ 1313, 1341(d).) This includes the Porter-Cologne Water Quality Control Act and other state requirements protecting surface waters from both point source and nonpoint source discharges of pollution. (33 U.S.C. § 1313.) Section 401 typically applies to dredge-and-fill activities in wetlands and other waters that require permits from USACE or hydropower projects seeking a license from the Federal Energy Regulatory Commission (FERC). Most water quality certifications are issued by the regional water boards; however, the State Water Board issues water quality certifications for projects that may fall under the jurisdiction of more than one regional board. (Cal. Code Regs., tit. 23, § 3855.)

Depending on the size and scale, projects may fit within a categorical exemption under CEQA. CEQA allows categorical exemptions for classes of projects that have been determined not to have a significant effect on the environment. (Pub. Resources Code, § 21084.) A Class 7 exemption "consists of actions taken by regulatory agencies as authorized by state law or local ordinance to assure the maintenance, restoration, or enhancement of a natural resource where the regulatory process involves procedures for protection of the environment." (Cal. Code Regs., tit. 14, § 15307.) A Class 8 exemption "consists of actions taken by regulatory agencies, as authorized by state or local ordinance, to assure the maintenance, restoration, enhancement, or protection of the environment where the regulatory process involves procedures for protection of the environment." (*Id*., § 15308.) Projects within waters of the state that affect less than 5 acres and 500 linear feet, occurring over a period of less than 5 years, may qualify for enrollment into the general 401 Water Quality Certification for Small Habitat Restoration. Projects that do not meet the eligibility requirements for this certification must seek other permit coverage through an individual or general water quality certification, waste discharge requirements, or a waiver of waste discharge requirements.

Other larger-scale activities would be subject to a more extensive project-level CEQA analysis, which would entail project-specific identification of any potentially significant environmental impacts and mitigation measures. On August 16, 2022, the State Water Board adopted the Proposed Clean Water Act Section 401 and Waste Discharge Requirements General Order for Restoration Projects Statewide that will expedite the regulatory approval of large habitat restoration projects, including stream crossing and fish passage improvements; small dam, tide gate, floodgate, and legacy structure removal; bioengineered bank stabilization; off-channel/side-channel habitat restoration and enhancement; water conservation projects; floodplain restoration; piling and other in-water structure removal; nonnative invasive species removal and native plant revegetation; tidal, subtidal, and freshwater wetland establishment, restoration, and enhancement; and stream and riparian habitat establishment, restoration, and enhancement (SWRCB 2022a). Restoration projects must incorporate specified protection measures (as applicable), such as design guidelines or avoidance and minimization techniques, or other criteria into their project descriptions to qualify within the scope of the proposed General Order. In addition, Governor Newsom signed Senate Bill (SB) 155, on

September 23, 2021, adding section 21080.56 to the California Public Resources Code. This section provides a new CEQA statutory exemption until January 1, 2025, for fish and wildlife restoration projects that meet certain requirements (statutory exemption for restoration projects). CDFW's Cutting the Green Tape Program is responsible for coordinating with lead agencies seeking SERP concurrence.

Large-scale projects could result in potentially significant impacts in a number of resource areas, such as aesthetics (e.g., if existing scenic views would be likely to change), air quality (e.g., from blasting, heavy equipment use), and biological resources and water quality (e.g., from release of turbid water or other pollutants). As a lead or responsible agency, the State Water Board, or regional water boards, would require implementation of mitigation measures to minimize water quality and other impacts within its jurisdiction to the extent feasible. Depending on the specific project, implementation of mitigation measures may not fully reduce all potentially significant impacts to less-than-significant levels, and such impacts may remain potentially significant after mitigation. Until a specific project is proposed and additional site-specific information becomes available, impacts identified and analyzed in this section remain potentially significant. The State Water Board or regional water board must decide and make findings, based on all available information, whether the benefits of the specific project outweigh the adverse impacts, with consideration of social, economic, legal, technical, or other aspects of the project. The findings would state the State Water Board's or regional water board's rationale for its decision in a restoration context. These projects may be approved if it is shown that they will result in long-term protection of beneficial uses and water quality.

The evaluation presented in this section utilizes existing environmental documentation and other available information related to habitat restoration projects and other ecosystem projects to identify the potential impacts of these actions on the various resource areas as well as mitigation measures. Documents reviewed for these purposes include, but are not limited to, the following.

- *American Basin Fish Screen and Habitat Improvement Project Final Environmental Impact Statement/Environmental Impact Report* (Reclamation and CDFG 2008), and *Record of Decision: American Basin Fish Screen and Habitat Improvement Project, Sutter and Sacramento Counties, California, Final Environmental Impact Statement/Environmental Impact Report* (Reclamation 2009).
- *AIPCP Programmatic Final Environmental Impact Report* (CDBW 2018).
- *Battle Creek Salmon and Steelhead Restoration Project Final Environmental Impact Statement/Environmental Impact Report* (Reclamation and SWRCB 2005) and *Findings of Fact* (CDFG 2007).
- *Delta Plan Program Environmental Program Impact Report* (^DSC 2011).
- *Environmental Impact Report for the Lower Klamath Project License Surrender* (SWRCB 2018).
- *North Delta Flood Control and Ecosystem Restoration Project Environmental Impact Report* (DWR 2007).
- *State Water Resources Control Board Restoration Projects Statewide Order: Program Environmental Impact Report* (SWRCB 2022b).

Many types of actions described in this section are already proposed or being implemented, while others will be developed and implemented in the future. The specific actions that could be

undertaken will depend on a number of factors, such as project feasibility, cost, timeline, and expected outcomes.

This evaluation assumes that all responsible entities will conduct, as appropriate, site-specific environmental analyses to evaluate project-level environmental impacts, alternatives, and mitigation measures. This evaluation also assumes that responsible entities will design, evaluate, and implement studies, pilot projects, management practices, and controls as appropriate in compliance with all applicable laws, regulations, ordinances, and relevant municipal and/or agency codes, standards, and practices.

Most physical habitat restoration and other complementary ecosystem projects would require construction activities (aquatic invasive species control and capture methods for predation control do not involve construction). The magnitude of construction impacts of any project depends on the extent and duration of disturbance to existing resources. Most construction projects require state and local agencies to conduct an independent CEQA environmental review. (Pub. Resources Code, § 21000 et seq.) Projects subject to CEQA include any activity that may cause a physical change in the environment that is either directly undertaken by any public agency or requires discretionary approval by a public agency through funding or regulatory approval. An initial study is used to decide whether to prepare a negative declaration if the proposed project will have no potential for significant impacts or an environmental impact report (EIR) if the project will have a significant effect on the environment. The EIR is a detailed report that identifies potentially significant environmental impacts and measures to avoid or mitigate those impacts, if feasible. CEQA requires agencies to prepare a written statement of overriding considerations when they decide to approve a project that will cause one or more significant effects on the environment that cannot be mitigated.

Construction projects that require federal approval or funding must comply with the National Environmental Policy Act (NEPA). (42 U.S.C. § 4321 et seq.) Under NEPA, an environmental assessment or environmental impact statement is prepared if an action will have significant adverse effects on the human environment. Both CEQA and NEPA provide for public review and comment and are intended to provide decision makers with the necessary information to make a well-informed decision. CEQA and NEPA compliance provide a mechanism for identifying and mitigating construction impacts in all resource categories.

In addition, construction projects on public land are subject to resource plans that include provisions that mitigate construction impacts in most resource categories. These planning documents, sometimes called resource management plans, provide coordinated direction for the development and management of recreation lands, waters, and facilities and serve as the basis for guiding resource management activities in a manner that maintains and enhances public and resource benefits. Projects on public land are developed and implemented through detailed and site-specific activity planning and any necessary environmental analysis. The plans are likely to regulate one or more of the following resource areas: aesthetics, air quality, cultural resources, forestry and fire management, land use, livestock management, geology and minerals, hazards, recreation, water, and wildlife habitat.

Construction projects on private land are subject to local county and city jurisdiction that mitigate construction impacts in most resource categories. In reviewing and making decisions on applications for various land use entitlements and development projects, the local government agency must typically make findings that the proposed activity (e.g., a conditional use permit, a subdivision of real property) is consistent with the applicable general plan. Each county and city has

numerous policies and regulations that are outlined in each jurisdiction's respective general plan, municipal service review, or other regulatory framework (e.g., zoning ordinance, performance standards, other municipal or county programs). General plans address land use, housing, circulation, conservation, noise, safety, and open space (Gov. Code, § 65302) and may include additional elements. Development in California must be consistent with both the general plan and zoning, and many construction projects will need to comply with the local jurisdiction's general plan and zoning regulations. This compliance may be adequate mitigation in some circumstances, as regulatory compliance can serve as mitigation. Some policies relate specifically to construction and are directly applicable to construction impacts and mitigation, while other policies are more general and may relate more to project siting decisions or project operations.

General plans and zoning ordinances are likely to regulate the following resource areas: hydrology and water resources, biological resources, land use and planning, agriculture and forestry, aesthetics, air quality, cultural resources, geology and soils, mineral resources, hazards and hazardous materials, noise, public services, recreation, transportation and traffic, utilities and service systems, and greenhouse gas (GHG) emissions. The following discussion includes examples of local requirements from representative general plans, but these are not intended to provide an exhaustive list of requirements. The study area spans 54 counties that are each subject to general plans and ordinances, as well as city plans. Any project proponent must consult its local planning department to determine the specific permitting and other requirements that apply to a specific project in a given jurisdiction. The potential for habitat restoration and other ecosystem projects to result in population growth is evaluated in Section 7.23, *Cumulative Impact Analysis, Growth-Inducing Effects, and Significant and Irreversible Changes*.

This section describes impact mechanisms and potential mitigation measures associated with common construction projects, as well as construction impacts that are specific to physical habitat restoration projects and other complementary ecosystem actions. Construction impacts common to all construction-related habitat restoration and other ecosystem projects are addressed in the beginning of each resource section and not repeated under the evaluation of each specific type of project. Appendix E, *Regulatory Framework for Construction Projects*, provides an overview of key federal, state, and local laws, policies, and regulations applicable to construction projects in general that could effectively avoid or minimize impacts of typical construction activities. Mitigation measures to avoid, minimize, or offset potential environmental impacts may include seasonal work windows; preconstruction biological surveys; biological monitoring during construction; construction noise and light reduction measures; traffic control; stormwater pollution prevention plan (SWPPP); spill prevention, control, and countermeasure plan; and turbidity compliance monitoring.[1] Some redundancy is unavoidable, but, to the extent possible, the organization of this section is intended to consolidate construction impact findings and provide further focus on operational impacts and unique issues associated with specific types of projects.

7.21.1 Descriptions of Physical Habitat Restoration and Other Ecosystem Projects

7.21.1.1 Physical Habitat Restoration

Habitat restoration includes the physical restoration of tidal, floodplain, and riparian habitats to increase hydrologic connectivity and habitat complexity. Tidal habitat restoration projects in the Sacramento/Delta watershed are typically focused on San Pablo and San Francisco Bays, Suisun Marsh, and the Delta. Floodplain and riparian habitat restoration projects are typically focused on the lowland mainstem and tributary reaches of Sacramento/Delta rivers.

These projects generally involve reconnecting historical stream and river channels and freshwater deltas with floodplains and reconnecting historical estuaries to tidal influence through levee removal, setback, and breaching. Levees may be adjusted, or a low levee bench may be created to allow for tidal inundation or channel margin habitat. Restoration actions rely on watershed processes to complete work over time to restore a channel network and floodplain that supports wetlands.

Tidal habitat restoration includes activities such as excavation and grading of the channel and banks and breaching levees that increase tidal exchange between marshes that are disconnected from main channels and surface water. Tidal restoration may involve dredging and placement of materials for beneficial reuse.

Floodplain restoration projects involve setback, breaching, and removal of levees, berms, and dikes and excavation and/or fill for hydraulic reconnection and revegetation. Floodplain restoration may involve reconnecting downcut channels to their floodplains to restore hydrologic processes; filling incised, entrenched channels; creating new stream channels; regrading floodplains; or realigning channels. Floodplain restoration can involve rock placement, specifically as engineered stream material; riffle ramps; weirs; and other strategies to aggrade the channel and enable connectivity to floodplains. Floodplains should mimic natural flooding patterns and remain flooded/inundated long enough to activate foodwebs.

Riparian restoration can involve the replanting of trees and shrubs and the reconfiguration of degraded, incised, and undefined streams to restore natural hydrology and encourage the reestablishment of native riparian plants.

Generally, construction activities for habitat restoration may include clearing of vegetation to construct temporary roads and staging areas; demolition and/or relocation of roads, utilities, and other existing structures; placement of temporary gravel berms, cofferdams, or other structures to provide construction access and isolate work areas from water; removal and/or placement of rock or biotechnical slope protection (depending on hydraulic considerations); stockpiling of equipment and materials; and installation of irrigation systems and restoration plantings. Construction equipment may include excavators, graders, loaders, cranes, boats, barges, pumps, dump trucks, and similar equipment.

Enhancement of in-channel complexity is a subset of habitat restoration that focuses on the placement of large wood or boulder structures and gravel augmentation to assist in the restoration of degraded river ecosystems. These types of projects occur in areas where channel structure is lacking because of past stream cleaning (removal of large woody material), riparian timber harvest, historical grazing and meadow dewatering practices, hydromodification, or urbanization and in

areas where natural gravel supplies are low as a result of human-caused disruptions. In-channel complexity-enhancing projects can increase channel stability, rearing habitat, pool formation, deposition of spawning gravel, channel complexity, hiding cover, low-velocity areas, and floodplain function. These projects involve reconnecting and creating side-channel, alcove, oxbow, pond, off-channel, floodplain, and other habitats and potentially removing off-channel fill and plugs.

In-channel enhancement work may involve removing or breaching levees, berms, and dikes; excavating channels; constructing wooden or rock tailwater control structures; and constructing large wood habitat features. Large woody material may be installed using either anchored or unanchored logs or both, depending on site conditions and wood availability. Wood loading methods may include direct felling, whole-tree tipping, and placement; use of helicopters; use of excavators; and grip hoisting.

Other in-channel complexity enhancement activities may include removing revetment and other streambank armoring materials, installing grade-control structures using native/natural materials to improve general habitat and water quality, and placing boulder structures (e.g., roughened channels, boulder ramps/riffle ramps, boulder weirs, vortex boulder weirs, boulder clusters, single and opposing boulder wing deflectors). In addition, infrastructure located along streams and in riparian areas may be removed or relocated to eliminate or reduce impacts on riparian areas and vegetation, improve bank stability, reduce erosion, reduce sedimentation into adjacent streams, and provide for native revegetation or natural native plant recruitment. Among the types of infrastructure that could be removed or relocated are boat docks, boat haul-out locations, campgrounds and campsites, day-use sites, roads/trails, and off-highway/off-road vehicle routes that affect aquatic resources or riparian habitat.

Equipment such as helicopters, excavators, dump trucks, front-end loaders, and similar equipment may be used to implement these projects.

Enhanced in-channel complexity projects are often done in conjunction with gravel augmentation. Gravel augmentation is the artificial addition of spawning-sized gravel to streams to increase the quantity and quality of spawning and incubation habitat where the natural processes of gravel recruitment have been disrupted by dams, regulated flows, gravel mining, and other instream activities (e.g., bank stabilization). Gravel augmentation can be done using a passive approach in which relatively large amounts of spawning-sized gravel are injected in channel areas where high flows can transport the gravel to downstream spawning areas (Bunte 2004). A more active approach involves adding spawning-sized gravel directly to known spawning areas (e.g., riffles) (Bunte 2004) and/or mechanical grading, bed ripping, or riffle cleansing (i.e., reducing fine sediment) to create or restore the streambed and hydraulic characteristics of functional spawning habitat (Wheaton et al. 2004). Heavy construction equipment is typically used, particularly if there is accessibility into the stream; but various kinds of conveyor belts, slurries, high pressure pipes, helicopters, and cable lines also may be used depending on the project (i.e., if the streambed is inaccessible to vehicles, if tread impact is to be avoided) (Bunte 2004).

Physical habitat restoration projects can vary widely in size. Riparian restoration projects may focus on areas of less than 1 acre for bank protection and plantings or may undertake channel rehabilitation along 1 or more miles of river; floodplain restoration projects may reconnect a few acres or hundreds of acres to the river and flooding; and tidal restoration projects may restore narrow tidal areas or entire estuaries. Some larger or multipurpose habitat restoration projects may

include hardscape elements or additional or modified water infrastructure and interpretive facilities (e.g., signage, public viewing platforms) or other features in addition to the habitat modifications.

Preproject assessment, planning, and design activities may include geomorphic surveys, topographic/bathymetric surveys, sediment sampling, hydrologic analyses, and hydraulic and sediment transport modeling.

Maintenance of restoration sites may include vegetation maintenance (irrigation, monitoring), terrestrial and aquatic weed control, control of burrowing rodents, visual inspections, and slope repair. These activities would require limited vehicle trips over the long term.

To help guide restoration efforts in the Delta, the San Francisco Estuary Institute and the Aquatic Science Center through the Delta Landscapes Project have produced an instructive report titled *A Delta Renewed: A Guide to Science-Based Ecological Restoration in the Sacramento-San Joaquin Delta* (A Delta Renewed) (^SFEI-ASC 2016). The report emphasizes process-based recovery of landscape functions that integrate natural and cultural processes and maximize resilience to climate change, invasive species, and other challenges. A Delta Renewed includes regional recommendations and on-the-ground strategies and discusses the potential for establishing smaller, modified landscapes that are resilient, productive, sustainable, and supportive of people and native wildlife. Project proponents should follow relevant guidance and recommendations in A Delta Renewed to the extent possible. Habitat restoration projects should be designed, planned, and implemented consistent with the techniques and minimization measures in various CDFW and NMFS guidance documents. When determining whether to approve voluntary implementation plans that include physical habitat restoration or other ecosystem projects, the State Water Board will evaluate the voluntary implementation plan with consideration of the guidance and recommendations in these reports.

Restoration projects must be designed to incorporate clear and measurable success criteria with associated monitoring that are tailored to the individual project and can inform implementation outcomes over time. Examples of measurable success criteria include abundance, productivity as measured by population growth rate, genetic and life history diversity, and population spatial structure. Reasonable contributions to achieving measurable success criteria may include meeting stream temperature targets and other measures of quality and quantity of spawning, rearing, and migration habitat; fry production; and juvenile outmigrant survival.

Monitoring is integral to any restoration project because it allows project proponents and reviewers to evaluate whether a project has been implemented according to applicable permit requirements and regulations and identify whether success criteria are being met over time; it also provides a mechanism to inform adaptive management. Monitoring may include qualitative or quantitative metrics or some combination of both, depending upon the project-specific characteristics and objectives. Monitoring programs should be commensurate with the complexity and objectives of the project and may vary from simple completion reports and photo-point documentation to more complex preevaluation and postevaluations of physical habitat or water quality changes, fish abundance and distribution sampling, use of indicator species and species assemblages to represent responses of multiple fish species, biological responses of aquatic organisms, and/or comparisons to reference site conditions.

Effectiveness monitoring of restoration activities is important to determine the capacity, opportunity, and realized functioning of habitat to meet the needs of native fish and other aquatic species. Several existing forums collect monitoring information or could provide assistance with postproject reporting and assessment related to habitat restoration and other ecosystem projects.

For example, the Interagency Ecological Program (IEP), a multiagency collaborative monitoring, research, modeling, and synthesis effort to inform planning and regulatory decisions, has formed a Tidal Wetland Monitoring Project Work Team. This team has developed a monitoring framework that includes effectiveness monitoring tools and project-specific monitoring plans to inform adaptive management and planning for future projects. The Sacramento-San Joaquin Delta Conservancy has also developed the Delta Restoration Network as a forum for information sharing and coordination to ensure an integrated and accountable restoration program in the Delta. The purpose of the network is to coordinate and integrate restoration actions to ensure integrated performance tracking among governmental and nongovernmental entities engaged in restoration and habitat management in the Delta and Suisun Marsh (^Delta Conservancy 2015).

7.21.1.2 Fish Passage Improvements

Fish passage improvements include fish screens and fishways, TCDs, and dam removal to facilitate fish passage at dams and other potential passage impediments and improve the survival rate of migrating adult and juvenile Chinook salmon and steelhead as they return to and from their natal spawning ground. Downstream fish passage is also important to prevent fish from entering into turbine intakes; to allow fish to move safely downstream past the facility; and to move fish, in a timely and safe manner, through the project reservoir. While TCDs do not provide passage, they can control the temperature of water released from dams for the protection of downstream fisheries by varying operations of release gates. Fish passage improvement projects may also serve as an implementation mechanism for the proposed cold water habitat objective. As described in Chapter 5, *Proposed Changes to the Bay-Delta Plan for the Sacramento/Delta*, the proposed cold water habitat objective is intended to ensure that salmonids have access to cold water habitat at critical times and that adequate water is available for minimum instream flow purposes downstream of reservoirs. The reintroduction of populations to historical habitat above the existing dams or, in the case of winter-run Chinook salmon, into other tributaries where cold water management is less challenging than on the mainstem tributary is a possible alternative strategy for fish protection (^DWR 2013).

Fish screens may include screening unscreened diversions or upgrading existing fish screens as necessary to meet fishery agency criteria. Fish screen design varies widely depending on site-specific engineering, hydraulic, and fish protection objectives and requirements. Common positive barrier screen types include flat plate, drum, traveling, cylindrical, and inclined screens. Fish screen projects where NMFS, USFWS, and CDFW have jurisdiction must be developed in consultation with these agencies and in accordance with established design, operational, and maintenance criteria and guidelines (e.g., CDFW 2010; NMFS 2011). For projects to address unscreened diversions, projects may be small in scope and require relatively basic construction and ongoing maintenance activities. For example, a small diversion could be fitted with a ready-made fish screen to address fish passage impediments at the diversion. Constructing or installing a fish screen usually includes site excavation, formation and pouring of a concrete foundation and walls, and installation of the fish screen structure. Typically, if the fish screen is placed in or near flood-prone areas, rock or other armoring is installed to protect the screen. Fish screen types include self-cleaning screens (e.g., flat plate, rotary drum screens, cone screens) and non-self-cleaning screens (e.g., tubular and box screens).

Fish passages may need to be built around dams to facilitate upstream migration of salmonids above reservoirs to cooler habitats. Fishways (ladders and nature-like) could be installed at structures (e.g., diversion dams, reservoirs) that currently lack a fish ladder, or existing fish ladders could be

upgraded as necessary to provide suitable fish passage conditions. Fish ladders, most used in California, naturally attract returning adult salmonids to swim up the inflow at the base of the ladder to either a holding pond at a fish hatchery (e.g., Feather River Fish Hatchery) or to upstream habitat (e.g., Butte Creek Fish Passage Improvement Project). Nature-like fishways are designed to recreate pools, riffles, steps, and/or cascades using natural materials (rock, with smaller particles, such as sand and gravel). These roughened channels provide diverse hydraulic conditions, mimic natural channels, and blend in with the surrounding visual environment. The design of a fishway depends on the degree to which the structure can hydraulically self-regulate, the species and the number of fishes that should be accommodated, and the structure's efficiency over a range of different flows. Fishway projects where NMFS, USFWS, and CDFW have jurisdiction must be developed in consultation with these agencies and in accordance with established design, operational, and maintenance criteria and guidelines (e.g., CDFW 2010). If the bypass fishway is isolated, most of the construction and maintenance can proceed in dry conditions outside of the channel. Fishways may include riffle-pool complexes (e.g., rock/boulder ramps) that bypass a passage barrier. Constructing and/or installing fishways usually requires site excavation, formation and pouring of a concrete foundation and walls, pile driving, excavation and installation of an entry and exit channel, and installation of the fishway structure. Heavy equipment is typically used for excavation and site preparation.

Installation or modification of TCDs can be used to manage water temperatures below reservoirs with outlet shutters and thermal curtains. Outlet shutters allow a reservoir operator to pull water from different levels depending on desired outflow temperature, which can improve a reservoir's ability to provide downstream cold water temperatures. Shasta Dam was fitted with shutters to allow water to be drawn from different levels in order to conserve cold water for the spawning of winter-run salmon. Similar outlet shutters are found on Folsom and Oroville Dams to benefit resident trout and fall-run salmon.

Thermal curtains are used to create a barrier that draws cooler water from deeper in the reservoir into the intake by blocking warmer water near the surface, allowing only the desired colder water to flow downstream to anadromous salmonid spawning and rearing habitat. Curtains can be constructed out of synthetic rubber fabric and are suspended from floating tanks on a reservoir surface and hang vertically. A curtain may be tethered to the reservoir bottom with long cables to leave space for water to pass underneath.

TCDs typically require minimal ground clearing; most structures can be assembled off site, hauled to the dam, and lowered into place from the top of the dam by a mobile crane. The construction methods vary in intensity depending on the dam size and the type of TCD being installed and may involve the use of heavy equipment and the need for new access roads. Assembly or attachment of the new structural components may require underwater cutting and assembly by divers. Installation of temporary barriers or dewatering is typically not necessary.

Dam removal projects include the removal of small structures (e.g., diversion dams) and potentially the removal of larger structures (e.g., reservoirs) as appropriate. Small dams include permanent, flashboard, debris basin, earthen, and seasonal dams that have a relatively small volume of sediment available for release (relevant to the size of the stream channel). The California Division of Dam Safety defines dams of nonjurisdictional size to be less than 25 feet in height or impounding less than 50 acre-feet of water (Wat. Code, § 6200). Implementing small dam removal projects may require the use of heavy equipment (e.g., self-propelled logging yarders, mechanical excavators, backhoes). Some small dams can be removed using hand tools such as jackhammers. Other larger

dam removal projects may require the use of heavy equipment, including cranes, excavators, pile drivers, bulldozers, backhoes, scrapers, dump trucks, and front-end loaders. The removal of dams may include demolition, excavation, construction of concrete structures, and fill and regrading operations. Projects could involve use of heavy equipment for clearing of vegetation to construct temporary roads, staging, and storage areas; placement of temporary structures (e.g., cofferdams) to isolate work areas from flowing water; clearing, grading, and armoring of the channel and banks; and pile driving. Explosives may also be used to remove large barriers, such as dams.

For large dam and reservoir removal, the approach and removal methods used are dependent on location and type of dam and the amount and type of sediment stored in the reservoir. The stream channel is normally restored to a natural alignment and grade, with natural-looking ground contours provided on the dam abutments following removal. Partial dam removal allows some structures or portions of structures to remain in place, either within or outside of the original stream channel. Under a natural erosion approach, sediment is left and moves downstream by the river after the dam is removed, or portions of the dam can be removed over time, so that sediment is removed more slowly. Another approach is to drain the reservoir and mechanically remove the sediment or stabilize the sediment in the upstream channel, prior to removing the dam. A temporary pilot channel may be constructed through the reservoir sediments to help guide the final stream location. Scour holes may be backfilled or allowed to fill by sediment deposition over time. The dam abutments and streambed within the footprint of the former dam may be stabilized to provide a suitable hydraulic section for velocity control and for fish passage during low flows. (USSD 2015.)

The method used for dam removal would depend on the site. For example, a broad canyon or floodplain site provides access to one or both abutments and flexibility in demolition methods and equipment, whereas a narrow, deep canyon site or a remote location may restrict construction access and thus may require the use of a helicopter or barge or construction of a new access road. Blasting can facilitate and expedite concrete demolition where equipment access may be limited. (USSD 2015.)

Additional areas may be required at dam-removal sites for construction offices and for temporary stockpile and storage sites. Access roads used for the original construction of a dam may not be suitable for modern construction equipment or current safety requirements, considering roadway widths, grades, curves, and load capacities (including bridges, culverts, and retaining walls) (USSD 2015). Accordingly, substantial improvements to existing access roads and bridges may be required. Depending on the proposed future land use at the site, access roads may be removed following dam removal.

In some cases, various types of new features will need to be constructed, including temporary structures for streamflow diversion during dam removal and permanent protective works for the remaining portions of the existing dam and appurtenant structures. Streamflow diversion may require temporary cofferdams, bypass channels, flumes, culverts, and pipelines. Use of these types of structures may necessitate installation of dewatering wells and erosion protection. Where a dam provides a river crossing along its crest, a bridge may need to be constructed once the dam is removed to meet local traffic demands. The removal of a diversion dam may require construction of a pumping plant or alternative intake configuration to maintain water supplies to existing irrigation canals or pipelines. New recreation facilities and access roads may be required to maintain a similar level of recreation capacity originally provided by the dam and reservoir. (USSD 2015.)

Large and complex dam removal projects require careful planning and analysis of the tradeoffs of both retention and removal, including financial considerations and environmental impacts (^Poff and Hart 2002). Dams serve numerous functions, including storage for municipal and domestic water supply, flood control, recreation, fish and wildlife habitat, hydropower generation, navigation, fire protection, and irrigation. Removal must take into consideration the benefits that the facility currently provides that will be lost once the facility is removed. Dam removal is usually considered as an option when there is a problem with the existing facility, such as concern for public safety, environmental impacts, or economics. The California Department of Water Resources (DWR) Division of Safety of Dams provides oversight to the design, construction, maintenance, and removal of over 1,200 jurisdictional-sized dams in California, primarily to prevent failure, safeguard life, and protect property. In addition, the United States Society on Dams published *Guidelines for Dam Decommissioning Projects* (USSD 2015), which provides information to help in the development and execution of successful dam decommissioning projects, including all necessary activities associated with the removal of a dam and restoration of the river, from project planning through design and implementation.

Project planning includes environmental, technical, and economic feasibility studies with fieldwork to gather data to confirm the site conditions. Dam removal will require the involvement of applicable federal, state, and local government agencies and any affected Native American tribes, as well as other project stakeholders, including public utilities, nongovernmental organizations, local businesses, and private citizens. If a dam removal project is determined to be feasible, more detailed design specifications will be developed to achieve the desired results, including specific methods for streamflow diversion and structure demolition and any special site restrictions (e.g., reservoir drawdown rate limitations or the prohibition of blasting; construction sequence requirements; additional site explorations, such as hazardous material assessments and sediment characterization; protection of existing structures and utilities; public protection requirements; any environmental constraints, such as in-water work periods and noise restrictions).

Maintenance of fish screens, fishways, and TCDs may include regular or periodic activities, including cleaning, inspections, and repairs, for the life of these projects. Fish screens generally require the removal of debris from the surfaces of the structure, which can be achieved by active or passive methods. Active cleaning methods rely on mechanical cleaning, whereas passive methods rely on screen design and sweeping flow across the screen face; passive screens may require manual cleaning (Reclamation 2014a). Debris load can vary by season, screen location, and debris type (e.g., woody debris, domestic refuse, aquatic plants). Most fish screens require power for cleaning. Power is required to operate trashrack and mechanical screen-cleaning systems. Many small screens can operate using alternate power sources, such as solar or wind, and flow- driven paddle wheels or propellers mounted downstream of the screen. Periodically, screens will require repairs or other basic maintenance beyond cleaning. For example, drum screens require maintenance and periodic replacement of bearing, seals, and drive chains (Reclamation 2006). Fishway maintenance can include debris (sediment and woody material) removal; where debris accumulation is anticipated to be high, an automated mechanical debris removal system may be installed (NMFS 2011). Postconstruction evaluation activities for TCDs may include testing and evaluation of mechanical and electrical systems, water temperature monitoring and evaluation, and adaptive management to address unforeseen issues. Postproject monitoring to determine the long-term efficacy of dam removal actions would require limited vehicle trips.

For dam removal projects with significant reservoir sediment volume, performance monitoring and adaptive management are conducted to detect and avoid significant impacts related to flooding,

water quality, and sediment deposition. Monitoring can continue for periodic intervals after dam removal (often at 1, 2, and 5 years) until the reservoir sediments have either fully eroded or stabilized. Mitigation for increases in turbidity and flood stages could include the construction of additional water treatment facilities and flood control levees or dikes. For projects that may expose a significant portion of previously inundated lands, a revegetation monitoring program may include monitoring of new plant growth after reservoir drawdown over a period of 2 to 5 years. Depending on the specific project location, an invasive species control and countermeasures plan may be required. Smaller projects may require little or no mitigation for long-term physical impacts. Physical barriers such as bridges and piers can also serve as potential fish passage impediments and can provide conditions conducive for some nonnative predators. Modification of physical barriers is discussed in Section 7.21.1.3, *Predatory Fish Control*.

7.21.1.3 Predatory Fish Control

Predatory fish control can increase the survival of migrating salmonids and other native fishes through localized reductions of targeted predatory fishes and/or elimination or modification of habitat for predatory fishes at locations of high predation risk (hotspots).

Strategies for predatory fish control include direct removal methods and modifications of physical barriers such as bridges and weirs that can provide conditions conducive to some nonnative predators. Direct removal methods include electrofishing, hook-and-line fishing, passive trapping (e.g., fyke nets, hoop nets, gill nets), and active capture methods (e.g., trawls, beach seines). Actions associated with direct removal would require mostly handheld equipment and would not involve construction. Direct removal methods can also be used for fish sampling and monitoring efforts.

Electrofishing is a fishing technique used by fisheries biologists to sample freshwater fish populations. Electrofishing uses electricity to temporarily stun fish, which allows for easier capture. Fisheries managers use this method to learn about fish populations, such as species composition, age distribution, and presence of invasive species. Captured fish are processed for biological data and revived in an aerated holding tank prior to being released. Electrofishing can be used as a management tool for the removal of introduced fish species. Captured fish are removed from the population to achieve a desired predator management goal. Backpack- and boat-mounted electrofishing gear are commonly used in fisheries research.

Hook-and-line fishing is also known as angling. The use of lures and bait are used to catch fish from shore or on a boat. Hook-and-line fishing can lead to high mortality rates of released fish depending on several factors, such as the hook size and fishing technique. Recreational and commercial fisheries commonly employ hook-and-line techniques. Hook-and-line gear can be used with passive or active techniques. Trotlines and longlines are examples of hook-and-line passive capture gear.

Passive capture techniques involve the capture of fish by entanglement or entrapment by gear that is not actively operated by humans or machines. Entanglement devices capture fish by holding them ensnared, gilled, or tangled in nets. Gill nets and trammel nets are examples of entanglement gear. Entrapment devices capture fish that enter an enclosed area through a funnel or V-shaped opening that prevents escape after entrance. Hoop and fyke nets are examples of entrapment gears.

Active capture techniques involve the capture of fish by machinery or human power. The term *active* means that the fishing gear is moved through the water by engine or human power. Common active capture techniques include the use of seine and trawlnets. Active fishing methods are suitable for sampling large proportions of the population or large numbers of fish. Trawlnets are funnel-shaped

nets that are towed on the bottom or midwater column by one or two boats. Seine nets are long nets that are used to surround an area to capture fish. A beach seine is a seine net operated from the shore to sample nearshore communities.

A scientific collecting permit (SCP), memorandum of understanding (MOU), and federal authorization (Endangered Species Act [ESA] [16 U.S.C. §§ 1531–1544], §§ 4(d), 10(a)(1)(A)) may be required to conduct scientific, education, propagation, and management activities in which take is anticipated to occur. *Take* means to hunt, pursue, catch, capture, or kill or attempt to hunt, pursue, catch, capture, or kill (Fish & G. Code, § 86). An SCP allows take of animals that are not listed as endangered, threatened, or candidate under the California Endangered Species Act (CESA) (Fish & G. Code, § 2051). CESA MOUs allow take of state-listed animals for the purposes of science, education, and management activities. California Fully Protected MOUs allow take of fully protected animals under CESA for scientific research purposes. Federal authorization may require a recovery permit and authorization under ESA section 4(d) to take a federally threatened species, such as Chinook salmon, coho salmon, steelhead, and green sturgeon.

Angling, particularly agency-based angling, may be less effective than other direct control methods. However, public participation in predatory fish control through angling could successfully reduce numbers of piscivores if participation were relatively substantial (Reclamation 2014b). An annual sportfishing license is required for any person attempting to take fish, mollusks, crustaceans, invertebrates, amphibians, or reptiles in inland or ocean waters. Report cards are required for any person fishing for steelhead, sturgeon, abalone, spiny lobster, or salmon (Klamath, Trinity, and Smith Rivers only). Each person fishing for these species must have an appropriate report card, including any person who is not required to have a sportfishing license, such as a child who is under 16 years of age, a person who is fishing from a public pier, and any person who is fishing on a free fishing day. All licenses and report cards are administered by CDFW. Licenses and report cards may be purchased online with CDFW's automated license system, at CDFW license office locations, or at local fishing sporting stores. Anglers are required to comply with California sportfishing regulations that define unlawful take and set general fishing provisions and conditions. In addition, some locations may have further take, method, gear. And closure provisions for various species. It is each angler's responsibility to verify the regulations for all species in their chosen location(s) and water(s), prior to sportfishing in California waters.

Structural modifications that may reduce local aggregations of predators or their feeding efficiency include the removal or modification of abandoned structures (e.g., dams, bridge piers, docks), water diversion facilities (e.g., water intakes, forebays), and scour holes. Potential construction activities include clearing of vegetation to construct temporary roads and staging areas; placement of temporary barriers or other structures to isolate active construction areas (e.g., cofferdams); and mechanical demolition, excavation, and extraction methods. Construction equipment may include excavators, hydraulic hammers, pile extractors, and cranes. Depending on the size of the structure to be removed or modified, construction could take between several months and several years. Postproject monitoring to determine the long-term efficacy of predator control actions would require limited vehicle trips. Riverbanks or channels may need to be graded after removal of human-made structures.

7.21.1.4 Invasive Aquatic Vegetation Control

Invasive aquatic vegetation control can prevent the introduction and control the spread of invasive aquatic species. Current methods for control of Brazilian waterweed, water hyacinth, and other

invasive plant species include small-scale and large-scale applications of herbicides and mechanical removal depending on the target species, site conditions, and objectives (^CDBW 2006; CDBW 2023a, 2023b). Invasive aquatic vegetation control does not involve construction activities.

Physical control, which can be successful at relatively small scales, involves the removal of invasive aquatic vegetation by hand or machine and disposal on land; disposal typically occurs at approved spoil sites away from the water, typically on nearby farm fields (CDBW 2018). There are specific criteria by which spoil sites are selected, including only property of willing landowners (private, state, federal, county, or other local), on or beyond the levee toe, and away from special-status species and habitat. The potential disposal site must be surveyed and approved by a CDFW-approved environmental scientist. Machine removal requires a mechanical harvester that cuts and collects aquatic plants. Cut plants are generally removed from the water by a conveyor belt system and stored on the harvester or another boat until ready for disposal. Physical control methods are not suitable for all aquatic weeds; for example, mechanical harvesting is not used in the control of Brazilian waterweed because the plant spreads readily from small fragments and therefore mechanical harvesting can actually increase its spread.

Chemical control (herbicide applications) is considered a feasible and effective control method because herbicides can be used to rapidly control invasive aquatic plants over large areas (hundreds or thousands of acres). All herbicides currently in use by the California Department of Parks and Recreation, Division of Boating and Waterways (CDBW) have been approved for aquatic use and are subject to permit restrictions on timing, application methods, frequency of application, and concentrations to avoid or minimize potential adverse effects on water quality and federally listed fish and wildlife species. Herbicide active ingredients include 2,4-D, glyphosate, penoxsulam, imazamox, diquat, fluridone, imazapyr, carfentrazone-ethyl, endothall, flumioxazin, and florpyrauxifen-benzyl. CDBW is the lead state agency for water hyacinth control and coordinates with other state, local, and federal agencies in controlling water hyacinth. The CDBW administers the Aquatic Invasive Plant Control Program (AIPCP), which covers 11 counties: Alameda, Contra Costa, Fresno, Madera, Merced, Sacramento, San Joaquin, Solano, Stanislaus, Tuolumne, and Yolo. The program is authorized by the Harbors and Navigation Code section 64 and provided authority through SB 1344 (Garamendi), Statutes of 1982, and Assembly Bill (AB) 2193 (Rainey), Statutes of 1996; AB 1540 (Buchanan), Statutes of 2012; and AB 763 (Buchanan), Statutes of 2013. CDBW's control program obtains environmental clearances from NMFS, USFWS, CDFW, the State Water Board, and county agricultural commissioners' offices.

According to the 2018 Programmatic EIR, the AIPCP is the only program operating in the Delta that is authorized under the ESA to use herbicides and mechanical methods to control aquatic invasive plants in the Delta (CDBW 2018). As a result, restoration agencies are dependent on the AIPCP to conduct treatments. The AIPCP supports these ecosystem restoration efforts as a component of the overall program, to the extent feasible. To manage aquatic invasive plant control for restoration, CDBW requests that restoration agencies submit proposed projects (timing, acres, aquatic invasive plant issues) to CDBW in September of each year. CDBW evaluates the requests, comparing restoration to proposed treatment for the upcoming year. CDBW meets with restoration agencies each fall to evaluate, prioritize, and select restoration control sites for the upcoming year. The annual meeting will likely take place through an existing initiative, such as the IEP Aquatic Vegetation Project Work Team.

In addition, in 2013, the State Water Board adopted the Statewide General National Pollutant Discharge Elimination System (NPDES) Permit for Residual Aquatic Pesticide Discharges to Waters of the United States from Algae and Aquatic Weed Control Applications (Water Quality Order 2013-

0002-DWQ [as amended by Orders 2014-0078-DWQ, 2015-0029-DWQ, and 2016-0074-EXEC]). Except for discharges on tribal lands that are regulated by a federal permit, this General Permit covers the point source discharge to waters of the United States of residues resulting from pesticide applications using products containing 2,4-D, acrolein, copper, diquat, endothall, fluridone, glyphosate, imazamox, imazapyr, penoxsulam, sodium carbonate peroxyhydrate, and triclopyr-based algicides and aquatic herbicides and adjuvants containing ingredients represented by the surrogate nonylphenol. The permit requires that discharges of residual algicides and aquatic herbicides must meet applicable water quality standards, and implementation of best management practices (BMPs) when applying aquatic algicides and aquatic herbicides must be detailed in an aquatic pesticide application plan.

Other invasive aquatic vegetation control methods could be implemented but are not evaluated here. For example, biological control methods involve the release of organisms (such as invertebrates or pathogens that target invasive aquatic vegetation or fish that graze on the plants) into the environment with the goal of establishing sufficient numbers to reduce or limit the growth of the target species. Laboratory and limited field evaluations are underway to determine the efficacy of these organisms and the potential risk they pose to nontarget species. Biological controls must be approved by both the U.S. Department of Agriculture's Animal and Plant Health Inspection Service and the California Department of Food and Agriculture. The use of biological controls is not widespread and is still under study and therefore not addressed in this analysis.

7.21.2 Evaluation of Potential Environmental Impacts

This section provides an evaluation, by resource, of potential environmental impacts related to physical habitat restoration projects, fish passage improvement projects, predatory fish control, and invasive aquatic vegetation control. This evaluation includes construction impacts related to these specific types of projects and actions implemented as part of operation and maintenance of these projects, such as periodic inspections, vegetation maintenance, monitoring, repairs, and sediment and debris management. A discussion of common construction and operational impacts for all projects is included in the beginning of each resource discussion. The analysis and impact determinations presented in this section reflect the highest level of potential impact. The specific projects that could be undertaken will depend on a number of factors, such as project feasibility, cost, timeline, and expected outcomes. Depending on the specific project, implementation of mitigation measures may or may not fully reduce all potentially significant impacts to less-than-significant levels. Until a specific project is proposed and until additional site-specific information becomes available, specific impacts identified and analyzed in this section remain potentially significant. Because the precise location and magnitude of construction and operational activities required are not known, impacts cannot be determined with certainty at this time. Therefore, impacts remain potentially significant.

7.21.2.1 Aesthetics

		Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
I. Aesthetics					
Would the project:					
a.	Have a substantial adverse effect on a scenic vista	☒	☐	☐	☐
b.	Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway	☒	☐	☐	☐
c.	Substantially degrade the existing visual character or quality of the site and its surroundings	☒	☐	☐	☐
d.	Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area	☒	☐	☐	☐

Section 7.3.2, *Environmental Setting*, describes the aesthetics resource setting, and additional regulatory setting is described in Appendix E, *Regulatory Framework for Construction Projects*.

Common Construction

Depending on the location, some habitat restoration and other ecosystem projects could affect scenic vistas, damage scenic resources viewed from within a state scenic highway, degrade the existing visual character of an area, or create light or glare. Potential aesthetic impacts from construction activities include physically damaging scenic resources (e.g., alteration of natural landscape contours), introducing large construction equipment to the landscape, removing vegetation, stockpiling materials (e.g., excavated soil), creating dust, and adding new sources of lighting and glare. Construction activities may be observable temporarily when heavy equipment (e.g., excavators, graders, bulldozers) is used for activities such as grading banks, moving sediment, and planting vegetation around the project site—particularly if sensitive viewers are located close to the project. Construction equipment may be observable for a temporary period when heavy equipment is used to grade banks, move sediment, and install structures. Removal of vegetation would also result in temporary visual changes until replacement vegetation is reestablished. During construction, stockpiles may be visible; if the color and form of the stockpiled materials do not blend visually into the surrounding landscape, stockpiles may temporarily substantially degrade the existing visual character or quality of the site and surroundings. While most construction would be expected to occur during daylight hours, it is possible that lighting and/or glare could be associated with projects if the construction schedule required continuous daytime and nighttime work to stay within a specified work window to complete the work. In addition, some projects could require nighttime lighting for construction site security. Temporary sources of light could be visible to residents, businesses, and other people in the vicinity. Glare could occur if reflective construction materials were positioned in highly visible locations where sunlight could be reflected.

Long-term aesthetic impacts would depend on the size of the project and preproject and postproject conditions. For example, projects that remove human-made structures and replace them with native

vegetation would have beneficial impacts, while projects that install artificial elements, such as riprap, could have adverse impacts. In addition, some habitat restoration and ecosystem projects could include a solar panel(s) and/or operational, security, and safety lighting, which could introduce new permanent sources of glare and light.

Aesthetic impacts associated with common construction activities would be potentially significant and can be avoided or reduced by implementation of Mitigation Measure 7.21 MM-AES-a–d: A (CMM-AES-a–d). Mitigation can include designing projects to minimize vegetation disturbance, preserving vegetation, screening construction sites, and shielding or directing construction lights away from sensitive receptors. In addition, as discussed in more detail below, implementation of Mitigation Measures 7.21 MM-AES-a–d: B and C can avoid or reduce additional potentially significant aesthetic impacts associated with habitat restoration and other ecosystem projects. If these mitigation measures are implemented, most, if not all, impacts (including construction impacts) can be mitigated to less than significant. Because the precise location and magnitude of activities required for habitat restoration and other ecosystem projects are not known, impacts on visual resources cannot be determined with certainty at this time. Therefore, potential impacts on visual resources remain potentially significant.

Physical Habitat Restoration

Physical habitat restoration projects could affect visual resources primarily during construction (see *Common Construction*). Habitat restoration actions could involve permanent landscape-level changes to the visual environment that could affect scenic vistas, views of resources from scenic highways, or the visual character of a site. In addition, floodplain and riparian habitat could be converted to tidal and wetland habitats. Most restoration projects would result in a more vegetated viewshed but could also result in more views of open water.

Once restoration is complete, it could take some time for vegetation to reach maturity and hydrologic dynamics to become established. After that, the area may be more aesthetically pleasing due to the enhanced vegetation and restoration of natural river morphology. Native vegetation could take several years to establish, and the restoration area would transform over time.

Restored natural habitats could enhance the visual character or quality of an area and improve views from scenic vistas by returning disturbed areas to a more natural state. However, these projects could alter the visual environment, including agricultural and other working landscapes. In the Delta, restoration could result in permanent landscape-scale changes by reintroducing native habitat types to areas that are currently dominated by agricultural fields and, to a lesser extent, urban land uses. If this land is left undeveloped, it would function visually as open space, and the change would not adversely affect scenic vistas or visual character. The visual characteristics of these new landscapes would be consistent with those characteristics of other areas of the Delta that are in a more natural state. Where restoration projects occur near existing habitats, there would be more vegetation of the same types as the existing surrounding conditions, and the area would blend in with the existing visual character.

While habitat restoration generally involves restoring natural landscape features, some projects may include hardscape elements (e.g., fence, bench, erosion control structures) or additional or modified water infrastructure, such as water storage structures and associated delivery lines. These features could result in long-term changes and impacts on visual resources. Adding a project feature that prominently contrasts with the existing visual qualities and character of the surrounding landscape could cause a substantial change in visual quality. In addition, gravel augmentation

projects can affect visual resources depending on where materials are stockpiled for use and from where the material is excavated, including borrow pits. These impacts would be potentially significant. In addition to common construction mitigation measures, implementation of Mitigation Measure 7.21 MM-AES-a–d: B would reduce this impact to less than significant. Restoration projects should be designed to blend with surrounding scenery. Hardscape elements must be blended or screened and natural vegetation used to the extent possible. Gravel stockpiles should be located in areas that minimize obstruction of public views, and places where gravel is extracted should be recontoured. Until mitigation measures are implemented, the impacts remain potentially significant.

For habitat restoration projects that include, for example, interpretive facilities (e.g., signage), facility lighting could be a new source of light, although it is unlikely to be substantial. Operations and maintenance activities would introduce workers and vehicles into the project area but would be temporary and intermittent. New structures, fencing, or walls could introduce new sources of glare, depending on the design or paint colors. Any new sources of glare from increased surface water area would likely be minor. A small number of structures for equipment storage and maintenance could reflect sunlight, which would also be minor.

Fish Passage Improvements

Fish passage improvement projects could affect visual resources, primarily during construction (see *Common Construction*). Most fish passage improvement actions would have few long-term impacts on visual resources because the projects would be associated with existing human-made structures, such as dams and diversions. TCDs would be located underwater at existing dams. However, some additional structures (e.g., buoys, binwalls) may be visible on the surface of the water or on the shore. For example, stabilizing buoys may be used to suspend a thermal curtain, and safety buoys with lights may be used to prevent boaters from approaching the curtain. However, structures such as buoys and new lighting would not likely substantially change the visual character of an area.

Dam removal projects could result in additional significant changes in the visual quality of a site. For large projects, long-term scenic vistas could be altered. Open water and reservoir vistas would be lost in favor of more natural river, canyon, and valley vistas. While not all people prefer a more natural, riverine setting, a free-flowing river view may be preferable to some viewers compared to flatwater reservoir views. In addition, large areas of bare sediment and rock could be exposed in previously inundated areas after reservoir drawdown and dam removal. Much of these areas could remain relatively bare after dam removal, while vegetation becomes reestablished in the former reservoir area. Aesthetic factors may affect a decision for partial dam removal, especially in areas subject to public view. These impacts would be potentially significant. In addition to common construction mitigation measures, implementation of Mitigation Measure 7.21 MM-AES-a–d: C could reduce aesthetic impacts on visual resources associated with dam removal. Until mitigation measures are implemented, the impacts remain potentially significant.

Predatory Fish Control

Removal or modification of structures for predation control could result in temporary construction impacts on visual resources identified in *Common Construction*.

Capture methods for predation control do not involve construction and therefore would not result in any of the construction impacts on visual resources discussed in *Common Construction*. Activities would be temporary, would require mostly handheld equipment, and would not likely result in

ground disturbance. These activities would not result in a permanent or temporary alteration of river views.

Invasive Aquatic Vegetation Control

Invasive aquatic vegetation control does not involve construction and therefore would not result in any of the construction impacts on visual resources discussed in *Common Construction*. Invasive aquatic vegetation control actions would be expected to return altered, clogged waterways to open water. These actions would change the visual character of the project sites and could result in improved views of more natural waterways, including views from scenic vistas.

Most changes in the visual character or quality of a site would be associated with use of equipment such as a mechanical harvester and would not significantly affect scenic vistas because invasive aquatic vegetation removal may be observable only for a temporary period of time and disposal of removed vegetation typically occurs at approved spoil sites away from the water, often on nearby farm fields (CDBW 2018). Use of herbicides would also be of short duration; involve minimal equipment; and leave vegetation in place to decay, which typically occurs rapidly. Because of the temporary nature of both methods, neither method would be likely to affect visual resources or damage a scenic resource or scenic vista.

Lighting is not expected to be used during invasive aquatic vegetation control or monitoring, as all activities would be expected to occur during the day. Although lighting is not expected to be used during invasive aquatic vegetation control or monitoring, removal of vegetation and return of open water could result in a minimal increase of glare.

Mitigation Measures

7.21 MM-AES-a–d: Mitigate impacts on visual resources

Entities or agencies designing and/or approving habitat restoration or other ecosystem projects will implement or require the following.

A. Construction AES Mitigation Measures (CMM-AES-a–d)

1. **Project Siting and Design:** Design the site or facilities to blend with surrounding land uses. Design will comply with applicable local plans (e.g., city/county general plans) and ordinances, as well as with applicable resource management plans for projects on public land.

   Design-related measures to reduce impacts on visual resources could include the following.

   i. Develop design form and materials to achieve aesthetic visual character instead of a strictly utilitarian objective. Use cast natural form elements or natural materials for facing to create texture and color compatible with the adjacent landscape.

   ii. Retain the existing topographic features, to the extent feasible, to lessen the degree of visual impact.

   iii. Avoid or minimize the removal of trees, shrubs, and other mature vegetation.

   iv. Design grading to blend with surrounding landforms.

v. Minimize the vertical profile of proposed structures. Use landscaped berms instead of walls to mask views of structures from high-visibility sites.

vi. Install any infrastructure (e.g., transmission lines) underground in areas with high visibility and high public use, to the extent feasible.

vii. Use compatible colors for proposed structural features. Use earth-toned paints and stains with low levels of reflectivity.

viii. Implement revegetation and landscaping that includes landscape planting and restoration of areas that were disturbed by construction activities to enhance the appearance of the new facilities or to screen negative visual elements. Specific requirements include replacement of scenic resources, including revegetation, tree planting (particularly if trees were removed), and installation of new native landscaping, to enhance the appearance of the new facilities or to screen negative visual elements.

ix. For projects that involve any new or relocated roads, develop aesthetically pleasing landscaping for new/relocated roads at the shoulders, intersections, and on- and off-ramps from highways. Design turnouts and scenic vista points where appropriate with high visibility and high public use.

2. **Screen Construction Areas:** Screen construction areas from public view.

3. **Spoil Disposal Areas:** Round the tops and bottoms of spoil disposal areas and contour the faces of slopes to create more natural-looking landforms. Create visual diversity by planting vegetation with diverse growth forms on the spoil disposal areas. Vegetation will not be limited to grasses.

4. **Dust Control Measures** (CMM-AQ-a–e: 3)

5. **Waste Management and Material Control Measures** (CMM-WQ-a–j: 4)

6. **Light and Glare Minimization:** Minimize new sources of substantial light or glare that would adversely affect day or nighttime views in the area:

   i. Limit construction activities to daylight hours, to the extent feasible.

   ii. When construction lighting is required, direct lighting away from residential and roadway areas where sensitive receptors may be present. Use shields for lighting, and direct lighting downward and inward toward the construction site.

   iii. Where lighting may be required for site security, use automatic motion-sensor lighting to reduce light emissions.

   iv. Use construction equipment and temporary, construction-related facilities with low levels of reflectivity.

   v. Permanent lighting will be downcast, cut-off type fixtures with non-glare finishes and controlled by photocells and motion sensors, depending on the location. Lighting will be of minimum intensity with adequate strength for security, safety, and access.

   vi. Follow applicable county and local jurisdiction lighting guidelines and requirements relevant to the proposed project site or area, which may include ensuring that project design incorporates outdoor lighting configurations and operational

practices that minimize creation of obtrusive misdirected, excessive, or unnecessary lighting and reduce potential for light pollution.

7. **Construction BIO Mitigation Measures: Avoid Vegetation Disturbance** (CMM-BIO-a–f: 9), **Revegetation Plan** (CMM-BIO-a–f: 11), and **Revegetation Monitoring and Reporting** (CMM-BIO-a–f: 12)

B. Physical Habitat Restoration AES Mitigation Measures

1. **Project Design:** Design restoration projects to blend with surrounding scenery. Use natural vegetation for bank stabilization. Blend or screen any structures. For projects that involve gravel augmentation, locate gravel stockpiles in areas that minimize obstruction of public views and recontour gravel extraction sites.
2. **Physical Habitat Restoration BIO Mitigation Measures** (7.21 MM-BIO-a–f: C)

C. Dam Removal AES Mitigation Measures

1. **Project Planning:** Preproject planning for dam removal will include the consideration of a wide variety of technical, environmental, social, political, and economic issues, including environmental feasibility. In feasibility studies, consider opportunities for aesthetic design when determining structural removal limits and other project features. Incorporate aesthetic design in any postconstruction interpretive features.
2. **Dam Removal BIO Mitigation Measures** (7.21 MM-BIO-a–f: E)
3. **Revegetation Plan:** Develop and implement a revegetation plan for areas that were exposed by reservoir drawdown and dam removal activities. The plan must provide for the recontouring and revegetation of the formerly inundated area and any disturbed areas, including structure sites, construction staging areas, temporary access roads, and waste disposal sites, to match the preinundation contour and appearance. The plan must further provide for the replacement of scenic resources, including revegetation and tree planting and installation of new landscaping, to enhance the appearance of the new facilities or to screen negative visual elements and complement the surrounding landscape.

7.21.2.2 Agriculture and Forest Resources

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
II. Agriculture and Forest Resources				
In determining whether impacts to agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997) prepared by the California Dept. of Conservation as an optional model to use in assessing impacts on agriculture and farmland. In determining whether impacts to forest resources, including timberland, are significant environmental effects, lead agencies may refer to information compiled by the California Department of Forestry and Fire Protection regarding the state's inventory of forest land, including the Forest and Range Assessment Project and the Forest Legacy Assessment Project; and forest carbon measurement methodology provided in Forest Protocols adopted by the California Air Resources Boards.				
Would the project:				
a. Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use	☒	☐	☐	☐
b. Conflict with existing zoning for agricultural use, or a Williamson Act contract	☒	☐	☐	☐
c. Conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code section 12220(g)), timberland (as defined by Public Resources Code section 4526) or timberland zoned Timberland Production (as defined by Government Code section 51104(g))	☒	☐	☐	☐
d. Result in the loss of forest land or conversion of forest land to non-forest use	☒	☐	☐	☐
e. Involve other changes in the existing environment which, due to their location or nature, could result in conversion of farmland to non-agricultural use or conversion of forest land to non-forest use	☒	☐	☐	☐

Section 7.4.2, *Environmental Setting*, describes the agriculture and forest resources setting, and additional regulatory setting is described in Appendix E, *Regulatory Framework for Construction Projects*.

Common Construction

Depending on the location, habitat restoration and complementary ecosystem projects could result in the conversion of farmland, including important farmland (i.e., Prime Farmland, Unique Farmland, Farmland of Statewide Importance), to nonagricultural use; conflict with existing zoning for agricultural use or a Williamson Act (Gov. Code, § 51200 et seq.) contract; or result in the loss or conversion of forest land. Impacts from construction activities could include removal of vegetation and/or topsoil; introduction of invasive weeds; restricting access to or interfering with use of agricultural land; disturbance of utilities and infrastructure that serves agriculture; disturbance of soil in development footprints, borrow/spoils areas, or staging areas (e.g., soil compaction resulting from heavy equipment storage, soil stockpiling); and dust generation.

Agriculture and forest resource impacts associated with common construction activities would be potentially significant and can be avoided or reduced by implementation of Mitigation Measure 7.21 MM-AG-a–e: A (CMM-AG-a–e). Mitigation can include designing projects to avoid or minimize impacts on farmland or forest land, agricultural soil protection measures, and paying the appropriate agricultural mitigation fee or purchasing a conservation easement on agricultural land pursuant to county or local jurisdiction requirements. In addition, as discussed in more detail below, implementation of Mitigation Measures 7.21 MM-AG-a–e: B–D can avoid or reduce additional potentially significant impacts on agriculture and forest resources associated with habitat restoration and other ecosystem projects. If mitigation measures are implemented, most, if not all, impacts (including construction impacts) can be mitigated to less than significant. Because the precise location and magnitude of activities required for habitat restoration and other ecosystem projects are not known, impacts on agriculture and forest resources cannot be determined with certainty at this time. Therefore, potential impacts on agriculture and forest resources remain potentially significant.

Physical Habitat Restoration

The development of large areas for crop production has resulted in historical and substantial losses of native wildlife habitat. It is therefore foreseeable that some habitat restoration projects could result in the conversion of some agricultural lands back to native habitats. Floodplain and tidal habitat restoration and restoration of off-channel/side-channel habitat could result in long-term or permanent changes in land use that would convert land to nonagricultural uses, conflict with agricultural zoning, or conflict with Williamson Act contracts. Restoration projects could also benefit agriculture by reducing soil erosion, recharging groundwater, providing natural pest control, and providing water quality buffers.

Local zoning codes typically use a designation such as “general agriculture,” which allows compatible public and quasi-public and natural open space areas, and “limited agriculture,” which can recognize and preserve areas where small-scale agricultural operations and dwellings may be concentrated. Williamson Act contracts generally allow agricultural and ancillary uses in addition to open space.

Restoration projects may occur on lands under Williamson Act contract and/or with these zoning designations. For example, floodplain expansion and riparian vegetation planting may occur on agriculture-zoned land near river channels. In the Delta, agriculture-zoned land could be affected by tidal wetland habitat restoration projects.

Restoration projects will create natural open space. Thus, in most instances, there would be no conflict between the projects and the existing zoning or a Williamson Act contract. In the unlikely event that a project is proposed for land that is zoned for agriculture or under a Williamson Act contract that does not provide for open space uses, then there would be a conflict with existing agricultural zoning.

If lands to be used for floodplain expansion and riparian vegetation projects are presently Prime Farmland, Farmland of Statewide Importance, and/or Unique Farmland, these projects would permanently convert the land to nonagricultural uses.

The extent of the impacts would depend on the total acres of restoration projects that are in inconsistent zoning designations or Williamson Act contracts and/or that are Prime Farmland, Farmland of Statewide Importance, and/or Unique Farmland.

In addition, habitat restoration projects that occur in the vicinity of agricultural lands could result in some incidental impacts on those agricultural lands. Depending on the habitat type and management practices, some habitat restoration projects could cause seepage issues on adjacent land. Specifically, as discussed in Section 7.21.2.9, *Hydrology and Water Quality—Surface Water and Groundwater*, increases in inundation for some habitat restoration projects could increase the groundwater infiltration area and provide for increased groundwater recharge, which could result in groundwater level rises and soil saturation on adjacent agricultural lands. Were this to occur, saturated soil conditions could limit agricultural production. Herbicides used for invasive plant species management on a restoration project could enter irrigation water or drift onto crops.

These impacts would be potentially significant. In addition to common construction mitigation measures, implementation of Mitigation Measure 7.21 MM-AG-a–e: B would avoid or reduce impacts to less than significant. Restoration projects should be designed and sited to avoid or minimize impacts on agricultural lands by focusing on public land and/or working with willing landowners, to the extent possible. Measures are also included that help avoid incidental impacts on agriculture, such as seepage and herbicide drift. Until mitigation measures are implemented, the impacts remain potentially significant.

Forest land and timberland occur in upland areas in the Sacramento/Delta, as well as in the Sierra Nevada and Coast Ranges; as discussed in Section 7.4, *Agriculture and Forest Resources*, forest lands are essential to the health of watersheds. Some habitat restoration projects in the upper watershed could include the restoration and protection of forests. Except for construction impacts discussed in *Common Construction*, these projects would benefit forest lands.

Fish Passage Improvements

Fish passage improvement projects would take place within the footprint of existing river channels and are not expected to be located on lands used for agriculture or forestry. Except for construction impacts discussed in *Common Construction*, these projects would not result in conversion of important farmland to nonagricultural use, conflict with existing zoning for agriculture use or a Williamson Act contract, conflict with existing zoning of forest land, or conversion of forest land to nonforest use.

In some cases, there may be the potential for an increase in forest land following dam removal due to revegetation of previously inundated lands with woody species. It is also possible that reservoir drawdown could increase agricultural opportunities on currently inundated lands. Dam and

reservoir removal projects could reduce or alter the seasonal availability of water supplies for irrigation. Agricultural diversion headworks downstream of a dam could experience siltation or otherwise be affected during reservoir drawdown, which could reduce irrigators' ability to divert water. Reservoir removal could also affect legal users of water if a diverter is dependent on the reservoir or reservoir infrastructure. These impacts would be potentially significant. In addition to common construction mitigation measures, implementation of Mitigation Measure 7.21 MM-AG-a–e: C could avoid or reduce impacts to less than significant. Preproject planning requires consideration of a wide variety of technical, environmental, social, political, and economic issues, including feasibility studies for all structures within the impoundment—as well as all upstream and downstream structures that may be affected by removal of the dam, such as pipelines, groundwater wells, and transmission lines. Engineering designs and construction plans will include any special accommodations for existing legal users of water and other infrastructure and minimize potential impacts associated with construction-related in-channel disturbances. Until mitigation measures are implemented, the impacts remain potentially significant.

Predatory Fish Control

Predatory fish control could affect agriculture and forest resources, primarily during construction activities related to the removal of structures (see *Common Construction*).

Capture methods for predation control do not involve construction and therefore would not result in any of the construction impacts on agriculture and forest resources discussed in *Common Construction*. Predatory fish control, both passive and active control and removal of structures, would not be expected to be located on lands used for agriculture or forestry but within existing river channels or immediately adjacent to them.

Invasive Aquatic Vegetation Control

Invasive aquatic vegetation control does not involve construction and therefore would not result in any of the construction impacts on agriculture discussed in *Common Construction*. Activities involving clearing of invasive aquatic vegetation would not occur on agricultural or forested lands and could benefit agricultural resources because these plants can interfere with irrigation intakes.

Invasive aquatic vegetation control is not expected to be located on lands used for agriculture or forestry but within or adjacent to existing water channels. Therefore, these projects would not result in conversion of farmland to nonagricultural use, conflict with existing zoning for agriculture use or a Williamson Act contract, conflict with existing zoning of forest land, or conversion of forest land to nonforest use.

Invasive aquatic vegetation control projects that occur in the vicinity of agricultural lands could result in some incidental impacts on those agricultural lands. For example, if herbicides are used for aquatic invasive species control, these practices could affect crops if herbicides used for invasive aquatic vegetation enter irrigation water or drift onto nearby crops. Controlling invasive aquatic vegetation could also clog agricultural irrigation intakes if application of herbicides, handpicking, or herding cause plant fragments to break loose. These potential impacts would likely be temporary and incidental. Implementation of Mitigation Measure 7.21 MM-AG-a–e: D would reduce this impact to less than significant by maximizing containment of plant fragments, collecting those fragments that remain following physical/mechanical treatments, and ensuring that the application of herbicides is done is such a way as to avoid or minimize drift and impacts on water quality. Until mitigation measures are implemented, the impacts remain potentially significant.

Mitigation Measures

7.21 MM-AG-a–e: Mitigate impacts on agriculture and forest resources

Entities or agencies designing and/or approving habitat restoration or other ecosystem projects will implement or require the following.

A. Construction AG Mitigation Measures (CMM-AG-a–e)

1. **Project Siting and Design:** Design and site projects to avoid or minimize impacts on farmland.
    i. Design project to avoid or minimize construction-related impacts on agriculture, particularly Prime Farmland, Unique Farmland, and Farmland of Statewide Importance.
    ii. Establish buffer areas between project construction zones and adjacent agricultural land that are sufficient to protect and maintain land capability and agricultural operation flexibility.
    iii. Redesign project features to minimize fragmenting or isolating farmland. Where a project involves acquiring land or easements, ensure that the remaining nonproject area is of a size sufficient to allow economically viable farming operations.
    iv. Site and/or design project to avoid land protected by agricultural zoning or a Williamson Act contract. Project proponents will take into account agricultural value when selecting a project site, preferring unprotected sites to protected sites and lower value sites (as quantified by the California Agricultural Land Evaluation and Site Assessment [LESA] model) to higher value and Williamson Act–protected lands.
2. **Invasive Species Control Measures:** Manage project construction activities to minimize the introduction of invasive species or weeds that may affect agricultural production on adjacent agricultural land. (See also CMM-BIO-a–f: 8.)
3. **Postconstruction Best Management Practices:** Following the completion of construction activities on agricultural land, implement postconstruction BMPs to return the land to preproject conditions. These measures may include but not necessarily be limited to the following.
    i. Reconnect utilities or infrastructure that serve agriculture uses, as necessary, if these facilities are disturbed by project construction. If a project temporarily or permanently cuts off roadway access or removes utility lines, irrigation features, or other infrastructure, the project proponents will be responsible for restoring access as necessary to ensure that economically viable farming operations are not interrupted.
    ii. Where underground infrastructure has been installed as part of the project, backfill to preproject contours to allow agricultural use to resume.
4. **Protect Agricultural Soils:** To protect agricultural soils, the following BMPs will be implemented.
    i. Protect exposed agricultural soils with mulches, geotextiles, and vegetative ground covers during and after project construction to minimize soil loss.

ii. Depending on the thickness of the topsoil, topsoil may be salvaged from construction work areas, stockpiled, and then applied over the surface of spoil and borrow areas or other areas temporarily disturbed during construction (e.g., due to trenching) to the maximum extent practicable.

iii. For staging areas and similar areas in which topsoil will not be excavated or overcovered, soil will be decompacted or otherwise remediated after demobilization.

5. **Agricultural Mitigation Consistent with County and Local Jurisdiction Requirements:** To offset the conversion of agricultural land to nonagricultural uses, comply with applicable county and local jurisdiction requirements, which may include, for example, purchase of a conservation easement on agricultural land at least equal to the number of acres converted to nonagricultural use (1:1 ratio) or the payment of the appropriate agricultural mitigation fee for converted acreages of agricultural land.

6. **Avoid or Minimize Impacts on Forest and Timberland:**

i. Design the construction plan to avoid or minimize construction-related impacts on lands zoned for timber production and on forest land. Where construction occurs on or near forest land, avoid and preserve on-site trees.

ii. Restrict ground-disturbing mechanical operations around forest land and timberland.

iii. Develop and implement a reforestation plan in the event that forest land conversion cannot be avoided during construction. Preserve in perpetuity other forest land through a conservation easement or by acquiring lands or contributing funds to a land trust or other agency (at a ratio of 1:1 to compensate for permanent loss). If there is an existing forest land mitigation program for construction-related impacts on forest land, comply with that program to the extent required by law.

iv. If applicable, obtain and comply with a timberland conversion permit from the California Department of Forestry and Fire Protection (CAL FIRE).

B. Physical Habitat Restoration AG Mitigation Measures

1. **Project Siting and Design:** Design and site projects to avoid or minimize impacts on agricultural lands (Prime Farmland, Unique Farmland, and Farmland of Statewide Importance).

   Focus habitat restoration efforts on restoring existing habitat or developing new habitat on public lands before converting agricultural land. If public lands are not available for restoration efforts, focus restoration efforts on acquiring lands that can meet ecosystem restoration goals from willing sellers where at least part of the reason to sell is an economic hardship (for example, land that floods frequently or where levees are too expensive to maintain).

2. **Agricultural Land Easements:** Obtain easements on existing agricultural land for minor changes in agricultural practices (such as flooding rice fields after harvest) that would increase the value of the agricultural crop(s) to wildlife.

3. **Compatible Agricultural Practices:** Include provisions in floodplain habitat restoration efforts for compatible agricultural practices.

4. **Monitor for Seepage:** Agricultural land areas that may be subject to seepage caused by habitat restoration will be monitored and evaluated on a site-specific basis prior to construction to identify baseline groundwater conditions. Once construction is complete, monitoring in these areas will continue. Monitoring will include placement of piezometers and/or periodic field checks to assess local groundwater levels and salinity and associated impacts on agricultural field conditions. In areas where it is determined that seepage impacts on adjacent parcels will occur, potentially feasible additional mitigation measures will be developed in consultation with affected landowners. These measures may include installation or improvement of subsurface agricultural drainage or an equivalent drainage measure, as well as pumping to provide suitable field conditions (groundwater levels near preproject levels). Such measures will ensure that the drainage characteristics of affected areas will be maintained to the level existing prior to project construction.
5. **Consistency with Local and Regional Land Use Plans:** Implement features that are consistent with local and regional land use plans. Involve all affected parties, especially landowners and local communities, in developing appropriate configurations to achieve the optimal balance between resource impacts and benefits.
6. **Invasive Aquatic Vegetation Control BIO Mitigation Measures** (7.21 MM-BIO-a–f: G2): Control the application of herbicides.

C. Dam Removal AG Mitigation Measure

1. **Dam Removal WQ Mitigation Measures** (7.21 MM-WQ-a–j: G), including project planning, regulatory compliance, and a sediment management and monitoring plan, to ensure that the project includes any necessary special accommodations for existing legal users of water and other infrastructure.

D. Invasive Aquatic Vegetation Control AG Mitigation Measure

1. **Invasive Aquatic Vegetation Control BIO Mitigation Measures:** Implement chemical-control methods (7.21 MM-BIO-a–f: G2) to maximize containment of plant fragments and to ensure that herbicide applications do not inadvertently affect irrigation water or drift to agricultural crops.

7.21.2.3 Air Quality

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
III. Air Quality				
Where available, the significance criteria established by the applicable air quality management or air pollution control district may be relied upon to make the following determinations. Would the project:				
a. Conflict with or obstruct implementation of the applicable air quality plan	☒	☐	☐	☐

		Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
b.	Violate any air quality standard or contribute substantially to an existing or projected air quality violation	☒	☐	☐	☐
c.	Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)	☒	☐	☐	☐
d.	Expose sensitive receptors to substantial pollutant concentrations	☒	☐	☐	☐
e.	Create objectionable odors affecting a substantial number of people	☒	☐	☐	☐

Section 7.5.2, *Environmental Setting*, describes the air quality conditions and relevant regulatory setting, and additional regulatory setting is described in Appendix E, *Regulatory Framework for Construction Projects*.

Common Construction

Habitat restoration and other ecosystem projects could affect air quality through construction actions that generate fugitive dust, as well as emissions from fuel combustion in heavy equipment. Short-term air pollutant emissions associated with construction activities could conflict with or obstruct implementation of the applicable air quality plan, violate air quality standards or contribute substantially to an existing or projected air quality violation, result in a cumulatively considerable net increase of any criteria pollutant, and expose sensitive receptors to substantial pollutant concentrations. Exposure of sensitive receptors (e.g., residences, hospitals, schools) to air pollutants could occur as a result of temporary construction activities and fugitive dust emissions from ground disturbance. Construction activity that includes blasting can generate substantial particulate emissions due to fugitive dust. Many of the emissions-generating activities would likely occur in or adjacent to surface waters, where there is a lower probability that sensitive receptors would be in proximity to construction or maintenance activities. If criteria pollutant standards are exceeded during construction and sensitive receptors are in proximity, impacts would be potentially significant.

Construction activities can inadvertently disperse contaminants into the environment. In areas where *Coccidioides* fungus (responsible for Valley fever) is endemic, disturbance of soils containing *Coccidioides* spores may expose workers and people adjacent to the construction site to these fungal spores in fugitive dust. Asbestos may be found in existing structures that were built with asbestos-containing products (e.g., insulation, flooring materials, cement). Asbestos also occurs naturally in certain rock types (e.g., serpentinites) or soil (^ATSDR 2015). Inhalation of airborne asbestos fibers is the primary way that people are exposed, and this can result in serious respiratory health issues. Accordingly, demolition of existing structures, substantial disturbance of asbestos-containing soil, or

crushing asbestos-containing rock during construction could adversely affect construction workers or others in the vicinity of the construction activity.

Air quality impacts associated with common construction activities would be potentially significant and can be avoided or reduced by implementation of Mitigation Measure 7.21 MM-AQ-a–e: A (CMM-AQ-a–e). Emissions would need to comply with the local air district regulations and established thresholds. Mitigation can include emissions and dust control measures that are required under local air district rules and regulations. In addition, as discussed in more detail below, implementation of Mitigation Measures 7.21 MM-AQ-a–e: B and C can avoid or reduce additional potentially significant air quality impacts associated with physical habitat restoration and other complementary ecosystem projects. If mitigation measures are implemented, most, if not all, impacts (including construction impacts) can be mitigated to less than significant. Because the precise location and magnitude of activities required for habitat restoration and other ecosystem projects are not known, air quality impacts cannot be determined with certainty at this time. Therefore, potential air quality impacts remain potentially significant.

Construction activities generally do not create objectionable odors affecting a substantial number of people. Odors may be generated during construction through exhaust emissions from diesel equipment, for example, or from project-specific activities, such as laying asphalt as part of a road construction/renovation project. However, construction-related emissions from equipment would not be localized long-term (i.e., remain in one location for long periods of time), and these emissions would be intermittent over the course of construction. Generally, construction-related odors would be temporary and would likely dissipate from the source relatively rapidly.

Common Operation and Maintenance

Operation and maintenance of habitat restoration and other ecosystem projects may include occasional vehicular trips for periodic inspections, monitoring, and evaluation, including operation of maintenance equipment and trucks on unpaved roads. Operations emissions would be substantially lower than construction emissions. Emissions from vehicle use during project operations would not be expected to prevent compliance with regulations or exceed thresholds established by the local air quality district, conflict with or obstruct implementation of the applicable air quality plan, violate any air quality standard or contribute substantially to an existing or projected air quality violation, or result in a cumulatively considerable net increase of any criteria pollutant, because few to no staff would likely be needed on site regularly. Maintenance of habitat restoration sites and sites where large dam removal has occurred may require more staff or more regular maintenance in the short term relative to other ecosystem projects. For example, regular maintenance at habitat restoration sites may be required in the short term to ensure that newly planted vegetation is establishing successfully; however, in the long term, it is expected that site maintenance requirements would be substantially reduced, and thus fewer vehicle trips would be required. Most habitat restoration and other ecosystem projects would not be expected to require the use of power for operations and maintenance. If a project requires power, such as for lighting of interpretive facilities or for fish screens with mechanical screen-cleaning systems, that power would be supplied by facilities that currently provide power or potentially by solar power. Existing facilities operate under permits that provide for meeting current emission standards by limiting emissions and/or offsetting emissions by using pollution credit.

Physical Habitat Restoration

Physical habitat restoration would likely result in emissions associated with the use of heavy equipment, haul trucks, and construction worker vehicle trips, as well as fugitive dust emissions from ground disturbance (discussed in *Common Construction*).

Some habitat restoration projects may result in conversion of agricultural lands, which would have the potential to provide some air quality benefits. The baseline of active agricultural operations and associated emissions occurs on a permanent basis because crop burning, soil tillage, crop harvesting, and pesticide and herbicide application occur seasonally, depending on the type of crop, over the long-term lifespan of the cropland. Air quality may therefore benefit somewhat from reductions in smoke, fugitive dust, and equipment exhaust emissions; and it is anticipated that the limited amount of potential fugitive dust emissions associated with unvegetated land would be outweighed by the reduction in potential long-term emissions associated with reduced agricultural activities.

Most habitat restoration projects would be unlikely to create objectionable odors affecting a substantial number of people as restoration sites would be located in open-land areas away from urban population centers. Some habitat restoration projects could create objectionable odors associated with wetlands. The shallow water or stagnant water commonly found in wetlands can lead to anaerobic decomposition of vegetation (i.e., the decay of plant matter in the absence of oxygen), which can release odorous compounds, such as ammonia and hydrogen sulfide. Shallow or stagnant water can also encourage the growth of algae, which can further exacerbate anaerobic conditions. These odors could affect nearby land uses, such as the closest recreational facilities and residential uses. These odor impacts have the potential to cause nearby recreationists and residents to reduce outdoor activity or take other actions to avoid detection of the odors (e.g., keep windows closed). This impact would be potentially significant. In addition to common construction mitigation measures, implementation of Mitigation Measure 7.21 MM-AQ-a–e: B would reduce odor-related impacts to less than significant by requiring a project-specific odor management plan that includes implementation of odor control measures and protocols for monitoring, reporting, and responding to odor events. Until mitigation measures are implemented, the impacts remain potentially significant.

Fish Passage Improvements

Construction of fish passage improvements would likely result in emissions associated with construction equipment and construction worker vehicle trips, as well as fugitive dust emissions from ground disturbance (discussed in *Common Construction*). In addition to construction impacts, TCDs could result in objectionable odors, such as from hydrogen sulfide, from an increase in the quantity of cool water pulled from deeper areas of a reservoir. At some reservoirs, hydrogen sulfide odors are a result of sulfates at the water/sediment level of the lake being reduced to sulfides under low dissolved oxygen concentrations and the release of hydrogen sulfide into the air as water is released below the dam. These odors may be noticeable to recreational users or other persons immediately downstream of the dam outlet. However, objectionable odors would not likely affect a large area or a substantial number of people, as odors would likely dissipate quickly as the water is aerated. Impacts would be less than significant.

Dam removal could generate some additional odor because these projects would drain existing reservoirs and expose the underlying sediments. Because reservoir sediment deposits can contain

unoxidized organic matter from algae detritus, earthy or hydrogen sulfide odors may be evident during or immediately following reservoir drawdown while the exposed sediments dry out and new vegetation is established. These odors could temporarily affect nearby land uses, such as the closest recreational facilities and residential uses. The odors have the potential to cause nearby recreationists and residents to reduce outdoor activity or take other actions to avoid detection of the odors (e.g., keep windows closed). The magnitude of impact would depend on receptors' proximity to the reservoirs and wind patterns during and immediately following reservoir drawdown. Within a relatively short amount of time (i.e., days to a few weeks), the sediment surfaces would oxidize as they are exposed to air, and the organic compounds causing the odors would be broken down.

Construction/demolition activities associated with dam removal projects could result in substantial particulate emissions due to fugitive dust generated from blasting activities and from removal and placement of excavated materials (cut-and-fill activities). Depending on the volume of rubble and excavated material (soil spoils) hauled away from a project site, fugitive dust could be spread off site via haul trucks as well. In addition, following drawdown of the reservoir and prior to the establishment of ground vegetation, there is also the potential for windblown dust to be generated from exposed sediment deposits remaining in the reservoir (i.e., from the desiccated lakebed). These impacts would be potentially significant. In addition to common construction mitigation measures, implementation of Mitigation Measures 7.21 MM-AQ-a–e: B and C would help minimize or avoid impacts on air quality associated with dam removal projects. Measures include the development of an odor management plan and a site-specific dust control plan.

Dam removal could reduce power production if the project involved dismantling hydropower facilities. This reduction in generated power would be made up by other existing powerhouses connected to the power grid, which could result in increased criteria pollutant emissions at other power facilities. However, these facilities operate under stringent air quality regulations and permitting processes pursuant to the federal Clean Air Act (42 U.S.C. § 7401 et seq.) and to California statutes and regulations. If additional emissions are generated as a result of a loss of hydropower, these emissions would be generated by facilities that are permitted to do so. The permit requirements would ensure that emissions remain consistent with existing air quality plans because there would be no net increase due to the facilities' permit requirements. If the reduction in power were substantial enough to require construction and operation of a new powerhouse, the new facility would be subject to a new source permitting process and would likely cause less emissions than the existing powerhouse. Air quality impacts may result, depending on the method of power generation used to replace lost hydropower. This impact would be less than significant. See Section 7.21.2.6, *Energy and Greenhouse Gas Emissions*, for additional discussion on energy and GHG emissions.

Predatory Fish Control

Predatory fish control activities requiring the removal or modification of human-made structures would likely involve the use of construction equipment and construction worker truck trips, as well as fugitive dust emissions from ground disturbance (discussed in *Common Construction*).

Capture methods for predation control do not involve construction and therefore would not result in any of the construction impacts on air quality. However, direct removal methods of predatory fish control would likely result in air emissions related to worker vehicle trips. Given the limited number of vehicles and vehicle trips that would be required, these emissions would likely be within established thresholds.

Invasive Aquatic Vegetation Control

Invasive aquatic vegetation control does not involve construction and therefore would not result in any of the construction impacts on air quality discussed in *Common Construction*. Invasive aquatic vegetation control would likely result in emissions associated with chemical trucks, mechanical harvesters, haul trucks, and/or boats, as well as worker vehicle trips. The magnitude and duration of invasive aquatic vegetation control activities would affect the amount of emissions and related air pollutant concentrations occurring at any one time. It is anticipated that, given the type of equipment that would be used and low level of activity associated with removal of invasive vegetation, emissions would not likely prevent compliance with regulations or exceed thresholds established by an air district. An objectionable odor could be present in the immediate vicinity of herbicide spraying for a brief time after application; however, these odors would be temporary and would be unlikely to affect a substantial number of people.

Mitigation Measures

7.21 MM-AQ-a–e: Mitigate impacts on air quality

Entities or agencies designing and/or approving habitat restoration or other ecosystem projects will implement or require the following.

A. Construction AQ Mitigation Measures (CMM-AQ-a–e)

1. **Regulatory Compliance:**
    i. Comply with all applicable California Air Resources Board (CARB) regulations and standards.
    ii. Adhere to all applicable air district rules and regulations with jurisdiction in the project area.
    iii. Comply with all applicable general plan policies and ordinances relating to air quality.
2. **Emission Reduction Measures:**
    i. Locate staging areas at least 1,000 feet away from sensitive receptors.
    ii. Minimize idling time from both on-road and off-road diesel-powered equipment either by shutting equipment off when not in use or reducing the time of idling to 5 minutes (Cal. Code Regs., tit. 13, §2485). Provide clear signage that posts this requirement for workers at the entrances to the site.
    iii. Maintain all construction equipment in proper working condition according to manufacturer's specifications. The equipment must be checked by a certified mechanic and determined to be running in proper condition before it is operated.
    iv. Use equipment and vehicles that comply with the CARB requirements and emissions standards for on-road and off-road fleets and engines.
    v. Install diesel particulate filters and utilize diesel oxidation catalysts on off-road equipment and vehicles.

vi. Discontinue all construction activities during first-stage smog alerts and first-stage ozone alerts and/or curtail construction during periods of high ambient pollutant concentrations.

vii. Produce concrete on site if determined to be less emissive than transporting ready mix.

viii. Lead agencies proposing projects will require their contractors, as a condition of contract, to reduce construction-related fugitive reactive organic gas emissions by ensuring that low–volatile organic compound (VOC) coatings are used during construction. The project applicant will submit evidence of the use of low-VOC coatings prior to the start of construction.

ix. Use locally sourced or recycled materials for construction materials, to the greatest extent feasible.

x. Implement reasonably available emission-control technology (i.e., U.S. Environmental Protection Agency [USEPA] Tier 4), including equipment and vehicles with zero-emission or lower-emission engines.

xi. Use low/zero carbon or alternative fuels, such as B20 biodiesel or renewable diesel.

3. **Dust Control Measures:**

i. Water exposed soil surfaces (e.g., access roads, staging areas) with adequate frequency for continued moist soil. Do not overwater to the extent that sediment flows off the site.

ii. Cover exposed stockpiles (e.g., dirt, sand) and/or water or stabilize them with nontoxic soil binders.

iii. Cover all trucks being utilized for transport and disposal of excavated material immediately after loading and throughout the transportation and disposal of excavated material. The cover must be installed in such a way to prevent wind from entering over the leading edge of the trailer rim.

iv. Install a rock pad or a construction mud mat at the project site's exit/entrance to protect streets and public rights-of-way. Design mats and rock pads to support the heaviest and widest equipment entering the project site.

v. Wash off all trucks and equipment, including their tires, prior to leaving the site.

vi. Use wet power vacuum street sweepers to remove any visible trackout mud or dirt on adjacent public roads at least once a day. Avoid use of dry power sweeping.

vii. Limit vehicle speeds on unpaved roads to 15 miles per hour.

viii. Complete all roadways, driveways, sidewalks, and parking lots to be paved as soon as possible. In addition, lay building pads as soon as possible after grading unless seeding or soil binders are used.

ix. Suspend excavation and grading activity when winds (instantaneous gusts) exceed 20 miles per hour.

x. Initiate landscaping and revegetation as soon as construction tasks allow in order to minimize wind erosion.

xi. Post a publicly visible sign with the telephone number and person to contact at the lead agency regarding dust complaints. This person will respond and take corrective action within 48 hours. The local air district's or districts' phone number(s) will also be posted in a visible location.

xii. Implement erosion control, sedimentation control, and soil stabilization measures (CMM-WQ-a–j: 3) to prevent silt runoff to public roadways from sites with a slope greater than 1 percent.

4. **Valley Fever Control Measures:**

i. Dust Control Measures (CMM-AQ-a–e: 3)

ii. Erosion Control, Sedimentation Control, and Soil Stabilization Measures (CMM-WQ-a–j: 3)

iii. Valley Fever Management Plan: In areas endemic for *Coccidioides* fungus, prior to starting construction, the project applicant will consult with the County Health Department to develop a Valley fever management plan that includes specific measures to reduce the potential for exposure to Valley fever. The Valley fever management plan will include a program to evaluate the potential for exposure to Valley fever from construction activities and to identify appropriate dust management and safety procedures that will be implemented, as needed, to minimize personnel and public exposure to potential Valley fever–containing dust. Measures in the Valley fever management plan, which will be implemented as applicable, may include the following.

- Provide high efficiency particulate air–filtered air-conditioned enclosed cabs on heavy equipment, and train workers on proper use of cabs, such as turning on air conditioning prior to using the equipment.
- Require National Institute for Occupational Safety and Health–approved half-face respirators equipped with N-100 or P-100 filters to be used during any surface-disturbing activities if determined to be necessary based on a job hazard analysis. Require employees to wear respirators when working near earth-moving machinery if determined to be warranted after conducting a job hazard analysis.
- To the maximum extent practicable, phase work efforts to ensure that site preparation work involving significant surface disturbance (i.e., grading, filling, trenching) and work that does not involve significant surface disturbance are not collocated so that dust potentially generated by high winds coupled with disturbed soil instability will not affect workers or other receptors.
- Workers that are required to use respirators as determined by a job hazard analysis will be medically evaluated, fit-tested, and properly trained on the use of the respirators, and a respiratory protection program will be implemented in accordance with the applicable California Division of Occupational Safety and Health (Cal/OSHA) Respiratory Protection Standard (Cal. Code Regs., tit. 8, § 5144). To the maximum extent practicable, ensure that areas involving significant surface disturbance are stabilized as soon as ground-disturbing activities are completed.

5. **Asbestos Control Measures:**

    i. Comply with the Asbestos National Emission Standards for Hazardous Air Pollutants (40 C.F.R. Part 61, Subpart M) for asbestos removal and disposal for demolitions operations.

    ii. When performing construction activities in areas where naturally occurring asbestos or serpentine or ultramafic rock is present, the lead agency will coordinate with the applicable air pollution control or air pollution management district and implement the appropriate dust abatement measures according to the area of potential disturbance and the type of construction activity (e.g., road construction and maintenance, construction and grading operations) (Cal. Code Regs., tit. 17, § 93105).

6. **Health Risk Assessment:** Lead agencies proposing construction projects within 1,000 feet of existing sensitive receptors will prepare a site-specific construction and operational health risk assessment (HRA). If the HRA demonstrates that the health risk exposures for adjacent receptors will be less than applicable thresholds, then additional mitigation would be unnecessary. However, if the HRA demonstrates that health risks would exceed applicable project-level thresholds, additional feasible on- and off-site mitigation will be analyzed by the applicant to reduce risks, to the greatest extent practicable.

7. **Minimize Construction-Related Traffic and Equipment Use:** Construction-related traffic and large equipment use will be minimized. The following measures will be implemented toward this goal to reduce construction-related emissions.

    i. Reduce the number of large pieces of equipment operating simultaneously during peak construction periods.

    ii. Schedule vendor and haul truck trips to occur during nonpeak hours.

    iii. Establish dedicated construction parking areas to encourage carpooling and efficiently accommodate construction vehicles.

    iv. Identify alternative routes to reduce congestion during peak activities.

    v. Develop a project-specific ride share program to encourage carpools, shuttle vans, transit passes, and/or secure bicycle parking for construction worker commutes.

    vi. Implement measures to reduce vehicle trips.

8. **Blasting Operations and Safety Plan** (CMM-GEO-a–e: 7) for fugitive dust control.

B. Odor Control Measure: Develop and implement a project-specific odor management plan to reduce odor-related impacts. Incorporate odor control measures into this plan, including protocols for monitoring, reporting, and responding to odor events, as well as odor control technologies and BMPs to minimize odor releases, such as vegetation management and sediment removal at wetland restoration sites.

C. Dam Removal AQ Mitigation Measures

1. **Site-Specific Dust Control Plan:** Develop and implement a site-specific dust control plan to minimize generation and duration of dust emissions associated with demolition of dams and appurtenant facilities (including blasting) and desiccation and exposure of

the former lakebed sediment. Dust control measures will be developed in compliance with applicable air pollution control regulations.

2. **Revegetation Plan** (7.21 MM-BIO-a–f: E3)
3. **Odor Control Measures** (7.21 MM-AQ-a–e: B)

7.21.2.4 Biological Resources

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
IV. Biological Resources				
Would the project:				
a. Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service	☒	☐	☐	☐
b. Have a substantial adverse effect on any riparian or other sensitive natural community identified in local or regional plans, policies, regulations or by the California Department of Fish and Game or U.S. Fish and Wildlife Service	☒	☐	☐	☐
c. Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal, pool, coastal, etc.) through direct removal, filling, hydrological interruptions, or other means	☒	☐	☐	☐
d. Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites	☒	☐	☐	☐
e. Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance	☒	☐	☐	☐
f. Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan	☒	☐	☐	☐

Section 7.6.1.2, *Environmental Setting*, and Section 7.6.1.3, *Regulatory Setting* describe the terrestrial biological resources environmental and regulatory settings, respectively. Section 7.6.2.2, *Environmental Setting*, and Section 7.6.2.3, *Regulatory Setting* describe the aquatic biological resources environmental and regulatory settings, respectively. Additional regulatory setting for biological resources is described in Appendix E, *Regulatory Framework for Construction Projects*.

Common Construction

Habitat restoration and other ecosystem projects would be located in or near waterways, wetlands, floodplains, and riparian areas where sensitive natural communities, habitat for special-status species, and wildlife corridors have a high potential to occur. Constructing a project in an area with a sensitive natural community, habitat for special-status species, or wetlands could have a substantial adverse effect on a candidate, sensitive, or special-status species; a riparian or other sensitive natural community; or federally protected wetlands. Locating a project in a wildlife corridor or waterway could interfere with the movement of native resident or migratory fish or wildlife species. In addition, depending on the locations, projects could conflict with local policies or ordinances protecting biological resources and provisions of an adopted habitat conservation plan (HCP), natural community conservation plan (NCCP), or other approved plan.

Construction activities could result in direct mortality or harm to special-status amphibian, reptile, mammal, and bird species or associated habitat. Construction activities that may affect habitat, result in direct contact to individuals, or result in indirect impacts on individuals include but would not be limited to demolition of structures; road and bridge upgrades; culvert improvements; digging holes or trenches where wildlife may be trapped; and movement of heavy machinery through construction areas, in staging areas, and along haul roads where these species could occur. Bird and bat roosts could also be disturbed through construction noise, physical vibration, and direct removal of structures (e.g., dams) that provide roosting habitat. Construction activities could result in direct mortality or damage to special-status plant species, or indirect damage by degrading special-status plant habitat or rare natural communities. Construction activities could require heavy machinery to move through construction areas, in staging areas, and along haul roads where these species could occur. Contact with construction vehicles could result in direct mortality or damage to species or their habitats. Special-status plants and rare natural communities may be present in the areas where construction activities may be performed. Without surveys to document these species and habitats and measures to adequately protect them, they could be removed and/or habitat could be degraded. Construction activities may introduce or spread invasive vegetative species through the movement of topsoil, fill, gravel, and construction equipment.

Construction located in or near river reaches is expected to have high potential for impacts on special-status plants and animal species, associated habitat, and supporting biological resources. The surrounding habitat on riverbanks may include riparian vegetation and/or wetlands. Riparian vegetation may have to be removed to facilitate heavy equipment movement, and wetlands may also be disturbed during construction activities. Construction activities in or near waterways could release sediment and possibly hazardous materials (e.g., oil or gas from construction equipment) into waterbodies, affecting water quality. Release of sediment can bury macroinvertebrates, which are prey for fish and other aquatic species; coat or bury eggs from frogs and fish; and fill in pool habitat. Water quality impairments, such as increased turbidity, can negatively affect aquatic species and habitats.

Construction in or near the water can injure or kill fish. For example, if pile driving is needed to construct a cofferdam, it can create noise and vibration impacts harmful to fish. Stranding within cofferdams can occur if special-status fish species become trapped inside a dewatered area. Fish rescue in the dewatered area (seining, electrofishing) could injure or kill fish. Fish may also become entrained into pumps used during dewatering. Other construction equipment can create noise impacts harmful to fish. Construction activity that involves blasting could injure or kill fish and

wildlife due to the release of concrete particles to surface waters, and ground vibrations and noise from blasting could disturb terrestrial wildlife and injure or kill fish.

The magnitude of construction impacts depends on the extent and duration of disturbance to existing habitat and species, and the extent of temporary and permanent habitat loss. Construction may result in temporary localized adverse effects on special-status plants, animals, and habitat; however, because activities would be temporary and relatively localized, construction would be unlikely to result in adverse population-level effects on any species.

Impacts on biological resources associated with common construction activities would be potentially significant and can be avoided or reduced by implementation of Mitigation Measure 7.21 MM-BIO-a–f: A (CMM-BIO-a–f). Mitigation can include seasonal work windows, preconstruction biological surveys, site design to avoid and minimize disruption to sensitive habitat, and invasive species control measures. In addition, discussed in more detail below, implementation of Mitigation Measures 7.21 MM-BIO-a–f: B–G can avoid or reduce additional impacts on biological resources associated with habitat restoration and other complementary ecosystem projects. If mitigation measures are implemented, most, if not all, impacts (including construction impacts) can be mitigated to less than significant. Because the precise location and magnitude of activities required for habitat restoration and other ecosystem projects are not known, impacts on biological resources cannot be determined with certainty at this time. Therefore, potential impacts on biological resources remain potentially significant.

Physical Habitat Restoration

Overall, habitat restoration projects would be expected to have beneficial long-term effects for sensitive aquatic and terrestrial species. Habitat restoration projects that complement the flow actions under the proposed Plan amendments would generally be expected to improve habitat conditions for native species such as Chinook salmon and steelhead. For example, functioning floodplains are important components of the aquatic ecosystem, providing abundant food and refugia, spawning grounds, and other critical habitat functions (^Jeffres et al. 2008; ^Sommer et al. 2001a, ^2001b; ^Li et al. 1994). The creation of floodplain and tidal shallow-water habitat is expected to provide high-quality floodplain rearing habitat, increase food availability, and increase growth rates for native fish. Restoration projects could also result in larger, more continuous areas of tidal, floodplain, and riparian habitat, which would also support the movement of native resident and migratory wildlife species. Once a restoration project is completed, wetlands would not be affected, and riparian vegetation would be enhanced. Projects would also improve the quality and extent of riparian habitat and wildlife access to habitat by removing invasive vegetation and substantially increasing the total riparian area. They would support a system that favors native species and self-maintaining habitat and increases the quality and extent of native riparian vegetation. Restoration of long stretches of riparian habitat would restore and enhance habitat for native or migratory corridor species. Overall, a beneficial effect on special-status fish species would be expected following restoration.

Physical habitat restoration projects could affect biological resources, primarily during construction (see *Common Construction*). In addition to construction impacts, riparian habitat could be lost when creating marsh and other habitat types, and large trees that provide nesting habitat could be killed by flooding required for marsh creation, which could have adverse impacts on migratory birds and conflict with applicable tree preservation policies or ordinances. Loss of riparian trees could affect special-status animal species, such as cavity-roosting bats and ringtails. Some habitat restoration

projects could change some sensitive habitats, such as nontidal perennial aquatic (open water) habitat and nontidal freshwater perennial emergent wetland habitat to tidal perennial aquatic and freshwater emergent wetlands. This potential change of habitat types could adversely affect some species and natural communities while benefiting others.

Some restoration projects could involve the conversion of agricultural land to native riparian and wetland communities. Overall, these actions would be expected to benefit native species, as well as riparian, wetland, and sensitive natural communities but could affect certain species that use agricultural lands for habitat.

A primary goal of floodplain restoration is to benefit juvenile salmonids by providing access to floodplain rearing habitat, which would increase food availability and production for juvenile fish and lead to increased fish growth and subsequent survival. However, if not properly designed, floodplain and other types of restoration could lead to fish stranding. Fish diverted onto the floodplain during high flows could be stranded if the floodplain drainage creates barriers, such as shallow puddles, and does not create flow back to the main channel.

The creation of freshwater wetland and floodplains could facilitate methylmercury production and the bioaccumulation of mercury in fish and other wildlife. The cycle of wetting and drying sediment and soil stimulates the methylation of mercury by sulfate-reducing bacteria and, to a lesser degree, by iron-reducing bacteria (Bigham et al. 2016). Studies indicate that effects related to mercury exposure in fish include hormonal and reproductive effects, liver necrosis, and altered predator avoidance behavior (Alpers et al. 2008). Floodplain restoration could also lead to increased predation on sensitive fish species that use shallow-water floodplain habitats because predatory fish and birds also use this habitat. Levee breaches can create areas of turbulence that can disorient small fish; predatory fish are known to congregate in these areas. Although the effects of increased predation would probably be offset by the benefits of floodplain inundation and shallow-water habitat, without proper design and management, shallow-water habitat could provide greater benefits to nonnative predatory fish and piscivorous birds than to native fish species.

In addition, project operations could contribute to the proliferation of invasive plant species, if not properly managed. This could result in the need to apply herbicides. Habitat restoration projects could create mosquito habitat, which could result in the application of pesticides (as described in Section 7.21.2.8, *Hazards and Hazardous Materials*). Certain herbicides and pesticides can be toxic to aquatic and/or terrestrial species (e.g., pyrethroids can be toxic to fish).

Gravel augmentation projects would change aquatic habitat by changing river width, river habitat types (riffles, pools, runs), and hydraulics, which could have beneficial long-term effects on Chinook salmon and steelhead spawning habitat. The addition of coarse sediment and various in-channel activities could affect spawning anadromous fish if instream work is not conducted within appropriate work windows (late-summer, low-flow period). Gravel augmentation could result in percussive impacts on incubating embryos and mortality through compression (crushing) of salmon and steelhead embryos and alevins. Placement of gravel could also cause water quality issues that affect redds and fish if the material used for gravel augmentation contained sand or silt, which can cause increased turbidity.

While overall it is expected that there would be a beneficial effect on special-status fish species following restoration, these impacts would be potentially significant. In addition to common construction mitigation measures, implementation of Mitigation Measures 7.21 MM-BIO-a–f: B and C would help minimize potential biological impacts associated with restoration projects to less than

significant and ensure that the restoration area is functioning as designed and benefiting fish and wildlife species once construction is complete. Physical habitat restoration projects must be developed and implemented in consultation with and are subject to approval from applicable state and federal fisheries agencies. Restoration projects must be designed in accordance with specific guidance documents (7.21 MM-BIO-a–f: B) and, where possible, implement ecological process-based recovery of landscape functions as articulated in A Delta Renewed (^SFEI-ASC 2016). Adaptive management, including the articulation of biological goals and monitoring, will be required for approval of restoration projects submitted as a part of any voluntary implementation plan under the proposed Plan amendments (7.21 MM-BIO-a–f: C2). Lead agencies can and should also implement Mitigation Measure 7.21 MM-BIO-a–f: C4, which identifies measures that should be taken to minimize potential impacts of fish stranding. Fish habitat and passage is a primary goal of such projects, and projects must be designed to take fish habitat drainage needs into account. Gravel augmentation should be timed to avoid affecting spawning spring- and fall-run Chinook salmon, coho salmon, steelhead, or their embryos once in the gravel (late-summer, low-flow conditions) (7.21 MM-BIO-a–f: C8). Restoration projects should be designed to incorporate anti-predation measures and avoid creating hotspots for predation (7.21 MM-BIO-a–f: C7). BMPs or mitigation measures, such as regularly monitoring for and treating invasive plant species, would address the proliferation of these invasive species. Water quality and hazard mitigation measures are cross-referenced to address biological impacts associated with mercury and pesticides (7.21 MM-BIO-a–f: C6). Until mitigation measures are implemented, the impacts remain potentially significant.

Fish Passage Improvements

Overall, fish passage improvement projects would provide a host of benefits for anadromous salmonids. Operation of new or improved fish screens would reduce impingement and entrainment at diversions. New or improved fishways would improve passage conditions for adult Chinook salmon and steelhead and provide greater access to upstream habitat. TCDs would be expected to support cooler temperatures downstream of dams and thereby create migration, spawning, and rearing conditions beneficial for Chinook salmon and steelhead and other native cold water species. Dam removal projects would be expected to benefit anadromous salmonids by restoring access to historical habitat that is currently blocked by impassible dams.

Fish passage improvement projects could affect biological resources, primarily during construction (see *Common Construction*). In addition to construction impacts, fish passage projects can obstruct and injure species without proper design. Operation of a TCD could draw down the depth of the thermocline in some years, which could cause an increase in the thickness of the warm epilimnion layer and therefore an increase in the reservoir area with warm water temperatures preferred by warm water species. For fish screens, velocities must be measured at the screen to ensure that they fall into the correct range for the fish species that may be present near the fish screen to prevent impingement. For fishway projects, large water level differences between pools, excessive flow velocities and turbulence, large eddies, and velocities and depths that are too low can create barriers for fish (^DWR 2013). In addition, fish are sensitive to other environmental factors, such as the level of dissolved oxygen, temperature, noise, light, and odor, which can negatively affect migration. This applies particularly if the quality of the water feeding the fishway is different than that passing across the dam. Fishways and dam removal can introduce special-status species to inhospitable habitat upstream and/or create conditions to allow invasive species upstream that were previously blocked. Fishways primarily designed for salmonids can be impediments to passage of other aquatic

species, if they do not have adequate surfaces for attachment, velocities are too high, or there are inadequate places for resting.

These impacts would be potentially significant. In addition to common construction mitigation measures, implementation of Mitigation Measures 7.21 MM-BIO-a–f: D and E would help avoid or reduce potential biological impacts associated with fish passage projects to less than significant and ensure that the project is functioning as designed and benefiting fish and wildlife species once construction is complete. Fish passage projects must be developed in consultation with NMFS, USFWS, and CDFW in accordance with established design, operational, and maintenance criteria and guidelines (e.g., NMFS 2011). Fishway projects should be designed to avoid creation of predator hotspots and avoid introducing invasive species upstream of the barrier. TCDs should be designed to ensure sufficient temperature and dissolved oxygen conditions to support special-status species above and below the reservoir. Fish passage projects submitted as part of compliance with the cold water habitat objective are subject to approval by the State Water Board and must be integrated into the long-term operations plan. Until mitigation measures are implemented, the impacts remain potentially significant.

Dam removal projects can range from relatively small impoundments (e.g., diversion dams) to large-scale construction and removal of larger structures (e.g., reservoirs). Small dams have a relatively small volume of sediment available for release (relevant to the size of the stream channel). When released by storm flows, this sediment would have minimal effects on downstream habitat. The removal of large dams would be likely to result in a more substantial release of sediment to areas downstream. If reservoir sediment is not removed or stabilized prior to dam removal, fine-grained sediment can be resuspended and cause turbidity and sedimentation downstream, which could affect downstream spawning areas. Suspended sediment can adversely affect fish and invertebrate species in multiple ways, including direct lethal impacts or sublethal effects on physiology (e.g., gill trauma, osmoregulation, reproduction) and behavior (e.g., avoidance, foraging, predation) (Kjelland et al. 2015). Elevated suspended sediment concentrations resulting from the release of sediment stored behind dams also has the potential to adversely affect or cause mortality of sensitive life stages of other species, such as amphibians, reptiles, and benthic macroinvertebrates occurring downstream of dam removal sites. High levels of sediment and turbidity affect aquatic ecosystems by reducing photosynthetic activity, reducing food availability, burying habitat, and directly harming organisms. Sediment-related effects would tend to diminish with distance downstream of the dam because of tributary inflows of water and sediment along with deposition along the channel. In addition, sediment impacts may diminish with time after dam removal because rates of reservoir sediment erosion diminish with time; however, coarse sediment initially released and deposited in the channel is likely to be subsequently reworked during future high flows (Reclamation 2017). If the sediments contain toxic pollutants (e.g., metals or bioaccumulative compounds, including legacy pesticides and methylmercury), the dam removal impacts can be more significant, at least in the short term. Following dam removal, once the sediment previously trapped behind the dam is redistributed downstream, natural sediment transport levels return; accordingly, constituents typically adsorbed to sediment (e.g., metals), are no longer found in excess, relative to the period before redistribution (^USEPA 2007).

When a reservoir is drawn down too quickly, supersaturation of nitrogen gas (water containing more dissolved gas than normal) can occur as the result of high water velocities in a stream, negatively affecting downstream organisms (e.g., fish lethality due to gas emboli in gills and tissues) (^USEPA 2007; ^American Rivers 2002).

Dam removal could also affect downstream riparian habitat due to sedimentation. In the short term, some impacts of sedimentation are possible on riparian habitat, but potential effects would not likely be substantial because vegetation growing within or along river channel margins is generally adapted to this scale of perturbation due to seasonal and interannual sedimentation dynamics typical of river systems. Moreover, sedimentation has the potential to create new surfaces for riparian plants to colonize depending on the sequence of water years following dam removal; under certain scenarios (e.g., wet water year followed by dry water years, whereby a lot of sediment is moved and vegetation has time to colonize), this may result in beneficial effects on riparian habitat—especially in areas where there is currently less sediment deposit due to upstream sediment trapping in reservoirs. In the long term, it is unlikely that permanent loss of riparian habitat due to erosion or sediment deposition would occur downstream of dam removal sites and new surfaces for colonization would be created. Dam-released sediment may temporarily deposit in pools and other slack water areas (e.g., eddies), at tributary confluences, and potentially along channel margins, where it could have a short-term negative impact on downstream wetland habitat due to temporary burial.

Dam removal would result in the change from reservoir to riverine habitat, which could alter habitat availability for aquatic species occurring within the reservoir. The impoundment behind a dam can provide a warm water habitat for fish, including predator species. Dam removal would provide a free-flowing cold water habitat that repopulates with cold water species found in riverine environments. This can result in improved water quality (including lower water temperatures and increased dissolved oxygen) and improved aquatic habitat diversity and availability. Nevertheless, reservoir removal would eliminate habitat availability for some aquatic species that currently occur within reservoirs. Terrestrial species, such as western pond turtle, that use shoreline habitat in some reservoirs could also be affected as a result of change in habitat availability. Waterbirds that currently use the reservoirs seasonally during migration and/or for overwintering would also be affected by the loss of this aquatic habitat for nesting, foraging, loafing (resting on the water), and roosting. The loss of aquatic reservoir habitat could also reduce foraging opportunities for fish-eating birds, including bald eagle, osprey, merganser, cormorant, egret, and heron. Changes in food availability for birds, such as dabbling ducks, that consume aquatic vegetation and invertebrates could occur. It is anticipated that birds (e.g., ducks, eagles, swifts) and bats would continue to use the river for foraging or would use other aquatic habitat. Existing wetland-dependent vegetation along the margins of the reservoirs could die out and transition to upland communities. Wetland species that occur near confluences are expected to conform to the riparian corridor width of the tributaries and over the subsequent years extend down the newly exposed mainstem river channel riparian corridor.

These impacts would be potentially significant. In addition to common construction mitigation measures and fish passage improvement mitigation measures (7.21 MM-BIO-a–f: D), implementation of Mitigation Measure 7.21 MM-BIO-a–f: E would help minimize or avoid impacts on biological resources associated with dam removal projects. Preproject planning requires consideration of a wide variety of technical, environmental, social, political, and economic issues, including environmental feasibility. A project design would feature restoration project goals and objectives, such as fish passage, connectivity, sustainability, restoration of natural riverine processes, and floodplain function and capacity, which would benefit species and incorporate special accommodations for terrestrial species (7.21 MM-BIO-a–f: E1). Mitigation would minimize potential impacts associated with construction-related in-channel disturbances. The required revegetation plan would provide for the recontouring and revegetation of the formerly inundated

area and any disturbed areas (7.21 MM-BIO-a–f: E3). A sediment management and monitoring plan would be required for dams that contain large quantities of sediment to reduce the impacts of the release of reservoir sediment on downstream aquatic resources (7.21 MM-WQ-a–j: G3). For some dam removal projects, a controlled drawdown of reservoir levels could enhance downstream transport of reservoir sediment in a metered fashion without the deleterious impacts of an instantaneous release. With an effective sediment management plan, potential impacts can be substantially reduced or avoided. In some cases, there may be benefits from the controlled release of reservoir sediments, such as the introduction of spawning gravel, wood, and nutrients for the restoration of downstream fish habitats. A project-specific analysis would be necessary to identify the preferred dam removal method for an individual project, and multiple approvals from various federal and state agencies would be required. Until mitigation measures are implemented, the impacts remain potentially significant.

While construction may result in temporary localized significant impacts on special-status species, plants, and habitat, fish passage activities are highly unlikely to result in population-level adverse effects for any species. Because fish passage projects are expected to produce beneficial results for special-status fish species, long-term operation of these projects would not conflict with local policies protecting biological resources or conflict with provisions of an adopted HCP or NCCP.

Operation of fish passage improvements would not interfere with the movement of native resident or migratory fish species and associated migratory corridors or impede the use of nursery sites, as these projects are intended to improve migration and nursery conditions.

Predatory Fish Control

Impacts of habitat modification projects for predatory fish control would be associated with construction activities, as discussed in *Common Construction*. Depending on the type of structure and location of the structure to be removed or modified, removal or modification of human-made structures could have temporary significant construction impacts (e.g., increases in turbidity) but beneficial long-term effects by allowing fish to access more and better habitat and decreasing predation. Removal or modification of structures is not expected to have a long-term substantial adverse effect, either directly or through habitat modifications, on special-status species.

Capture methods for predation control do not involve construction and therefore would not result in any of the construction impacts on biological resources discussed in *Common Construction*. Direct methods of predatory fish control, such as electrofishing, hook-and-line fishing, passive trapping (e.g., fyke nets, hoop nets, gill nets), and active capture methods (e.g., trawls, beach seines), could cause some turbidity and could startle native fish. Capture methods (e.g., hook-and-line fishing, traps, electrofishing) could also inadvertently ensnare or stun special-status fish species. The inadvertent capture (bycatch) of native fish relative to the capture of predatory fish is expected to be low but nevertheless would be potentially significant. Implementation of Mitigation Measure 7.21 MM-BIO-a–f: F, which includes appropriate authorization from state and federal fisheries agencies, can reduce impacts to less than significant. Until mitigation measures are implemented, the impacts remain potentially significant. Passive capture methods would not result in disturbance or removal of riparian vegetation or wetlands, as these methods would be implemented within existing river channels and would not temporarily or permanently remove habitat.

Invasive Aquatic Vegetation Control

Invasive aquatic vegetation control does not involve construction and therefore would not result in any of the construction impacts on biological resources discussed in *Common Construction*. Overall, removal of invasive aquatic plants, such as water hyacinth and Brazilian waterweed, would be expected to improve habitat for native aquatic species, including special-status species, by allowing regrowth of native plant species and improving water quality (e.g., increasing dissolved oxygen levels).

Physical control methods could affect species through direct contact with workers and equipment or if plant fragments are left to propagate. Chemical treatment of invasive aquatic vegetation could harm sensitive habitats, as well as plant and wildlife species, either by direct contact through overspray or by runoff, leaching, or plant uptake. The potential impact of the herbicide would depend on the concentration and toxicity of the herbicide; the application method; and the habitat, plant species, or wildlife species affected. Herbicides can kill aquatic plant species, and, if the plants are not removed, decompose and decrease dissolved oxygen in the water. It is possible that herbicide spraying could inadvertently extend beyond or below the targeted area and affect other plants. Herbicide exposure could also potentially adversely affect fish and wildlife. Although the risk is generally considered low, and in most cases the exposure would likely be far too diluted for negative effects to occur, the possibility of direct or concentrated exposure exists, particularly to amphibians, who are thought to be more sensitive to chemical exposure. These impacts would be potentially significant.

Implementation of Mitigation Measure 7.21 MM-BIO-a–f: G, which identifies mitigation measures for both physical and chemical control mechanisms, can reduce impacts to less than significant. AIPCP is the only program operating in the Delta that is authorized under the ESA to use herbicides and mechanical methods to control aquatic invasive species in the Delta. In addition, the NPDES Permit for Residual Aquatic Pesticide Discharges to Waters of the United States from Algae and Aquatic Weed Control Applications (Water Quality Order 2013-0002-DWQ) requires that discharges of residual algicides and aquatic herbicides must meet applicable water quality standards, and implementation of BMPs when applying aquatic algicides and aquatic herbicides must be detailed in an aquatic pesticide application plan. CDBW has found that impacts on other plants can be minimized with practices such as following herbicide label instructions, using the largest size spray droplets and the lowest spray pressure that would be effective, and not spraying in windy conditions. Only herbicides approved by the California Department of Pesticide Regulation (DPR) may be used, and herbicides must be applied by a licensed applicator in accordance with all directions and protective actions listed on the product label of the herbicide being applied. Timing restrictions, water quality measures such as monitoring turbidity and chemicals during removal, and other water quality BMPs must be followed. Until mitigation measures are implemented, the impacts remain potentially significant.

Given the dilution of herbicides and the limited area of treatment, the risk of foodweb effects from herbicides is likely low but could occur. Bioaccumulation occurs when compounds, such as persistent herbicides, accumulate in organisms faster than they are metabolized or excreted. Foodweb effects occur if herbicides adversely affect the food sources of fish, such as zooplankton. Herbicides used for invasive aquatic vegetation control are not known to bioaccumulate; and invasive plants, such as water hyacinth, do not provide habitat for zooplankton and displace native plants, such as pennywort, that do provide habitat. The potential for herbicide use to result in bioaccumulation and foodweb effects is considered low.

Mitigation Measures

7.21 MM-BIO-a–f: Mitigate impacts on biological resources

Entities or agencies designing and/or approving habitat restoration or other ecosystem projects will implement or require the following.

A. Construction BIO Mitigation Measures (CMM-BIO-a–f):

1. **Regulatory Compliance:** Develop a mitigation and management plan in coordination with fish and wildlife agencies to implement all appropriate measures as required by ESA section 7 consultation and to satisfy any other local, state, and federal requirements for achieving no net loss of wetlands, riparian habitat, or other critical habitat or take of wildlife species of concern. The plan should be submitted to the local city/county environmental planning department, USACE, USFWS, CDFW, NMFS, applicable state or regional water board (e.g., as part of a Clean Water Act section 401 (33 U.S.C. § 1341) water quality certification application), and/or other oversight agencies as applicable for approval prior to its implementation if an impact on special-status species population(s) is determined to occur based on the biological assessment and evaluation of the final project site and design.
2. **Preconstruction Surveys:** Conduct preconstruction surveys (by a qualified biologist) for special-status species in accordance with USFWS, NMFS, and CDFW (as applicable) survey methodologies and appropriate timing to determine presence and locations of any special-status species and their habitats and to avoid, minimize, or compensate for impacts on special-status species in coordination with the appropriate resource agencies; demarcate the boundaries of construction buffers around sensitive habitats; and submit survey reports for approval according to applicable federal, state, and local agency guidelines. This may include hiring a qualified biologist to identify riparian and other sensitive natural communities, including wetlands, and/or habitat for special-status plants and animals. As part of preconstruction surveys, evaluate potential impacts on trees or other biological resources protected by local policies and ordinances and observe any permit requirements associated with these policies and ordinances. In addition, conduct a delineation of affected aquatic resources areas to determine the acreage of loss in accordance with current USACE methods.
3. **Avoid, Minimize, or Compensate for Impacts on Sensitive Natural Communities:** The following measures will be implemented to reduce impacts on sensitive natural communities.
    i. Avoid, minimize, or compensate for reduction in area and/or habitat quality of sensitive natural communities through implementation of the following.
        - Select project site(s) that would avoid sensitive natural communities.
        - Design, to the maximum extent practicable, project elements to avoid effects on sensitive natural communities.
        - Establish temporary construction buffers for wetlands, vernal pools, and other sensitive natural communities that could be affected by construction activities. A qualified biologist will determine the location of the buffer(s) prior to the start of construction. The outer edge of the buffer zones will be demarcated using

flagging or temporary orange mesh construction fencing before initiation of construction activities and based on site-specific conditions, seasonal restrictions for wildlife, local planning department specifications, and resource agency requirements.

- Replace, restore, or enhance on a "no net loss" basis, in accordance with USACE and the applicable regional water quality control board, wetlands and other waters of the United States and waters of the state that would be removed, lost, or degraded. In coordination with USACE and the regional water quality control board, a wetland mitigation and monitoring plan will be developed before any groundbreaking activity commences. Once the mitigation and monitoring plan is approved and implemented, mitigation monitoring will continue for a minimum of 5 years from completion of mitigation, or human intervention (including recontouring and grading), or until the performance standards identified in the approved mitigation and monitoring plan have been met, whichever is longer. Prior to commencement of any construction activities that could result in the permanent loss of wetlands, conduct a delineation of affected aquatic resources areas to determine the acreage of loss in accordance with current USACE and regional water board methods.
- Compensate for unavoidable impacts on sensitive natural communities (other than waters of the United States or state) by restoring and/or preserving in-kind sensitive natural communities on site or off site at a nearby site, or by purchasing in-kind restoration or preservation credits from a mitigation bank that services the project site and that is approved by the appropriate agencies, in consultation with applicable regulatory agencies (at ratios that offset temporal loss of habitat value).

4. **Avoid, Minimize, or Compensate for Impacts on Special-Status Species:** The following measures should be implemented to reduce impacts on special-status species.

   i. Project Siting and Design: Site and design the project, in general, and construction footprint, in particular, to avoid, when possible, or otherwise minimize, impacts on special-status species and habitat occupied by special-status species (particularly critical habitat). Select project site(s) that would avoid habitats of special-status species (which may include foraging, sheltering, migration, and rearing habitat in addition to breeding or spawning habitat), and to the maximum extent practicable, (re)design project elements to avoid effects on such species.

   ii. Construction Schedule: To the extent feasible, schedule construction to avoid special-status species' breeding, spawning, or migration locations during the seasons or active periods that these activities occur. Construction will be allowed only if authorized by the appropriate state and federal resource agencies, and additional construction timing restrictions could be imposed by these agencies, to protect specific species. For example, all in-water construction activities where special-status species have the potential or are known to occur would be conducted during the allowable in-water work periods established by NMFS, USFWS, and CDFW.

   iii. Buffers: Establish buffers around special-status species habitats to exclude effects of construction activities. A qualified biologist will determine the location of the

buffer(s) prior to the start of construction. The size of the buffer will be in accordance with USFWS, CDFW, and NMFS protocols, as applicable, for the applicable special-status species.

iv. Nest Trees: Nest trees for special-status bird species will not be removed unless avoidance measures (e.g., establishing buffers between construction activities and active nests) are determined to be infeasible. If nest tree removal is necessary, remove the tree only after the nest is no longer active, as determined by a qualified biologist.

v. Relocation of Special-Status Plants and Animals: As appropriate, relocate special-status plant and animal species (excluding state Fully Protected species, which cannot be authorized for relocation and must be fully avoided) or their habitats from project sites following USFWS, NMFS, and CDFW protocols (e.g., for special-status plant species, elderberry shrubs).

vi. Compensation: Where impacts on special-status species are unavoidable, compensate for impacts by restoring or preserving in-kind suitable habitat on site or off site, or by purchasing restoration or preservation credits (in compliance with CESA and the ESA) for affected state- or federally listed species from a mitigation bank that serves the project site and that is approved by the appropriate agencies, in consultation with the appropriate regulatory agencies (at ratios that offset the temporary loss of habitat value).

5. **Environmental Awareness Training:** Prior to the start of construction activities, all personnel will participate in mandatory worker environmental awareness training conducted by an agency-approved biologist or resource specialist. Construction personnel will be informed about the identification, potential presence, legal protections, avoidance and minimization measures, and applicable general protection measures for state- and federally listed species and associated habitats with potential to occur within or immediately adjacent to the project site. Construction personnel will be informed of the procedures to follow if these biological resources are disturbed during construction activities. For projects where the agency-approved biologist or resource specialist is not regularly on the project site, training may be provided via online/web-based meeting. For projects that may continue over an extended duration and require a large number of training events, a training video developed under the supervision of a qualified biologist or resource specialist may be used to train new personnel, as long as a biologist or resource specialist is available via phone to answer questions about the training or that may arise during construction.

6. **Incorporate Protection Measures for In-Water Construction:** Design in-water construction projects to avoid or minimize stranding of and direct injury to special-status aquatic species.

i. Dewatering/Diversion: Any area to be dewatered will encompass the minimum area and time necessary to perform construction activities. Develop and implement a dewatering plan that describes proposed dewatering structures, design guidelines for contractors, and appropriate types of BMPs for the installation, operation, maintenance, and removal of those structures. Dewatering/diversion will be designed to avoid direct and preventable indirect mortality of fish and other aquatic species. Where feasible, dewatering/diversion will occur via gravity-driven systems.

When pumping is necessary to dewater a work site, a temporary siltation basin and/or silt bags will be used to prevent sediment from reentering the wetted channel. Pump intakes will be covered with mesh per the requirements of current fish screening criteria to prevent potential entrainment of fish or other aquatic species that could not be removed from the area to be dewatered. Diverted flows must be of sufficient quality and quantity, and of appropriate temperature, to support existing fish and other aquatic life both above and below the diversion.

ii. Cofferdams: Cofferdams may be installed if necessary to isolate the extent of the work areas. When feasible, construction of cofferdams will begin in the upstream area and continue in a downstream direction, allowing water to drain and fish and aquatic wildlife species to leave (under their own volition) from the area being isolated by the cofferdam, prior to closure. If pile driving (sheet piles) is required, vibratory hammers will be used, and use of impact hammers will be avoided. When cofferdams with bypass pipes are installed, debris racks will be placed at the bypass pipe inlet in a manner that minimizes the potential for fish impingement and/or entrapment. All dewatering/diversion facilities will be installed such that natural flow is maintained upstream and downstream of project areas.

iii. Fish and Aquatic Species Exclusion: Fish and other aquatic species will be excluded from occupying the area to be dewatered by blocking the stream channel above and below the area to be dewatered with fine-meshed block nets or screens while cofferdams and other diversion structures are being installed. Block net mesh will be sized to ensure that aquatic species upstream or downstream do not enter the areas proposed for dewatering. Mesh will be no greater than 1/8-inch diameter. The bottom of the net must be completely secured to the channel bed. Block nets or screens will be placed and maintained throughout the dewatering period at the upper and lower extent of the areas where aquatic species will be removed.

iv. Fish Capture and Relocation: Where potential in-water construction effects may result in take of special-status fish species, capture fish from the affected areas and relocate them to areas that would support their growth and development. Captured fish would be temporarily held in aerated coolers for transport to relocation sites. A fish capture and relocation plan will be developed and implemented for review and approval by appropriate agencies (e.g., CDFW, NMFS, USFWS, as applicable). The plan will describe the biologist qualifications, capture methods, capture and relocation work areas, and reporting requirements. Fish capture operations will occur at any project site where dewatering and resulting isolation of fish may occur; for example, when dewatering creates pools within the stream channel or when an enclosed area within a cofferdam is dewatered. Collection of fish from areas isolated by dewatering may occur by electrofishing, seine, dip net, throw net, minnow trap, and hand capture, or a combination of these. The appropriate collection method will be determined based on site conditions. If capture and relocation are not feasible or would not be the most protective approach to managing fish in the work area (e.g., dewatering not needed or appropriate; large, unconfined waterbody), other methods to protect covered fish species (e.g., timing restrictions around season and tide, bubble curtains) will be detailed in a plan and submitted for approval by the appropriate resource agencies.

v. Removal of Diversion and Barriers to Flow: Upon completion of in-channel construction activities, any diversions or barriers to flow will be removed in a manner that will allow flow to resume with the least disturbance to the substrate. Alteration of creek beds will be minimized; any imported material that is not part of the project design will be removed from streambeds upon completion of the project. When appropriate, cofferdams will be removed so surface elevations of water impounded above the cofferdam will not be reduced at a rate greater than 1 inch per hour. Cofferdams in tidal waters will be removed during the lowest possible tide and in slack water to minimize disturbance and turbidity. Preproject flows must be restored to the affected surface waterbody upon completion of work at that location.

vi. In-Water Pile Driving: Develop a plan for pile-driving activities to minimize impacts on special-status species and submit it to relevant agencies for approval prior to the start of in-water pile-driving activities. The plan will describe the method with the least impacts on aquatic organisms and will identify the number, type, and size of piles; estimated sound levels caused by the driving; the number of piles that will be driven each day; qualifications of monitors; any other relevant details on the nature of the pile-driving activity; and the measures that will be implemented to minimize underwater sound pressure to levels below fish thresholds for peak pressure and accumulated sound exposure levels. Threshold levels for special-status fish under NMFS jurisdiction are established in the Fisheries Hydroacoustic Working Group's *Agreement in Principle for Interim Criteria for Injury to Fish from Pile Driving Activities* (^FHWG 2008) and may be used as a guideline for special-status fish. Pile driving will also follow the criteria outlined in the most recent version of the California Department of Transportation's *Technical Guidance for Assessment and Mitigation of the Hydroacoustic Effects of Pile Driving on Fish* (^Caltrans 2020). If thresholds are exceeded, sound dampening or attenuation devices will be implemented to reduce levels.

An agency-approved biologist will be on site during pile-driving activities to minimize effects on special-status species that could be present. If any stranding, injury, or mortality of special-status species is observed, federal and state wildlife agencies will be notified in writing (e.g., via email) within 24 hours, and in-water pile driving will cease until the applicable federal and/or state agencies provide guidance on how to proceed.

A silt curtain will prevent the release of a turbidity plume and trap sediment that may become suspended as a result of the pile driving. The silt curtain must restrict the surface-visible turbidity plume to the area of pile construction and must control and contain the migration of resuspended sediments at the water surface and at depth.

7. **Avoid or Minimize Impeding Access to Established Native Resident or Migratory Wildlife Corridors or Native Wildlife Nurseries for Fish or Wildlife Species during Construction:** Site the construction footprint to avoid or otherwise minimize impeding access to established native wildlife movement corridors or native wildlife nurseries. If impeding access cannot be avoided, provide alternative access to these areas through such means as culverts, overpasses, or underpasses, for example.

8. **Invasive Species Control Measures:**

    i. Follow guidelines in the CDFW *California Aquatic Invasive Species Management Plan* (^CDFW 2008), *Aquatic Invasive Species Disinfection/Decontamination Protocols* (^CDFW 2013), and/or *Preventing the Spread of Invasive Plants: Best Management Practices for Land Managers* (^Cal-IPC 2012), where relevant. Construction supervisors and managers will be educated on weed identification and the importance of controlling and preventing the spread of noxious weeds.

    ii. Construction material to be used in (or immediately adjacent to) streams and wetlands, such as seed mixes, mulch topsoil, sand, gravel, crushed stone, and rock, brought on the project site from an outside source will be free of invasive plant material.

    iii. Avoid the spread of aquatic invasive species (e.g., zebra/quagga mussels, New Zealand mudsnails, chytrid fungus) to and from the project area according to the current aquatic invasive species disinfection/decontamination protocols, such as *Aquatic Invasive Species Disinfection/Decontamination Protocols* (^CDFW 2013), *Aquatic Invasive Species Disinfection/Decontamination Protocols (Northern Region)* (^CDFW 2016a) or other similar protocols.

    iv. Consult with CDFW and local experts, such as the University of California Extension, county agricultural commissioners, representatives of county weed management areas, California Invasive Plant Council, and California Department of Food and Agriculture, to ensure that invasive plant species and populations are kept below preconstruction abundance and distribution levels.

    v. Wash down all major construction equipment prior to entry into the project site in a manner that limits runoff, away from areas proximate to any stream/wetland resources.

    vi. If invasive species are encountered, conduct appropriate treatment and removal methods. The preferred method is removal by hand followed by proper disposal. If hand removal is not effective, then herbicide/pesticide treatment may be necessary. Any herbicide spot treatment will be applied in accordance with approved herbicide treatment measures. Chemical use is restricted in accordance with approved application methods and BMPs designed to prevent exposure to nontarget areas and organisms. The use of any chemical considered for control of invasive species must be approved for use in California, adhere to all DPR regulations, and be applied by a licensed applicator under all necessary state and local permits. A pest control advisor can ensure that legal, appropriate, and effective chemicals are used with appropriate methodologies. Aquatic pesticides will be applied in compliance with NPDES order(s), where applicable.

    vii. Monitor the site for invasive plants after all construction activities have been completed and implement additional control activities, if necessary.

9. **Avoid Vegetation Disturbance:** Minimize the amount of soil, terrestrial vegetation, emergent vegetation, and submerged vegetation (e.g., eelgrass and kelp in marine areas, submerged aquatic vegetation in brackish and freshwater areas) disturbed during project construction and completion. Disturbance to existing grades and native vegetation, the number of access routes, the size of staging areas, and the total area

disturbed by the project will be limited to the extent of all temporary and permanent impacts as defined by the final project design. All roads, staging areas, and other facilities will be placed to avoid and limit disturbance to waters of the state and other aquatic habitats (e.g., streambank or stream channel, riparian habitat). When possible, existing ingress or egress points will be used, and/or work will be performed from the top of streambanks, from barges on the waterside of the stream or levee bank, or from dry gravel beds. Existing native vegetation will be retained as practicable, emphasizing the retention of shade-producing and bank-stabilizing trees and brush with greater than 6-inch diameter branches or trunks. Remove temporary access roads and decompact soils as necessary to support desired revegetation. Minimize vegetation disturbance and soil compaction by using low ground-pressure equipment with a greater reach or that exerts less pressure per square inch on the ground than other equipment.

10. **Staging Areas:** Where appropriate and practical, barges will be used to stage equipment and construct the project, while reducing noise, traffic disturbances, and effects on terrestrial vegetation. When barge use is not practical, construction equipment and project materials may be staged in designated upland staging areas. Existing staging sites, maintenance toe roads, and crown roads will be used if available for project staging and access to avoid affecting previously undisturbed areas. For projects that involve in-water work for which boats and/or temporary floating work platforms are necessary, buoys will be installed so moored vessels will not beach on the shoreline and anchor lines will not drag. Moored vessels and buoys will not be located within 25 feet of vegetated shallow waters.
11. **Revegetation Plan:** Develop and implement a revegetation plan if vegetation will be disturbed during construction. The revegetation plan will specify sites where revegetation will be implemented. Site contours will be returned to preconstruction conditions or designed to provide increased biological and hydrological functions. All temporarily disturbed areas will be decompacted and seeded/planted with the planting stock appropriate for the area; appropriate designs (e.g., plant arrangements that, when mature, replicate the natural structure and species composition of similar habitats); and appropriate planting techniques, monitoring frequency, and success criteria (e.g., sapling trees no longer require active management). Where natural communities have been disturbed during construction, restore to similar or improved function. If an irrigation system is necessary for plant establishment, install and ensure that the system is operational prior to installation of plantings, or prior to any periods where the weather forecast may jeopardize successful establishment of plants. If erosion control fabrics are used in revegetated areas, they will be slit in appropriate locations as necessary to allow for plant root growth. Only non-monofilament, wildlife-safe fabrics will be used. All plastic exclusion netting placed around plantings will be removed after 2 years or sooner if practicable.
12. **Revegetation Monitoring and Reporting:** All revegetated areas will be maintained and monitored for a minimum of 2 years after replanting is complete and until success criteria are met to ensure that the revegetation effort is successful. The standard for success is 60 percent absolute cover compared to an intact local reference site. If an appropriate reference site cannot be identified, success criteria will be developed for review and approval by the authorizing regional water board on a project-by-project basis based on the specific habitat affected and known recovery times for that habitat

and geography. The project permittee will prepare a summary report of the monitoring results and recommendations at the conclusion of each monitoring year.

13. **Compliance with HCPs and NCCPs:**

    i. If the project site is within the planning area for any adopted HCP, NCCP, or similar conservation plan, consult CDFW and/or USFWS, as applicable, to identify any potential conflicts with the plan's goals, objectives, or conservation measures. Seek input regarding potential design features, conservation measures, or other mitigation strategies to avoid potential conflicts and achieve substantial conformance with the objectives of the HCP, NCCP, or similar conservation plan.

    ii. Comply with measures contained within an adopted HCP or NCCP, as applicable. Consult with biologists who have training and are knowledgeable about HCPs or NCCPs in the region where the project is located.

14. **Construction WQ Mitigation Measures** (CMM-WQ-a–j)

15. **Avoid or Minimize Lighting and Glare Effects:** Minimize nighttime construction site lighting to minimize impacts on wildlife. If nighttime construction is necessary, all project lighting (e.g., staging areas, equipment storage sites, roadway, construction footprint) will be selectively placed and directed onto the roadway or construction site and away from aquatic habitats. Light glare shields will be used to reduce the extent of illumination into aquatic habitats. If the work area is located near surface waters, the lighting will be shielded such that it does not shine directly into the water. (See also CMM-AES-a–d: 6 for additional mitigation for light and glare during construction and operation.)

16. **Dust Control Measures** (CMM-AQ-a–e: 3)

17. **Construction NOI Mitigation Measures: Noise-Reduction Measures** (CMM-NOI-a,b,d–f: 2) and **Vibration-Reduction Measures** (CMM-NOI-a,b,d–f: 3)

18. **Blasting Operations and Safety Plan** (CMM-GEO-a–e: 7) to reduce potential harm to special-status species from blast and pressure waves.

B. Approval by State and Federal Fisheries Agencies: Habitat restoration and other ecosystem projects must be developed and implemented in consultation with and subject to approval from applicable state and federal fisheries agencies, including CDFW, NMFS, and USFWS. Projects will conform to the following guidance documents, as applicable.

- NMFS' programmatic restoration biological opinion to facilitate implementation of restoration projects in the Central Valley (NMFS 2018).
- CDFW's *California Salmonid Stream Habitat Restoration Manual* (Flosi et al. 2010).
- NMFS' *Guidelines for Salmonid Passage at Stream Crossings* (NMFS 2023).
- NMFS' *Fish Screening Criteria for Anadromous Salmonids* (NMFS 1997).
- NMFS' *Science Base and Tools for Evaluating Stream Engineering, Management, and Restoration Proposals* (Skidmore et al. 2011).

C. Physical Habitat Restoration BIO Mitigation Measures: Ensure that ecosystem restoration benefits for fish species are maximized, while minimizing the potential for adverse effects on native fish species from habitat creation.

1. **Restoration Strategy:** Design and implement habitat restoration projects to work with existing and augmented flows, including guidelines articulated in A Delta Renewed (^SFEI-ASC 2016) (e.g., reestablish connections between tidal and stream floodplains, restore fluvial processes along streams, connect riparian areas to fluvial processes). Design restoration projects that consider the multiple interactions of physical, chemical, and biological processes over a wide variety of spatial and temporal scales and to confirm that the project will be effective and appropriate given the physical setting.
2. **Adaptive Management:** To address uncertainties in the ecological process governing habitat formation and maintenance at selected sites, monitor and guide the progress toward achieving the objectives or optimizing the benefits of these projects through an adaptive management process. Restoration projects submitted as part of a voluntary implementation plan are subject to approval by the State Water Board.
3. **Biological Goals:** If appropriate, apply biological goals to inform management actions, adaptive methods, and to assess effectiveness of physical habitat restoration projects.
4. **Avoid Fish Stranding:** Design projects to prevent fish stranding by ensuring entrance and exit to the restoration area. A project should not create habitats that could attract fish that then become isolated from the stream without providing an opportunity to return to the stream. Any off-channel features should be designed so that they slope toward and drain to the primary stream habitat as streamflow subsides. Fish passage and/or screening needs should be addressed with the installation of any new structures.
5. **Vegetation Management:** Design species palette for revegetation based on the species that naturally or historically occur in the project area, have the best chance of survival considering current site conditions, and can provide required habitat elements for special-status species. Revegetation that is not dependent on irrigation systems is generally preferred; however, there can be instances where irrigation is desirable. If an irrigation system is necessary for plant reestablishment, install and have the system operational prior to installation of planting or prior to any periods where the weather forecast may jeopardize successful establishment of plants. Acquire native seed or plant sources as close to the project site as possible.
6. **Physical Habitat Restoration WQ Mitigation Measures** (7.21 MM-WQ-a–j: E).
7. **Invasive Species Control:** Design projects to avoid creation of predation by invasive species and minimize conditions that would allow for the proliferation of invasive nonnative plant species, such as water hyacinth. Implement invasive aquatic vegetation control BIO mitigation measures to control any application of herbicides and pesticides (7.21 MM-BIO-a–f: G2).
8. **Gravel Augmentation BIO Mitigation Measures:**
    i. Avoid gravel augmentation during the period that could affect spawning spring-run and fall-run Chinook salmon, coho salmon, steelhead, or their embryos once in the gravel (late-summer, low-flow conditions).
    ii. Limit gravel augmentation to locations where the natural supply has either been eliminated, significantly reduced through anthropogenic disruptions, or where it can be used to initiate gravel accumulations in conjunction with other projects, such as simulated logjams and debris flows.

iii. Size gravel with the proper gradation for the stream, using nonangular rock. When possible, use gravel of the same lithology as found in the watershed.

iv. Do not mine gravel from the floodplain at elevations above bank-full in a manner that would cause stranding during future flood events. Avoid use of crushed rock.

v. Use imported gravel that is free of invasive species and nonnative seeds.

vi. Place gravel directly into the stream channel, at tributary junctions, or other areas in a manner that mimics natural debris flows and erosion.

vii. Gravel Augmentation WQ Mitigation Measures (7.21 MM-WQ-a–j: E8).

9. **Approval by State and Federal Fisheries Agencies** (7.21 MM-BIO-a–f: B)

D. Fish Passage BIO Mitigation Measures

1. **Consultation with Fish and Wildlife Agencies:** Fish screen and fishway projects must be developed in consultation with NMFS, USFWS, and CDFW in accordance with established design, operational, and maintenance criteria and guidelines (e.g., NMFS 2011).

   i. Fishway projects should conduct watershed and reach scale analysis of the hydrograph, sediment and large woody debris supply and transport, and streambed and bank dynamics (e.g., is the channel actively incising or aggrading) to confirm that the proposed design is appropriate and expected to function as designed over the lifetime of the project (20 to 30 years).

   ii. Fishway design should be based on target species, level of maintenance, and monitoring requirements to ensure reliable fish passage.

   iii. Where appropriate, design fishways considering passage for other aquatic wildlife species (e.g., amphibians) in addition to that of salmonids, sturgeon, and other native fish species. For example, providing rounded corners, resting areas, or a natural stream channel (stream simulation) or wetted ramp for passage over the impediment have been effective in facilitating passage of other aquatic wildlife.

   iv. Design fishway projects to avoid creation of predator hotspots and avoid introducing invasive species upstream of the barrier.

2. **TCD Design:** Design TCD to ensure sufficient temperature and dissolved oxygen conditions to support special-status species above and below the reservoir.

3. **State Water Board Approval:** Fish passage projects submitted as part of compliance with the cold water habitat objective are subject to approval by the State Water Board and are integrated into the long-term operations plan. (See Mitigation Measure MM-AQUA-a,d: 1 in Section 7.6.2, *Aquatic Biological Resources*.)

4. **Approval by State and Federal Fisheries Agencies** (7.21 MM-BIO-a-f: B)

E. Dam Removal BIO Mitigation Measures

1. **Project Planning:** Utilize *Guidelines for Dam Decommissioning Projects* (USSD 2015) or other appropriate planning guidance to help in the development and execution of the project from preliminary investigation to design and implementation.

i. Feasibility Studies: Collect data, including biological surveys for threatened and endangered species and their habitats. Conduct a feasibility study to evaluate the potential impacts from the erosion, transport, and deposition of reservoir sediment. Proceed with project if feasibility analysis verifies that constructing or operating a project will not result in unacceptable environmental consequences to endangered species.

ii. Structural Removal Limits: Develop structure removal limits that satisfy the restoration project goals and objectives, such as fish passage, connectivity, sustainability, restoration of natural riverine processes, and floodplain function and capacity.

iii. Engineering and Construction Design: Incorporate into engineering designs and construction any special accommodations for terrestrial species, such as bat roosts and wildlife crossings. The final design specifications should include any potential schedule constraints, including key fish spawning, bird nesting, or winter hibernation periods of sensitive species that could be affected by the project. Site clearing prior to construction may be limited to nonnesting periods for migratory birds or require special hazing procedures to prevent nesting of sensitive species.

2. **Regulatory Compliance:** Actions affecting threatened and endangered species (under the ESA) will involve USFWS and NMFS. Changes to the waterway may involve a state fish and wildlife agency, such as CDFW for a streambed alteration (section 1602) permit within the state of California. Proposed actions affecting Native American interests, including fishing rights and cultural resources, will involve the affected tribal governments and the Bureau of Indian Affairs. If the project involves any modifications to a hydropower facility licensed by FERC, the FERC license must either be amended or surrendered.

3. **Revegetation Plan:** Develop and implement a revegetation plan for areas that were exposed by reservoir drawdown and dam removal activities. The plan must provide for the recontouring and revegetation of the formerly inundated area and any disturbed areas, including structure sites, construction staging areas, temporary access roads, and waste disposal sites. The revegetation plan may include manual revegetation or other methods and should consider appropriate revegetation methods, such as hydroseeding. Various types of vegetation may be required, depending on the ability of the areas to sustain growth, the nature and composition of the sediments, and the purposes intended for the vegetation. If possible, use only native species. Special erosion control provisions (such as BMPs) may be necessary until the new vegetated areas take hold. Treatment for invasive plant species (or weeds) may also be required.

4. **Dam Removal WQ Mitigation Measures** (7.21 MM-WQ a–j: G)

F. Predatory Fish Control BIO Mitigation Measures

1. **Regulatory Compliance:** An SCP, MOU, and federal authorization may be required to conduct scientific, education, propagation, and management activities associated with predatory fish control through capture methods. Comply with California sportfishing regulations that define unlawful take and set general fishing provisions and conditions.

2. **BMPs for Hook-and-Line Sampling:** For active and passive capture methods, appropriate BMPs for hook-and-line sampling must be implemented to minimize impacts on special-status species.

3. **Selective Capture:** Implement predatory fish capture methods that select large predatory fish rather than juvenile salmonids. For example, capture of most juvenile salmonids could be avoided by using large hooks or selecting a trap mesh that allows escape of small fish. Electrofishing equipment should be set to target the appropriate fish size.

4. **Fish Handling:** In the case of inadvertent capture (bycatch) or disorientation of native fish, handle fish carefully to avoid injury and, if necessary, hold fish in a bucket of water until they have recovered and then release.

G. Invasive Aquatic Vegetation Control BIO Mitigation Measures

1. **Physical-Control Methods:** Apply BMPs for physical harvesting of invasive aquatic vegetation, including but not limited to:

   i. Follow environmental compliance measures for species avoidance, equipment operation, and spoiling when conducting mechanical harvesting operations.

   ii. Collect plant fragments during and immediately following treatments. To maximize containment of plant fragments, crews will collect plant fragments that are released from physical/mechanical treatments. Collected plants will be disposed of in approved locations away from the water's edge and sensitive habitats, typically on nearby farm fields. Crews will also be trained on the importance of minimizing fragment escape.

   iii. Conduct handpicking and herding only as required. Limit handpicking and herding activities for water hyacinth primarily to winter months when water hyacinth is dormant.

2. **Chemical-Control Methods:**

   i. Enroll and implement NPDES Permit for Residual Aquatic Pesticide Discharges to Waters of the United States from Algae and Aquatic Weed Control Applications (Water Quality Order 2013-0002-DWQ) and any updated permit.

   ii. Prior to the start of an invasive aquatic plant control herbicide or pesticide treatment effort, conduct environmental awareness training for all field crew members. Environmental awareness training should include species identification and impact avoidance guidelines; protocol for identification and protection of elderberry shrubs and other special-status plants as appropriate; protocol for identification and protection of Delta smelt, Chinook salmon, steelhead, green sturgeon, and other special-status species and habitats as appropriate; protocol for take of protected species; and use and calibration of equipment.

   iii. Develop an aquatic pesticide application plan, including BMPs (e.g., following herbicide label instructions, using the largest size spray droplets and the lowest spray pressure that would be effective, not spraying in windy conditions). Maintain a pesticide application log, including specific information on each application. Develop and implement a quality assurance project plan for chemical residue and toxicity monitoring, describing procedures and protocols for data collection and

analysis. Develop an annual report describing permit compliance and program findings and conclusions.

iv. To the extent feasible, avoid and minimize herbicide and pesticide treatment for invasive aquatic species control near special-status species, sensitive riparian and wetland habitat, and other biologically important resources. Specific measures that can be taken to reduce incidental impacts related to herbicide and pesticide use include but are not limited to the following.

- Adhere to timing restrictions based on outmigration of juvenile salmonids at specific sites (e.g., no treatment before June 1 at sites with juvenile outmigration, no treatment from October 16 to March 31).
- Survey for elderberry shrubs (*Sambucus* ssp.) and treat at low tide if any elderberry shrubs are within 100 feet of the water's edge.
- Follow application window restrictions on timing between repeat applications for water hyacinth.
- To minimize the potential for drift when applying herbicides, in addition to complying with the label application requirements, to the degree possible, schedule herbicide applications to occur at high tide or at a point in the tidal cycle determined by the field supervisor to provide the least nontarget impact at a particular site. In general, treatment at high tide will allow for better spray accuracy and access and will provide for greater dilution volume of herbicides. Change nozzle type and spray pressures whenever conditions warrant, limiting the amount of herbicide that may inadvertently contact nontarget species or enter the water.

v. Conduct monitoring and monthly reporting of the following.

- Pretreatment and posttreatment measurements of chemical residue.
- pH, turbidity levels, water temperature, and dissolved oxygen at selected sites.
- Water temperature and dissolved oxygen changes resulting from treatment activities.
- Amounts, types, and dates of herbicide application at each site.
- Visual assessment of pretreatment and posttreatment conditions of treated sites to determine efficacy of treatment and any effects of chemical drift.
- Operational status of equipment and vessels.

7.21.2.5 Cultural Resources

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
V. Cultural Resources				
Would the project:				
a. Cause a substantial adverse change in the significance of a historical resource as defined in § 15064.5	☒	☐	☐	☐
b. Cause a substantial adverse change in the significance of an archaeological resource pursuant to § 15064.5	☒	☐	☐	☐
c. Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature	☒	☐	☐	☐
d. Disturb any human remains, including those interred outside of formal cemeteries	☒	☐	☐	☐

Section 7.7.2, *Environmental Setting*, and Section 7.7.3, *Regulatory Setting*, describe the cultural resources environmental setting and regulatory setting, respectively. Additional cultural resources regulatory setting is described in Appendix E, *Regulatory Framework for Construction Projects*.

Common Construction

Construction of habitat restoration and other ecosystem projects in areas where cultural resources (significant historical, archeological, or paleontological resources) may be present could result in a substantial adverse change in the significance of a historical or archaeological resource (as defined in Cal. Code Regs., tit. 14, § 15064.5); directly or indirectly destroy a unique paleontological resource or site or unique geologic feature; or disturb human remains, including those interred outside of formal cemeteries. Construction activities could damage an archaeological site or historic built environment resource, which could alter or diminish its significance under the National Register of Historic Places or the California Register of Historical Resources (CRHR). Impacts could result from ground-disturbing activities, such as impacts on unknown buried or near-surface cultural resources. Deep excavation at a construction site or construction projects sited on relatively undisturbed or undeveloped areas where excavation is required may have a greater potential to encounter as-yet-unrecorded cultural resources. Changes in topography, hydrologic patterns, and soil movement may also degrade or otherwise affect near-surface archaeological or built environment resources. Other effects on cultural resources, albeit typically built environment resources, include damage from dust, which can alter the appearance of historic resources, making it difficult to see and potentially hiding historical information, as the potential of dust interacting with an object's surface could cause damage or chemical alteration. In addition to dust, impacts on cultural resources from visual obstructions, whether they are temporary or permanent could diminish the resource's integrity.

Cultural resources also could be affected if construction enables access (by construction crews or the public) to sites that were not previously known or accessible, which could result in unauthorized removal or vandalism of cultural resources. Access to cultural resources during construction could

be reduced and thereby prevent or impair visits to cultural resources by people with a religious or cultural connection to the resource. Impacts on historic built environment resources may also result from vegetation clearing, generation of dust, and visual impacts from the presence of large-scale equipment, machinery, and vehicles—particularly if the affected cultural resources have an associated landscape or other visual component that contributes to their significance, such as a sacred landscape or historic trail. Additionally, construction activity, including pile driving, has the potential to cause vibration that could physically damage or alter nearby historic built environment resources or linear features.

The magnitude of construction impacts on cultural resources depends on the extent and duration of disturbance and whether cultural resources are present in the project area. Impacts on cultural resources due to common construction activities would be potentially significant and can be avoided or reduced by implementation of Mitigation Measure 7.21 MM-CUL-a–d: A (CMM-CUL-a–d). Mitigation would include preconstruction surveys, monitoring during construction, and avoidance. If avoidance is not feasible, data recovery and/or removal of the resource would minimize those impacts by recovering valuable archaeological data through conducting intensive subsurface investigations. In addition, as discussed in more detail below, implementation of Mitigation Measure 7.21 MM-CUL-a–d: B can avoid or reduce additional potentially significant impacts on cultural resources associated with fish passage improvement projects. If mitigation measures are implemented, most, if not all, impacts (including construction impacts) can be mitigated to less than significant. Because the precise location and magnitude of activities required for habitat restoration and other ecosystem projects are not known, cultural impacts cannot be determined with certainty at this time. Therefore, potential impacts on cultural or paleontological resources remain potentially significant.

Physical Habitat Restoration

Construction and operation of floodplain, riparian, and tidal restoration projects would likely be within existing riverbanks and channels or immediately adjacent. As explained in *Common Construction*, it is unknown if cultural resources exist in these locations. Typically, river and tidal channels have experienced high levels of disturbance because of hydraulic conditions, and, as such, there is a low potential for significant intact cultural resources to exist within the rivers. Similarly, there would be a low potential for the discovery of intact human remains due to the regular disturbance. Some restoration projects could occur in agricultural areas where historic-period homes, barns, outbuildings, and infrastructure may be present. Other nonagricultural historic-period resources could be present, such as landscape features and town sites. Archaeological resources could also be present, depending on the site conditions. Heavily disturbed agricultural areas, such as agricultural ditches, would have a low potential for significant intact cultural resources. Operation of restoration areas would have a very low potential to affect cultural resources because operations would be along the riverbank and channels. Once the construction of a restoration project is complete, operational impacts on cultural resources would be less than significant.

Fish Passage Improvements

Construction and operation of fish passage improvements would likely be within existing riverbanks and channels or immediately adjacent. As explained in *Common Construction*, it is unknown if cultural resources exist in these locations. Most projects would have a low potential to affect cultural

resources because operations would be along the riverbank and channels where cultural resources are already diminished.

Historical and cultural values may play a role in the removal or modification of older structures for TCD and dam removal projects. Many dams and other instream structures in the Sacramento/Delta are reasonably within or beyond the 50-year threshold to be considered for evaluation for listing in either the national or state historical registers, and removal or modifications to these structures could be a potentially significant impact on cultural resources. Fish passage improvement projects that would result in the removal of dams or major changes to diversion structures would require the identification and evaluation of potentially significant built environment resources that may include dams and diversion structures and whether or how the device may affect a site or structure eligible under the National Register of Historic Places or CRHR. California Public Resources Code section 21084.1 and California Code of Regulations section 15064.5 subdivision (a) maintain that the project proponent should consider the eligibility of these structures for listing in the CRHR.

In addition to the potential impact on the structures themselves, the drawdown of a reservoir prior to dam removal could result in shifting, erosion, and exposure of known or as-yet-unrecorded previously submerged cultural resources or human remains.

These impacts would be potentially significant. In addition to common construction mitigation measures, implementation of Mitigation Measure 7.21 MM-CUL-a–d: B could reduce the potential impact of fish passage projects (TCDs and large dam removal) on cultural resources. Preproject planning requires consideration of a wide variety of technical, environmental, social, political, and economic issues, including cultural resource impacts and opportunities. A project design may provide opportunities for historic preservation, such as leaving portions of the structure, such as a stone masonry abutment or a concrete thrust block. Postconstruction interpretive features to educate the public on the cultural and historical aspects of the project should be considered in preproject planning and feasibility studies. The dam and appurtenant structures may be protected under the National Historic Preservation Act (NHPA) (54 U.S.C. § 300101 et seq.), and retention of portions of the dam may be desirable to preserve a particular element of the original design for posterity. Mitigation Measure 7.21 MM-CUL-a–d: B also includes appropriate protocols to be implemented when cultural resources or human remains are encountered. With timely discovery and appropriate steps to address exposure, shifting, or erosion impacts, many cultural resources can maintain their current level of significance. Additionally, providing a means for the long-term protection or enhancement of affected cultural resources can mitigate certain impacts. Until mitigation measures are implemented, the impacts remain potentially significant.

Predatory Fish Control

Construction impacts from removal or modification of human-made structures for predatory fish control would be similar to those described in *Common Construction*.

There would be no operational changes for either the removal or modification of the structures and no ground-disturbing activities associated with passive and active fish capture methods; thus, there would be no impact on cultural resources or human remains from operations.

Capture methods for predation control do not involve construction and therefore would not result in any of the construction impacts on cultural resources or human remains discussed in *Common Construction*. Therefore, there would be no impact.

Invasive Aquatic Vegetation Control

Invasive aquatic vegetation control does not involve construction and therefore would not result in any of the construction impacts on cultural resources discussed in *Common Construction*. Operations would involve limited ground-disturbing activities to set up equipment adjacent to channels and therefore would have a low potential for disturbing any known or as-yet-unrecorded cultural resources, including built environment resources or human remains.

Mitigation Measures

7.21 MM-CUL-a–d: Mitigate impacts on cultural resources

Entities or agencies designing and/or approving habitat restoration or other ecosystem projects will implement or require the following.

A. Construction CUL Mitigation Measures (CMM-CUL-a–d)

1. **Regulatory Compliance:** Conduct construction activities in compliance with all applicable federal, state, and local laws and regulations, including but not limited to, the National Historic Preservation Act (NHPA) (54 U.S.C. § 300101 et seq.), Antiquities Act (16 U.S.C. §§ 431–433), Archaeological Resources Protection Act (16 U.S.C. §§ 470ee–470mm), Native American Graves Protection and Repatriation Act (25 U.S.C. § 3001 et seq.), CEQA and the State CEQA Guidelines (Pub. Resources Code, § 2100 et seq., §§ 21083.2–21084.1; Cal. Code Regs., tit. 14, § 1500 et seq.), Public Resources Code sections 5020–5029 and 5097 et. seq., Health and Safety Code section 7050 et seq., and any relevant local general plan.
2. **Preconstruction Surveys for Historical, Archaeological, and Paleontological Resources, Cultural Landscapes, and Traditional Cultural Properties:** Conduct cultural resources surveys, subsurface investigations, and other research to determine whether early Native American and post-contact-era archaeological resources, cultural landscapes, or traditional cultural properties in the project area are eligible for listing in the CRHR.
3. **Cultural Resources Management Plan:** Prior to the start of any ground-disturbing activities, a qualified archaeologist will be retained (per the Secretary of the Interior's Professional Qualification Standards) to prepare a comprehensive site-specific cultural resources management plan (CRMP). The purpose of the CRMP is to document the actions and procedures to be followed to ensure avoidance or minimization of impacts on cultural resources consistent with State CEQA Guidelines section 15126.4(b) and to develop a detailed program of mitigation for direct and indirect impacts on cultural resources during project implementation.

The CRMP will include, but is not limited to, the following measures.

i. A description of the roles and responsibilities of cultural resources personnel and the reporting relationships between project construction management and the mitigation and monitoring team, including lines of communication and notification procedures.

ii. Prescribed actions to be taken in the event that cultural resources are inadvertently discovered during construction or known resources are affected in an unanticipated manner.

iii. Specific measures to be taken to avoid impacts on significant cultural resources, such as the designation of environmentally sensitive areas.

iv. Artifact collection, retention/disposal, and curation policies, including a statement that all cultural materials retained will be prepared in accordance with the requirements of an identified, qualified curatorial facility.

v. Conform to the Secretary of the Interior's Standards for Rehabilitation and Guidelines for Rehabilitating Historic Buildings (36 C.F.R. pt. 67) in the event of relocation. If any historic buildings, structures, or levees are relocated or altered, the lead agency must ensure that any changes to significant buildings or structures conform to these standards.

vi. If eligible or significant resources cannot be avoided and would be affected by a project, complete appropriate documentation, archival practices, and communication with the Native American Heritage Commission and Native American community, depending on project-specific circumstances.

4. **Unanticipated Discovery Measures:** Construction will stop within a 50-foot radius of any archeological, paleontological, or historical resources discovered during construction activities, and treatment measures will be devised as needed. A qualified archaeologist or other qualified cultural or paleontological resources specialist will be brought on site within 24 hours of the discovery. If the specialist determines the find is significant, a full archaeological survey will take place. Construction activities in the area would resume once the survey is completed.

   If human remains are discovered and become exposed, follow procedures under Health and Safety Code section 7050.5 and Pub. Resources Code section 5097.9. If the human remains occur on lands owned and administered by a federal agency, the provisions of the Native American Graves Protection and Repatriation Act will apply.

5. **Oversight and Monitoring of Construction Activities:** Require a qualified professional cultural or paleontological resources specialist (per the Secretary of the Interior's Professional Qualification Standards) trained to identify paleontological, archaeological, and built environment resources in a construction setting to be present during project ground-disturbing activities if significant cultural or paleontological resources are known to exist on the project site or if there is a high probability for significant cultural or paleontological resources to exist.

6. **Worker Cultural Resources Sensitivity Training:** A worker cultural resources sensitivity program will be implemented for the project. Prior to any ground-disturbing activity, an initial sensitivity training session will be provided to all project employees,

contractors, subcontractors, and other professionals prior to their involvement in any ground-disturbing activities. The sensitivity program will address the cultural (Native American, archaeological, and paleontological) sensitivity of the project site; and a tutorial will provide information on how to identify these types of resources, appropriate behavior, worker access routes and restrictions, specific procedures to be followed in the event of an inadvertent discovery per the CRMP, and consequences in the event of noncompliance.

7. **Dust Control Measures** (CMM-AQ-a–e: 3)
8. **Construction NOI Mitigation Measures: Noise-Reduction Measures** (CMM-NOI-a,b,d–f: 2) and **Vibration-Reduction Measures** (CMM-NOI-a,b,d–f: 3)
9. **Construction Site Security Measures** (CMM-HAZ-a–h: 7)
10. **Construction AES Mitigation Measures: Project Siting and Design (**CMM-AES-a–d: 1) and **Screen Construction Areas** (CMM-AES-a–d: 2)

B. Fish Passage CUL Mitigation Measures

1. **Historic Dams and Structures:** For temperature control device and dam removal projects, determine whether the dam is eligible for listing in the CRHR treatment of historic dams and structures under Pub. Resources Code section 21084.1 and California Code of Regulations section 15064.5 subdivision (a). A cultural resource management strategy for recording and evaluating dams or structures will be conducted prior to any modifications. This includes a records search of the area; a field recordation of the dam and any associated historical structures on California Department of Parks and Recreation series 523 forms, specifically 523B (building, structure, or object) and/or 523E (linear resource); and submission of these materials and any nominating materials to the State Historical Resources Commission of the California Office of Historic Preservation.
2. **Project Planning:** Preproject planning for dam removal requires consideration of a wide variety of technical, environmental, social, political, and economic issues, including environmental feasibility. A project design may provide opportunities for historic preservation such as leaving portions of the structure, such as a stone masonry abutment or a concrete thrust block. Consider postconstruction interpretive features to educate the public on the cultural and historical aspects of the project.
3. **Cultural Resources Management Plan:** For dam removal projects, develop and implement a CRMP to address potential exposure of cultural resources after drawdown of the reservoir. The plan must incorporate procedures to ensure compliance with all applicable federal, state, and local laws and regulations, including but not limited to, NHPA (54 U.S.C. § 300101 et seq.), Antiquities Act (16 U.S.C. §§ 431–433), Archaeological Resources Protection Act (16 U.S.C. §§ 470ee–470mm), Native American Graves Protection and Repatriation Act (25 U.S.C. § 3001 et seq.), CEQA and the State CEQA Guidelines (Pub. Resources Code, § 2100 et seq., §§ 21083.2–21084.1; Cal. Code Regs., tit. 14, § 1500 et seq.), Public Resources Code sections 5020 through 5029 and 5097 et seq., Health and Safety Code section 7050 et seq., and any relevant local general plan.

4. **Coordination with General or Resource Management Plan:** Coordinate with relevant general (private land) or resource management plan (public land), including provisions for inventory, evaluation, research, and interpretation of cultural resources. Plans should contain site management measures, training for all operations and maintenance staff, and routine monitoring of known cultural resources. Implement any relevant historic properties management plan or CRMP to meet the requirements of section 106 of the NHPA for projects on federal lands and to coordinate historic preservation reviews in conjunction with other aspects of a project.
5. **Human Remains:** If human remains become exposed in areas previously inundated at reservoirs, follow procedures under Health and Safety Code section 7050.5 and Public Resources Code section 5097.9. If the human remains occur on lands owned and administered by a federal agency, the provisions of the Native American Graves Protection and Repatriation Act will apply.

7.21.2.6 Energy and Greenhouse Gas Emissions

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
VII. Energy				
Would the project:				
a. Adversely affect the reliability of California's electric grid	☒	☐	☐	☐
b. Result in inefficient, wasteful, and unnecessary energy consumption	☒	☐	☐	☐
VII. Greenhouse Gas Emissions				
Would the project:				
a. Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment	☒	☐	☐	☐
b. Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases	☒	☐	☐	☐

Section 7.8.2, *Environmental Settin*g, describes the energy setting. Sections 7.10.2, *Environmental Setting*, and 7.10.3, *Regulatory Setting*, describe the GHG emissions environmental and regulatory settings, respectively. Additional regulatory setting is described in Appendix E, *Regulatory Framework for Construction Projects*.

Common Construction

Because of the connection between energy use and GHG emissions, these two resources are addressed together in this section. Note that energy and GHG emissions are analyzed independently in Sections 7.8, *Energy,* and 7.10, *Greenhouse Gas Emissions* for changes in hydrology or water supply associated with the proposed Plan amendments. Section 7.8 addresses overall per-capita energy consumption, reliance on natural gas and oil, and renewable energy as a means of achieving the goal

of energy conservation as identified in CEQA Appendix F, *Energy Conservation*. A more abbreviated and combined analysis is presented in this section for habitat restoration and ecosystem projects.

Habitat restoration or other ecosystem projects would result in energy consumption and GHG emissions primarily from construction activities. Total GHG emissions and the energy required for construction activity would depend on the size of the project; duration of construction activities; the types, quantities, and energy efficiency of equipment used; and the materials required for construction (e.g., gravel, concrete). Depending on the location of the project sites and the corresponding applicable jurisdictional air quality management district or air pollution control district regulations, GHG emissions generated by construction activities could exceed adopted air district thresholds and thereby conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing GHG emissions.

The most common construction impact on energy would be related to the energy required to operate heavy construction equipment. Various types of fuel-consuming equipment would be necessary for actions such as excavating, grading, transporting materials, and transporting construction workers to and from the work sites. Construction equipment, such as trucks or barges, earthmoving equipment, and power tools, involve using petroleum products and electricity to operate. These energy demands would be temporary (i.e., limited to the construction period) and would be greatly reduced when construction activities are complete. Although construction-related energy consumption would be limited to the construction period, these activities would cause irreversible commitments of finite nonrenewable energy resources, such as gasoline and diesel fuel, and could result in inefficient, wasteful, and unnecessary energy consumption.

The energy use of construction equipment would not adversely affect the reliability of California's electric grid because construction electricity requirements are low compared to total use of electricity in the state and because much construction activity is powered directly by fossil fuel and, as such, does not require use of the electric grid.

Construction activities requiring heavy construction equipment, haul trucks, and worker vehicles would generate GHG emissions due primarily to gasoline and diesel usage (i.e., fuel combustion). The primary GHG emissions generated by construction are carbon dioxide (CO_2), methane, and nitrous oxide. Construction activities could also result in the removal of vegetation that acts to sequester GHGs. Depending on the project size and location, equipment required, and construction duration, GHG generation during construction could affect the environment and conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of GHGs. Activities may not be consistent with policies that have not been adopted as rules or regulations. For example, it may not be feasible to use electric or alternatively fueled equipment, which could conflict with a specific county's climate action plan.

Energy and GHG emissions impacts associated with common construction activities would be potentially significant and can be avoided or reduced by implementation of Mitigation Measure 7.21 MM-EN-a,b/GHG-a,b: A (CMM-EN-b/GHG-a,b). Mitigation can include using energy-efficient equipment and other GHG emission control measures, as well as applicable air emission reduction measures and traffic control measures. Mitigation measures for air quality and GHG emissions would ensure the efficient use of energy during construction. CARB has developed various statewide programs and strategies to reduce emissions related to on- and off-road sources, such as heavy-duty construction equipment and vehicles. In addition, as discussed in more detail below, implementation of Mitigation Measure 7.21 MM-EN-a,b/GHG-a,b: B can avoid or reduce additional

potentially significant energy and GHG emissions impacts, respectively, associated with dismantling of existing hydropower facilities. If mitigation measures are implemented, most, if not all, impacts (including construction impacts) can be mitigated to less than significant. Because the precise location and magnitude of activities required for habitat restoration and other ecosystem projects are not known, energy use and GHG emissions impacts cannot be determined with certainty at this time. Therefore, potential impacts related to GHGs remain potentially significant.

Following construction, electric power may be required for some habitat restoration projects (e.g., lighting for interpretive facilities) and some fish passage improvement projects (e.g., fish screens, TCDs). Electric power could be provided by nonrenewable or renewable (e.g., solar) sources. It is unlikely that the power required for these purposes would be of a magnitude that could adversely affect the reliability of California's electric grid. Further, on-site solar power could meet many project needs. Electricity needed for operation of habitat restoration projects and fish screen projects would not result in inefficient, wasteful, and unnecessary energy consumption or substantial GHG emissions. Potential effects of hydropower reductions are discussed under the *Fish Passage Improvements* subsection.

During operations, some vehicles may be needed for monitoring or maintenance of restored areas or other ecosystem projects. However, these trips would be expected to be limited and require only a few vehicles and small pieces of equipment, resulting in minor increases in emissions. Accordingly, energy use and GHG emissions from operation of habitat restoration and other ecosystem projects would be temporary and limited.

Physical Habitat Restoration

Habitat restoration projects would use energy and generate GHG emissions from the combustion of fossil fuel for the use of heavy equipment and vehicles during construction and for vehicles needed for periodic maintenance and monitoring of restored sites (see *Common Construction*). In addition, heavy equipment may be needed to periodically replenish gravel at gravel augmentation sites. The use of heavy equipment for this purpose, and therefore associated energy use and GHG emissions, would likely be limited in duration (hours).

Operation of restoration projects could have GHG benefits due to potential increases in biomass carbon sequestration over time. For some projects, carbon sequestration could occur as restoration plantings take up carbon (as CO_2) from the atmosphere and store it in the soil and vegetation. Establishing, restoring, and enhancing tidal and freshwater wetlands would result in the creation of new wetlands, which sequester carbon. Carbon sequestration plays an important role in preventing global climate change by reducing GHG emissions and by preserving carbon sinks, such as forests and wetlands. This would provide more trees and plants that store carbon as they absorb CO_2 from the air, thus reducing net GHG emissions.

Fish Passage Improvements

Fish passage improvement projects would use energy and generate GHG emissions from the combustion of fossil fuel for the use of heavy equipment haul trucks and other vehicles used during construction and from vehicles needed for periodic maintenance and monitoring of some sites (see *Common Construction*).

In addition, installation of TCDs at reservoirs where hydropower is generated could require temporary, short-term interruption of hydropower generation. Operation of TCDs could entail

changes in flow releases and power generation. However, it is highly unlikely that installation and operation of TCDs would affect the reliability of California's electric grid unless a very large hydropower plant were affected at a time when electricity supply was low relative to demand. Operators would likely minimize disruptions to hydropower generation from construction and maintenance activities and would time construction activities to occur during the nonpeak season (e.g., fall, winter) or nonpeak hours. Changes in TCD operations could induce compensating changes elsewhere in the interconnected energy grid, resulting in GHG emissions from other power plants that rely on fossil fuels. However, the magnitude of this effect would likely be small, and the state's cap-and-trade program sets a limit on GHG emissions at these facilities and allows sources to trade emissions or purchase allowances to meet the emissions limit. Therefore, any indirect increases in GHG emissions would not exceed emission limits or obstruct the state's compliance with GHG reduction targets. Once construction is complete, energy and GHG emissions impacts would be less than significant.

Dam removal projects can range from relatively small impoundments (e.g., diversion dams) to large-scale construction and removal of larger structures (e.g., reservoirs). The removal of a small dam would not result in significant energy or GHG emissions impacts because of its minor contribution to power generation, if at all. Large dam removal projects require careful planning and analysis of the tradeoffs of both retention and removal, including any hydropower generation that would be lost once the facility is removed. Dam removal is often focused on abandoned or inefficient dams, and the decision-making process is not likely to result in inefficient, wasteful, and unnecessary energy consumption. However, in some cases, large dam removal could reduce power production if the project involved dismantling existing hydropower facilities. Dam removal is unlikely to affect the reliability of California's electric grid unless it resulted in decommissioning of one or more very large hydropower plants with no plans to replace the energy source.

Removing a renewable source of energy by removing a hydropower dam has the potential to result in increased GHG emissions from nonrenewable alternate sources of power. GHG emissions could occur in the event that the renewable source of power was replaced by other regional power sources (including GHG-emitting fossil fuels). This reduction in generated power would likely be compensated by other existing power plants connected to the power grid. The generation of additional power could result in increased GHG emissions at other power facilities. However, the state's cap-and-trade program sets a limit on GHG emissions at these facilities and allows sources to trade emissions or purchase allowances to meet the emissions limit. Therefore, if additional emissions are generated as a result of a loss of hydropower, these emissions would not exceed emission limits or obstruct the state's compliance with GHG reduction targets. If the reduction in power were substantial enough to require construction and operation of a new power plant, the new facility would be subject to a new source permitting process and the state's cap-and-trade program and would likely operate more cleanly in terms of emissions than the existing power plant. Nevertheless, impacts would be potentially significant. In addition to common construction mitigation measures, implementation of Mitigation Measure 7.21 MM-EN-a,b/GHG-a,b: B is expected to reduce the potential energy and GHG emissions impacts of dam removal. Because of the relatively small magnitude of these potential impacts compared to California's total use of electricity and because a high priority is placed on grid reliability, mitigation is expected to reduce these potential impacts to a less-than-significant level. Until mitigation measures are implemented, the impacts remain potentially significant.

Predatory Fish Control

Strategies for predatory fish control include direct removal methods and modifications of physical barriers such as bridges and weirs that can provide conditions conducive to some nonnative predators. Removal or modification of human-made structures would result in energy use and increased GHG emissions due to fuel combustion by heavy construction equipment, as discussed in *Common Construction*.

Capture methods for predation control do not involve construction and therefore would not result in any of the construction impacts related to energy use and GHG emissions discussed in *Common Construction*. Direct removal of predatory fish would result in energy use and GHG emissions due to round-trip vehicle trips to river locations where removal and subsequent monitoring would occur. Vehicle trips would be periodic and require only one or two vehicles per monitoring and/or maintenance trip; therefore, energy use and GHG emissions would be temporary and minor.

Invasive Aquatic Vegetation Control

Invasive aquatic vegetation control does not involve construction and therefore would not result in any of the construction impacts related to energy use and GHG emissions discussed in *Common Construction*. However, invasive aquatic vegetation control would result in energy use and increased GHG emissions due to fuel combustion of vehicles used by crew to commute to river locations where chemical or mechanical vegetation control would be implemented, as well as by boats, a mechanical harvester, and/or haul truck, as needed. Given the limited duration of removal activities where a boat and/or mechanical harvester may be utilized and the limited amount of equipment, including vehicles, needed to implement invasive aquatic vegetation control, energy use and GHG emissions would likely be relatively minor and unlikely to incur energy impacts or exceed established thresholds and conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing GHG emissions.

Mitigation Measures

7.21 MM-EN-a,b/GHG-a,b: Mitigate energy and GHG emissions impacts

Entities or agencies designing and/or approving habitat restoration or other ecosystem projects will implement or require the following.

A. Construction EN/GHG Mitigation Measures (CMM-EN-b/GHG-a,b)

1. **Regulatory Compliance:** Comply with the legislative mandates of the State of California for the reduction in statewide GHG emissions, including SB 32 and Executive Order (EO) S-3-05 and EO B-55-18. Comply with any relevant regional or local plan, policy, or ordinance addressing GHG emissions.
2. **GHG Emission Reduction Measures:** Construction BMPs and onsite measures to reduce GHG emissions will be implemented and will include, but not be limited to, the following.
    i. Preserve known GHG sinks to the extent feasible and limit GHG sources as a component of project design.

ii. Implement the most recent applicable air quality management district guidance and local air district controls to reduce criteria pollutant emissions and to minimize GHG emissions.

iii. Use electric or hybrid-electric off-road construction equipment and vehicles instead of diesel-powered. Use vehicles that use alternative fuels.

iv. Design and construct the project to be energy-efficient according to Cal. Code Regs., title 24, Part 6 (*Energy Efficiency Standards for Residential and Nonresidential Buildings*).

v. Use at least 10 percent of building materials that are locally manufactured.

vi. Divert and recycle or salvage non-hazardous construction and demolition waste.

vii. Minimize the amount of concrete for paved surfaces and use a low-carbon concrete option.

viii. Minimize tree removal and mitigate indirect GHG emissions increases that occur due to vegetation removal, loss of sequestration, and soil. When onsite preservation is not feasible, replace onsite trees, or contribute to a mitigation program providing carbon storage. Implement a tree-planting program to sequester an amount of GHG emissions equal to direct emissions produced during construction. Develop the program per the principles of CARB's *Compliance Offset Protocol Urban Forest Projects* (^CalEPA and CARB 2011).

ix. When generators must be used, consider use of alternative fuels, such as propane or solar.

x. Minimize idling time by requiring that equipment be shut down after 5 minutes when not in use (Cal. Code Regs, tit. 13, § 2485). Provide clear signage that posts this requirement for workers at the entrances to the site.

xi. Maintain all construction equipment in proper working condition and perform all preventive maintenance. Required maintenance includes compliance with all manufacturer's recommendations, proper upkeep and replacement of filters and mufflers, and maintenance of all engine and emissions systems in proper operating condition. Maintenance schedules will be detailed and clearly posted for workers prior to commencement of construction.

xii. Implement a tire inflation program on each jobsite to ensure that equipment tires are correctly inflated. Check tire inflation when equipment arrives onsite and every 2 weeks for equipment that remains onsite. Check vehicles used for hauling materials offsite weekly for correct tire inflation.

xiii. Develop a project-specific ride share program to encourage carpools, shuttle vans, transit passes, and/or secure bicycle parking for construction worker commutes.

xiv. Reduce electricity use in temporary construction offices by using high-efficiency lighting and requiring that heating and cooling units be Energy Star compliant. Require that all contractors implement procedures for turning off computers, lights, air conditioners, heaters, and other equipment each day at close of business, wherever feasible.

3. **Construction AQ Mitigation Measures: Regulatory Compliance** (CMM-AQ-a–e: 1), **Emission Reduction Measures** (CMM-AQ-a–e: 2), and **Minimize Construction-Related Traffic and Equipment Use** (CMM-AQ-a–e: 7)

B. Dam Removal EN/GHG Measures: For projects that may require the dismantling of existing hydropower facilities, appropriate measures should be taken to minimize the loss of renewable energy production.

1. **Feasibility Studies:** Proceed with project only if feasibility analysis verifies that the project will not result in unacceptable impacts on the reliability of California's energy grid.
2. **Renewable Energy**: Replace lost power with renewable energy sources such as solar or wind energy or hydropower generation at existing or new facilities to the extent feasible.
3. **Increase Power Generation**: If increased renewable energy sources cannot be used in the short term to replace reduction in hydropower production (e.g., due to limited ability to store solar or wind energy), increase power generation at existing or new facilities to a degree that ensures grid reliability.

7.21.2.7 Geology and Soils

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
VI. Geology and Soils				
Would the project:				
a. Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:				
4. Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.	☒	☐	☐	☐
5. Strong seismic ground shaking	☒	☐	☐	☐
6. Seismic-related ground failure, including liquefaction	☒	☐	☐	☐
7. Landslides	☒	☐	☐	☐
b. Result in substantial soil erosion or the loss of topsoil	☒	☐	☐	☐
c. Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse	☒	☐	☐	☐

		Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
d.	Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property	☒	☐	☐	☐
e.	Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water	☒	☐	☐	☐

Section 7.9.2, *Environmental Setting*, describes the geology and soils setting, and additional regulatory setting is described in Appendix E, *Regulatory Framework for Construction Projects*.

Common Construction

Depending on the location, construction habitat restoration and other ecosystem projects could expose people or structures to potential substantial adverse effects involving rupture of a known earthquake fault, strong seismic ground shaking, seismic-related ground failure (including liquefaction), or landslides; result in substantial soil erosion or the loss of topsoil; be located on a geologic unit or soil that is unstable or would become unstable due to the project and would potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse; be located on expansive soil creating substantial risks to life or property; or be located on soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems. Construction actions that involve ground disturbance could affect, or could be affected by, the geology and soil environment. Construction projects could occur in areas known to have seismic activity or experience landslides or could be located on expansive soil or on a geologic unit or soil that is unstable or would become unstable due to construction. Common construction activities in and of themselves would be unlikely to expose structures to potential substantial adverse effects related to rupture of a known earthquake fault or other seismic activity. However, workers could be exposed to seismic and geologic hazards during the construction period depending on project location, although the potential risk would be temporary and short-term. Any structures constructed as part of a project could be exposed to risk of loss due to rupture of an earthquake fault or seismic activity. If structures were built on saturated soils prone to liquefaction, they could be damaged or destroyed during an earthquake.

Construction activities could occur in areas underlain by soft or loose soils, where high groundwater or seepage may be present, and on sloping grounds. Areas of unstable soils with the potential for lateral spreading, subsidence, liquefaction, or collapse could result in unsafe working conditions. For example, in areas of unstable soils, with the potential for lateral spreading, subsidence, liquefaction, or collapse, heavy and/or tall equipment could sink, tip over, and/or be difficult to handle. Such unsafe working conditions would potentially expose people or structures to risk of loss, injury, or death. Construction of projects on deep organic soils could eventually result in structural damage due to subsidence. Construction activities like excavation and grading near unstable slopes could trigger a landslide, which could result in substantial adverse effects on people or existing structures.

Ground disturbance as part of construction, including grading and excavation, heavy equipment traffic, and changes to surface runoff patterns during construction, could expose geologic materials or soil, destabilize the material, and cause soil erosion or loss of topsoil.

Siting projects on expansive soil (as defined in Table 18-1-B of the 1994 Uniform Building Code [International Conference of Building Officials 1994]) could create risks to life or property through structural failure of buildings or roads. Expansive soils are susceptible to shrinking and swelling during rain events and to subsequent drying, which can cause building foundations to crack.

On-site wastewater treatment system (OWTS; septic system) tanks are not typically installed for use during construction. Rather, wastewater generated by construction is usually limited to that generated by construction personnel, which is typically accommodated by portable toilets emptied into municipal sewage or septic systems off site. However, for projects that include installation of an OWTS, improper siting of this system could result in adverse environmental impacts. Soils incapable of supporting the wastewater load to a septic system would result in daylighting of wastewater at the ground surface.

In addition, construction activity that involves blasting could trigger landslides on unstable slopes and expose construction workers or members of the public to the risk of injury or death.

Geology and soil impacts associated with common construction activities would be potentially significant and can be avoided or reduced by implementation of Mitigation Measure 7.21 MM-GEO-a–e: A (CMM-GEO-a–e). Mitigation can include designing project construction to prevent erosion and sedimentation; implementing soil and erosion control BMPs for all stages of construction and operations (as applicable) as part of a site-specific SWPPP; and implementing site-specific geologic and geotechnical investigations to address the potential for liquefaction, subsidence, ground shaking, and slope failure. In addition, as discussed in more detail below, implementation of Mitigation Measures 7.21 MM-GEO-a–e: B and C can avoid or reduce additional potentially significant impacts on geology and soils associated with habitat restoration and other ecosystem projects as applicable. If mitigation measures are implemented, most, if not all, impacts (including construction impacts) can be mitigated to less than significant. Because the precise location and magnitude of activities required for habitat restoration and other ecosystem projects are not known, impacts cannot be determined with certainty at this time. Therefore, potential impacts on geology and soils remain potentially significant.

Physical Habitat Restoration

Potential construction-related erosion and soil impacts are described in *Common Construction*. Other possible topsoil and erosion impacts associated with habitat restoration include increased wind and water erosion related to intended levee breaching (e.g., to increase tidal exchange). Breaching levees can increase wind and water erosion at areas adjacent to the breach. The increased inundation associated with breaching can also lead to increased erosion from wind-wave fetch. Further, although the degree of setback of a setback levee would vary by project, narrow setback may result in erosion on the surface of newly established floodplain due to high velocities. In addition to the erosion mitigation for common construction activities, implementation of Mitigation Measure 7.21 MM-GEO-a–e: B would minimize erosion related to intended levee breaching, as well as due to other aspects of physical habitat restoration, to less than significant. Until mitigation measures are implemented, the impacts remain potentially significant.

Habitat restoration could have beneficial impacts on soil stability because the planting and growth of native vegetation would decrease erosion and stabilize soils. In addition, returning an area to a more natural state in which sediment transport is in dynamic equilibrium could decrease erosion. Beneficial impacts associated with enhanced in-channel complexity projects could include decreased soil erosion. These projects are designed to restore degraded rivers and therefore often include bank stabilization measures that reduce erosion.

Fish Passage Improvements

Potential construction-related erosion and soil impacts are described in *Common Construction*. In addition, large dam removal projects may result in soil instability and landslides. Reservoir drawdown would be required prior to dam removal, exposing previously inundated slopes and the sediment deposited in the reservoir. Reservoir drawdown could result in hillslope instability in reservoir rim areas. Erosion of sediment on the slopes would occur during drawdown, and most of this sediment would be retained behind the dam until the dam itself was removed. The rate of dam removal and reservoir drawdown can have a strong influence on the rate that sediments are eroded and transported to the downstream river channel. If the rate of reservoir drawdown is too fast, it could exceed the safe downstream channel capacity and could induce potential landslides along the reservoir margins or a slope failure of an embankment dam and cause additional erosion and sedimentation downstream.

These impacts would be potentially significant. In addition to common construction mitigation measures, implementation of Mitigation Measure 7.21 MM-GEO-a–e: C would avoid or reduce the potential for adverse effects. Site-specific geologic and soil investigations would help determine the appropriate reservoir drawdown rate to manage hillslope instability in reservoir rim areas. The impacts from releasing a large volume of reservoir sediment into the downstream channel can be reduced by slowing the rate of reservoir drawdown. This might be accomplished by incrementally and progressively lowering the reservoir over a period of weeks, months, or years, depending on the size of the dam and the volume of the reservoir sediments. Measures also include slope stabilization, sediment stabilization, sediment management, and sediment release actions within a reservoir footprint and downstream. Until mitigation measures are implemented, the impacts remain potentially significant.

Predatory Fish Control

Removal or modification of human-made structures such as bridge piers and docks for the purpose of predatory fish control would not expose people or structures to seismic risks or other geologic hazards, including landslides, or unstable or expansive soils. Potential construction-related erosion and soil impacts, such as those associated with the removal of docks or other structures for the purpose of predatory fish control, would be similar to those described in *Common Construction*.

Capture methods for predation control do not involve construction and therefore would not result in any of the construction impacts on geology and soils discussed in *Common Construction*. No structures would be built or operated as part of predatory fish control; therefore, there would be no effects related to expansive soils, unstable geologic units and landslides, lateral spreading, subsidence liquefaction, or collapse. Passive and active capture methods would not expose people or structures to potential substantial adverse effects involving rupture of a known earthquake fault, strong seismic shaking, or seismic-related ground failure, given the nature of these activities.

There would be no operational changes related to the removal or modification of human-made structures and passive and active capture of predatory fish that would expose people or structures to seismic risks or geologic hazards or result in substantial erosion or the loss of topsoil.

Invasive Aquatic Vegetation Control

Invasive aquatic vegetation control does not involve construction and therefore would not result in any of the construction impacts on geology and soils discussed in *Common Construction*. Invasive aquatic vegetation control through physical or chemical means would not expose people or structures to seismic risks or geologic hazards. Related activities would be periodic and short-term. Implementation would involve limited ground-disturbing activities to set up equipment adjacent to channels and thus would not result in substantial soil erosion or loss of topsoil.

Mitigation Measures

7.21 MM-GEO-a–e: Mitigate geology and soils impacts

Entities or agencies designing and/or approving habitat restoration or other ecosystem projects will implement or require the following.

A. Construction GEO Mitigation Measures (CMM-GEO-a–e)

1. **Regulatory Compliance:** Comply with existing federal, state, and local geotechnical regulations; water quality regulations; building codes (including the current approved version of the International Building Code and the California Building Standards Code); standards; specifications; zoning; and the site-specific recommendations of a geotechnical study prepared for the project.
2. **Project Siting and Design:**
    i. Locate projects away from areas with unsuitable soils or steep slopes.
    ii. During preliminary project design, a detailed site-specific geotechnical investigation of the project area will be performed/prepared by a certified engineer. The geotechnical investigation will include, but not necessarily be limited to, assessment of liquefaction potential, bearing strength of soils, and seismic hazards (including fault displacement). Based on results from the geotechnical investigation, project design measures will be developed and incorporated into the final project design to address any adverse geologic, seismic, and/or soil conditions (e.g., expansive soils). The geotechnical investigation will follow industry standard of practice and use American Society for Testing and Materials standards, where applicable. Design measures will conform to applicable design codes, guidelines, and standards. At a minimum, the investigation will evaluate the soil potential for expansion, lateral spreading, subsidence, liquefaction, or collapse.
    iii. The lead agency will ensure that findings/recommended design measures from the site-specific geotechnical investigation are incorporated into project design and siting to avoid potential adverse seismic effects and adverse soil conditions. The lead agency will ensure that the design specifications are properly executed during construction.

3. **Assurance of No Fault Traces:** A licensed practitioner will certify that no fault traces are present within the footprint of any building intended for human occupancy to be constructed within the Alquist-Priolo Special Studies Zone.
4. **Geology and Soils Management Measures:** Design, implement, and maintain site-specific measures as recommended by a qualified geotechnical professional in areas susceptible to landslides, lateral spreading, subsidence, liquefaction, or collapse.
    i. Implement ground improvements such as soil compaction and excavation and disposal of liquefiable soils.
    ii. Implement structural improvements, such as berms or dikes, to prevent large lateral spreading.
    iii. Stabilize areas susceptible to landslides with buttress fills or other appropriate measures.
    iv. Install special drainage devices and water injection wells.
    v. Monitor groundwater level to ensure stable soil conditions.
5. **Construction WQ Mitigation Measures: Regulatory Compliance** (CMM-WQ-a–j: 1) and **Erosion Control, Sedimentation Control, and Soil Stabilization Measures** (CMM-WQ-a–j: 3)
6. **Septic System Management Measures:** Mitigate impacts associated with soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater.
    i. Comply with all provisions of the state's *Water Quality Control Policy for Siting, Design, Operation, and Maintenance of Onsite Wastewater Treatment Systems* (^SWRCB 2012), as implemented by the applicable regional water board or local county agency in which construction and operation of a septic system is proposed. The design, site evaluation, siting, construction, installation, and operation of the OWTS will be required to comply with all applicable minimum standards.
    ii. Comply with all provisions of the applicable codes for the county or counties in which construction and operation of a septic system is proposed, including the design and installation of septic systems.
    iii. Comply with Health and Safety Code sections 117400–117450 and any other applicable county code regarding cleaning septic tanks, chemical toilets, cesspools, and seepage pits.
7. **Blasting Operations and Safety Plan:** Prior to construction, a blasting operations and safety plan will be prepared and will identify BMPs to be implemented prior to, during, and following any blasting activities to minimize the potential for blasting-related hazards. These BMPs include the following.
    i. The transport and use of explosives for blasting will be conducted according to applicable regulations (e.g., Cal. Code Regs, title 8, article 115, *Transportation of Explosives*, and article 116, *Handling and Use of Explosive Materials in Blasting Operations*) and permits.

ii. Implement measures to avoid potential hazards related to flyrock, such as the following.

- Accurately measure the burden for each blast hole and be aware of the true burden for each hole along the free faces.
- Use adequate stemming and stem through incompetent zones. Use crushed stone for stemming.
- Place primer lower in the hole, increase delays between rows, reduce burden in back rows.

iii. Implement measures to minimize fugitive dust due to blasting operations, such as the following**.**

- Conduct blasting on calm days when wind conditions are suitable (e.g., no strong winds blowing toward sensitive receptors). Wind direction with respect to the nearby residences and other receptors will be considered.
- Wet ground prior to blasting.
- Install wind fence(s) for control of windblown dust.

iv. Implement safety measures to prevent personal injury and fire related to the use of explosives. At a minimum, these measures will include the following.

- Limit blasting activities to daylight hours.
- Notify occupants of nearby buildings, stores, residences, places of business, and places of public gathering at least 48 hours in advance of blasting.
- Use a signaling system to alert workers of an impending blast.
- Do not locate explosive materials where they may be exposed to flame, excessive heat, sparks, or impact.
- Conduct all blasting work in compliance with all pertinent fire prevention laws.

v. Avoid blasting in potential rockslide/landslide areas and consult with a geologist prior to blasting in such areas.

vi. Implement BMPs to reduce short-term noise and vibration impacts.

8. **Protect Agricultural Soils** (CMM-AG-a–e: 4)

B. Physical Habitat Restoration GEO Migitation Measure: Where intended levee breaches and/or setback levees are proposed, design, maintain, and repair levees consistent with federal and state levee design criteria and guidelines for levee maintenance and repair to prevent or minimize erosion.

C. Dam Removal GEO Mitigation Measures

1. **Feasibility Studies:** Evaluate geologic site conditions, including slope stability of the abutments and upstream embankment slopes; streambank stability; determination of the erosion resistance of the dam abutments and foundation for flood flows; subsurface explorations for the design of potential diversion channels or tunnels; and estimation of foundation permeability and groundwater levels for dewatering the site excavations. Incorporate into engineering designs and construction any special accommodations for

geological resources and worker safety. Design the reservoir drawdown rate to avoid inducing any potential landslides along the reservoir margins or a slope failure of an embankment dam. Proceed with project if feasibility analysis verifies that constructing or operating a project will not result in unacceptable consequences.

2. **Sediment Management and Monitoring Plan:** A sediment management and monitoring plan (7.21 MM-WQ-a–j: G3) will be required to provide for the natural erosion, or handling and disposal, of both coarse- and fine-grained materials where the impoundment contains large quantities of sediment. During and for an appropriate period following reservoir drawdown, potentially unstable areas within a reservoir footprint should be visually monitored for slope instability. If slope failure is observed, an exclusion zone should be established around the unstable area, and the areas should be monitored. Slope stabilization measures should be implemented as appropriate. Potential impacts can be offset through appropriate actions, such as engineering structural slope improvements (e.g., drilled shafts or other structural elements that could be installed to resist slope movement) and revegetation of affected areas. The plan must provide for removal and/or remediation of unstable or expansive soils, as appropriate.

7.21.2.8 Hazards and Hazardous Materials

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
VIII. Hazards and Hazardous Materials				
Would the project:				
a. Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials	☒	☐	☐	☐
b. Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment	☒	☐	☐	☐
c. Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school	☒	☐	☐	☐
d. Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment	☒	☐	☐	☐
e. For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area	☒	☐	☐	☐

		Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
f.	For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area	☒	☐	☐	☐
g.	Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan	☒	☐	☐	☐
h.	Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands	☒	☐	☐	☐

Section 7.11.2, *Environmental Setting*, describes the hazards and hazardous materials setting, and additional regulatory setting is described in Appendix E, *Regulatory Framework for Construction Projects*.

Common Construction

Depending on the project location, construction of habitat restoration and other ecosystem projects could emit hazardous emissions or require the handling of hazardous materials, substances, or waste within 0.25 mile of an existing or proposed school; be located on a hazardous materials site and create a significant hazard to the public or the environment; or be located within an airport land use plan or within 2 miles of a public or public use airport or in the vicinity of a private airstrip and result in a safety hazard for people residing or working in the project area. In addition, construction projects could impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan or expose people or structures to a significant risk of loss, injury, or death involving wildland fires.

Construction activities could require the transport, use, or disposal of hazardous materials (e.g., fuel, motor oil, hydraulic fluid, solvents, cleaners, sealants, welding flux, paint, paint thinner); therefore, project construction could result in accident conditions involving the release of hazardous materials, which could result in a significant hazard to the public or the environment. Most heavy construction equipment requires petroleum products such as fuel, oil, and hydraulic fluid for effective operations. Equipment refueling is required daily for most heavy construction equipment, and oil and hydraulic fluid changes and replenishment are required periodically. Generally, service trucks deliver these types of hazardous fluid on site where fuel and oil transfers occur. On-site refueling and equipment maintenance could result in the accidental release of hazardous materials. In addition, if equipment is not properly maintained or if on-site construction-related hazardous materials are improperly stored, leakage and inadvertent spills could occur, respectively.

Construction activities also could include excavation. Excavation could disturb areas with existing soil or groundwater contamination or could occur on an unrecorded hazardous material site. Where construction projects may require demolition of existing structures, adverse impacts could result if construction activities inadvertently dispersed contaminated material into the environment, such as

asbestos or lead-based paint from existing building materials or stored liquid paints, solvents, and household or industrial-strength maintenance chemicals and cleaners, which could adversely affect construction workers or others in the vicinity of the construction activity or the environment. In addition, construction activities on a site included on a list of hazardous materials sites compiled pursuant to Government Code section 65962.5 (Cortese site) could also spread existing soil or groundwater contaminants if the activity includes substantial excavation. Further, existing underground infrastructure (e.g., natural gas pipelines, utility lines) within a project area could be encountered during excavation and could result in hazards to the public or environment if damaged. In areas where *Coccidioides* fungus (responsible for Valley fever) is endemic, disturbance of soils containing *Coccidioides* spores may expose workers and people adjacent to the construction site to these fungal spores in fugitive dust.

Construction activities could occur within 0.25 mile of a school. A release of hazardous material, potentially exposing school occupants, could result if materials were to become airborne (e.g., gases, asbestos particles) or could occur through ignition of flammable liquids or vapors. Construction also could expose schools within 0.25 mile of the construction and haul corridors to the potential of accidental hazardous materials spills.

Depending on their location, construction activities have the potential to temporarily impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan by impairing the access of emergency response services to a location or interfering with emergency evacuation by rerouting traffic during construction, for example. Although some construction projects may not directly conflict with an adopted emergency response plan or emergency evacuation plan, these projects could create a situation that requires additional need for emergency service providers due to accidental releases of hazardous materials, work site fires, and vehicular accidents due to construction-related changes in traffic, for example.

Construction could involve the use of electrical or gas-powered equipment and flammable materials (e.g., fuels, solvents) and could involve activities that could start a wildfire, depending on the project location. For example, solvents used on site for maintenance of heavy equipment could be inadvertently ignited by sparks from equipment/machinery or lit cigarettes of construction crew members if proper safety measures were not implemented. In addition, fires could be caused by other construction-related activities, including welding or parking and starting heavy equipment or vehicles on dry grass. Construction activity that involves blasting requires that special precautions be taken to minimize the fire risks and safety risks (e.g., from flying rock fragments) related to the use of any explosive materials on the project site. If a project were adjacent or relatively close to wildlands, people or structures could be exposed to a substantial risk of property loss, personal injury, or death due to a wildland fire resulting from these types of construction hazards.

Airspace safety hazards occur when project components, such as buildings or construction equipment, encroach on the airspace of an airport runway. Construction occurring in proximity to an airport or a private airstrip that requires the use of equipment with a vertical reach of 200 feet or more (e.g., a tower crane) or a helicopter (as may be required for certain physical habitat restoration projects) could result in a safety hazard for people residing or working in the project area.

Construction could create new disease vector habitat that would pose a significant public health hazard. Mosquitoes require standing water to complete their growth cycles, and any body of standing water that remains undisturbed for multiple days represents a potential mosquito

breeding site. Stagnant ponded water could be created at construction sites following a rainstorm. Ponding areas that do not dry for several days can potentially create temporary mosquito habitat if water ponding occurred when ambient temperatures are relatively warm (i.e., spring through fall). In addition, to comply with stormwater permit requirements, construction contractors may create drainage ditches and subsequent retention ponds to prevent stormwater runoff from entering nearby waterbodies, which could also provide breeding habitat for mosquitoes. Mosquito control may require application of pesticides.

Some habitat restoration and other ecosystem projects may include the installation of underground or aboveground storage tanks (USTs and ASTs, respectively) for bulk fuel storage. Faulty installation or inadequate operation and maintenance of USTs or ASTs may result in the release of fuel, which could result in surface water and groundwater contamination, or other adverse effects including the potential for fire and explosion. In addition, improper siting, construction, or maintenance of public restrooms could expose the public to raw sewage, which would be a public health hazard. Similarly, for projects that include installation of a septic system, improper siting of this system could result in daylighting of wastewater at the ground surface.

Hazards and hazardous materials impacts associated with common construction activities would be potentially significant and can be avoided or reduced by implementation of Mitigation Measure 7.21 MM-HAZ-a–h: A (CMM-HAZ-a–h). Mitigation of construction-related hazards and hazardous materials impacts can include preparation of environmental site assessments and preparation and implementation of an emergency response plan, a fire prevention and management plan, and a spill prevention and response plan. In addition, as discussed in more detail below, implementation of Mitigation Measures 7.21 MM-HAZ-a–h: B–F can avoid or reduce additional potentially significant hazards or hazardous materials impacts associated with habitat restoration and other ecosystem projects. If these mitigation measures are implemented, most, if not all, impacts (including construction impacts) can be mitigated to less than significant. Because the precise location and magnitude of activities required for habitat restoration and other ecosystem projects are not known, impacts related to hazards cannot be determined with certainty at this time. Therefore, potential impacts related to hazards and hazardous materials remain potentially significant.

Physical Habitat Restoration

In addition to the potential for hazards related to the use of hazardous materials in heavy equipment during construction, operations, and maintenance (see *Common Construction*), herbicide application may be necessary for the ongoing control of invasive terrestrial plant species as part of maintenance at some restored habitat sites. Accidental release (e.g., spills) or improper use or storage of herbicides could result in the exposure of the application crews and general public (including children, for sites located within 0.25 mile of a school) to toxic chemicals.

Habitat restoration could create conditions favorable to mosquitos, which could lead to increased transmission of mosquito-borne diseases (e.g., West Nile virus). The practice of flooding previously dry land (e.g., seasonal wetlands) during the early fall for attracting waterfowl for conservation and recreational purposes can create favorable mosquito-breeding habitat. Mosquitoes require standing water to complete their growth cycles, and waterbodies with poor circulation, continual slow-changing water levels, higher temperatures, and higher organic content produce greater numbers of mosquitoes. Although measures would be included in the project design and management to minimize favorable mosquito-breeding conditions, the application of pesticides may be necessary.

Restoration of floodplain, riparian, and tidal habitat could attract waterfowl and other birds. If restored areas are in proximity to existing airport flight zones, there could be the potential for increased bird-aircraft strikes, which would create a potential safety hazard for people residing or working in or near the project area.

An increase in vegetation as part of some types of physical habitat restoration (e.g., riparian restoration) could cause an increase in the risk of wildland fire by increasing the fuel load. Riparian corridors could also act as a corridor for the spread of fire under dry climatic conditions and where dry fuel has accumulated. In addition, for larger habitat restoration projects that attract visitors, the risk for wildfires may be increased due to an increased number of cars and people to the area. For example, hot exhaust pipes and mufflers are capable of igniting dry grass or brush with sustained contact.

Replacement recreational facilities, including marinas and campgrounds, may be required at other nearby locations if it is necessary to remove these types of recreational facilities for the purpose of habitat restoration (see discussion in Section 7.21.2.15, *Recreation*). Construction impacts related to hazards and hazardous materials would be similar to those described in *Common Construction*. For marinas, additional siting/construction considerations may include the installation of underground or aboveground storage tanks (USTs and ASTs, respectively) for bulk fuel storage at new fueling stations. Faulty installation or inadequate operation and maintenance of USTs or ASTs may result in the release of fuel, which could result in surface water and groundwater contamination or other adverse effects including the potential for fire and explosion. Improper siting, construction, or maintenance of public restrooms could expose the public to raw sewage, which would be a public health hazard.

These impacts would be potentially significant. In addition to common construction mitigation measures, implementation of Mitigation Measure 7.21 MM-HAZ-a–h: B would help minimize or avoid potentially hazardous impacts on the public or environment from habitat restoration projects to a less-than-significant level. Measures include herbicide application control and mosquito abatement control measures (including safe pesticide application); air traffic safety measures; and wildfire prevention measures. Physical habitat restoration WQ mitigation measures (7.21 MM-WQ-a–j: E) are incorporated by reference for water quality control and flood risk and infrastructure protection. Until mitigation measures are implemented, the impacts remain potentially significant.

Water quality, flood risk, and infrastructure protection are evaluated in Section 7.21.2.9, *Hydrology and Water Quality—Surface Water and Groundwater*.

Fish Passage Improvements

Potential hazards posed to the public or environment due to fish screen, fishway, and TCD construction activities are described in *Common Construction*. In addition, certain types of TCDs, such as thermal curtains, would increase the reservoir area that would be restricted from use by recreationists. Thermal curtains and associated structures could pose a physical safety hazard (e.g., collision) to recreationists such as water skiers, wakeboarders, and others being towed behind boats and to other water-based recreationists in the vicinity of the TCD. Implementation of Mitigation Measure 7.21 MM-HAZ-a–h: C would require that an area around the temperature curtain be restricted and posted with warning signs and buoys for the safety of recreationists and could avoid or minimize this impact to less than significant. Until these potential mitigation measures are implemented, the impacts remain potentially significant.

Dam removal projects can range from relatively small impoundments (e.g., diversion dams) to large-scale construction and removal of larger structures (e.g., reservoirs). Structure removal limits for large dam removals are based on a wide range of factors, including public safety and liability issues, type of dam and appurtenant structures, and presence of hazardous materials. Public safety and liability issues would require consideration of the potential hazards to the public, if remaining portions of the dam could represent a potential hazard, such as an attractive nuisance on the stream. Construction-related traffic could cause hazards on existing transportation infrastructure (e.g., roadways, bridges, culverts) en route to the dam site.

Removal of fish passage barriers could require the demolition of structures (including mechanical and electrical equipment) containing hazardous materials, such as lead, asbestos, treated wood, coating contaminants (e.g., lead-based paint), batteries, chemicals, petroleum products, polychlorinated biphenyls (PCBs), and mercury. Demolition and disposal of structures containing hazardous materials could create a significant hazard to the public or the environment through accidental release. Without proper protections, contaminants could leach into surface water or groundwater and potentially migrate to drinking water sources, posing public health concerns.

Construction activities could include drilling and cutting into large quantities of concrete. This could result in the release of a substantial amount of concrete dust, which could pose a hazard to the public or the environment.

Reservoir dam removal projects could result in short-term construction-related impacts consisting of an increase in traffic on narrow rural roads from commuting workers, hauling of large equipment, and disposal of wastes. Construction/demolition actions related to removal of a reservoir dam would potentially be the period of highest construction intensity and therefore would require the largest workforce and number of worker vehicle trips and haul truck trips. This additional traffic could temporarily result in interference with an adopted emergency response plan or emergency evacuation.

Removal of reservoirs as a source of water for fire suppression could substantially increase the public's risk of loss, injury, or death associated with wildfires if other sources of water or means of fire suppression are not readily available. In addition, removal of a reservoir could result in an increased source of wildfire fuel in the form of dead trees and other vegetation around the former reservoir shoreline.

These impacts would be potentially significant. In addition to common construction mitigation measures, implementation of Mitigation Measure 7.21 MM-HAZ-a–h: D would reduce or avoid potentially hazardous impacts on the public and environment from dam removal projects to less than significant. Measures include preproject planning and facility design to ensure that removal of structures would be done so that flooding, fire, and other risks would be controlled. A sediment management and monitoring plan (7.21 MM-WQ-a–j: G3) would be required for natural erosion or handling and disposal of sediment stored behind the barrier. Mitigation Measure 7.21 MM-HAZ-a–h: D2 requires the development and implementation of a hazardous materials management plan (HMMP). Materials determined to be hazardous would require special handling and disposal at approved facilities. Testing, labeling, manifesting, transporting, and disposing of hazardous materials are regulated by federal and state law. Mitigation Measure 7.21 MM-HAZ-a–h: D4 would also require a fire management plan to identify long-term water sources for helicopter and ground crews and remove dead or dying vegetation around the former reservoir shoreline that could serve as wildfire fuel. A project-specific analysis would be necessary to identify the preferred dam

removal method for an individual project, and multiple approvals from various federal and state agencies would be required. Until mitigation measures are implemented, the impacts remain potentially significant.

Predatory Fish Control

Effects related to hazards during construction from removal or modification of instream human-made structures for predation control are described in *Common Construction*.

Capture methods for predation control do not involve construction and therefore would not result in any of the construction impacts related to hazards and hazardous materials discussed in *Common Construction*. However, electrofishing operations, if not implemented safely (i.e., according to safe electrofishing practices and techniques), could result in electrocution of nearby swimmers, for example, as well as nontarget wildlife species; exposure to a low electrical current may cause death through respiratory arrest or cardiac fibrillation (American Fisheries Society 2008). As such, this impact would be potentially significant. Implementation of electrofishing safety BMPs under Mitigation Measure 7.21 MM-HAZ-a–h: E would avoid or minimize the impact. Until this mitigation measure is implemented, the impacts remain potentially significant.

Passive and active capture methods would not result in a safety hazard for people residing or working in or near the project area if it is located within 2 miles of a public or public use airport or within the vicinity of a private airstrip because these methods would be implemented along riverbanks and within river channels and do not require tall structures or reflective features that could impede or interfere with air traffic or otherwise compromise air safety.

Removal or modification of human-made structures and passive and active capture methods would not physically interfere with an adopted emergency response plan or emergency evacuation plan because the sites would be located off-road within riverbanks and river channels.

Invasive Aquatic Vegetation Control

Invasive aquatic vegetation control does not involve construction and therefore would not result in any of the construction impacts related to hazards and hazardous materials discussed in *Common Construction*. However, chemical control of invasive aquatic vegetation could result in the accidental release of herbicides and the exposure of application crews and the general public (including schools within 0.25 mile) to herbicides. Misuse of herbicide or accidental spill could also adversely affect aquatic and terrestrial species and habitat, as well as water supplies, depending on the amount and type of chemical spilled, the location of the spill, weather conditions, and emergency response time (e.g., cleanup).

As discussed in Section 7.21.2.4, *Biological Resources*, there are specific regulations regarding the use of herbicides for aquatic vegetation control. Implementation of BMPs for the safe use of herbicides for chemical control of invasive aquatic vegetation (7.21 MM-BIO-a–f: G2) would avoid or minimize potentially hazardous impacts on the public or environment from the improper application of herbicides. Until this mitigation measure is implemented, the impacts remain potentially significant.

Mitigation Measures

7.21 MM-HAZ-a–h: Mitigate hazards and hazardous materials impacts

Entities or agencies designing and/or approving habitat restoration or other ecosystem projects will implement or require the following.

A. Construction HAZ Mitigation Measures (CMM-HAZ-a–h)

1. **Measures for Transport, Use, or Disposal of Hazardous Materials:**

   i. Regulatory Compliance: Comply with all federal, state, and local plans, policies, ordinances, and permit requirements related to the handling, storage, transport, disposal, and accidental spill response for hazardous materials, including the Hazardous Waste Control Law, Cal/OSHA, and Asbestos National Emission Standards for Hazardous Air Pollutants for asbestos removal and disposal for demolition operations.

   ii. Hazardous Materials Storage: All hazardous materials will be stored in secondary containment in a clearly identified and protected area, and all hazardous materials brought on site will have a Material Safety Data Sheet that will be made readily available to employees and other personnel at the construction site.

   iii. Spill Prevention and Response Plan: Develop and implement a spill prevention and response plan that will comply with all governmental approvals and applicable local, state, and federal laws and regulations. The plan will include detailed procedures to prevent and respond to hazardous materials spills during construction of the project. At a minimum, the plan will include provisions for immediate response, containment, and cleanup of a spill, including excavation and disposal of contaminated soil at an approved disposal site, and notification responsibilities. Materials needed for potential cleanup activities will be kept on site.

   iv. Procedures for Hazardous Waste Generation and Disposal: Hazardous waste generated at work sites, such as contaminated soil, will be segregated from other construction spoils and properly handled, hauled, and disposed of at an approved disposal facility by a licensed hazardous waste hauler in accordance with state and local regulations. The contractor will obtain permits required for such disposal. The accumulation and temporary storage of hazardous waste will not exceed 90 days. Asbestos encountered as part of demolition activities will be disposed of according to the requirements of both the federal Clean Air Act and Cal/OSHA (Cal. Code Regs., tit. 8, subch. 4, art. 4, § 1529).

   v. Procedures for Hazardous Materials Use near Streams: Storage, use, or transfer of hazardous materials in or near wet or dry streams will be consistent with Fish and Game Code section 5650 and/or with the permission of CDFW.

   vi. Waste management and material control measures (CMM-WQ-a–j: 4).

2. **Project Siting:**

   i. Avoid locating project construction areas within 0.25 mile of an existing or proposed school whenever feasible. If not feasible, provide preconstruction

notification to schools within 0.25 mile of construction sites, alerting them of potential uses of hazardous materials and anticipated construction schedule.

ii. Avoid locating projects on potentially contaminated sites and hazardous materials sites (including sites on the most recent Hazardous Waste and Substances Sites [Cortese] List).

iii. Prior to beginning construction, project proponents will confirm utility/ infrastructure locations through consultation with utility service providers, preconstruction field surveys, and services such as Underground Service Alert to ensure that underground utilities are not affected.

3. **Demolition Measures:**

   i. Characterize and separate hazardous materials from structures before demolition and ensure that such materials are disposed of at an approved disposal site according to applicable regulations. Implement proper handling and disposal procedures for potentially hazardous materials, such as solvents and household or industrial-strength maintenance chemicals and cleaners in buildings to be demolished.

   ii. As applicable, a Cal/OSHA-certified lead-based paint contractor will prepare a site-specific lead hazard control plan with recommendations for the containment of lead-based paint materials during demolition activities for appropriate disposal methods and locations. Containers suspected of, or confirmed as, containing lead-based paint will be separated from other building materials during the demolition process. Separated paint will be classified as a hazardous waste if the lead content exceeds 1,000 parts per million and will be disposed of in accordance with applicable regulations.

   iii. Hazardous waste, including contaminated soil, generated at demolition sites will be handled, hauled, and disposed of at an appropriately licensed disposal facility under appropriate manifest by a licensed hazardous waste hauler.

4. **Herbicide and Pesticide Use:** Any chemical considered for control of invasive species must adhere to all regulations, be approved for use in California, adhere to all regulations per DPR, and be applied by a licensed applicator under all necessary state and local permits. A pest control advisor can ensure that legal, appropriate, and effective chemicals are used with appropriate methodologies. Aquatic pesticides will be applied in compliance with NPDES order(s), where applicable.

5. **Hazardous Materials and Work Site Safety Training:** Provide hazardous materials and work site safety training for construction workers in accordance with local, state, and federal requirements, including but not limited to the Occupational Safety and Health Act, title 9 of C.F.R. and California Code of Regulations title 8.

6. **Emergency Response Plan:** The project proponent will develop and implement an emergency response plan. The emergency response plan will include descriptions of procedures to be implemented to help prevent emergency incidents, to ensure preparedness if these incidents occur and to provide a systematic and orderly response to emergencies through coordination with emergency response agencies. The emergency response plan will be posted and readily accessible on site and will be

coordinated, as applicable, with a traffic management plan (CMM-TRA-a,b,d–f: 2), fire prevention and management plan (CMM-HAZ-a–h: 9), and spill prevention and response plan (CMM-HAZ-a–h: 1iii).

7. **Construction Site Security:** To ensure adequate construction site security where equipment, chemicals, or hazardous conditions may be present, implement the following.

    i. Fence project construction site and install and enable motion-detecting lights.

    ii. Provide 24-hour on-site security personnel. Security personnel will serve as the first line of defense against criminal activities and nuisances at construction sites. Private patrol security operators hired to provide site security will have the appropriate licenses from the California Bureau of Security and Investigative Services. Individual security personnel will have, at a minimum, a security guard registration license that meets the California Bureau of Security and Investigative Services requirements for training and continuation training as required for that license. All security personnel will also receive environmental training similar to that of on-site construction workers so that they understand the environmental conditions and issues (e.g., hazardous conditions, cultural resources present) associated with the various areas for which they are responsible at a given time. At a minimum, the project construction site will be fenced**.**

8. **Construction near Airports:** Where construction occurs within an airport land use plan area, within 2 miles of a public airport or public use airport, or within the vicinity of a private airstrip, the following BMPs will be implemented, at a minimum, to avoid safety hazards for people residing or working in the project area.

    i. Follow applicable requirements of any relevant airport land use compatibility plan relevant to the proposed project site or area.

    ii. If proposed construction is within 2 miles of a private airstrip, coordinate with that airport to ensure that construction activities do not introduce air safety hazards.

9. **Fire Prevention and Management Plan:** A fire prevention and management plan will be developed to address fire prevention and response methods, including fire prevention and management/suppression measures. Coordinate with local, state, and federal fire suppression agencies, as applicable, in development of the plan. The fire prevention and management plan will, at a minimum, require the following BMPs be implemented.

    i. Identify and adhere to local laws, ordinances, and building codes related to fire prevention and protection, burning, welding, and other potentially hazardous activities that could increase the potential for fires in general and for wildland fires; obtain any necessary permits; and adhere to permit conditions.

    ii. Clear or wet areas of construction and demolition (as applicable) containing dried vegetation to prevent wildfires in high-risk areas.

    iii. Prohibit smoking, open flames, or welding in on-site refueling or service areas.

    iv. Maintain an adequate number of fire extinguishers and other tools and equipment that can be used for fighting fire on site and ensure that personnel are trained in their use.

v. If refueling is done on site, turn off vehicle engines during refueling.

vi. Equip all construction vehicles and machinery with functional spark arresters and/or mufflers, where applicable.

vii. Maintain a water tender during extensive welding and cutting operations.

viii. If the project includes blasting activities, include special precautions to minimize the risk of fire related to any explosive materials on the project site.

10. **Asbestos Control Measures** (CMM-AQ-a–e: 5)

11. **Valley Fever Control Measures** (CMM-AQ-a–e: 4)

12. **Blasting Operations and Safety Plan** (CMM-GEO-a–e: 7)

13. **Septic System Management Measures** (CMM-GEO-a–e: 6)

14. **Mosquito Control Measures:** Eliminate standing water to reduce mosquitoes at a construction site. Avoid leaving containers that can accumulate water in an uncovered or upright position. This includes wheelbarrows, drums, buckets, cans, tarps, and other containers. Create holes to drain water from containers. Fill in potholes and other areas where water is likely to accumulate. Routinely remove garbage and other debris. Implement CMM-HAZ-a–h: 4 if pesticide is applied.

15. **Installation and Operation of Underground and Aboveground Storage Tanks:** Conduct design, siting, construction, and operations activities in compliance with all applicable federal, state, and local laws and regulations, including but not limited to, International Fire Code, National Fire Protection Association (NFPA) codes (NFPA 30, 30A, 303), Uniform Fire Code (Articles 52 and 79), California Fire Code (Cal. Code Regs., tit. 19, div. 1), NPDES (40 C.F.R. pt. 122), U.S. Coast Guard requirements for transferring oil or hazardous materials (33 C.F.R. pt. 154), and USEPA spill prevention control and countermeasure plan requirements (40 C.F.R. pt. 112).

16. **Installation and Maintenance of Plumbing in Public Restrooms:**

    i. Design, site, and construct restroom facilities in compliance with all applicable state and local laws and regulations, including but not limited to, California Plumbing Code (Cal. Code Regs., tit. 24, pt. 5) and applicable municipal code related to sanitary sewer connections.

    ii. Public restrooms and associated infrastructure will be regularly maintained to ensure that toilets and sewage lines are functioning properly at all times.

B. Physical Habitat Restoration HAZ Mitigation Measures

1. **Herbicide Application Control Measures:** Implement BMPs for herbicide use, including the following.

    i. Comply with applicable regulations and permits for the use and storage of herbicides.

    ii. During all project activities, herbicides will be used only by a licensed applicator in accordance with all product label requirements and restrictions.

    iii. Herbicides will be applied only to target plants.

iv. Minimize public exposure to herbicide-treated water by posting notices adjacent to treatment areas and at public access points for the day of treatment and through the end of the restricted use period. Send advance notice to adjacent property owners.

A licensed applicator will minimize potential for drift when applying herbicides.

v. A licensed applicator will implement BMPs to minimize the risk of and/or potential impacts of an herbicide spill, including the following.

- Locating areas for mixing and loading of herbicides where accidental spills to nearby waterbodies cannot occur.
- Reporting spills immediately to appropriate state and local agencies.
- Immediately stopping movement of land spills using absorbent materials.
- Marking and monitoring spills in surface water for herbicide residues and environmental impacts, if appropriate.

vi. Implement an adaptive management approach to minimize the use of herbicides in the long term.

2. **Mosquito Abatement Control Measures:** For restoration projects that result in standing water and are located near populated areas, design projects to achieve the following.

i. Freshwater habitat management will include management of water control structures, vegetation management, mosquito predator management, drainage improvements, and other BMPs. The agency implementing the restoration project will coordinate with CDFW and local mosquito and vector control agencies regarding these strategies and specific techniques to minimize mosquito production.

ii. Permanent ponds will be maintained to increase the diversity of waterfowl yet decrease the introduction of vectors through constant circulation of water, vegetation control, and periodic draining.

iii. The project will avoid ponding in tidal marsh habitat or in areas within the waterside of setback levees. Restoration projects will be designed to minimize standing water; and other mosquito control methods, such as stocking of mosquitofish, will be used to reduce mosquito breeding.

iv. Pesticide use for mosquito abatement must be conducted by a trained and certified vector control pesticide applicator. Only pesticides approved by both USEPA and DPR may be used by a California vector control agency.

v. Minimize public exposure to pesticide-treated areas by posting notices adjacent to treatment areas and at public access points for the day of treatment.

3. **Mitigate Potential Impacts on Air Traffic Safety:** For restoration projects located near an airport, implement the following.

i. Follow applicable requirements of any applicable airport land use compatibility plan.

ii. Implement measures to reduce wildlife attractants near airports and private airstrips, including the following.

- Avoid creating hazardous wildlife attractants within a distance of 10,000 feet of an Airport Operations Area.
- Maintain a distance of 5 statute miles between the farthest edge of the Airport Operations Area and hazardous wildlife attractants.

4. **Wildfire Prevention Plan:** For restoration projects located in areas designated as Very High or High Fire Hazard Severity Zones where public access is granted and encouraged (i.e., public viewing platforms, interpretive facilities), prepare and implement a site-specific wildfire prevention plan that. at a minimum, includes the following measures.
    i. Install and maintain fire restriction and fire danger signage in locations visible to the public.
    ii. Restrict parking to cleared areas away from dry vegetation.
    iii. Perform regular vegetation clearance in critical locations to reduce wildfire intensity and rate of spread.
    iv. Provide site operations and maintenance staff with access to a fire extinguisher and other tools and equipment that can be used for fighting fire on site and train them in the use proper use of firefighting equipment.
5. **Roadway Detour Plan** (7.21 MM-TRA-a,b,d–f: B1)
6. **Physical Habitat Restoration WQ Mitigation Measures** (7.21 MM-WQ-a–j: E) to reduce water quality impacts and flood risks and to protect infrastructure.

C. Fish Passage Improvements HAZ Mitigation Measure

1. **Signage and Buoys for Temperature Control Curtains:** Warning signs and lighted buoys noting the presence of a temperature control curtain will be placed where fully visible, around the curtain, and an area of at least 10 feet from the curtain will be maintained as a restricted area to all but reservoir staff.

D. Dam Removal HAZ Mitigation Measures

1. **Project Planning:** For feasibility studies, collect data for all structures within the impoundment, as well as all upstream and downstream structures that may be affected by removal of the dam, such as mechanical and electrical equipment and impounded items. Incorporate into engineering designs and construction any special accommodations for hazardous materials. Develop structural design limits to ensure public safety. Some structures, or portions of structures, may remain in place, so long as no hazard potential remains. Any retained portions of the dam must be stable and may have to accommodate fish passage for a certain range of flows. Identify alternative water sources (e.g., dip ponds, river pools suitable for helicopter drafting, dry hydrants) for both ground and helicopter crews for wildfire protection. Proceed with project if feasibility analysis verifies that constructing or operating a project will not result in unacceptable hazard risks.
2. **Hazardous Materials Management Plan:** Conduct an inventory of all hazardous materials on and around the site. If it is determined that a fish passage barrier and/or associated facility or facilities considered for removal may contain hazardous materials (e.g., asbestos, lead-based paint) an HMMP will be developed and implemented prior to, during, and following construction, as applicable. The HMMP will include an inventory

of all hazardous materials on site. Implementation of the HMMP will ensure that all hazardous materials removed from the project site will be managed and disposed of at an approved hazardous waste facility. Transformer oils would be tested for PCBs if no data exist. Any tanks that contain hazardous materials would be decontaminated prior to disposal. Universal hazardous waste (e.g., lighting ballasts, mercury switches, batteries) would be handled per applicable federal and state universal waste regulations. The HMMP is required to comply with Health and Safety Code, title 27, division 20, chapter 6.95, sections 25500–25545, and California Code of Regulations title 19, division 2, chapter 4.

3. **Dam Removal WQ Mitigation Measures** (7.21 MM-WQ-a–j: G)

4. **Fire Management Plan:** A post–dam removal fire management plan will be developed in consultation with CAL FIRE. The fire management plan will, at a minimum, include the following.

    i. Identify long-term water sources for helicopter and ground crews (including construction and use of proposed dry hydrants, dip ponds, or other alternatives). After reaching agreement on the fire management plan with CAL FIRE, the project lead will submit the final fire management plan to CAL FIRE and implement any portions of the plan for which the project lead has identified responsibilities.

    ii. In coordination with CAL FIRE, monitor vegetation around the former reservoir shoreline annually and remove any dead or dying vegetation that could serve as wildfire fuel.

E. Predatory Fish Control HAZ Mitigation Measures

1. **Electrofishing Safety Best Management Practices:** To minimize the potential that electrofishing would affect public safety, implement the following electrofishing safety BMPs.

    i. All personnel involved in electrofishing operations will have received recent training on safe electrofishing practices and techniques. The equipment will be kept in good working order, and all personnel will wear appropriate protective gear.

    ii. A temporary sign will be posted at the reach being electrofished, warning people to stay out of the creek in that location (the electrical field extends only a few feet from the anode). The sign will include a brief explanation of the project.

    iii. Electrofishing will not be performed near bystanders, pets, or livestock that are in or near the water.

    iv. The electrofishing crew leader and, at minimum, one other crewmember must be trained in cardiopulmonary resuscitation, as well as in automated external defibrillator procedures if the crew is equipped with an automated external defibrillator.

    v. A first aid kit will be maintained and immediately available as part of the electrofishing team's basic equipment.

F. Invasive Aquatic Vegetation Control BIO Mitigation Measures for chemical control (7.21 MM-BIO-a–f: G2)

7.21.2.9 Hydrology and Water Quality—Surface Water and Groundwater

		Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
IX. Hydrology and Water Quality					
Would the project:					
a.	Violate any water quality standards or waste discharge requirements	☒	☐	☐	☐
b.	Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)	☒	☐	☐	☐
c.	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 which would result in substantial erosion or siltation on- or off-site	☒	☐	☐	☐
d.	Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site	☒	☐	☐	☐
e.	Create or combine runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff	☒	☐	☐	☐
f.	Otherwise substantially degrade water quality	☒	☐	☐	☐
g.	Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map	☒	☐	☐	☐
h.	Place within a 100-year flood hazard area structures which would impede or redirect flood flows	☒	☐	☐	☐
i.	Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam	☒	☐	☐	☐
j.	Inundation by seiche, tsunami, or mudflow	☒	☐	☐	☐

Sections 7.12.1.2, *Environmental Setting*, and 7.12.2.2, *Environmental Setting*, describe the surface water and groundwater setting, respectively. Additional regulatory setting is described in Appendix E, *Regulatory Framework for Construction Projects*.

Common Construction

Physical habitat restoration and other ecosystem projects are intended to correct a water quality problem or condition that causes or threatens to cause a detrimental effect on an aquatic ecosystem and beneficial uses. While habitat restoration and other ecosystem projects would generally be expected to benefit water quality, some of these projects could result in adverse impacts on hydrology and water quality. Most potential adverse impacts would be temporary and/or construction-related and could occur as a result of the location and construction of the project.

Construction activities have the potential to violate water quality standards or waste discharge requirements or otherwise substantially degrade water quality. Construction activities may lower local groundwater through dewatering and 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. Depending on the location and type of project, structures could be placed within a 100-year flood hazard area; expose people or structures to a significant risk of loss, injury, or death involving flooding; and be subject to inundation by seiche, tsunami, or mudflow.

All construction activities have the potential to contribute polluted runoff and sediment to nearby waterbodies, potentially violating water quality standards or otherwise degrading water quality. Construction sites can generate stormwater runoff that can negatively affect the quality of downstream receiving waters. Due to the disturbance of the landscape, the most likely pollutant is sediment; however, other pollutants are also of concern. Excess sediment can reduce the amount of sunlight reaching aquatic plants, clog fish gills and thereby interfere with respiration, smother aquatic habitat and spawning areas, and impede navigation in waterways. Sediment also transports other pollutants, such as nutrients, metals, and oils and greases.

In-water construction can cause temporary sediment disturbance and resuspension, which may cause increased turbidity, siltation, and bioavailability of sediment-associated pollutants. Excavation and dredging are two types of in-channel activities that are likely to cause increased turbidity. Dredging typically refers to removal of sediment to increase channel depth, often for navigation, but also potentially for creating geomorphic changes. Excavation typically refers to removal of sediment in shallower water (^USACE 2020), often for structure placement or maintenance. Other types of in-channel activities that could increase movement of sediment include breaching levees, operating heavy equipment, and placement or removal of structures.

Another type of in-water construction activity that could affect water quality is the placement of fill. Fill material may include placement of temporary gravel berms, cofferdams, or other structures to provide construction access and isolate work areas from water; and permanent placement of structures or material, such as soil (for recontouring), rocks, wood, or gravel. Placement of fill can cause turbidity to increase and, depending on the type of fill, can introduce contaminants. Fill can also affect channel hydraulics, potentially causing erosion and sedimentation. If the quantity of fill is large or if it is placed in an instream location that may already be somewhat constricted, it could increase the likelihood of flooding.

Construction could also result in accidental release of pollutants, which could adversely affect water quality. Construction pollutants can enter storm drains or streams directly or indirectly. Pollutants from construction activities include petroleum products (fuel, oil, and grease from vehicles and equipment), paving materials such as concrete and asphalt (accidental discharge of concrete wash water or wet concrete into a waterway can increase pH), other materials used or stored on site (pesticides, herbicides, fertilizer, detergents, paint, adhesives, solvents), and project waste (litter, debris, hazardous and liquid waste). The use of herbicides to control invasive plant species during construction could affect water quality and violate water quality standards if improperly applied.

Some habitat restoration and other ecosystem projects may include the installation and use of USTs or ASTs for bulk fuel storage and/or construction and maintenance of public restrooms. Faulty installation or inadequate operation and maintenance procedures may result in the release of fuel from UST and ASTs, which could result in surface water and groundwater contamination. Improper siting, construction, or maintenance of restrooms could result in the release of raw sewage, which could adversely affect groundwater and surface water quality. Septic systems are not typically installed for use during construction. However, for projects that include installation of septic systems, improper siting of these systems could result in adverse water quality effects. If a septic system is not working properly, it can contaminate nearby surface water or groundwater, if located too close to a groundwater well, with excess nutrients and pathogens.

Localized degradation of groundwater quality could result from temporary, short-term construction activities, such as building access roads and temporary facilities. If hazardous materials were to be discharged to the land surface or surface waters during this work, they could travel to underlying aquifers. If the discharge volume were large enough and/or the water table is high, the hazardous materials could degrade local groundwater quality to a sufficient degree to impair its continued use. Untreated groundwater used to control dust at construction sites could deposit dissolved salts on the ground's surface, which could ultimately enter nearby surface water. In addition, if improperly stored, contaminated dredged material or other materials could be stockpiled in storage or disposal areas within a construction site and reintroduced to waterways through erosion. Weathering of spoils could cause leaching and oxidation, thereby releasing chemicals into the water.

Construction activities that involve blasting, saw-cutting, and hydraulic hammering, for example, could release concrete dust and other particles into surface waters, which could violate water quality standards and/or affect aquatic resources. Fugitive dust from blasting may cause a temporary increase in turbidity in nearby surface waters depending on proximity to the blast and dust generated. In addition, blasting materials, such as explosives and detonators, may not be fully combusted during blasting, which may result in the release of soluble substances to groundwater (^NHDES 2010).

Water quality could be affected by dewatering. In some cases, groundwater may accumulate in excavated areas. If the groundwater is of poor quality and is discharged to a surface waterway, the surface water quality could become degraded by increased turbidity, dissolved solids, nutrients, metals, or other constituents in the groundwater. The presence of groundwater on a construction site also may increase the likelihood of accidental contamination of groundwater. The quantity of groundwater dewatering associated with construction of restoration projects would likely have minimal effect on groundwater volume. Dewatering of surface water ponded as part of construction (e.g., by use of sheet-pile barriers or check dams) also could affect surface water quality. This ponded water could have elevated temperature, turbidity, or construction contaminants and could affect water quality when it is discharged to a surface waterbody.

Construction could substantially alter drainage patterns of a project site and thereby cause erosion, siltation, or flooding onsite or offsite. Actual alterations of drainage patterns would depend on the type of construction activity and site-specific hydrologic and hydraulic factors. Land grading; placement of dredged or excavated material; constructing structures, roads, and earthen embankments; and stockpiling construction materials could create physical barriers to flowing stormwater runoff (drainage), which could redirect runoff and potentially contribute to flooding onsite and offsite. In addition, construction activities could change the on-site land slopes across which drainage flows, which could alter the flow rates, directions, water surface elevations, or velocities of runoff that enters or originates on the construction site.

Activities such as grading, vegetation removal, soil compacting, or paving could increase land surface imperviousness (inability to be penetrated by water) and decrease precipitation losses to soil infiltration. Impervious surfaces can affect water quality by creating surfaces where pollutants, such as petroleum products from vehicles, can accumulate and later be washed into waterways, causing polluted runoff. Impervious surfaces can affect hydrology by preventing rainwater from absorbing into the soil and thus increasing runoff and reducing groundwater recharge. Increased runoff can cause increases in water surface elevations, velocities, and erosion. Most habitat restoration and other ecosystem projects would not add large areas of impervious surfaces. Some paved or concreted areas may be necessary for fish passage improvements, for projects such as channel armoring, slope protection with riprap or other materials with low permeability, and construction of roads, which may create larger impervious or semi-impervious areas. These impacts have the potential to occur at any construction site, because stormwater runoff occurs on all land surfaces.

The susceptibility of a project to a seiche, tsunami, or mudflow depends on location. Areas where there would be construction and operations near reservoirs and the ocean could be subject to inundation by seiches and tsunamis, respectively. Construction and operation of any type of habitat restoration projects or other ecosystem measures could be subject to mudflow because any of these could be located at the base of a steep slope.

Impacts on hydrology and water quality associated with common construction activities would be potentially significant and can be avoided or reduced by implementation of Mitigation Measure 7.21 MM-WQ-a–j: A (CMM-WQ-a–j). The magnitude of construction impacts depends on the extent, location, and duration of construction. Common mitigation or BMPs to avoid, minimize, or offset potential water quality effects may include preconstruction surveys and analysis, preparation and implementation of site-specific SWPPPs, turbidity compliance monitoring, drainage plans, and erosion control measures. In addition, discussed in more detail below, implementation of Mitigation Measures 7.21 MM-WQ-a–j: B–H can avoid or reduce project-specific potentially significant impacts on water resources from habitat restoration and other ecosystem projects. If mitigation measures are implemented, most, if not all, impacts (including construction impacts) can be mitigated to less than significant. Because the precise location and magnitude of activities required for habitat restoration and other ecosystem projects are not known, impacts on water quality cannot be determined with certainty at this time. Therefore, potential impacts on hydrology and water quality remain potentially significant.

Physical Habitat Restoration

Habitat restoration projects could provide many long-term benefits related to hydrology and water quality. Restoration projects would be expected to provide increased quality and availability of

native habitat (e.g., floodplain habitat) that, in combination with a more natural flow regime, would be expected to benefit native species and ecosystems. Riparian and floodplain restoration projects could also increase the groundwater infiltration area, provide increased groundwater recharge, and thereby help to maintain or increase groundwater table levels.

Restoration projects would also be expected to support native vegetation, which would provide water quality benefits by filtering and retaining sediment, nutrients, and some pollutants. Increased riparian vegetation, particularly riparian trees, can improve water quality by providing more shaded water surface, thereby reducing water temperature. In addition to providing potential ecological benefits, these projects could provide benefits related to flood protection. Large restoration projects have the potential to provide additional flood storage space and reduce flood stage in the main waterway. Possible future restoration projects that increase the capacity or extent of floodplain habitat in the Sacramento/Delta, such as setback levee projects, could provide additional capacity to convey flows in rivers and flood bypasses in the Sacramento/Delta. Overall, it is expected that there would be a beneficial effect on water quality and flood control following restoration.

Water quality impacts from habitat restoration projects are primarily associated with construction activities—that is, grading and excavation of riverbanks and channels, construction of temporary roads, and placing and anchoring structures and operating heavy equipment in and near the river channel, which could be mitigated, in part, through the implementation of construction mitigation measures, as discussed in *Common Construction*.

In addition to common construction impacts, geomorphic changes from habitat restoration could increase long-term rates of erosion or sedimentation. Habitat restoration may modify channels to improve geomorphic function and increase floodplain and tidal habitat, which may alter sediment movement. These geomorphic actions include improving hydrologic connectivity between terrestrial and aquatic habitats for key geomorphic or ecological functions, including the exchange of food, nutrients, and sediment. The landscape may be prepared in a manner that facilitates a more natural geofluvial process that also includes active movement of soils and other material. Fill activities unique to physical habitat restoration could include in-channel placement of large pieces of wood, boulders, and spawning gravel. Placement of these materials could increase the potential for water quality degradation if the material contains sand, silt, or other contaminated materials that could be released into the stream. Placement of fill and gravel has the potential to release turbidity and existing contaminants from in-channel sediment into the water column.

Water quality may also be affected in the location where gravel material is obtained. Gravel mining often occurs in or near streams and where the groundwater table is high and, as such, may result in increased turbidity of surface water and release of contaminants to both surface water and groundwater. After mining is completed, pits often fill with groundwater, which may have relatively low quality compared to surface water originating from runoff.

Water quality objectives for sediment and turbidity provide that sediment load and discharge rate will not be altered in a way that would cause nuisance or adversely affect beneficial uses. In the San Francisco Bay Basin Plan, increases in turbidity are constrained to less than 10 percent in areas where the natural turbidity is already greater than 50 nephelometric turbidity units (NTUs) (San Francisco Bay Water Board 2019). Controllable water quality factors will not cause a detrimental increase in the concentrations of toxic pollutants in sediment or aquatic life (San Francisco Bay Water Board 2019). The Central Valley Basin Plan contains a more specific tiered system with allowable turbidity increases based upon the natural turbidity of the surface water, with exceptions

during dredging operations (Central Valley Water Board 2019). Large-scale restoration projects may cause significant discharges of waste into waters of the state and may require a longer time to achieve water quality standards.

Habitat restoration projects could alter the existing drainage pattern of the site or area and, if improperly designed, alter hydrology and/or increase erosion and sedimentation. Floodplains allow water to spread across a wider area and relieve constricted channels of flow, whereas constriction of flow typically results in erosion. Floodplain restoration typically increases conveyance capacity, thereby reducing the likelihood of flooding or slowing channel velocity and increasing the chance of sedimentation. Channel constriction, which could be associated with fill activities, could increase channel velocity and the likelihood of erosion. Tidal restoration allows tidal flow into new areas, which may increase flow in and out of the restored site. Physical habitat restoration projects that would change aquatic habitat by changing river width or river habitat types (riffles, pools, runs) could also alter hydrology and/or increase erosion and sedimentation. Even in cases where channel volume is increased, new flow pathways could alter flow patterns and locations of erosion and deposition.

Increases in erosion or sedimentation may often have no deleterious consequences and may just represent relocation of sediment. In some cases, changes in sediment movement may be beneficial, such as when sediment is flushed from spawning gravel or sediment deposits enable growth of riparian vegetation. However, movement of sediment and sedimentation could cause damage to infrastructure due to erosion and reduce conveyance capacity.

Operation of habitat restoration projects (i.e., tidal, floodplain, riparian) could direct water through restoration areas with contaminated soils and organic material. This soil could contain mercury or other metals, organic material, biocides, and other contaminants. For example, it has been suggested that creation of wetland habitat in abandoned salt ponds in southern San Francisco Bay could result in increased erosion at some locations that could unearth deeper bay sediments that are more contaminated than newer more recently deposited sediments (Greiner and Davis 2010). By routing water through these areas, contaminants and organic material could enter the water column and be transported off site. For example, activities such as breaching levees and notching the Fremont weir could enable or increase flow over areas that have been treated with agricultural pesticides and fertilizers. Concentrations of some contaminants are unlikely to increase substantially in response to physical habitat restoration because they are already ubiquitous or because they degrade rapidly.

Tidal restoration may alter Delta hydrodynamics and could alter salinity, with the effect depending on the location, acreage, and type of restoration. For example, restoration in Suisun Marsh may have a larger effect on X2 than restoration in Cache Slough, but even a large, 65,000 acres of restoration associated with the proposed Bay Delta Conservation Plan was estimated to increase X2 by only a little more than a kilometer, indicating only a minor increase in Delta salinity (RMA 2012).

Restoration projects could also affect water quality constituents through natural on-site processes. For example, floodplain and tidal habitat restoration sites generally would have good conditions for primary productivity (algal growth), including the presence of nutrients, warm temperatures, and shallow slow-moving water. Increased primary productivity can have benefits such as supporting the base of the foodweb, which can be beneficial for fish. It is also possible that algae produced at restoration project sites could be a source of dissolved organic carbon to nearby waterways, which could reduce drinking water quality if drinking water intakes are nearby. In addition, restoration

that produces inundation areas during warmer parts of the year could lead to the formation of harmful algal blooms, which could affect beneficial uses.

Habitat restoration projects that involve dredging would remove and rearrange sediment, which could mobilize sediment and contaminants. Potentially contaminated sediments would require containment to the extent feasible and disposal at a waste disposal facility engineered and permitted for contaminated sediment. In some cases, dredged material may be suitable for beneficial reuse, such as for wetland creation and restoration or for levee maintenance, construction fill, or daily cover at sanitary landfills. Surface water quality or groundwater quality could be adversely affected via runoff or leachate from dredged material, respectively, if the material is stored on site or at rehandling facilities. In the San Francisco Bay and its marshes and creeks, the State Water Board and its state and federal partners manage dredging and the beneficial reuse of dredged material under the *Long-Term Management Strategy for the Placement of Dredged Material in the San Francisco Bay Region* (USACE et al. 2001).

Mercury is converted to the more toxic and bioavailable methylmercury when anaerobic conditions are present in creeks, rivers, and wetlands (^Central Valley Water Board 2010). Wetlands, including floodplains and tidal marshes, can provide organic material along with anoxic conditions that increase conversion of mercury to methylmercury by sulfate- and iron-reducing bacteria, primarily (Windham-Myers et al. 2014; ^Marvin-DiPasquale et al. 2009; Mitchell and Gilmour 2008; Podar et al. 2015). The formation of methylmercury may be enhanced by cycles of wetting and drying, which can increase the activity of sulfate- and iron-reducing bacteria (Gilmour et al. 2004; Fleming et al. 2006; Maher et al. 2020). Methylmercury formation is not expected to increase in areas that already are inundated but could increase in areas of new inundation. The effect of increases in mercury and methylmercury may carry downstream, but the effect would be dissipated by mixing with other water sources, settling of mercury attached to sediment, dredging, accumulation in organisms, and photodegradation of methylmercury back to mercury (^Central Valley Water Board 2010). An additional way that increased floodplain inundation (either due to floodplain inundation or notching of the Fremont weir) may affect water quality is by reducing water depth and velocity, allowing water temperature to increase farther upstream than it otherwise might if flow is maintained in a narrow, deep, and fast-moving channel. Floodplains located lower in the watershed have warmer temperatures that are closer to equilibrium values and, therefore, would not increase as much as temperatures in the same habitat farther upstream. Smaller floodplain projects are unlikely to have substantial temperature effects.

On-site natural processes in floodplain and tidal restoration areas could increase methylmercury formation. As discussed in Section 7.12.1, *Surface Water*, mercury contamination occurs throughout California. The creation of freshwater wetlands and floodplains could facilitate methylmercury production and loading. When temporarily flooded, floodplains may also produce methylmercury. Seasonal trends of mercury occur, with variable aqueous methylmercury concentrations and export from the Cosumnes River, Sacramento River, Feather River, and rice-dominated regions, and concentrations and loads are substantially higher in winter compared with summer months. Increasing the flow of water leaving wetlands has the potential to increase methylmercury loading into the Delta. The concentration of methylmercury in water also influences loading, such as processes within rice fields that appear to increase aqueous methylmercury concentrations. However, methylmercury concentrations can be lower than upstream methylmercury inputs due to photodemethylation and particle settling, which can remove methylmercury from the water column (Eagles-Smith et al. 2014; Tanner et al. 2016).

Replacement recreational facilities, including marinas and campgrounds, may be constructed at other locations if it is necessary to remove these facilities for the purpose of habitat restoration at a site (see Section 7.21.2.15, *Recreation*). Construction impacts on water quality for these facilities are described in *Common Construction*. For marinas, additional siting/construction considerations may include the installation of USTs or ASTs for bulk fuel storage at new marina fueling stations. Faulty installation or inadequate operations and maintenance procedures may result in the release of fuel from USTs and ASTs, which could result in surface water and groundwater contamination. Improper siting, construction, or maintenance of public restrooms at marinas and/or campgrounds could result in the release of raw sewage, which could adversely affect groundwater and surface water quality.

While overall it is expected that there would be a beneficial effect on water quality following habitat restoration, the impacts identified above would be potentially significant. In addition to common construction mitigation measures, implementation of Mitigation Measures 7.21 MM-WQ-a–j: B–E would help minimize potential water quality impacts associated with habitat restoration projects. Physical habitat restoration projects require extensive analysis and evaluation during both the design and operational phases to ensure proper hydrological functioning and to avoid water quality impacts. These projects must be developed and implemented in consultation with and subject to approval from applicable state and federal fisheries and flood control agencies (7.21 MM-WQ-a–j: B). Restoration projects must be designed in accordance with specific guidance documents, including the ecological process-based guidelines articulated in A Delta Renewed (^SFEI-ASC 2016) (7.21 MM-WQ-a–j: B and E1). Adaptive management, including the articulation of biological goals and monitoring, would be required for approval of restoration projects submitted as a part of any voluntary implementation plan under the proposed Plan amendments (7.21 MM-WQ-a–j: E2). Site design would consider existing hydrology and channel geomorphology to ensure that the restoration meets project objectives and provides benefits to intended targeted species (7.21 MM-WQ-a–j: C). Regulatory compliance regarding siting, installation, and maintenance of USTs and ASTs (CMM-HAZ-a–h: 15) would minimize or avoid impacts on water quality associated with marina fueling stations. Regulatory compliance regarding design, siting, and construction of public restrooms at marinas and campgrounds, as well as regular maintenance (CMM-HAZ-a–h: 16) would minimize or avoid impacts on water quality from the inadvertent release of sewage.

Because one of the goals of habitat restoration projects is to improve the hydrologic function of the restored area, these projects should be designed to reduce erosion, siltation, and flooding issues. This would help minimize the likelihood that a floodplain or tidal marsh restoration project would affect drinking water quality. Drinking water treatment plants monitor intake water quality and can respond to water quality degradation, although elevated dissolved organic carbon may still lead to the formation of disinfection byproducts, and harmful algal blooms can lead to taste and odor problems. The State Water Board and regional water boards have authority under existing law to include permit requirements for nonpoint-source discharges and applicants for wetlands projects or dredging activities to control mercury (7.21 MM-WQ-a–j: D). In areas with elevated levels of mercury, the State Water Board and regional water boards may consider requiring wetland design features or management practices to minimize methylation. The State Water Board and regional water boards recognize that wetlands and wetland restoration projects provide valuable water quality, wildlife habitat, and flood control functions and that these types of projects should not be disincentivized due to mercury concerns. Potential water temperature effects can be evaluated and minimized through water temperature and fish habitat suitability modeling. In general, but perhaps

not always, fish benefits associated with increased floodplain habitat are likely to outweigh impacts on fish due to increases in water temperature.

On a long-term basis, habitat restoration projects would be expected to benefit riverine habitat and species and improve hydrology and water quality. Projects would need to be monitored to determine and ensure that they are functioning as designed and benefiting native fish species. Until mitigation measures are implemented, the impacts remain potentially significant.

Fish Passage Improvements

Overall, fish passage improvement projects would provide a host of benefits for water quality. Operation of new or improved fish screens would reduce impingement and entrainment at diversions. New or improved fishways would improve passage conditions for adult Chinook salmon and steelhead and provide greater access to upstream habitat. TCDs would be expected to support cooler temperatures downstream of dams and thereby create migration, spawning, and rearing conditions beneficial for Chinook salmon and steelhead and other native cold water species. Dam removal projects would be expected to benefit anadromous salmonids by restoring access to historical habitat that is currently blocked by impassible dams.

Water quality impacts from fish passage improvement projects are primarily associated with construction activities (i.e., grading and excavation of riverbanks and channels, construction of temporary roads, placing and anchoring structures and driving heavy equipment in and near the river channel). Impacts can be mitigated, in part, through the implementation of construction mitigation measures, as discussed in *Common Construction*.

Fish passage improvements can range from small projects, such as installing a single fish screen or ladder, to large projects, such as removing a dam. The impacts on hydrology and water quality associated with these projects are often related to the size of the project, as well as the magnitude and duration of instream construction required. Sediment issues related to installing fish screens would be fairly minimal, whereas water quality issues associated with dam removal where sediment is trapped behind barriers could be substantial. Fishways aligned in a straight line without bends have high velocities down the center at moderate to high flows, which can cause erosion downstream of the fishway if the channel is narrow or if the fishway is aligned toward a bank.

The purpose of TCDs Is to provide more control over the depth from which water is drawn for reservoir releases. The goal is typically to decrease river water temperature at periods when cold water is needed for anadromous fish, while avoiding temperature impacts in the river during other times of the year, as well as temperature impacts in the reservoir. Nonetheless, TCDs could affect the distribution of water temperatures in reservoirs, particularly during the period of summer thermal stratification. Increased withdrawal of water from deeper in the reservoir would reduce the volume of cold water in the deeper layers. It could also simultaneously result in some mixing and increase dissolved oxygen concentrations in upper portions of the hypolimnion. Temperature in the middle depths of a reservoir would be most likely to be affected by TCDs; because fish would be less likely to be found at middle depths rather than near the surface, they are not likely to be adversely affected. While reservoir levels and temperature profiles already vary by month and from year to year based on hydrologic conditions, it is possible that TCDs could change the distribution of water temperatures in reservoirs from existing conditions.

TCDs could also affect water quality by changing the dissolved oxygen concentration of water discharged to downstream surface waters. The dissolved oxygen concentration in the deeper layers

of a reservoir is generally lower relative to the concentration nearer the surface. However, oxygen reaeration at discharge outlets would likely rapidly increase dissolved oxygen levels. Dissolved oxygen levels would quickly return to baseline levels as the water is aerated.

These impacts would be potentially significant. In addition to common construction mitigation measures, implementation of Mitigation Measures 7.21 MM-WQ-a–j: B–D and F would help avoid or reduce water quality impacts associated with fish passage projects to less than significant and ensure that the project is functioning as designed and benefiting fish and wildlife species once construction is complete. Fish passage projects must be developed in consultation with NMFS, USFWS, and CDFW in accordance with established design, operational, and maintenance criteria and guidelines (e.g., NMFS 2011). Projects must be carefully designed to ensure proper function and to avoid direct and indirect water quality impacts. TCDs must be designed to ensure sufficient temperature and dissolved oxygen conditions to support special-status species above and below the reservoir. Fish passage projects submitted as part of compliance with the cold water habitat objective are subject to approval by the State Water Board and must be integrated into the long-term operations plan. Until mitigation measures are implemented, the impacts remain potentially significant.

Impacts associated with dam removal partially depend on the amount of sediment behind a barrier, which may depend on the size, shape, and age of the barrier. Dam removal projects can range from relatively small impoundments (e.g., diversion dams) to large-scale construction and removal of larger structures (e.g., reservoirs). Small dams have a relatively small volume of sediment available for release (relevant to the size of the stream channel). When released by storm flows, this sediment would have minimal effects on downstream habitat. Large reservoir removal projects would be likely to result in more substantial short-term effects related to sediment compared to smaller dam removal projects. If reservoir sediments are not removed or stabilized prior to dam removal, fine-grained material can be resuspended and cause water quality issues downstream (USSD 2015). For some projects, the barrier may be isolated, and the area dewatered, which would allow for mechanical removal of sediment. For other barrier-removal projects, the water stored behind the barrier could be released in a controlled manner during low-flow conditions to reduce sediment movement. Once the barrier is removed, sediment may incrementally be allowed to move downstream at times of high flow. Sediment could initially be deposited in upstream pools or left along streambanks but would be scoured and moved downstream with each high-flow event under normal winter conditions. Sediment effects would tend to diminish with distance downstream of the barrier because of tributary inflows and deposition along the length of the channel. In addition, sediment effects may diminish with time after dam removal because rates of reservoir sediment erosion would diminish with time, and coarse sediment initially released and deposited in the channel is likely to be subsequently reworked during future high flows.

Barrier removal could affect water quality if contaminants (e.g., PCBs, chlorinated pesticides, mercury) are present in the sediment trapped behind the barrier. Removal of the barrier could release these contaminants into downstream environments. Mechanical removal (i.e., excavation, dredging), stabilization via capping or retaining dikes or walls, or demonstration of a low downstream transport potential may be required prior to dam removal if contaminants are present in reservoir sediment at levels significantly higher than baseline levels. Additionally, downstream water users may be affected by increased turbidity. For example, organic materials within the sediments may contribute to clogging issues for downstream water intakes. In addition, high concentration of organic material mixed with the sediment could lead to short-term increases in

oxygen demand, and reductions in dissolved oxygen could occur due to release of sediments trapped behind the dam. (USSD 2015).

Water users in the vicinity of the reservoir or served by the downstream river channel may be affected by changes in both the quantity and quality of water resulting from drawdown of the reservoir and by the release of impounded sediments to the river. In some locations, groundwater levels near existing dams are recharged by seepage from the water stored behind the dam. Sometimes removing reservoirs from an area can result in percolation of less surface water to the underlying groundwater aquifers. Groundwater levels adjacent to a reservoir could decline in response to the decrease in reservoir surface water elevation if the dam is removed. The location, underlying hydrogeologic conditions (i.e., how groundwater moves through underlying sediment and rock), and construction characteristics for a groundwater well can influence the potential impact of reservoir removal on well water levels if groundwater wells are present. It is possible that removal of the reservoir could cause a substantial decrease of groundwater levels and a corresponding decrease in production rates in some existing wells to a degree that interferes with existing or planned uses. Many reservoirs are located above the valley floor and lie within rock valleys where groundwater recharge and well use would be expected to be low.

Removal of barriers could alter the existing drainage pattern of the site or area such that sediment mobilized upstream of the barrier site could move downstream instead of settling behind the barrier. Removal of a barrier would increase the frequency of high sediment concentrations in the river during high-flow events because sediment previously trapped by the barrier would no longer be trapped. If large amounts of sediment previously had been trapped behind a barrier, sediment management activities could be necessary to maintain channel function and fish passage. Removal of a barrier would allow more sediment and water to move downstream to the lower portions of the watershed, which could result in increased peak flows, more erosion in some areas, and more sediment deposition in other areas, depending on sediment load and flow velocity. In some cases, this increase in deposition and erosion could change the downstream channel geometry, reduce conveyance capacity, or destabilize infrastructure.

For larger dams that provide some attenuation of flood peaks, downstream flow depths and discharges may fluctuate more in the absence of the dam and reservoir and accordingly may require the construction of downstream dikes or levees to reduce potential flood damage. In addition, without the retention of sediment in a reservoir, the river may also tend to migrate or meander, which may result in the need for bank stabilization measures if existing infrastructure is at risk or when downstream turbidity must be controlled. Coarse sediments released from the reservoir area may partially fill the downstream channel, raising the bed and resulting in higher flood stages—in which case, roadways may need to be raised, and new levees may be required. Where barrier removal could substantially increase the movement of sediment into the lower watershed or substantially increase flood flows, the capacity of the channel to hold all flows may be reduced, and the size of the 100-year flood hazard area may expand. Small dam and barrier removal projects would not substantially increase the number of people and structures exposed to the risk of flooding. (USSD 2015.)

Reservoir drawdown and dam removal could result in short-term increases in downstream surface water flows and result in exposing people and/or structures to a substantial risk of damage, loss, injury, or death involving flooding.

In the long term, removal of large dams and reservoirs could alter the 100-year floodplain inundation area. Changes in peak water surface elevations and the extent of inundation following dam removal could affect people and structures along the river downstream of the dam removal site during a flood event. It is unlikely that a dam removal project would be proposed or constructed if it were likely to result in a significant increase in flood risk to downstream communities. Removal of some barriers could reduce the risk of flooding. Old dams that do not meet modern seismic requirements can pose a threat to downstream communities if they were to fail, as could occur during an earthquake or high flows. Large amounts of sediment are often trapped behind these dams, which could be released during dam failure, compounding the problem of flooding.

Increased movement of sediment and water from the upper watershed to the lower watershed may restore the natural flow, sediment, and gravel supply to a channel; but monitoring may be needed to ensure that excessive flow, sedimentation, or erosion does not cause conveyance or infrastructure concerns.

Long-term changes in water quality associated with barrier removal would primarily be characterized by the shift from a reservoir to a river environment at the dam removal site and the associated alterations in physical and chemical processes on water quality in this and downstream river reaches. Overall, dam removal would cause water temperatures at the dam and downstream of the dam removal site to more closely align with historical or natural riverine conditions. The return to a more natural thermal regime compared with existing conditions could be beneficial. While overall it is expected that there would be a beneficial effect on water quality following dam removal, these impacts would be potentially significant. In addition to mitigation already identified, including common construction mitigation measures, implementation of Mitigation Measure 7.21 MM-WQ-a–j: G would help minimize or avoid impacts on water quality associated with dam removal projects. Preproject planning requires consideration of a wide variety of technical, environmental, social, political, and economic issues, including environmental feasibility. Facility design would consider existing hydrology and channel geomorphology, and removal of the structures would be done so that erosion or flooding would be controlled. Modeling would help determine whether dam removal could lead to excessive risk. Engineering designs and construction plans would include any special accommodations for existing legal users of water and other infrastructure and minimize potential impacts associated with construction-related in-channel disturbances. Implementation of Mitigation Measure 7.21 MM-WQ-a–j: G3 would require the development and implementation of a sediment management and monitoring plan to help reduce turbidity-related impacts of dam removal on downstream water quality. The plan must include plans for treatment, stabilization, removal, or downstream release of the accumulated sediment, as well as plans for revegetation and sediment tracking. If downstream siltation is substantial, implementation of Mitigation Measure 7.21 MM-WQ-a–j: E3 (levee protection) could be warranted. A project-specific analysis would be necessary to identify the preferred dam removal method for an individual project, and multiple approvals from various federal and state agencies would be required. With an effective sediment management plan, potential impacts can be substantially reduced or avoided. In some cases, there may be benefits from the controlled release of reservoir sediments, such as the introduction of spawning gravel, wood, and nutrients for the restoration of downstream fish habitats. In the long term, water quality would be expected to improve as conditions downstream of the removed barrier become similar to upstream conditions. However, the short-term impact of dam removal on water quality remains potentially significant.

Dam removal would result in an increase in the 100-year floodplain, which would potentially place people and structures within that floodplain. Project proponents would need to coordinate with the

Federal Emergency Management Agency (FEMA) for final determination of the future 100-year floodplain after dam removal and implement appropriate plans to move or elevate habitable structures within the 100-year floodplain before dam removal, where feasible, to reduce the risks of exposing people and/or structures to damage, loss, injury, or death due to flooding (7.21 MM-WQ-a–j: G9).

Predatory Fish Control

Removal or modification of scour holes or human-made structures may temporarily affect water quality as a result of increased turbidity due to construction (see *Common Construction*).

Capture methods for predation control do not involve construction and therefore would not result in any of the construction impacts on hydrology and water quality discussed in *Common Construction*. However, direct removal of predatory fish could disturb substrate and potentially affect water quality depending on the method used. Direct removal methods could require people to enter the water for fishing or to set up nets or traps and then retrieve the nets or fish in traps. These methods can result in a slight disturbance of the substrate; however, a limited number of people would be in the water so that substrate disturbance would be less than significant.

Invasive Aquatic Vegetation Control

Invasive aquatic vegetation control does not involve construction and therefore would not result in any of the construction impacts on hydrology and water quality discussed in *Common Construction*.

Invasive aquatic vegetation control efforts can provide water quality benefits because some invasive aquatic vegetation, such as water hyacinth and Brazilian waterweed, can spread rapidly, clog waterways, increase sedimentation, reduce turbidity (but also reduce light penetration for algal primary productivity), and create low dissolved oxygen conditions. Although invasive aquatic vegetation control efforts could provide overall water quality benefits, invasive aquatic vegetation control may affect water quality, whether the control is mechanical or by use of herbicides.

Mechanical removal involves use of a harvester, which can disturb channel substrate and increase surface water turbidity. In addition, a harvester leaves plant material in the water, which would decay. The decay of large amounts of plant matter can lower dissolved oxygen concentrations because of decomposition of the shredded organic material (^Greenfield et al. 2007). If aquatic vegetation is controlled with herbicides, decay of the resulting dead plant matter could also contribute to low dissolved oxygen. The effect of invasive aquatic vegetation control on dissolved oxygen could be reduced to less than significant by implementation of Mitigation Measure 7.21 MM-WQ-a–j: H1. Until mitigation measures are implemented, the impacts remain potentially significant.

Use of herbicides could also affect water quality directly, and water quality standards regarding herbicides could be violated. As a result, aquatic species, including fish and invertebrates, could be adversely affected. This impact would be potentially significant. The impact could be avoided or reduced to less than significant through implementation of Mitigation Measure 7.21 MM-WQ-a–j: H2, which requires adherence with regulatory controls on herbicide applications. CDBW is the only agency authorized to use herbicides on invasive aquatic vegetation, and they must receive biological opinions from USFWS and NMFS before applying herbicides. In addition, the Central Valley Regional Water Quality Control Board requires compliance with a statewide NPDES General Permit for Residual Aquatic Pesticide Discharges to Surface Waters from Aquatic Vegetation Control Application. The two biological opinions (USFWS and NMFS) and the NPDES permit require a water

monitoring program that involves a minimum of 10 percent of all treatment sites be sampled to collect and analyze Delta water quality data and results of chemical residue and toxicity tests after applying herbicides (CDBW 2009). Compliance with the most recent State Water Board NPDES General Permit for Residual Aquatic Pesticide Discharges to Waters of the United States from Algae and Aquatic Weed Control Applications would be expected to reduce potentially significant impacts on water quality associated with herbicide use. Until these mitigation measures are implemented, the impacts remain potentially significant.

Mitigation Measures

7.21 MM-WQ-a–j: Mitigate impacts on hydrology and water quality

Entities or agencies designing and/or approving habitat restoration or other ecosystem projects will implement or require the following.

A. Construction WQ Mitigation Measures (CMM-WQ-a–j)

1. **Regulatory Compliance:**

   i. Obtain and comply with all necessary permits and regulations related to waste discharge, including but not limited to, regional water board waste discharge requirements. For construction and land disturbance activities on sites larger than 1 acre, comply with State Water Board Order No. 2022-0057-DWQ (Construction General Permit), which regulates stormwater discharges from construction sites. This permit requires development of a SWPPP, which includes preconstruction and postconstruction BMPs to limit the discharge of pollutants in stormwater runoff. The BMPs would address all land- and water-based construction activities; excavation, grading, placement/removal of in-channel material; hazardous materials and waste containment and disposal procedures; and spill prevention, response, and cleanup procedures. The plan also would describe BMP inspection, monitoring, and maintenance procedures.

   ii. Obtain Clean Water Act section 404 permit and 401 water quality certifications, if necessary.

   iii. Obtain a dewatering permit from the regional water board, if necessary. Implement other BMPs as determined necessary by the regulating entity (city, county, or other state agency).

   iv. Water use must be pursuant to a valid water right.

   v. Comply with California Building Code or other applicable state and local regulations to adhere to building standards.

2. **Project Siting and Design:**

   i. Preproject assessment, planning, and design activities could include geomorphic surveys and topographic/bathymetric surveys (including evaluation of susceptibility to mudflow).

   ii. Locate projects away from areas with unsuitable soils or steep slopes.

   iii. Avoid siting roads and other permanent features near streams. New road construction will be outside of waters of the state.

iv. Avoid locating structures in a 100-year flood hazard area, to the extent feasible. If structures must be placed in a 100-year flood hazard area, perform analysis to determine whether the structure could substantially impede or redirect flood flows. If so, determine whether redesign could improve flood conveyance. To mitigate exposure to loss due to flooding, purchase flood insurance and strengthen levees if appropriate (e.g., if nearby levees are weak, or project work will directly affect a levee).

v. Avoid locating projects in areas subject to seiche or tsunami.

vi. Limit any construction activities within a floodplain but above the ordinary high-water line to those actions that can adequately withstand high river flows without resulting in inundation of and entrainment of materials in flood flows.

3. **Erosion Control, Sedimentation Control, and Soil Stabilization Measures:**

i. Minimize Potential for Erosion through Project Design: Evaluate the project site and upgradient and downgradient areas for erosion potential. Locate projects away from areas with unsuitable soils or steep slopes. During construction, maintain vegetation to minimize or prevent loss of topsoil. Remove vegetation only when necessary and make every effort to conserve topsoil for reuse in revegetation of disturbed areas.

ii. Stabilize and Revegetate Disturbed Soil: Stabilize and revegetate all disturbed soil surfaces before the beginning of the rainy season. Establish native and annual grasses or other vegetative cover on construction sites immediately upon completion of work causing disturbance.

iii. Erosion Control BMPs: Implement measures to prevent soil or sediment loss. Implement general erosion control measures, such as use of hydraulic mulch, straw, polyacrylamide, temporary and permanent seeding, soil stabilizers, binders, fiber rolls or blankets, temporary vegetation, earth dikes, drainage swales, and velocity dissipation devices. Other standard measures include prevention of runoff from construction equipment wash-down areas; installation of sediment basins and traps in conjunction with grading operations; development of slope drains; stabilization of streambanks; and installation of silt fences, gravel bag berms, sandbag barriers, storm drain inlet protection, and check dams. Monitor measures for effectiveness and maintain measures throughout the construction operations and between construction seasons.

iv. Perimeter Controls: Implement erosion control measures for the construction site perimeter, installing silt fences or placing straw wattles below slopes. Place gravel bags, silt fences, and other erosion containment along the edge of all work areas to contain particulates prior to contact with receiving waters.

v. Turbidity BMPs: Apply BMPs to minimize turbidity for construction activities in or adjacent to channels, such as the use of silt curtains, cofferdams, environmental dredges, erosion control on all inward levee slopes, and various levee-stabilization techniques—including revegetation for long-term construction sites. Apply bank stabilization BMPs, as needed, for any in-channel construction, such as maintenance of a 100-foot vegetative or engineered buffer between the construction zone and

surface waterbody. Implement turbidity monitoring during construction to maintain compliance with basin plan water quality objectives.

vi. Construction Timing: Limit any construction activities within an area of the ordinary high-water line of drainages and lakes to the dry season.

4. **Waste Management and Material Control Measures:**

i. Staging and Stockpile Management: Staging, storage, and stockpiling will occur on access roads or other previously disturbed upland areas, such as developed areas, paved areas, parking lots, areas with bare ground or gravel, and areas clear of vegetation, to avoid aquatic habitats and limit disturbance to surrounding habitats. Construction stockpiles will be covered to prevent blow-off or runoff during weather events, and concrete and scrap drywall and stucco materials will be covered when stored outside and potentially exposed to rain.

ii. Equipment Maintenance and Materials Storage: Vehicle traffic will be confined to existing roads and the proposed access route(s). All machinery must be in good working condition, showing no signs of fuel or oil leaks. Oil, grease, or other fluids will be washed off at designated wash stations, prior to equipment entering the construction site. Inspect and evaluate daily during construction for the potential of fluid leakage. No equipment refueling or fuel storage will take place within 100 feet of a body of water. All fuel and chemical storage, servicing, and refueling will be done in an upland staging area or other suitable location (e.g., barges) with secondary containment to prevent spills from traveling to surface water or drains. Project proponents will establish staging areas for equipment storage and maintenance, construction materials, fuels, lubricants, solvents, and other possible contaminants in coordination with resource agencies. Staging areas will have a stabilized entrance and exit and will be located in upland areas and at least 100 feet from bodies of water as site-specific circumstances allow. Fluids will be stored in appropriate containers with covers and properly recycled or disposed of offsite. Machinery stored on site will have pans or absorbent mats placed underneath potential leak areas.

iii. Hazardous Materials Management and Spill Response Plan: Prepare and implement a hazardous materials management and spill response plan to ensure that any hazardous materials are stored at the staging area(s) with an impermeable membrane between the ground and hazardous material and that the staging area is designed in such a way as to prevent the discharge of pollutants to groundwater and runoff water. Use and store hazardous materials, such as vehicle fuels and lubricants, in designated staging areas located away from stream channels and wetlands according to local, state, and federal regulations, as applicable. Contaminated sediments would need to be contained and transported to a waste disposal facility engineered and permitted for contaminated sediment. In the event of an accidental spill of hazardous materials, stop work, follow the spill response plan, and arrange for repair and cleanup by qualified individuals of any fuel or hazardous waste leaks or spills. (Wat. Code, § 13271.) Notify regulatory agencies within 24 hours of any leaks or spills. Properly contain and dispose of any unused or leftover hazardous products off site. Implement measures for transport, use, or disposal of hazardous materials (CMM-HAZ-a–h: 1).

iv. pH Control for In-Water Concrete Use: A dewatering plan, if applicable, will be submitted and approved by State and/or regional water boards for in-water concrete use. Avoid concrete pours during rainy weather and treat pH-impaired stormwater from construction sites in a filter or settling pond or basin, with additional natural or chemical treatment if necessary. Poured concrete will be excluded from contact with surface water or groundwater during initial curing. Confine concrete washing and spoils dumping to a designated location.

v. Trash: All refuse, debris, unused materials, and supplies that cannot reasonably be secured will be removed daily from the project work area and deposited at an appropriate disposal or storage site. All construction debris will be removed from the project work area immediately upon project completion. During project activities, all trash will be properly contained within sealed containers, removed from the work site, and disposed of daily.

vi. Handling, Storage, and Disposal of Dredged Material: For construction involving dredging, handling, storage, and disposal of dredged materials in accordance with permit requirements. Dredge permits are issued pursuant to several acts and regulations, including section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. § 401 et seq.) and section 404 of the Clean Water Act. Permits are issued by the regional water board, California State Lands Commission, CDFW, USACE, and USEPA. Other agencies that may participate in the permit process include NMFS and USFWS. Measures will include sediment sampling and testing prior to dredging to assess sediment quality to determine whether any additional precautions are needed for dredging operations, disposal, or beneficial reuse due to the presence of contaminants. Permits will incorporate mitigation strategies to prevent release of contaminants that could degrade water quality.

5. **In-Water Placement of Materials, Structures, and Operation of Equipment:** Material used for bank stabilization will minimize discharge sediment or other forms of waste to waters of the state. Where feasible, construction will occur from the top of the streambank or on a ground protection mat underlain with filter fabric. All materials placed in streams, rivers, or other waters will be nontoxic. Any combination of wood, plastic, cured concrete, steel pilings, or other materials used for in-channel structures will not contain coatings or treatments or consist of substances toxic to aquatic organisms (e.g., zinc, arsenic, creosote, copper, other metals, pesticides, petroleum-based products) that may leach into the surrounding environment in amounts harmful to aquatic organisms.

6. **Stream-Crossing, Culvert, and Bridge Projects:** Design stream-crossing, culvert, and bridge projects to avoid or minimize water quality impacts. Design guidelines may include but not be limited to the following.

i. Stream-crossing projects will consider storm-proofing measures presented in the *Handbook for Forest, Ranch, and Rural Roads: a Guide for Planning, Designing, Constructing, Reconstructing, Upgrading, Maintaining, and Closing Wildland Roads* (^Weaver et al. 2015) and any subsequent editions.

ii. Bridges and culverts will be designed to adequately convey flow and materials (e.g., 100-year flood). Culverts will conform to design guidelines for conveyance of the 100-year peak flow and associated sediment and wood loads. If a bridge/culvert is

designed to convey less than the 100-year design flow, the project will demonstrate how the smaller culvert avoids excessive erosion/ sedimentation, headcutting, or habitat impacts.

iii. Road and stream-crossing structures will comply with current NMFS and CDFW fish passage guidelines and utilize stream simulations following NMFS Stream Simulation Design to inform project design. Structures will be designed to provide passage for all life stages of native fish species.

iv. Avoid placement of rock slope protection within the bankfull width of the stream except for the minimum necessary for protection of bridge abutments and pilings, culverts, and other stream-crossing infrastructure.

v. Drivable wet crossings will be appropriately armored on the downstream side to reduce potential for scouring.

7. **Groundwater Protection Measures:** During construction of any project that requires dewatering of groundwater resulting in a negative effect on nearby well yields, implement the following measures.

   i. Install sheet piles to reduce the area influenced by shallow groundwater level declines.

   ii. If sheet piles are not an option and domestic well fields are affected temporarily, truck in water to satisfy the well-user's needs.

   iii. If sheet piles are not effective and the impact on the well yield is substantial such that trucking in water is not economically feasible, deepen the affected well or install a new, deeper well.

   iv. Water used for construction must be pursuant to a valid water right, and recycled water will be used during construction where available (CMM-UT-a,f,g: 2).

8. **Drainage and Flood Protection Measures:**

   i. Prepare a drainage or hydrology and hydraulic study for the design of drainage-related features, such as new on-site drainage systems or new cross drainage facilities. Prepare the study in accordance with applicable standards of the Federal Emergency Management Agency, USACE, DWR, and the appropriate reclamation district, flood control agency(ies), county, and city. Design subsequent drainage features in accordance with the final study and with the applicable standards of the Federal Emergency Management Agency, USACE, DWR, and applicable flood protection agency. Based on the results of the study, design considerations could include arranging the length of any stockpiles or other construction features in the direction of the floodplain flow to maximize surface flows under flood flow conditions.

   ii. Provide cross drainage, replacement drainage paths and facilities, and enlarged flow paths to reroute drainage around, under, or over the project facilities and to restore the function of any affected existing drainage or flow paths and facilities.

   iii. Incorporate measures into overall drainage design that maximize infiltration/permeability and trap sediment and pollutants in stormwater runoff.

iv. Provide temporary drainage bypass facilities to reroute drainage around, along, or over the facilities and construction sites. Design the temporary bypass facilities in accordance with the results and recommendations of a drainage or hydrology and hydraulic study; temporary facilities will be in place and fully functional until long-term facilities are completed.

v. Provide on-site stormwater detention storage at construction and project facility sites to reduce project-caused short- or long-term increases in drainage runoff. Design the storage space placement and capacity based on the drainage or hydrology and hydraulic study.

vi. At instream construction sites that might reduce channel capacity, perform hydraulic studies to evaluate channel capacity and the likelihood of flooding. If necessary, modify project design or install setback levees or bypass channels to maintain channel capacity and to mitigate hydraulic impacts. Where low channel velocities might result from construction, implement a sediment management program to maintain channel capacity.

9. **Construction GEO Mitigation Measures: Blasting Operations and Safety Plan** (CMM–GEO-a–e: 7) to reduce discharges of fugitive dust, soil, and other matter into surface waters and **Septic System Management Measures** (CMM-GEO-a–e: 6).

10. **Construction BIO Mitigation Measures** (CMM-BIO-a–f)

11. **Construction HAZ Mitigation Measures: Herbicide and Pesticide Use** (CMM-HAZ-a–h: 4), **Installation and Operation of Underground and Aboveground Storage Tanks** (CMM-HAZ-a–h: 15), and **Installation and Maintenance of Plumbing in Public Restrooms** (CMM-HAZ-a–h: 16).

B. Approval by State and Federal Fisheries, Flood-Control, and Water Resources Agencies: Habitat restoration and other complementary ecosystem projects must be developed and implemented in consultation with and subject to approval from applicable state and federal fisheries agencies, including CDFW, NMFS, and USFWS (7.21 MM-BIO-a–f: B). Comply with the requirements of USACE and the Central Valley Flood Protection Board to avoid increased flood potential. Restoration projects submitted as part of a voluntary implementation plan are subject to approval by the State Water Board. Projects proposed for compliance with the cold water habitat objective are subject to approval by the State Water Board and must be submitted and incorporated into long-term strategy and annual operations plan for reservoirs (see Mitigation Measure MM-AQUA-a,d: 1 in Section 7.6.2, *Aquatic Biological Resources*). Projects must be operated pursuant to a valid water right, if applicable.

C. Project Siting and Design of Habitat Restoration and Other Ecosystem Projects: Preproject assessment, planning, and design activities could include geomorphic surveys, topographic/bathymetric surveys (including evaluation of susceptibility to mudflow), sediment sampling and testing, and/or collection and evaluation of water temperature and flow data. Prior to implementing habitat restoration or other ecosystem projects, perform modeling of hydrodynamic or hydraulic conditions, groundwater, sediment transport, salinity, water temperature, or other constituents or fish habitat features as applicable. This analysis could include investigation of water surface elevations, flow, and velocities. Based on this analysis, develop design criteria to minimize impacts. For example, design the

project so any channels built or modified as part of a project have adequate capacity to convey the 100-year design flow.

D. Waste Discharge Requirements: In issuing waste discharge requirements and/or water quality certification, the State Water Board or regional water board will require that water quality objectives be achieved within the shortest amount of time possible and that all applicable BMPs and mitigation measures are incorporated into the project to minimize soil erosion, surface runoff, and other potential adverse environmental impacts, including cumulative impacts. Turbidity would be monitored to maintain compliance with basin plan water quality objectives.

E. Physical Habitat Restoration WQ Mitigation Measures: Ensure that ecosystem restoration benefits for fish species are maximized, while minimizing the potential for adverse effects on water quality from habitat creation.

1. **Restoration Strategy:** Design and implement habitat restoration projects to work with existing and augmented flows, including guidelines articulated in A Delta Renewed (e.g., reestablish connections between tidal and stream floodplains, restore fluvial processes along streams, connect riparian areas to fluvial processes) (^SFEI-ASC 2016). Design restoration projects that consider the multiple interactions of physical, chemical, and biological processes over a wide variety of spatial and temporal scales and to confirm that the project will be effective and appropriate given the physical setting. Implement measures to avoid fish stranding (7.21 MM-BIO-a–f: C4), manage vegetation (7.21 MM-BIO-a–f: C5), and control invasive species (7.21 MM-BIO-a–f: C7).
2. **Adaptive Management:** To address uncertainties in the ecological process governing habitat formation and maintenance at selected sites, progress toward achieving the objectives or optimizing the benefits of these projects must be monitored and guided through an adaptive management process. Restoration projects submitted as part of a voluntary implementation plan are subject to approval by the State Water Board.
3. **Levee Protection:** Conduct applicable hydrologic studies or models to determine the likelihood of levee overtopping. If it is determined that there would be a significant likelihood of levee overtopping that would adversely affect water quality, construct levee structures/enhancements as part of the project. The design of the structures/ enhancements must include considerations for sea level rise. Levee improvements must be approved by FEMA, applicable reclamation districts, and USACE.
4. **Dredging Plan:** For habitat restoration projects that involve dredging, develop and implement a dredging plan to ensure that contaminated sediments are contained to the extent feasible and transported to a waste disposal facility engineered and equipped to receive contaminated sediment. In some cases, dredged material may be suitable for beneficial reuse, including wetland and setback levee creation and maintenance. In the San Francisco Bay and its marshes and creeks, the State Water Board and its state and federal partners manage dredging under the *Long-Term Management Strategy for the Placement of Dredged Materials in the San Francisco Bay Region* (USACE et al. 2001). This program is part of the Bay Area Basin Plan Implementation Program. (See also CMM-WQ-a–j: 4vi.)
5. **Minimize Impacts on Infrastructure:** Design projects to avoid or minimize impacts on infrastructure from increased sedimentation and hydrological changes. This includes

accommodations for adverse changes in water quality that may affect municipal drinking water intakes. In some cases, infrastructure and site topography may need to be modified or upgraded.

6. **Contaminant Evaluation:** Evaluate future floodplain or marsh sediments for suspected contaminants (e.g., pesticides on agricultural lands). If levels are extremely high, avoid site, remove contaminated sediment, and/or stop or reduce actions that cause the contamination. If feasible, avoid creating wetlands in areas with exceptionally high concentrations of mercury. Require wetland design features or management practices to minimize methylation. For example, permanent inundation may result in generation of less methylmercury than an annual cycling of wet and dry phases. Depending on site ecosystem characteristics, chemical additions to a wetland could reduce methylation, and creation of clear open water could enhance photodegradation of methylmercury.
7. **Monitor Groundwater Levels:** Monitor local groundwater levels to ensure that adjacent properties and infrastructure are not inundated and that there are no agricultural effects. If high groundwater level infringes on beneficial uses, initiate groundwater pumping or install tile drains.
8. **Gravel Augmentation WQ Mitigation Measures:**
    i. Gravels must be composed of washed, spawning-sized gravels from a local basin source. Gravel must be washed to remove any silts, sand, clay, and organic matter and will be free of contaminants, such as petroleum products.
    ii. Recontour extraction site.
    iii. Gravel Augmentation BIO Mitigation Measures (7.21 MM-BIO-a–f: C8).
9. **Harmful Algal Bloom Mitigation:** Develop design criteria for restoration areas to minimize planktonic and benthic cyanobacteria blooms. This can be accomplished by maintaining adequate flushing while also maintaining the benefits of habitat restoration (i.e., zooplankton production, fish food quality, fish feeding success). Water residence time considerations, for both phytoplankton and cyanobacteria, will be incorporated into restoration area site design using best available science at the time of design.
10. Approval by State and Federal Fisheries, Flood-Control, and Water Resources Agencies (7.21 MM-WQ-a–j: B)
11. Project Siting and Design of Habitat Restoration and Other Ecosystem Projects (7.21 MM-WQ-a–j: C)
12. Waste Discharge Requirements (7.21 MM-WQ-a–j: D)

F. Fish Passage WQ Mitigation Measures

1. **Consultation with Fish and Wildlife Agencies:** Fish screen and fishway projects must be developed in consultation with NMFS, USFWS, and CDFW in accordance with established design, operational, and maintenance criteria and guidelines (e.g., NMFS 2011).
2. **Fish Passage BIO Mitigation Measures** (7.21 MM-BIO-a–f: D)
3. **Approval by State and Federal Fisheries, Flood-Control, and Water Resources Agencies** (7.21 MM-WQ-a-j: B)

4. **Project Siting and Design of Habitat Restoration and other Ecosystem Projects** (7.21 MM-WQ-a-j: C)

5. **Waste Discharge Requirements** (7.21 MM-WQ-a-j: D)

G. Dam Removal WQ Mitigation Measures

1. **Project Planning:** Utilize *Guidelines for Dam Decommissioning Projects* (USSD 2015) or other appropriate planning guidance to help in the development and execution of dam removal, from project planning, including stakeholder identification, through design and implementation.

    i. Feasibility Studies: Conduct feasibility studies to evaluate the potential impacts from the erosion, transport, and deposition of reservoir sediment. Collect data for all structures within the impoundment, as well as all upstream and downstream structures that may be affected by removal of the dam, such as bridges, pipelines, groundwater wells, and transmission lines. Hydrologic analysis is typically necessary to define the range of flood events that can be reasonably expected during dam removal. Proceed with project if analyses verify that constructing or operating a project will not result in unacceptable environmental consequences to water quality and legal users of water.

    ii. Structural Removal Limits: Structure removal limits will be based on minimizing public safety and liability issues, type of dam and appurtenant structures, fish passage, sediment management issues, geomorphology, presence of hazardous materials, and other factors. For partial dam removal, any retained portions of the dam must be stable and accommodate fish passage for a certain range of flows.

    iii. Engineering and Construction Designs: Incorporate into engineering designs and construction any special accommodations for existing legal users of water and other infrastructure. Final design specifications will include any potential schedule constraints such as reservoir drawdown rate limitations, construction sequence requirements, additional hazardous material assessments and sediment characterization, protection of existing structures and utilities, and any environmental constraints, such as in-water work periods.

2. **Regulatory Compliance:** Dam removal projects will require multiple permits from state, federal, and local agencies to ensure that the removal minimizes short- and long-term environmental impacts. At a minimum, dam removal projects require a Clean Water Act section 404 dredge and fill permit from USACE and a Clean Water Act section 401 Water Quality Certification from the State Water Board. In addition, if the dam is part of a hydropower facility, a FERC License Surrender Approval may also be required. ESA consultations may be required if endangered species occur near the removal project. CEQA/NEPA requirements and other state and municipal permits may also be required prior to the dam removal project.

3. **Sediment Management and Monitoring Plan:** Prior to implementation of a barrier removal project identified as potentially resulting in a substantial release of sediment to downstream waterways, a sediment management and monitoring plan will be developed to provide for the natural erosion, or handling and disposal, of both coarse- and fine-grained material. The plan must be developed in consultation with staff from the State Water Board, Central Valley Regional Water Quality Control Board, and state

and federal resource agencies and describe actions to be taken to minimize the potential impacts of the release of sediment on water quality. At a minimum, the sediment management and monitoring plan should include the following.

i. Sediment transport modeling results to inform construction plans, including whether a staged or gradual dam removal or an instantaneous dam removal project is required to minimize turbidity impacts on instream beneficial uses.

ii. Testing must include the surrounding soils and impounded reservoir sediments for possible contamination, with respect to future sediment transport and disposal of sediments and soils excavated as part of the project. Evaluate the volume, grain size distribution, and hazardous material composition (e.g., mercury, pesticides) of the sediment accumulated behind the dam. Develop a site-specific plan for treatment, stabilization, removal, or release of this sediment to downstream riverine habitat to reduce potential impacts during drawdown and during and after dam removal.

iii. The plan must provide for the treatment, stabilization, removal, or downstream release of the accumulated sediment, as well as plans for revegetation and sediment tracking. Include contingency planning in performance monitoring and adaptive management (up to 5 years) after removal is complete.

iv. The plan will account for associated maintenance activities (e.g., dredging of reservoir sediment) to reduce the volume of reservoir sediment that would be released to downstream waterways.

v. Where large barriers or dams are removed, monitor downstream sediment accumulation; for increases greater than 0.5 foot relative to baseline conditions, implement channel restoration to remove sediment.

vi. Potential turbidity effects on fish may require the establishment of "fish windows" during which time no reservoir drawdown producing elevated turbidity levels from the release of sediments would be allowed. Other related activities that could minimize turbidity impacts on downstream aquatic resources could be incorporated as a component of the sediment management and monitoring plan, such as a fish relocation plan.

4. **Revegetation Plan:** Develop and implement a revegetation plan for areas that were exposed by reservoir drawdown and dam removal activities. The plan must provide for the recontouring and revegetation of the formerly inundated area and any disturbed areas, including structure sites, construction staging areas, temporary access roads, and waste disposal sites. This will stabilize the sediment and reduce the potential for short-term and long-term elevated suspended sediment concentrations downstream of the dam removal site after vegetation begins to grow and establish. The revegetation plan may include manual revegetation or other methods and should consider appropriate revegetation methods, such as hydroseeding. Various types of vegetation may be required, depending on the ability of the areas to sustain growth, the nature and composition of the sediments, and the purposes intended for the vegetation. If possible, use only native species. Special erosion control provisions (such as BMPs) may be necessary until the new vegetated areas take hold. Treatment for invasive plant species (or weeds) may also be required. Include monitoring of new plant growth after reservoir drawdown over a period of 2 to 5 years.

5. **Dam Removal BIO Mitigation Measures** (7.21 MM-BIO-a–f: E)
6. **Dam Removal HAZ Mitigation Measures** (7.21 MM-HAZ-a–h: D)
7. **Dam Removal GEO Mitigation Measures** (7.21 MM-GEO-a–e: C)
8. **Control Concrete Dust:** Implement site-specific dust control plan (7.21 MM-AQ-a–e: C1) to limit or prevent concrete dust from entering the water.
9. **Flood Control Measures:**
    i. The rate of reservoir drawdown needs to be slow enough so as not to exceed the safe downstream channel capacity or exceed the permissible rate for increasing downstream flow to ensure public safety. Some form of flow control will be provided for the diversion facilities to control the rate of reservoir drawdown for sediment management and to limit downstream releases, which could exceed the safe downstream channel capacity.
    ii. Dam removal projects should generally be scheduled around the permissible in-water work period for the site. Required work outside of the stream channel, such as for site clearing and access, can be performed early to facilitate the dam removal process. Instream work should normally not be scheduled during periods that could be interrupted by high flows, as defined by river stage or by flow rate, unless necessary to meet project requirements. The potential risks associated with high flows must be considered in the project plan, and emergency action plans should be developed accordingly.
    iii. Structures prone to flood damage, especially habitable structures, will be moved or elevated before dam removal, where feasible, to reduce the risks of exposing people and/or structures to damage, loss, injury, or death due to flooding. This action can be based on preproject flow modeling, although final determination of the 100-year flood hazard area after dam removal will be made by FEMA. Comparison of modeled flows to levee and channel capacities will indicate if levees need to be strengthened, raised, or set back. Monitoring for accumulation of sediment or scour may be necessary after high-flow events to ensure that channel conveyance capacity or levee integrity is not substantially reduced.
    iv. Implement applicable hydrologic studies or models to determine the likelihood of levee overtopping. If it is determined that there would be a significant likelihood of levee overtopping that would adversely affect water quality, construct levee structures/enhancements as part of the project. Levee improvements must be approved by FEMA, applicable reclamation districts, and USACE.
10. **Performance Monitoring and Adaptive Management:** Conduct performance monitoring and adaptive management to detect and avoid future significant impacts related to flooding, water quality, and sediment deposition once removal is completed. Monitoring can continue for periodic intervals after dam removal (often at 1, 2, and 5 years) until the reservoir sediments have either fully eroded or stabilized. Long-term monitoring could result in the construction of additional flood control levees or dikes and other facilities. Impacts and mitigation measures would be the same as those already described.

11. **Approval by State and Federal Fisheries, Flood-Control, and Water Resources Agencies** (7.21 MM-WQ-a-j: B)
12. **Project Siting and Design of Habitat Restoration and other Ecosystem Projects** (7.21 MM-WQ-a-j: C)
13. **Waste Discharge Requirements** (7.21 MM-WQ-a-j: D)

H. Invasive Aquatic Vegetation Control WQ Mitigation Measures

1. **Reduce Dead Vegetation in Channel:** The volume of dead vegetation in channels prone to low dissolved oxygen will be reduced either through mechanical removal of the vegetation from the channel (either before or after decay has begun) or through a reduction in herbicide application. Other options include increasing flow through an area of localized low dissolved oxygen or installation of aeration devices.
2. **Limit Herbicide Use in Water:** Implement AIPCP mitigation measures to minimize or reduce potential impacts on water quality. Comply with the most recent State Water Board NPDES General Permit for Residual Aquatic Pesticide Discharges to Waters of the United States from Algae and Aquatic Weed Control Applications.

7.21.2.10 Land Use and Planning

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
X. Land Use and Planning				
Would the project:				
a. Physically divide an established community	☒	☐	☐	☐
b. Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect	☒	☐	☐	☐
c. Conflict with any applicable habitat conservation plan or natural community conservation plan	☒	☐	☐	☐

Section 7.13.2, *Environmental Setting*, describes the land use and planning setting, and additional regulatory setting is described in Appendix E, *Regulatory Framework for Construction Projects*.

Common Construction

Depending on the location, construction of habitat restoration and other ecosystem projects could physically divide an established community; conflict with an applicable land use plan, policy, or regulation of an agency with jurisdiction over the project adopted for the purpose of avoiding or mitigating an environmental effect; or conflict with an applicable HCP or NCCP. Inconsistencies or conflicts with land use plans, policies, or regulations typically relate to the design and density of infrastructure, resource consumption, and zoning for land use types. Many habitat restoration and

other ecosystem projects would be located within existing riverbanks and channels where communities are not established; and restoration would be consistent and even further the goals of land use plans, policies, and regulations. Nevertheless, depending on the location, configuration, and magnitude of the project, construction could result in a permanent change in land use that could conflict with land use plans and zoning ordinances. In addition, construction may temporarily physically divide an established community primarily by cutting off access to roadways or bridges. Roadway or bridge access could be temporarily affected if construction activities include trenching in or near roadways, for example, or construction staging in or near roadways.

Land use impacts associated with common construction activities would be potentially significant and can be avoided or reduced by implementation of Mitigation Measure 7.21 MM-LU-a,b: A (CMM-LU-a–c). Mitigation for potential construction impacts can include complying with all applicable zoning and land use laws and designing projects to avoid or minimize dividing established communities. In addition, as discussed in more detail below, implementation of Mitigation Measures 7.21 MM-LU-a,b: B and C can avoid or reduce additional potentially significant impacts on land use associated with habitat restoration and other ecosystem projects as applicable. If mitigation measures are implemented, most, if not all, impacts (including construction impacts) can be mitigated to less than significant. Because the precise location and magnitude of activities required for habitat restoration and other ecosystem projects are not known, impacts on land use and planning cannot be determined with certainty at this time. Therefore, potential impacts related to land use and planning remain potentially significant.

During construction, existing land use(s) could be affected by activities such as ground clearing and increased traffic, noise, dust, and human activity and by changes in the visual landscape; these impacts are considered under the individual resource analyses (e.g., noise, aesthetics). See also Section 7.21.2.2, *Agriculture and Forest Resources*, for a discussion of conflicts with agricultural zoning or Williamson Act contracted land and existing zoning for forest land or timberland.

Potential conflicts with an applicable HCP or NCCP are addressed further in Section 7.21.2.4, *Biological Resources*.

Physical Habitat Restoration

As discussed in *Common Construction*, it is possible that construction of habitat restoration projects may temporarily physically divide an established community primarily by cutting off access to roadways or bridges or result in temporary physical conflicts (e.g., construction activities that may conflict with land designated as open space) with existing land uses in or immediately adjacent to the project area and long-term impacts, depending on the location and design, particularly for large-scale habitat restoration projects.

Most floodplain and riparian restoration projects, including in-channel enhancement and gravel augmentation, would not be expected to physically divide an established community because these projects would be located within existing riverbanks and channels or immediately adjacent to them, and communities are not established in these areas. In addition, many tidal habitat restoration projects would likely be sited on land designated for agriculture or open space and would therefore not physically divide a community. However, tidal habitat restoration projects could be sited in or near an existing community or land designated for future development. Removing roads for construction of a new setback levee might isolate agricultural areas from facilities and communities that provide services and markets to farmers. Also, periodic inundation of roadways from flood widening projects could preclude or inhibit access between communities and services. These

projects could be large and could include actions, such as levee breaching and road removal, that could isolate communities from services and markets or cut off access to properties.

Most habitat restoration projects would occur in existing riverbanks and channels or immediately adjacent to them and would not conflict with land use designations or zoning or HCPs/NCCPs. Frequently, these areas are designated natural resource or open space areas by land use plans, and restoration would be consistent with those designations because it would enhance existing habitat for fish and wildlife species. However, some habitat restoration projects could conflict with existing land use plans, policies, or regulations if the projects were incompatible with land use designations that serve to avoid or mitigate an environmental effect. For example, as discussed in Section 7.21.2.2, *Agriculture and Forest Resources*, a restoration project could result in the conversion of farmland to nonagricultural use, which could be considered inconsistent with applicable land use plans, policies, or regulations intended to preserve and protect agricultural use of that land. Similarly, some counties in the Delta, such as Yolo and San Joaquin Counties, have exclusive agricultural designations where ecosystem restoration is not a permitted land use; accordingly, in such areas habitat restoration projects could conflict with local land use plans, which would be a significant impact. An amendment or variance from the lead agency may be required prior to project approval and construction.

These impacts would be potentially significant. In addition to construction mitigation measures, implementation of Mitigation Measure 7.21 MM-LU-a,b: B would avoid or mitigate land use impacts to less than significant. Most habitat restoration projects would be expected to occur voluntarily; therefore, it is unlikely that a habitat restoration project would be designed in a manner that could isolate communities from services and markets, cut off access to properties, or result in incompatible land use designations. Until mitigation measures are implemented, the impacts remain potentially significant.

Fish Passage Improvements

As discussed in *Common Construction*, construction of fish passage improvement projects may temporarily physically divide an established community primarily by cutting off access to roadways or bridges or result in temporary physical conflicts (e.g., construction activities that may conflict with land designated as open space) with existing land uses in or immediately adjacent to the project area. Because these projects would be located within existing riverbanks and channels, most projects would not likely conflict with local land use laws and, in the long term, most fish passage improvement projects would not permanently physically divide an established community because they would be located within existing riverbanks and channels where communities would not be established. Frequently, reservoir areas are designated as natural resource or open space areas by land use plans, and fish passage projects would be consistent with those designations because these types of projects would enhance existing habitat for fish species.

Although similar to construction impacts already identified, impacts associated with large dam removal projects could be more substantial given that these projects would take years to complete, taking into account reservoir drawdown, removal of the dam, and site restoration following dam removal. Removal of a dam that provides a river crossing along its crest may physically divide an established community, requiring a new bridge to restore connectivity. New land use and zoning designations may need to be determined for areas previously inundated by the reservoir.

These impacts would be potentially significant. In addition to mitigation already identified, including common construction mitigation measures (7.21 MM-LU-a,b: A), implementation of Mitigation

Measure 7.21 MM-LU-a,b: C can avoid or reduce land use impacts associated with dam removal to less than significant. Preproject planning requires consideration of a wide variety of technical, environmental, social, political, and economic issues, including the existing and future land use designations after a dam is removed. Feasibility studies must address impacts on structures such as bridges and roads that could be affected by dam removal. Additional fieldwork would identify off-site locations and haul distances for backfill materials and for disposal of waste materials to minimize disruptions to any existing communities surrounding the project construction site. Unless and until mitigation is fully implemented, the impacts remain potentially significant.

See Section 7.21.2.15, *Recreation,* for a discussion of recreation impacts associated with TCDs and dam removal, and Section 7.21.2.16, *Transportation and Traffic*, for a discussion of transportation infrastructure that may be affected by large dam removals.

Predatory Fish Control

As discussed in *Common Construction*, construction associated with habitat modifications for predator control (i.e., the removal or modification of human-made structures) may temporarily physically divide an established community primarily by cutting off access to roadways or bridges or result in temporary physical conflicts (e.g., construction activities that may conflict with land designated as open space) with existing land uses in or immediately adjacent to the project area. Projects would not permanently conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project adopted for the purpose of avoiding or mitigating an environmental effect.

Capture methods for predation control do not involve construction and therefore would not result in any of the construction impacts on land use discussed in *Common Construction*. Passive and active capture methods are short-term actions that do not involve construction and would not affect land use. There would be no impact.

Invasive Aquatic Vegetation Control

Invasive aquatic vegetation control does not involve construction and therefore would not result in any of the construction impacts on land use discussed in *Common Construction*. Invasive aquatic vegetation control would not physically divide an established community because aquatic plants would be located within existing riverbanks and channels where communities are not established. Similarly, due to the locations of where aquatic vegetation control would be implemented, it is unlikely that there would be a conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project adopted for the purpose of avoiding or mitigating an environmental effect. Frequently, these areas are designated natural resource or open space areas by land use plans, and the removal of aquatic vegetation would be consistent with those designations because it would enhance existing habitat for fish and wildlife species. There would be no impact.

Mitigation Measures

7.21 MM-LU-a,b: Mitigate land use impacts

Entities or agencies designing and/or approving habitat restoration or other ecosystem projects will implement or require the following.

A. Construction LU Mitigation Measures (CMM-LU-a–c)

1. **Regulatory Compliance:** Projects must comply with applicable city and county general plans and other local policies and ordinances. Implement CMM-BIO-a–f: 13 (*Compliance with HCPs and NCCPs*), if applicable. If a project is located on public land, comply with any applicable resource management plan. If a project is located in the Delta, pursuant to the Delta Reform Act, the lead agency will ensure project compliance with the Delta Plan, as applicable (i.e., if the project is a "covered action" as defined by Wat. Code, § 85057.5(a)).
2. **Project Siting and Design:** Site and design projects to avoid or minimize physical division of existing or established communities or residential areas by designing construction facilities and infrastructure to be located underground or with sufficient points of visual and physical access. Examples of methods of minimizing physical division include but are not limited to the following actions.
    i. Bury or visually mask construction infrastructure or facilities.
    ii. Restore disturbed landscapes to preconstruction conditions.
    iii. Implement other feasible mitigation to reduce the disturbance to a community's physical composition, visual character, or other features integral to the community's identity.
    iv. Notify all affected persons (e.g., residents, property owners, school officials, business owners) in the project vicinity of the construction plans and schedules. This could include arranging schedules for road detours with residents and businesses to maintain access to homes, schools, and businesses, as well as providing protection, relocation, or temporary disconnection of utility services.
    v. Minimize the amount of permanent easement required for construction of facilities and consult with property owners to select easement locations that would lessen property disruption and fragmentation, if applicable.
    vi. Relocate roads prior to project construction to ensure continued access through the project vicinity.
3. **Traffic Management Plan** (CMM-TRA-a,b,d–f: 3)

B. Physical Habitat Restoration LU Mitigation Measures

1. **Project Siting and Design:** Design and site project consistent with local and regional land use plans and any applicable HCP or NCCP. Involve all affected parties, especially landowners and local communities, in developing appropriate habitat configurations to achieve the optimal balance between resource impacts and benefits. Minimize design features that would preclude or inhibit access between communities and services.
2. **Develop New Habitat on Public Lands:** Focus habitat restoration efforts on developing new habitat on public lands. If public lands are not available for restoration efforts, focus restoration efforts on acquiring lands that can meet ecosystem restoration goals from willing sellers where at least part of the reason to sell is an economic hardship (e.g., land that floods frequently, where levees are too expensive to maintain).
3. **Compensate for Loss or Reduction in Environmental Value:** Where habitat restoration projects take place on land with inconsistent land uses, compensate for the

loss or reduction in environmental values protected by the subject land use plan, policy, or regulation. For example, if the project would result in conversion of agricultural land to a nonagricultural use, potential mitigation actions could include recording a deed restriction that ensures permanent conservation and mitigation on other property of equal or greater environmental mitigation value. See also physical habitat restoration Agricultural and Forest Resources mitigation measures (7.21 MM-AG-a–e: B).

C. Dam Removal LU Mitigation Measures

1. **Feasibility Study:** Land use impacts from dam removal must be considered and addressed in the feasibility study, including consideration of existing and future land use designations once the dam is removed. The impacts on structures such as bridges and roads affected by dam removal must be addressed in the feasibility study, and the project must not result in the physical division of an established community.
2. **Minimize Community Disruption Due to Hauling/Disposing of Construction Waste:** Identify off-site locations and haul distances for backfill materials and for disposal of waste materials to avoid or minimize disruptions to communities near the project construction site.
3. **Dam Removal TRA Mitigation Measures** (7.21 MM-TRA-a,b,d–f: C)
4. **Dam Removal REC Mitigation Measures** (7.21 MM-REC-a,b: C)

7.21.2.11 Mineral Resources

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
XI. Mineral Resources				
Would the project:				
a. Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state	☒	☐	☐	☐
b. Result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan	☒	☐	☐	☐

Section 7.14.2, *Environmental Setting*, describes the mineral resources setting, and additional regulatory setting is described in Appendix E, *Regulatory Framework for Construction Projects*.

Depending on location, construction of habitat restoration and other ecosystem projects could result in the loss of availability of a known mineral resource of value to a region and residents of the state or of a locally important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan. Construction of large-scale projects could affect mineral resources of statewide or regional importance (i.e., in Mineral Resource Zone 2 [MRZ-2] areas as designated by the State Mining and Geology Board) or locally important mineral resource recovery sites by making the resource inaccessible for extraction. For example, if land at or near a site selected for habitat

restoration is designated as an MRZ-2 area (i.e., an area known to contain mineral resources), that land could become unavailable for mineral extraction as a result of construction on that land. Active mines and areas zoned as MRZ-2 occur in nearly all counties of the state, and many active mines and MRZ-2 areas occur near waterways on the alluvial floodplains because of the high-quality aggregate found in this depositional environment.

Habitat restoration could occur in areas with active natural gas, oil, or aggregate production or the potential to contain untapped reserves of those resources. Siting/construction of a project that substantially restricts access to underlying mineral resources, including oil and natural gas, could also result in temporary or permanent loss of availability of the mineral resource. For example, implementation of some tidal and floodplain restoration projects could entail permanent inundation of areas containing natural gas extraction wells or aggregate resources. While natural gas wells can remain productive in flooded areas, these wells may require modification (e.g., construction of a protective cage and platform above the well) or abandonment and relocation. In some cases, extraction could continue, or pad sites could be designated for future extraction. In other cases, resources could be accessed from wells off site using horizontal drilling techniques. Impacts on mineral extraction sites would be temporary if effects were limited to the period of construction, such as could occur if access to a mining operation was temporarily restricted. Impacts would be permanent if the built project itself interfered with extraction of the mineral resource.

Construction demand for aggregate and/or cement for some habitat restoration and other ecosystem projects could exceed local supplies. For example, constructing setback levees and widening floodways would require large quantities of construction aggregate, which could limit the ability of other aggregate users in the area to obtain and use aggregate.

Impacts on mineral resources associated with common construction activities would be potentially significant and can be avoided or reduced by implementation of Mitigation Measure 7.21 MM-MIN-a,b: A (CMM-MIN-a,b). Mitigation can include designing and locating these types of projects to minimize interference with access to active oil and gas wells and any gravel or sand mines. If mitigation measures are implemented, most, if not all, impacts can be mitigated to less than significant. Because the precise location and magnitude of activities required for habitat restoration and other ecosystem projects are not known, mineral resource impacts cannot be determined with certainty at this time. Therefore, potential impacts on mineral resources remain potentially significant.

In-channel enhancing structures and gravel for augmentation would be placed within existing river channels but would not be expected to prevent access to existing mineral areas for this reason. Substantial depletion of mineral resources (specifically aggregate) as a result of gravel augmentation would not occur because these types of projects are not anticipated to require the use of substantial quantities of aggregate resources. Such materials are widely available from existing commercial sources, as well as from potentially developable sources (^Clinkenbeard and Gius 2008; O'Neal and Gius 2018). Impacts would be less than significant.

Invasive aquatic vegetation control would also not result in the removal of or inability to access state or regionally important mineral resources or result in the loss of availability of a locally important mineral resource recovery site, because the associated temporary activities would not entail construction, result in inundation of an area overlying mineral resources, or introduce physical obstructions to potentially underlying mineral resources.

Mitigation Measures

7.21 MM-MIN-a,b: Mitigate impacts on mineral resources

Entities or agencies designing and/or approving habitat restoration or other ecosystem projects will implement or require the following.

A. Construction MIN Mitigation Measures (CMM-MIN-a,b)

1. **Project Siting and Design:**
   i. Design and locate projects to avoid displacement of and maintain access to active oil and gas wells or aggregate resource sites, to the extent feasible.
   ii. Avoid siting projects on land designated for ongoing or potential mineral extraction, either on a California Geological Survey Mineral Land Classification Map as MRZ-2 or -3 or zoned in a general plan for mining.
   iii. Ensure land use compatibility between existing mineral resource extraction activities and projects, activities, or actions that may be implemented.
   iv. If the project is located in the vicinity of designated MRZ-2 sectors, maintain adequate buffer distance.
   v. Establish designated work areas to ensure that they are not located within a state- or locally designated mineral resource area. Confine construction traffic to designated access roads and staging areas.
2. **Aggregate Use:**
   i. Limit use of construction aggregate to local sources with sufficient capacity to meet both project and future local development needs.
   ii. Use recycled aggregate, where possible, to decrease the demand for new aggregate.
3. **Access to Extraction Sites:** Ensure that access is maintained to existing active mineral resource extraction sites during project construction.
4. **Implement the California Department of Conservation's Geologic Energy Management Division's (CalGEM) Recommendations:** Implement recommendations identified in CalGEM's Construction Site Well Review Program in coordination with the local CalGEM district office.

7.21.2.12 Noise

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
XII. Noise				
Would the project result in:				
a. Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies	☒	☐	☐	☐

		Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
b.	Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels	☒	☐	☐	☐
c.	A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project	☐	☐	☒	☐
d.	A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project	☒	☐	☐	☐
e.	For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels	☒	☐	☐	☐
f.	For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels	☒	☐	☐	☐

Section 7.15.2, *Environmental Setting*, describes the noise and vibration setting, and additional regulatory setting is described in appendix E, *Regulatory Framework for Construction Projects*.

Common Construction

Construction activities associated with habitat restoration and other ecosystem projects could temporarily (1) generate noise levels in excess of standards established in local general plans, noise ordinances, or applicable standards; (2) generate groundborne vibration or groundborne noise; and (3) increase ambient noise levels in the project vicinity. In addition, depending on project location, construction crew members may be temporarily exposed to excessive noise levels in the project area from a nearby public or private airport or airstrip during project construction.

Noise impacts from construction come from the use of heavy construction equipment at the construction site. Heavy construction equipment includes excavators, graders, scrapers, bulldozers, backhoes, pile drivers, jackhammers, and concrete mixing and pumping trucks. Small-scale projects would require the use of heavy construction equipment over a shorter period and would potentially require fewer pieces of equipment. Large-scale projects, on the other hand, could have longer periods during which this type of equipment is used and may require larger and potentially louder construction equipment. Depending on the type and model of equipment used for construction, noise levels could range from a maximum level of 85 to 101 maximum sound level (Lmax) A-weighted decibels (dBA) at 50 feet (USDOT 2019). Haul trucks could be used to move borrow, spoils, and other materials and could generate a maximum level of noise up to 88 Lmax dBA at 50 feet. As a point of reference, normal conversational levels are approximately 60 dBA (^Center for Hearing and Communication 2019). Actual noise exposure levels would depend on the intensity of the construction activity and the distance between sensitive receptors and the noise source.

Applicable noise standards for construction would be those specified by county or city ordinance or general plan.

Because of its temporary nature, construction does not result in a substantial permanent increase in ambient noise levels but may result in a substantial temporary or periodic increase in ambient noise levels in the project vicinity. The use of heavy construction equipment can generate noise levels in excess of standards established in a jurisdiction's general plan or municipal code or applicable standards of other agencies. Some city municipal codes or county codes of ordinances have exemptions for construction noise during daytime hours.

Where noise-sensitive receptors are located near construction sites, they may be exposed to noise levels in excess of standards established in the local general plan or noise ordinance or applicable standards of other agencies, or to a substantial temporary increase in ambient noise. Residential uses, schools, hospitals, places of worship, parks, and natural preserves are among the most common noise-sensitive receptors. Noise attenuation due to distance, atmospheric effects, ground absorption, and terrain effects would reduce noise effects on noise-sensitive receptors to some extent.

Construction activity can result in varying degrees of groundborne vibration, depending on the equipment and method used. Operation of heavy construction equipment, particularly pile driving and other impact devices such as pavement breakers and jackhammers, creates seismic waves that radiate along the surface of the earth and downward into the earth. These surface waves can be felt as ground vibration. Vibration from operation of this equipment can result in effects ranging from annoyance of people to damage of structures. The use of equipment such as pile drivers, vibratory compactors, and jackhammers could generate groundborne vibrations ranging from 0.035 to 1.518 inches per second peak particle velocity at 25 feet, with the range representing the maximum amplitude and frequency of vibration waves that could be caused by these types of equipment (^FTA 2018). Actual exposure levels would depend on the distance between receptors and the vibration source. Perceptible groundborne vibration is generally limited to areas within a few hundred feet of construction activities. Vibration may inhibit general well-being and contribute to stress and annoyance and can interfere with human activities, including sleep, speech, recreation, and tasks demanding concentration or coordination. At moderate and high levels, groundborne vibration may result in detectable vibrations and slight damage to nearby structures. At the highest levels of vibration, damage to structures is primarily architectural (e.g., loosening and cracking of plaster or stucco coatings). Vibration rarely results in damage to structural components. At sufficiently high amplitudes, propagation of vibration waves through the ground can cause building elements to vibrate at a frequency that is audible to the human ear. Groundborne noise could result in rattling of windows, walls, or other items coupled to building surfaces. Within the range of expected amplitude, groundborne vibrations would pose the greatest risk to extremely fragile historic structures (buildings, ruins, ancient monuments), fragile buildings, historic structures (buildings, bridges, gates, weirs, and other levee structures that are more than 50 years old), and some newer structures (less than 50 years old but not constructed to current building standards).

Construction activities that involve drilling and blasting could result in noise and vibration impacts. While a portion of the energy from a blast detonation would be consumed in material that is blasted, the remaining energy would be dissipated through the ground as vibration and/or through the air as air overpressure or airblast (air vibrations). If any sensitive receptors are nearby (e.g., nearby residents), groundborne vibration and groundborne noise from these construction activities could be considered excessive.

Construction, depending on project location, may temporarily expose construction crew members to excessive noise levels in the project area from a nearby public or private airport or airstrip during project construction.

Noise and vibration impacts associated with common construction activities would be potentially significant and can be avoided or reduced by implementation of Mitigation Measure 7.21 MM-NOI-a,b,d–f: A (CMM-NOI-a,b,d–f). Mitigation for potential construction noise and vibration impacts includes complying with regulations related to noise, implementing noise-reducing construction measures, and designing projects to limit groundborne vibration from construction equipment like pile drivers and jackhammers. If mitigation measures are implemented, most, if not all, impacts (including construction impacts) can be mitigated to less than significant. Because the precise location and magnitude of activities required for habitat restoration and other ecosystem projects are not known, noise and vibration impacts cannot be determined with certainty at this time. Therefore, potential noise and vibration impacts remain potentially significant.

Long-term operation and maintenance of habitat restoration and other ecosystem projects may include occasional vehicular trips for periodic inspections, monitoring, and evaluation. Some heavier maintenance and repair activities could generate impacts similar to those discussed for the construction phase, but far less frequently. Any associated noise would be periodic and temporary. Operation and maintenance activities would not create an excessive or substantial permanent increase in ambient noise or result in excessive groundborne vibrations or groundborne noise. Operation and maintenance of new projects would not likely result in workers being exposed to excessive aircraft noise, even if the restoration sites or other ecosystem project sites are located near an airport, because operation and maintenance of these projects would likely require relatively few maintenance trips, and these would likely be of short duration. Long-term noise impacts would be less than significant.

The effects of construction-related noise and groundborne vibration on wildlife are evaluated in Section 7.21.2.4, *Biological Resources*.

Physical Habitat Restoration

Physical habitat restoration projects could result in temporary (months to years) noise and vibration impacts during construction (see *Common Construction*). Most habitat restoration is likely to occur within or immediately adjacent to riverbanks, nontidal channels, and tidal channels. While many projects would likely be located in remote locations away from noise-sensitive receptors, there may be locations where construction would occur near noise-sensitive land uses (e.g., residences).

Fish Passage Improvements

Fish passage improvement projects would create noise related to the use of heavy equipment during construction, as described in *Common Construction*. Construction of fish passage improvement projects would occur within or immediately adjacent to riverbanks and channels in the Sacramento/Delta. While projects would likely be located in remote locations away from noise-sensitive receptors, there may be locations where construction would occur near noise-sensitive land uses (e.g., residences, recreational facilities). Because of their in-channel location, many fish passage improvement projects may require temporary dewatering of in-channel areas for construction activities (e.g., fish screen installation). This would be facilitated by installing a cofferdam, which would require the use of a pile driver. Where fish ladders are to be upgraded or

small dams removed, jackhammers may be required to facilitate removal. In addition, drilling and blasting could be required for large dam removal to break up concrete. These activities would potentially result in temporary excessive groundborne vibration and groundborne noise.

Predatory Fish Control

Removal or modification of abandoned structures (e.g., dams, bridge piers, docks), water diversion facilities, and scour holes would create temporary noise and groundborne vibration related to the use of heavy equipment (e.g., pile drivers, jackhammers) (as described in *Common Construction*). People would not be permanently exposed to noise levels in excess of standards established in the local general plan, noise ordinance, or applicable standards of other agencies due to the temporary nature of the activities associated with the removal or modification of abandoned structures. Long-term noise impacts would be less than significant.

Capture methods for predation control do not involve construction and therefore would not result in any of the construction noise impacts already discussed. Given the nature of the activities, passive and active capture methods for predatory fish control would not generate noise in excess of standards established in the local general plan or noise ordinance or applicable standards of other agencies, or result in a substantial temporary, periodic, or permanent increase in ambient noise levels. Passive capture methods only require that nets or other entrapment devices be set up, an activity that would not require the use of construction equipment. Active capture methods may require motorboat use to capture fish by trawlnets, for example. However, any noise generated by a boat engine would not be substantial relative to other boats (e.g., recreational motorboats) in areas where predatory fish control might be implemented. In addition, because of the nature of these activities, there would be no excessive groundborne vibration and groundborne noise.

Invasive Aquatic Vegetation Control

Invasive aquatic vegetation control does not involve construction and therefore would not result in any of the construction noise impacts discussed in *Common Construction*. However, invasive aquatic vegetation control would temporarily and periodically create noise related to the use of a mechanical harvester. Although noise-sensitive receptors could be nearby (e.g., zoned or designated recreational areas), any noise effects would be temporary (hours) and potentially intermittent over a period of days, given the nature of the work. If aerial herbicide application (e.g., using fixed-wing aircraft) were used, this would also generate noise. While there may be elevated noise levels in excess of standards established in local general plans, noise ordinance, or applicable standards due to the operation of these aircraft, it would only occur during the day and would be of relatively short duration. As such, this impact would be less than significant.

People would not be exposed to permanent noise levels in excess of standards established in the local general plan, noise ordinance, or applicable standards of other agencies due to the small nature of the projects and the relatively remote areas where these projects may be located.

Excessive groundborne vibration or groundborne noise levels due to invasive aquatic vegetation control are not expected due to the type of equipment that would be used for mechanical or chemical vegetation removal.

Monitoring of areas where invasive aquatic vegetation control has been implemented would not create noise because no noise- or vibration-generating equipment would be used.

Mitigation Measures

7.21 MM-NOI-a,b,d–f: Mitigate noise and vibration impacts

Entities or agencies designing and/or approving habitat restoration or other ecosystem projects will implement or require the following.

A. Construction NOI Mitigation Measures (CMM-NOI-a,b,d–f)

1. **Regulatory Compliance:** Comply with applicable state and local noise policies and regulations. Comply with Cal/OSHA standards related to occupational noise exposure (Cal. Code Regs., tit. 8, § 5096).
2. **Noise-Reduction Measures:** Implement noise-reducing construction measures such that noise from construction does not exceed applicable local noise standards or limits specified in the applicable county or city ordinances and general plan noise elements. Such measures may include the following.
    i. Restrict construction activities near noise-sensitive (e.g., residential) land uses to daytime hours on weekdays.
    ii. Prior to construction, the contractor will identify noise-sensitive receptors near a project site. At least 2 weeks prior to the start of construction, the contractor will notify all property owners within 1,000 feet of the project site that construction activities are scheduled to commence.
    iii. Where construction occurs near residences, the contractor will provide local residents with a noise complaint hotline phone number, and noise complaints will be promptly addressed.
    iv. Maintain construction equipment to manufacturers' recommended specifications, equip all construction vehicles and equipment with appropriate mufflers and other approved noise-control devices, and/or use newer equipment with improved noise muffling. Ensure that all equipment items have the manufacturers' recommended noise abatement measures (e.g., mufflers, engine covers, engine vibration isolators) intact and operational. Newer equipment will generally be quieter in operation than older equipment. Inspect all installation equipment at periodic intervals to ensure proper maintenance and presence of noise-control devices (e.g., mufflers, shrouding).
    v. Shroud or shield all impact tools, to the extent feasible.
    vi. Locate all stationary noise-generating equipment (e.g., compressors) as far as possible from adjacent occupied offices, residents, or sensitive habitats (if they are adjacent to the project site).
    vii. Limit idling of construction equipment to reduce the time that noise is emitted.
    viii. Use temporary noise barriers or curtains along construction boundaries or partial enclosures around continuously operating stationary equipment.
    ix. Use the shortest possible routes from construction sites to local freeways for truck delivery routes, except when selecting routes to avoid going through residential neighborhoods.

x. Establish an active community liaison program that notifies landowners within 300 feet of construction areas of the construction schedule, in writing, prior to construction to keep them informed of schedule changes; designate a disturbance coordinator for the construction site.

xi. Monitor construction noise and vibrations and modify and/or reschedule construction activities if monitoring determines that maximum limits set by local or regional noise ordinances are exceeded.

xii. Conduct individual traffic noise analysis of identified haul routes and provide mitigation at locations where noise standards cannot be maintained for sensitive receptors.

3. **Vibration-Reduction Measures:** Measures to limit or minimize exposure of persons to or generation of excessive groundborne vibration or groundborne noise may include the following.

   i. Design projects to limit vibration from construction equipment to comply with the applicable local standards or commonly accepted thresholds.

   ii. Conduct a preliminary groundborne vibration analysis report to determine future construction-related groundborne vibration levels based on, but not limited to, a detailed equipment list, hours of operation, and distances to sensitive receptors located within 500 feet of project sites. If preliminary analysis determines that groundborne vibration would expose sensitive receptors to significant impacts in excess of local standards, implement the following actions.

      - Designate a complaint coordinator and post this person's contact information in a location near construction areas where it is clearly visible to the nearby receptors most likely to be affected.
      - Conduct vibration monitoring before and during vibration-generating operations occurring within 100 feet of historic structures. Make every attempt to limit construction-generated vibration levels during pile driving and other groundborne noise- and vibration-generating activities near the historic structures.
      - Cover or shore adjacent historic features, as necessary, for protection from vibrations, in consultation with the appropriate local or state cultural resources authority.
      - For pile driving required within a 50-foot radius of residences, use alternative installation methods where feasible.
      - Conduct any pile-driving activities close to sensitive receptors only during daytime hours.
      - Use small equipment that generates less vibration when equipment must be used close to sensitive uses.

4. **Blasting Operations and Safety Plan (CMM-GEO-a–e: 7)**: Implement BMPs to reduce short-term noise and vibration impacts.

5. **Construction near Airports (CMM-HAZ-a–h: 8):** Implement BMPs to avoid safety hazards for people residing or working in the project area.

7.21.2.13 Population and Housing

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
XIII. Population and Housing				
Would the project:				
a. Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)	☐	☐	☐	☒
b. Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere	☐	☐	☐	☒
c. Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere	☐	☐	☐	☒

Section 7.16.2, *Environmental Setting*, describes the population and housing setting, and additional regulatory setting is described in Appendix E, *Regulatory Framework for Construction Projects*.

Habitat restoration and other ecosystem projects would not involve construction of new homes or businesses, extension of roads, other infrastructure, or other actions that may directly or indirectly induce substantial population growth in an area. Project sites would be located within or immediately adjacent to riverbanks and channels and therefore would not displace substantial numbers of people or existing housing. Further, these projects would not develop amenities (e.g., malls, amusement parks, hotels, recreation areas) that would attract substantial numbers of people to an area. The potential for habitat restoration and other ecosystem projects to result in population growth is evaluated in Section 7.23, *Cumulative Impact Analysis, Growth-Inducing Effects, and Significant and Irreversible Changes*. During construction, nonlocals may move to a project area to support these activities; however, construction employees are generally pulled from the region's existing labor pool and typically do not relocate when assigned to a new construction site. Those who are hired from outside of the existing labor pool generally tend to commute to jobsites, as projects can change several times a year and offer no permanent place of business. Some more specialized construction workers may be needed and potentially would relocate to the construction area; however, relocation by specialized workers is usually temporary and limited to the duration needed to complete a particular phase of construction that requires their skills. The need for lodging would be temporary and could likely be met via local accommodations (e.g., motels). Once that construction phase is completed, specialized workers typically move on to the next jobsite requiring their skills. Construction of restoration projects may take as little as a few days or as long as several years, depending on the specific project being constructed. As such, worker relocation could vary depending on the size, type, and length of construction activities. There would be no impact related to population and housing due to construction and operation of habitat restoration projects and other ecosystem projects.

7.21.2.14 Public Services

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
XIV. Public Services				
a. Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:				
Fire protection?	☐	☐	☒	☐
Police protection?	☐	☐	☒	☐
Schools?	☐	☐	☒	☐
Parks?	☐	☐	☒	☐
Other public facilities?	☐	☐	☒	☐

Section 7.17.2, *Environmental Setting*, describes the public services setting, and additional regulatory setting is described in appendix E, *Regulatory Framework for Construction Projects*.

The need for additional public services (e.g., fire protection, police protection, libraries, parks, schools, other public facilities) or the deterioration of existing public services such that new or physical modifications to government facilities would be required typically results from new development and an increase in the local population. As a location's population increases, the need for additional or new public services and public service facilities generally increases. As discussed in Section 7.21.2.13, *Population and Housing*, habitat restoration and other ecosystem projects would not result in increases in housing or in population where implemented. As such, these types of projects would not create a need for additional schools, parks, or other public facilities.

Construction activities for habitat restoration and other ecosystem projects could result in temporary, short-term increased response times for fire, police, and other emergency responders due to increased construction traffic and potential road closures and detours. Potential road detours or closures due to construction activities and the associated potential traffic congestion could make areas in the near vicinity of construction temporarily inaccessible or less accessible to emergency services. This may temporarily increase emergency response times. Construction activities could also temporarily increase the need for traffic patrol and emergency route management. However, these would be temporary impacts and would not necessitate the need for new or physically altered governmental facilities in order to maintain acceptable service ratios, response times, or other performance objectives for any public services.

Construction actions could result in temporary increases in the number of fire, police, or emergency medical provider service calls in the vicinity of work sites from emergencies related to construction. However, these potential increases in calls are not expected to be large enough or frequent enough

to affect response times beyond the regular variation experienced by providers of emergency services. Operations would require maintenance and monitoring activities to support successful project establishment. Routine maintenance activities would not result in substantially adverse physical traffic impacts that would lead to increased response times for fire protection, police protection, schools, and other public facilities.

Any potential increase in demand for emergency services would be temporary and would not result in the need for new or physically altered governmental facilities in order to maintain acceptable service ratios, response times, or other performance objectives. Therefore, impacts on public services due to construction and operation of habitat restoration projects and other ecosystem projects would be less than significant.

Mitigation for potential construction-related interference with emergency access due to traffic, road closures, and detours is presented in Section 7.21.2.16, *Transportation and Traffic*. Mitigation for potential increases in emergencies related to construction is presented in Section 7.21.2.8, *Hazards and Hazardous Materials*. Mitigation for potential recreation impacts is presented in Section 7.21.2.15, *Recreation*.

7.21.2.15 Recreation

		Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
XV. Recreation					
a.	Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?	☒	☐	☐	☐
b.	Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?	☒	☐	☐	☐

Section 7.18.2, *Environmental Setting*, describes the recreation setting, and additional regulatory setting is described in Appendix E, *Regulatory Framework for Construction Projects*.

Common Construction

Habitat restoration and other ecosystem projects would likely be constructed along waterways—locations popular for many types of recreational activities (e.g., boating, swimming, fishing, hunting, hiking, wildlife viewing). Recreationists near an active construction site could be affected by construction-related traffic, visual impacts, water quality effects, noise, fugitive dust, and exhaust emissions from heavy equipment. These construction-related environmental effects could temporarily affect recreational activities (e.g., disrupt wildlife viewing, swimming, picnicking), as well as result in a decrease in the quality of recreational experiences in the immediate vicinity of the construction site and at nearby facilities (e.g., river access, trails, private parks not directly affected by construction).

Recreational activities in the vicinity of the project areas could also be affected by potential access restrictions to these areas during construction, such as temporary closure of recreational areas or trails. Such closures could be short-term for small projects but could last several years for large projects. Due to these potential effects on the quality of people's recreational experience, recreationists may choose other locations that provide similar opportunities for recreation, which could ultimately result in physical deterioration of these alternative locations and facilities over time. This impact would be more likely to occur due to large restoration or ecosystem projects that require substantially longer than a year (i.e., more than one spring/summer recreational season) to construct and in areas where alternative recreational areas are limited.

Impacts on recreation associated with common construction activities would be potentially significant and can be avoided or reduced by implementation of Mitigation Measure 7.21 MM-REC-a,b: A (CMM-REC-a,b). Mitigation can include providing appropriate signage for route relocations and rehabilitation or restoration of degraded facilities promptly upon completion of construction. Construction mitigation measures for impacts on other environmental resources, including measures for aesthetics (CMM-AES-a–d), air quality (CMM-AQ-a–e), water quality (CMM-WQ-a–j), noise and vibration (CMM-NOI-a,b,d–f) and transportation and traffic (CMM-TRA-a,b,d–f), would minimize effects on recreation. In addition, as discussed in more detail below, implementation of Mitigation Measures 7.21 MM-REC-a,b: B and C can avoid or reduce additional potentially significant impacts on recreational resources associated with habitat restoration and other ecosystem projects as applicable. If mitigation measures are implemented, most, if not all, impacts (including construction impacts) can be mitigated to less than significant. Because the precise location and magnitude of activities required for habitat restoration and other ecosystem projects are not known, impacts associated with recreation cannot be determined with certainty at this time. Therefore, potential impacts on recreation resources remain potentially significant.

Physical Habitat Restoration

Because physical habitat restoration projects would require construction in areas where recreationists may be, there would potentially be temporary short- or long-term effects (depending on the project) on recreation, as described in *Common Construction*.

While many construction-related impacts may be temporary, some other impacts may be long-term and permanent. Habitat restoration projects that require levee breaching, construction of setback levees, and floodplain expansion could adversely affect marinas and other land-based facilities (e.g., picnic areas). For example, there are approximately 100 marinas in the Delta, and most of those are located on levees or within the floodway (^DSC 2011). Establishing, restoring, or enhancing stream, riparian, or tidal habitats may require permanently relocating or decommissioning existing trails or roads. Infrastructure may be removed or relocated along streams and in riparian areas. The infrastructure affected may include boat docks, boat haul-out locations, campgrounds and campsites, day-use sites, and roads/trails and off-highway/off-road vehicle routes in the areas of the restoration projects. Habitat restoration could require permanent removal of marinas and other recreation facilities, which may cause recreationists to be displaced to other facilities. This displacement would potentially result in increased use of existing alternative recreational facilities, possibly leading to substantial physical deterioration or accelerated deterioration of those facilities.

This would be a potentially significant impact. In addition to common construction mitigation measures, implementation of Mitigation Measure 7.21 MM-REC-a,b: B would avoid or reduce recreational impacts to less than significant. Measures would require that, to the extent feasible,

restoration areas would be sited and designed to minimize disturbances to or losses of existing recreational areas, including marinas. Where long-term impacts on existing facilities are unavoidable, the project proponent would compensate for impacts through mitigation, restoration, or creation of additional permanent new replacement facilities. However, unless and until the mitigation measures are fully implemented, the impacts remain potentially significant.

Impacts from actions to modify or rebuild recreation facilities would be similar to the impacts of other construction actions addressed throughout this section, and implementation of common construction mitigation measures can avoid or reduce the impacts to a less-than-significant level. Depending on the size and scope of the action, modification or construction of a new marina or campground could have additional construction and operations impacts associated with fueling facilities and restrooms (as discussed in Sections 7.21.2.8, *Hazards and Hazardous Materials*, and 7.21.2.9, *Hydrology and Water Quality—Surface Water and Groundwater)*.

Habitat restoration could result in changes in fish and game species that use the restored area, which could affect fishing, hunting, and wildlife viewing opportunities. These changes in recreational opportunities at restored locations may cause recreational users to be displaced to other locations. However, it is unlikely that displaced recreationists such as fisherpersons, hunters, and wildlife viewers would cause the substantial deterioration or accelerated deterioration of existing recreational facilities elsewhere given that these kinds of recreational activities (i.e., fishing, hunting, wildlife viewing) do not generally require the use of physical facilities or involve large numbers of people gathered in one location. The change of habitat type could also affect the type of boating opportunities available and create conflict between motorized and nonmotorized boaters in areas where open water and marsh habitats meet. A change in habitat type due to restoration is not likely to cause most recreationists to seek other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated given that restored habitat would still likely provide a variety of recreational opportunities. These impacts would be less than significant.

Habitat restoration would have beneficial impacts on recreation. Habitat restoration projects would generally be expected to improve conditions for native fish, resulting in improved fishing opportunities for native species. Floodplain restoration projects could provide improved habitat for both wetland and upland game species, which would provide improved hunting and birdwatching opportunities for recreationists. Riparian restoration and enhanced in-channel complexity projects could provide improved canoeing and kayaking opportunities by creating a more natural, varied, and dynamic riverine setting in some locations. In addition, large restoration projects could include interpretive facilities or signage related to the ecological history and restoration of the site, which would enhance the recreational experience in the long term.

Fish Passage Improvements

Construction of most fish passage improvement projects (i.e., fish screens, fishways, TCDs) would potentially have temporary effects on recreation, as described in *Common Construction*, but would not be expected to have long-term effects because recreational opportunities where these projects are implemented would not be changed. Fish passage improvement projects would generally be expected to improve conditions for native fish, resulting in improved fishing opportunities for native species.

The placement of certain types of TCDs (e.g., a thermal curtain) in a reservoir could result in a reduction in reservoir area that would be available for recreational users. Following construction, some reservoir areas could remain permanently off-limits to boaters and other water recreationists

due to safety concerns, as discussed in Section 7.21.2.8, *Hazards and Hazardous Materials*. The reduction in the lake area available for boating and other recreational uses would likely not be substantial in proportion to the total lake area. Therefore, these devices would not displace recreationists to other locations and result in the substantial physical deterioration or accelerated deterioration of other recreational facilities. This impact would be less than significant.

Dam removal projects can range from relatively small impoundments (e.g., diversion dams) to large-scale construction and removal of larger structures (e.g., reservoirs). In locations where an existing small dam may provide relatively localized recreational opportunity, such as creating a swimming hole, removal of the barrier could displace some recreationists. In the Sacramento/Delta and along upstream waterways, there are numerous opportunities for swimming and wading. As such, this displacement is unlikely to concentrate on specific facilities and thus is unlikely to result in the substantial physical deterioration of a recreational facility or substantially accelerate deterioration. This impact would be less than significant.

Removal of large reservoir dams could result in short-term and long-term effects on recreation in addition to the potential effects related to construction activities described in *Common Construction*. The expected increase in turbidity during the reservoir drawdown and sediment flushing period could temporarily reduce visibility for boaters, swimmers, and fisherpersons and thus would potentially reduce participation in these activities at these project locations (e.g., swimmers might be less likely to enter the river due to concern about reduced visibility of submerged boulders and logs, fisherpersons might be less successful due to the reduced water clarity). Elevated turbidity would be temporary and potential related effects on recreation would depend on when (relative to the peak outdoor recreational season, which is generally May to September) drawdown and flushing were implemented. Mitigation Measure 7.21 MM-WQ-a–j: G would minimize potential impacts associated with construction-related in-channel disturbances. Further, it is likely that recreational sites in and around the project area would be temporarily closed for safety during construction. Following completion of reservoir drawdown activities, water quality and clarity would be expected to improve over a period of months as sediments are flushed downstream. Sediment release could also decrease the quality of water-contact-based recreational opportunities if sediment deposited downstream resulted in longer-term deposition in pools, eddies, slack water, and banks and decreased the availability of these areas for recreational activity. Because elevated turbidity would be most pronounced immediately downstream of the dam, recreationists would likely find other locations further downstream that were less affected by suspended sediment. Regardless, given the temporary nature of this increase in turbidity and potentially multiple other accessible areas along rivers for recreation to accommodate additional users, it is unlikely that substantial physical deterioration of other recreational facilities would occur or be accelerated. This impact would be less than significant.

Dam removal could provide new boating opportunities in previously inundated areas. However, flow-dependent activities such as whitewater rafting could be affected in river reaches downstream of a reservoir removal location. Some dam-controlled rivers provide consistent, predictable water flows that whitewater rafters rely upon during the spring/summer recreation season. Potential changes in flows due to dam removal may affect opportunities at certain locations and at certain times of the year. This could increase in the use of put-in and other facilities on other rivers that remain available for whitewater activities, which could cause substantial physical deterioration of the facilities.

Similarly, reservoir dam removal projects would result in the long-term loss of existing opportunities for reservoir-based recreation activities, such as power boating, waterskiing, lake swimming, and flat-water boat angling. In addition, many reservoirs are popular recreational areas for sightseeing, fishing, camping, picnicking, and wildlife viewing; large dam removal projects would reduce some of these opportunities locally. Reservoir drawdown and the return to a natural river from a reservoir could affect recreational facilities associated with the removed reservoir, including roads/trails, boat docks, and campgrounds. There are many lakes and reservoirs in the Sacramento/Delta, and it is likely that other lakes and reservoirs may be available in the vicinity of the reservoir removal site and would likely provide similar opportunities for recreation. The displacement of recreationists to other locations could result in the accelerated physical deterioration of some recreational facilities (e.g., more popular recreational sites) over time.

This impact would be potentially significant. In addition to common construction mitigation measures, implementation of Mitigation Measure 7.21 MM-REC-a,b: C could avoid or reduce additional impacts on recreation associated with large dam removals to less than significant. Preproject planning for large dam removal requires consideration of a wide variety of technical, environmental, social, political, and economic issues. Feasibility studies must address impacts on recreation, such as reservoir boating and boat facilities, campground facilities and roads/trails, and other infrastructure that could be affected. New recreation facilities and access roads to the river channel may be required to maintain a similar level of recreation capacity originally provided by the dam and reservoir. Engineering designs and construction plans will include any special accommodations for recreation impacts and opportunities, including the need to relocate facilities and create new recreation opportunities once dam removal is complete. A project-specific analysis would be necessary to identify the preferred dam removal method for an individual project, and multiple approvals from various federal and state agencies would be required. Until the mitigation measures are implemented, the impact remains potentially significant.

Impacts from actions to modify or rebuild recreation facilities would be similar to other construction actions addressed throughout this section, and implementation of common construction mitigation measures can avoid or reduce the impacts to a less-than-significant level. Depending on the size and scope of the action, modification or construction of new marinas or campgrounds could have additional construction and operations impacts associated with fueling facilities and restrooms (as discussed in Sections 7.21.2.8, *Hazards and Hazardous Materials*, and 7.21.2.9, *Hydrology and Water Quality—Surface Water and Groundwater)*. Unless and until the mitigation measures are fully implemented, the impacts remain potentially significant.

Fish screens and fishways may require periodic maintenance, which could temporarily affect recreation. For example, fish screens would potentially require periodic inspections, repairs, cleaning, and sediment and debris management. These activities could temporarily interfere with access to small in-channel and riverbank areas, which could displace recreationists, depending on the location. Given the temporary and periodic nature of these potential activities, the temporary displacement of recreationists would be unlikely to result in the substantial or accelerated physical deterioration of alternative recreational facilities. Therefore, this impact would be less than significant.

Predatory Fish Control

Removal or modification of human-made structures and passive and active capture methods would occur within riverbanks and channels and would not include or require the construction or

expansion of recreational facilities. It is possible that recreational facilities would be located in areas where predatory fish control would be implemented. If recreationists were in proximity, activities associated with the removal or modification of human-made structures may affect them in ways similar to those described for construction in *Common Construction*.

Capture methods for predation control do not involve construction and therefore would not result in any of the construction impacts on recreation discussed in *Common Construction*. Passive and active capture of fish may occur in recreational areas; however, these activities would not be expected to substantially affect recreational users because the activities would be limited in scope and duration and therefore would not displace substantial numbers of recreationists to other locations or recreational facilities. As such, there would be no impact.

Removal or modification of human-made structures and passive or active capture methods could target recreational and sportfish species, such as striped bass. While the number of fish that might be removed through predation control is unknown, the removal of these species from the rivers could result in a reduction in recreational and sportfishing opportunities. However, a few selected areas (e.g., below dams, areas where juvenile hatchery fish are released) would be targeted for predator fish removal, and these fish would likely eventually repopulate the area (^Cavallo et al. 2012). Fisherpersons may also be directly affected by the removal of abandoned docks, as these can be popular fishing locations. However, the reduction in fishing opportunities at certain locations would be unlikely to result in the substantial deterioration or accelerated deterioration of existing recreational facilities elsewhere given that fishing does not necessarily require the use of physical recreational facilities or involve large numbers of people gathered in one location. In addition, removal or modification of structures that provide types of recreational opportunities, such as a small, abandoned dam that creates a swimming hole, could displace recreationists to other areas suitable for swimming. It is unlikely that a substantial number of recreationists would be displaced resulting in the substantial degradation of other recreational facilities given the relatively limited capacity at small swimming holes. Additionally, there are many locations for swimming along rivers in the Sacramento/Delta. Lastly, given the nature of the action, varying the location and/or timing of releases or routing of fish would not be expected to affect recreationists. This impact would be less than significant.

Invasive Aquatic Vegetation Control

Invasive aquatic vegetation control does not involve construction and therefore would not result in any of the construction impacts on recreation discussed in *Common Construction*. It is possible that some areas may be temporarily restricted for recreational activities during primary application of chemicals or during mechanical removal of aquatic vegetation; however, access would be restored, and, as such, significant effects on recreational facilities are not expected. Removal of thick aquatic vegetation may allow increased boat access to areas that previously were not accessible. Monitoring activities following chemical applications or mechanical removal would not likely affect recreational facilities because only a few people would be involved in the monitoring activities. Accordingly, invasive aquatic vegetation control would not displace recreationists to other locations and result in the substantial physical deterioration or accelerated deterioration of other recreational facilities.

Invasive aquatic vegetation control would not increase the use of existing parks or recreational facilities and would not result in the construction of recreational facilities. There would be no impact.

Mitigation Measures

7.21 MM-REC-a,b: Mitigate impacts on recreation

Entities or agencies designing and/or approving habitat restoration or other ecosystem projects will implement or require the following.

A. Construction REC Mitigation Measures (CMM-REC-a,b)

1. **Project Siting and Design:** Site and design construction project to minimize disturbances to or losses of existing recreational areas and associated facilities.
2. **Maintain Access to Existing Recreational Facilities during Construction:** If feasible, maintain access to the affected recreational site/facilities by providing appropriate signage for route relocations, including as appropriate, river markers. Provide additional operations and maintenance of existing recreational facilities to prevent deterioration.
3. **Coordinate with Public and Private Recreation Providers:** If substantial temporary or permanent impairment, degradation, or elimination of recreational facilities causes recreationists to be directed toward other existing facilities, the project proponent will coordinate with affected public and private recreation providers to direct displaced users to underutilized recreational facilities. Provide temporary replacement facilities of equal capacity and quality.
4. **Rehabilitate or Restore Degraded Recreational Facilities or Provide Replacement Recreational Facilities:** Where impacts on existing facilities are unavoidable, compensate for impacts through mitigation, restoration, or preservation off site or creation of additional permanent replacement facilities. For construction of new recreational facilities, site the project in area that would have minimal adverse physical effects on the environment. If modification of existing facilities or construction of new facilities is required, implement all construction mitigation measures identified in this section. Facilities with fueling stations or restroom facilities must implement additional construction and operational mitigation measures.
5. **Construction AES Mitigation Measures** (CMM-AES-a–d)
6. **Construction AQ Mitigation Measures** (CMM-AQ-a–e)
7. **Construction WQ Mitigation Measures** (CMM-WQ-a–j)
8. **Construction NOI Mitigation Measures** (CMM-NOI-a,b,d–f)
9. **Construction TRA Mitigation Measures** (CMM-TRA-a,b,d–f)

B. Physical Habitat Restoration REC Mitigation Measures

1. **Project Siting and Design:** Site and design restoration areas to minimize disturbances to or losses of existing recreational areas and associated facilities (e.g., campgrounds, parks, marinas) and consider methods to maintain access to adjacent areas or to recreational areas that could be affected as a result of restoration.
2. **Compensation for Unavoidable Long-Term Impacts:** Where long-term impacts on existing facilities are unavoidable, the project proponent will compensate for impacts through mitigation, restoration, or creation of additional new permanent replacement

facilities. Facilities with fueling stations or restroom facilities must implement additional construction and operational mitigation measures.

C. Dam Removal REC Mitigation Measures

1. **Project Planning:** The impacts on recreation by dam removal must be considered and addressed in a feasibility study. Include contingency planning for recreation in performance monitoring and adaptive management (up to 5 years) after removal is complete and consider transportation impacts and needs associated with recreation facilities.
2. **Coordination with Public Recreation Providers:** For reservoir dam removal projects that would displace recreationists to other similar facilities (e.g., lakes, reservoirs) such that substantial deterioration or accelerated deterioration of those facilities may occur, the project proponent will coordinate with affected public recreation providers to direct displaced users to underutilized recreational facilities, provide additional operations and maintenance of existing recreational facilities, or otherwise compensate the provider to prevent deterioration or accelerated deterioration of affected facilities.
3. **Compensate for Impacts on Recreational Facilities:** Where long-term impacts on existing facilities are unavoidable, the project proponent will compensate for impacts through mitigation, restoration, or creation of additional new permanent replacement facilities. Facilities with fueling stations or restroom facilities must implement additional construction and operational mitigation measures.

7.21.2.16 Transportation and Traffic

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
XVI. Transportation/Traffic				
Would the project:				
a. Conflict with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including, but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit	☒	☐	☐	☐
b. Conflict with an applicable congestion management program, including, but not limited to level of service standards and travel demand measures, or other standards established by the county congestion management agency for designated roads or highways	☒	☐	☐	☐
c. Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks	☐	☐	☐	☒

		Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
d.	Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)	☒	☐	☐	☐
e.	Result in inadequate emergency access	☒	☐	☐	☐
f.	Conflict with adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance or safety of such facilities	☒	☐	☐	☐

Section 7.19.2, *Environmental Setting*, describes the transportation and traffic setting, and additional regulatory setting is described in Appendix E, *Regulatory Framework for Construction Projects*.

Common Construction

Construction of physical habitat restoration and other ecosystem projects may result in a temporary and short-term increase in traffic during the construction phase due to additional vehicles (e.g., construction vehicles, construction workers' personal vehicles) on roads near project sites. For example, certain habitat restoration projects may require the import or export of fill material to or from a project site or the import of gravel, and, depending on the volume required to be transported, there could be a relatively substantial temporary increase in the number of trucks at intersections and on road segments that are not designed to accommodate increased traffic levels. Roads may need to be relocated, which would cause new rerouted traffic at an intersection not designed to accommodate additional traffic. Increased traffic congestion on roads and at intersections could result in transportation facilities operating below minimum level-of-service standards. In addition, if the use of a substantial number of haul trucks or trips is required for fill transport, for example, roads could be substantially degraded such that repairs are required. Further, some projects could require temporary relocation, closure, or complete removal of existing bicycle and pedestrian paths and trails, depending on the location of the project. These types of potential effects during/due to construction may conflict with a congestion management plan or an applicable transportation plan, ordinance, or policy—at least temporarily. Habitat restoration and other ecosystem projects requiring in-channel construction activities could temporarily obstruct boat navigation and cause boat traffic delays, depending on the location. Construction equipment (e.g., barges and dredges) could temporarily obstruct boat traffic.

Depending on the location, construction of habitat restoration or other ecosystem projects may result in roads being temporary blocked, rerouted, or altered, which could impede and result in inadequate emergency access and delay the response time for emergency vehicles. Although most of these projects would occur in locations typically removed from major roadways and traffic sources, if a project were in a location that would require lane closures during construction, emergency access could be affected. In addition, if construction of habitat restoration and other ecosystem projects required permanent relocation of a road segment, relocation could require changes in the horizontal or vertical alignment of the segment. The new segment, depending on the design, could increase or introduce a hazard to vehicles traveling on that segment. The severity of the impacts

would depend on several factors, such as the location, size, and duration of the project and the number of vehicles and vehicle trips needed.

Transportation and traffic impacts associated with common construction activities would be potentially significant and can be avoided or reduced by implementation of Mitigation Measure 7.21 MM-TRA-a,b,d–f: A (CMM-TRA-a,b,d–f). Mitigation can include preparing and implementing a construction Traffic Management Plan (TMP) and, as applicable, a waterway traffic control plan and restoration of roads, bicycle lanes, or pedestrian facilities damaged during construction. The TMP should be implemented in close coordination with an emergency response plan (CMM-HAZ-a–h: 6) to minimize or avoid causing inadequate emergency access during construction through coordination with emergency response agencies. In addition, as discussed in more detail below, implementation of Mitigation Measures 7.21 MM-TRA-a,b,d–f: B and C can avoid or reduce additional potentially significant impacts associated with habitat restoration and other ecosystem projects as applicable. If mitigation measures are implemented, most, if not all, impacts (including construction impacts) can be mitigated to less than significant. Because the precise location and magnitude of activities required for habitat restoration and other ecosystem projects are not known, transportation and traffic impacts cannot be determined with certainty at this time. Therefore, potential impacts related to transportation and traffic remain potentially significant.

Operation of habitat restoration and other ecosystem projects would not generate additional vehicle trips beyond those periodically needed to monitor and maintain the sites. If maintenance activities are needed, they would be temporary, infrequent, and would not substantially increase traffic (resulting in congestion on roads or at intersections) or affect pedestrian and bicycle paths or mass transit; therefore, maintenance activities would not likely conflict with an applicable transportation plan, ordinance, or policy. For similar reasons, operation of these projects would not be likely to conflict with an applicable congestion management program; congestion management programs are developed by the regional transportation agency and are based on land use and population growth projections.

Habitat restoration and other ecosystem projects would not result in a change in air traffic patterns because no airport facilities are proposed, and there would be no increase in demand for air travel as a result of implementing these types of projects.

Physical Habitat Restoration

As described in *Common Construction*, habitat restoration projects could have temporary impacts on traffic, circulation, and emergency access during construction. For larger habitat restoration projects, construction-related effects could occur over several years; for larger restoration projects, including floodplain restoration, the location and operation of these projects may result in inundation of roads that could impede use and also cause traffic congestion at intersections or on certain roadway segments. This impact would potentially conflict with an applicable transportation plan, ordinance, or policy. This impact would be potentially significant. Mitigation Measure 7.21 MM-TRA-a,b,d–f: A (CMM-TRA-a,b,d–f) identifies mitigation measures that lead agencies can and should implement to reduce potentially significant transportation and traffic impacts related to construction and location of a project. In addition, implementation of a roadway detour plan (7.21 MM-TRA-a,b,d–f: B1) would avoid or minimize effects on transportation from large restoration projects and reduce this impact to less than significant. Unless and until the mitigation measures are fully implemented, the impacts remain potentially significant. Section 7.21.2.8, *Hazards and*

Hazardous Materials, describes potential hazards for airports in the vicinity of restoration sites by attracting waterfowl and other birds.

Fish Passage Improvements

Fish passage improvement projects could have temporary construction-related impacts on transportation (including emergency access), as discussed in *Common Construction*. Although similar, construction impacts on transportation related to dam removal specifically could be more substantial given that large dam removal projects would take years to complete, taking into account reservoir drawdown, removal of the dam, and site restoration following dam removal. Dam removal itself would potentially be the period of highest construction intensity and therefore likely involve the largest workforce and number of worker vehicle trips and haul truck trips. The additional construction-related traffic on local, likely rural, roads may affect local residential and recreational traffic. Existing transportation infrastructure (e.g., roadways, bridges, culverts) en route to the dam site may require improvements over their current conditions in order to withstand construction-related traffic. A dam that provides a river crossing along its crest may require the construction of a new bridge to meet local traffic demands upon its removal. The impacts on transportation could result in a temporary conflict with an applicable transportation plan, ordinance, or policy or congestion management program. This impact would be potentially significant. Mitigation Measure 7.21 MM-TRA-a,b,d–f: A (CMM-TRA-a,b,d–f) identifies mitigation measures that lead agencies can and should implement to reduce potentially significant transportation and traffic impacts related to construction. In addition, implementation of Mitigation Measure 7.21 MM-TRA-a,b,d–f: C would avoid or minimize effects on transportation from large dam removal to less than significant. Unless and until the mitigation measures are fully implemented, the impacts remain potentially significant.

Effects on transportation due to removal or modification of instream human-made structures would be similar to those described in *Common Construction*.

Once construction is complete, removal or modification of instream human-made structures would not require new transportation infrastructure and would not introduce an incompatible use to existing transportation infrastructure. Therefore, there would be no long-term increase in potential hazards to transportation due to design features or incompatible use.

Predatory Fish Control

Capture methods for predation control do not involve construction and therefore would not result in any of the construction impacts on transportation and traffic discussed in *Common Construction*. Predatory fish capture methods would not conflict with an applicable transportation plan, ordinance, or policy or a congestion management program because of the location of these activities away from roadways, railways, and bicycle and pedestrian paths—and because relatively few workers would be required to drive to these locations. Any boats that may be required for passive and active capture of predator fish would not be expected to interfere with navigation given that boat traffic in the area would be a primary consideration for gear deployment. In addition, road closures and detours would not be required; therefore, level of service and emergency access would also not be affected. There would be no impact.

Invasive Aquatic Vegetation Control

Invasive aquatic vegetation control does not involve construction and therefore would not result in any of the construction impacts on transportation and traffic discussed in *Common Construction*.

Invasive aquatic vegetation would result in a few limited additional vehicle trips associated with a relatively small number of workers commuting to sites. Where mechanical vegetation control is required, a truck would be necessary to transport (i.e., tow) a mechanical aquatic weed harvester to and from the site. Harvested aquatic weeds would require transport to an approved location. The temporary increase in vehicles on roadways during aquatic vegetation control activities would not be substantial enough to result in congestion or otherwise affect the performance of the circulation system and therefore would not conflict with an applicable transportation plan, ordinance, or policy or congestion management program.

Because invasive aquatic vegetation control would not require any construction activities and because control methods would be implemented within rivers and streams, likely not close to public transit, bicycle, or pedestrian facilities, it is unlikely that this action would conflict with adopted policies, plans, or programs regarding these facilities or otherwise decrease the performance or safety of such facilities. Similarly, due to the location and nature of the action, neither chemical nor mechanical invasive aquatic vegetation control would substantially increase transportation hazards or result in inadequate emergency access. These impacts would be less than significant.

Aerial herbicide application (e.g., using fixed-wing aircraft) may be required at some locations periodically. However, because it is likely that only one aircraft would be required for herbicide application at any time, there would be no resultant change in air traffic patterns—either an increase in air traffic levels or a change in location.

Mitigation Measures

7.21 MM-TRA-a,b,d–f: Mitigate transportation impacts

Entities or agencies designing and/or approving habitat restoration or other ecosystem projects will implement or require the following.

A. Construction TRA Mitigation Measures (CMM-TRA-a,b,d–f)

1. **Regulatory Compliance:** Comply with all applicable federal, state, and local transportation regulatory requirements, including but not limited to, 23 U.S. Code section 109 and 23 C.F.R. part 630, subpart J, *Federal Work Zone Safety and Mobility Regulations*.
2. **Avoid and Minimize Interference with Transportation Networks:** Avoid modifications to federal, state, and county highways; local roadways; and bridges that may reduce vehicle capacity. Avoid and minimize impacts on bicycle and pedestrian circulation by minimizing closures of paths and providing for temporary or permanent relocation of the facility. Consult with the appropriate public works department to determine the most feasible alignment for facility relocation.
3. **Traffic Management Plan:** Prior to construction and in coordination with applicable transportation entities (Caltrans Permit Department, local jurisdictions, and the California Highway Patrol), prepare a TMP to provide safe and efficient traffic flow during construction. The TMP will identify the project's effects on the surrounding road network, including any necessary closures, diversion routes for traffic and pedestrians, traffic management measures, waiting/loading restrictions, and emergency services access.

Coordinate the TMP, as applicable, with the project's emergency response plan (CMM-HAZ-a–h: 6), fire prevention and management plan (CMM-HAZ-a–h: 9), and spill prevention and response plan (CMM-HAZ-a–h: 1iii).

The TMP could include the following measures.

i. Identify elements (e.g., warning and detour signage) to address traffic control for any street closure, detour, or other disruption to traffic circulation.

ii. Identify routes that construction vehicles will use to access the site, construction detour routes, and vehicle weight and speed limits on local roads used to access the construction site.

iii. Locate informational signs along roads directly adjacent to or approaching construction work zones to direct construction traffic regarding ingress and egress points.

iv. Use signage, striping, fencing, barricades, and other physical structures to minimize pedestrian or bicyclist accidents or disruption of pedestrian or bicycle traffic and to prevent bicyclists and pedestrians from entering the construction area.

v. Provide notice to transit operators, emergency service providers, businesses, and residences of construction work of any anticipated delays, traffic control measures, temporary road closures, and emergency and evacuation routes.

vi. Identify appropriate emergency access routes and equipment that provide adequate response time.

4. **Restore Damaged Transportation Facilities:** Restore damaged roads and roadway shoulders, public transit facilities, bicycle lanes, or pedestrian facilities to preproject or better conditions during (as needed for public safety) and upon completion of construction.

5. **Waterway Traffic Control Plan:** Prepare and implement a waterway traffic control plan to ensure safe and efficient vessel navigation during construction in or over waterways. The plan will identify vessel traffic control measures to minimize congestion and navigation hazards. Include the following components as appropriate for the project.

   i. Barricade or guard construction areas in the waterway with readily visible barriers or other effective means to warn boaters and to restrict access.

   ii. Where temporary partial channel closure is necessary, identify and implement alternate detour routing and procedures for notifying boaters of construction and partial closures, including coordination with the U.S. Coast Guard, local boating organizations, and marinas.

   iii. Ensure safe boat access to public launch and docking facilities, businesses, and residences, to the extent feasible.

6. **Road and Bridge Design:** Road and bridge projects will be constructed consistent with the latest version of the Caltrans *Highway Design Manual* (7th Edition [^Caltrans 2022]) or equivalent and will not conflict with any applicable plan, ordinance, or policy related to performance of the transportation system, traffic safety, and/or congestion management of the area in which the project is implemented.

B. Physical Habitat Restoration TRA Mitigation Measures

1. **Roadway Detour Plan:** For roads that will be flooded during floodplain or other habitat restoration operations, prepare and implement a roadway detour plan, as necessary, prior to inundation. Provide convenient and parallel vehicular traffic detours for routes closed because of inundation. The detour plan will be prepared and implemented in accordance with current Caltrans Standard Plans and Specifications. The detour plan will include an assessment of existing roadway conditions, whether paved or unpaved, and provisions for repair and maintenance if the roadway conditions are substantially degraded from increased use. After the detour route is identified and before flood flows are released that would overtop roads, the condition of the detour road surface will be assessed and documented. The documentation will be submitted to the local agency responsible for maintenance of the road. After the detour is no longer needed, the condition of the road surface will be assessed and documented. The documentation will identify substantial changes in the condition of the road surface, such as potholing or rutting. Repair and maintenance actions needed to restore the road surface to pre-detour conditions will be identified. In coordination with the local maintenance agency, the repair and maintenance actions may be conducted by the agency conducting the floodplain operations or by the local maintenance agency to be proportionately reimbursed by the flood management authority.
2. **Protection of Rail Lines:** Design restoration projects to avoid or minimize impacts on rail lines.

C. Dam Removal TRA Mitigation Measures

1. **Project Planning:** Preproject planning for dam removal requires consideration of a wide variety of technical, environmental, social, political, and economic issues, including environmental feasibility. A project design must take into consideration traffic management during and after construction to minimize impacts on transportation in and around the project site.
2. **Road Design:** Any new or relocated roads or existing access roads that remain once the dam is removed must be constructed in conformance with applicable road design standards and regulations to avoid hazards (e.g., sharp curves, dangerous intersections) or incompatible uses.
3. **Dam Removal WQ Mitigation Measures**, including incorporation of any special accommodations for road infrastructure into engineering designs (7.21 MM-WQ-a–j: G1)
4. **Dam Removal LU Mitigation Measures**, including the consideration of transportation in feasibility studies on existing and future land use designations once the dam is removed (7.21 MM-LU-a,b: C1)
5. **Dam Removal REC Mitigation Measures**, including the consideration of transportation impacts and needs associated with recreation facilities (7.21 MM-REC-a,b: C)

7.21.2.17 Utilities and Service Systems

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
XVII. Utilities and Service Systems				
Would the project:				
a. Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board	☒	☐	☐	☐
b. Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects	☐	☐	☒	☐
c. Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects	☐	☐	☒	☐
d. Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed	☐	☐	☒	☐
e. Result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments	☐	☐	☒	☐
f. Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs	☒	☐	☐	☐
g. Comply with federal, state, and local statutes and regulations related to solid waste	☒	☐	☐	☐

Section 7.20.2, *Environmental Setting*, describes the utilities and service systems setting, and additional regulatory setting is described in Appendix E, *Regulatory Framework for Construction Projects*.

Common Construction

The need for additional utilities and service systems typically results from new development and an increase in population. As population increases, the need for additional services, such as water treatment, wastewater treatment, and landfills, increases. Habitat restoration and other ecosystem projects would not result in population and housing growth (see Section 7.21.2.13, *Population and Housing*) or employment growth. Accordingly, habitat restoration and other ecosystem projects would not result in associated impacts on utilities and service systems as a result of increased population and development. The potential for habitat restoration and other ecosystem projects to result in population growth is evaluated in Section 7.23, *Cumulative Impact Analysis, Growth-Inducing Effects, and Significant and Irreversible Changes*.

Construction sites can generate stormwater runoff that discharges sediment and potentially other pollutants. Wastewater from construction can also include wastewater from sanitation facilities used by construction crews or wastewater generated directly from construction-related activities, such as concrete washout, slurry fluids from boring and drilling (e.g., for tunnels and foundations), groundwater from dewatering activities, and leachate from dredged sediment. If not adequately controlled, construction discharges of waste could exceed wastewater treatment requirements of the applicable regional water board. Wastewater from construction activities is subject to permitting requirements under the Clean Water Act (see Appendix E, Section E.2.9.1). The potential for construction activities to violate water quality standards or waste discharge requirements and potential mitigation for those impacts are discussed in Section 7.21.2.9, *Hydrology and Water Quality—Surface Water and Groundwater*. Adequate toilet facilities are typically placed at construction sites for the duration of construction and are regularly cleaned and maintained for construction crews; typically, both county and state regulations dictate requirements for the appropriate number of these facilities and sanitary conditions.

The relatively small volume of wastewater generated during construction would not likely require the construction of new or expanded wastewater treatment facilities or result in a determination by the wastewater treatment provider that it has inadequate capacity and would not affect the ability of a wastewater treatment plant to meet wastewater treatment requirements of a regional water board. Similarly, the amount of stormwater runoff generated from construction activities would likely not require or result in the construction of new stormwater drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects. Construction activity would not necessitate a determination by the wastewater treatment provider that serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments.

Construction activities require water supply for construction workers on site, manufacture and curing of concrete and mortar, testing for waterproofing, cleaning, dust control, and other activities. Although construction can require water for uses such as dust control, soil compaction, and concrete work, these uses are generally not of the magnitude or duration that would require new or expanded entitlements for water supply. Dust suppression needs and other disturbance-related water demand would vary depending on the weather and soils conditions. Construction-related water demand is temporary and short-term, and the water needed for construction and construction workers could be provided by existing municipal and nonmunicipal systems (e.g., water wells, water trucks). In addition, where available, use of recycled water would reduce the use of potable water for these purposes during construction.

Construction of facilities could temporarily increase the volume of solid waste (e.g., soil, vegetative material, construction debris) disposed of at landfills. The amount of solid waste generated would depend on the size and nature of the project and the ability to recycle, reuse, or dispose of materials on site. The materials generated would be hauled off site to landfills (e.g., building demolition waste), delivered to recycling facilities (e.g., concrete), sold (e.g., organic material to cogeneration facilities), or reused on site or nearby (e.g., other projects needing fill material).

Construction projects could also temporarily disrupt existing electric and natural gas utilities and telecommunication lines. Construction may require temporary shutdown of utilities or could disrupt utilities inadvertently by damaging underground utilities during trenching, augering, or other excavation. Construction activities could also damage utility poles or snag suspended utility lines.

The magnitude of construction impacts depends on the extent and duration of disturbance to existing habitat and species and the extent of temporary and permanent habitat loss. Transportation and traffic impacts associated with common construction activities would be potentially significant and can be avoided or reduced by implementation of Mitigation Measure 7.21 MM-UT-a,f,g: A (CMM-UT-a,f,g). Wastewater control measures and any water used for construction must be pursuant to a valid water right or contract with a water provider. For solid waste, mitigation includes compliance with federal, state, and local statutes and regulations related to solid waste and solid waste disposal, and preparation and implementation of a construction recycling plan for reuse of construction waste. Project proponents will coordinate with area utility or service providers to identify existing underground utilities and telecommunication lines at excavation sites prior to construction and will avoid or relocate them. In addition, as discussed in more detail below, implementation of Mitigation Measure 7.21 MM-UT-a,f,g: B can avoid or reduce additional potentially significant impacts on utilities and service systems associated with habitat restoration and other complementary ecosystem projects, as applicable. If mitigation measures are implemented, most, if not all, impacts (including construction impacts) can be mitigated to less than significant. Because the precise location and magnitude of activities required for habitat restoration and other ecosystem projects are not known, impacts on utilities and service systems cannot be determined with certainty at this time. Therefore, potential impacts related to utilities and service systems remain potentially significant.

Physical Habitat Restoration

Utility impacts from habitat restoration projects are primarily associated with construction activities and could be avoided or minimized by implementation of common construction mitigation measures, as discussed in *Common Construction*. In addition, some habitat restoration projects may initially require a water supply for newly planted vegetation once construction is completed or for temporary irrigation needs in dry years until vegetation is sufficiently established. However, this temporary supply of irrigation water could be obtained from locally available water sources without requiring the procurement of additional water supply entitlements or the construction or expansion of new water treatment facilities. Moreover, habitat restoration projects will generally be designed and implemented to work with existing and augmented flows (7.21 MM-BIO-a–f: C1) in order to reestablish connections between tidal and stream floodplains, restore fluvial processes along streams, and connect riparian areas to fluvial processes. Restoration projects must be operated pursuant to a valid water right if applicable (7.21 MM-WQ-a–j: B). Construction of habitat restoration projects would involve earthmoving activities (e.g., excavation) but may use excavated soils elsewhere within the project footprint (e.g., to raise land elevation to create refugia or other habitat), limiting the amount that would require landfill space. Similarly, cleared vegetative materials could be disposed of on site by chipping for mulch, piling to create wildlife habitat, or burying. Dredging may be required at some habitat restoration sites, which could generate dredged materials that require disposal if not reused as part of the construction. As discussed in Section 7.21.2.9, *Hydrology and Water Quality—Surface Water and Groundwater*, contaminated sediments would require containment to the extent feasible and disposal at a waste disposal facility engineered and permitted for contaminated sediment. In some cases, dredged material may be suitable for beneficial reuse, such as on site for wetland creation and restoration or for levee maintenance, construction fill, and daily cover at sanitary landfills. Dredged material would only be generated during construction and subject to permit conditions, there potentially would be multiple beneficial uses for uncontaminated dredged material. It is unlikely that any required disposal of these materials would exceed the capacity of a landfill.

Operation of habitat restoration projects would not exceed wastewater treatment requirements of the regional water board and would not require the construction of new or expanded wastewater treatment facilities because these projects would not involve the discharge of wastewater. Operations would not generate significant amounts of solid waste, and therefore operations would not require the use of a landfill. Operations may include periodic inspections, repairs, replacement of structural elements, and interpretive facilities. It is unlikely that these activities would affect utilities or service systems because they would not involve the discharge of wastewater or generate solid waste, require the construction of additional stormwater drains, or require a water supply.

Fish Passage Improvements

Utility impacts from fish passage improvement projects are primarily associated with construction activities as discussed in *Common Construction*. Dam removal projects, particularly reservoir dam removal, could affect public utilities if water pipelines or electrical transmission lines cross the dam or reservoir (see Section 7.21.2.9, *Hydrology and Water Quality—Surface Water and Groundwater*) or by the loss of a source of hydropower (see Section 7.21.2.6, *Energy and Greenhouse Gas Emissions*). The removal of a diversion dam may require the design and construction of a new pumping plant or alternative intake configuration to maintain water supplies to existing irrigation canals or pipelines. Water storage tanks may be required for local communities to replace the water supply previously provided by the reservoir for firefighting. Structures located within, upstream, or downstream of the impoundment area may be subjected to higher flow velocities once the impoundment is returned to a natural free-flowing condition.

Dam removal would generate a substantial volume of solid waste, including excavated material and demolition debris (e.g., concrete, treated wood, other waste), that would require disposal at a landfill. It is possible that potential project needs could exceed permitted landfill capacity.

These impacts would be potentially significant. In addition to mitigation already identified, including common construction mitigation measures, implementation of Mitigation Measure 7.21 MM-UT-a,f,g: B would help minimize or avoid impacts on utilities associated with dam removal projects to less than significant. Preproject planning requires consideration of a wide variety of technical, environmental, social, political, and economic issues. Feasibility studies must address impacts on structures such as water and sewer pipelines, gas transmission lines, and other infrastructure that could be affected by dam removal. Additional fieldwork to confirm the site conditions includes identifying off-site locations and haul distances for backfill materials and for disposal of waste materials. Engineering designs and construction plans will include any special accommodations for existing legal users of water and other infrastructure and minimize potential impacts associated with construction-related in-channel disturbances. Unless and until mitigation is fully implemented, the impacts remain potentially significant.

Predatory Fish Control

Removal or modification of human-made structures for predator control would have construction impacts on utilities and service systems discussed in *Common Construction*. Capture methods do not involve construction and would not result in impacts on utilities or service systems.

Invasive Aquatic Vegetation Control

Invasive aquatic vegetation control does not involve construction and therefore would not result in any of the construction impacts on utilities and service systems discussed in *Common Construction*.

Invasive aquatic vegetation control would not generate waste that would be disposed of at a landfill or require the use of treated water such that new or expanded water treatment facilities would be required. Disposal typically occurs at approved spoil sites, which are typically located on nearby farm fields.

Mitigation Measures

7.21 MM-UT-a,f,g: Mitigate impacts on utilities and service systems

Entities or agencies designing and/or approving habitat restoration or other ecosystem projects will implement or require the following.

A. Construction UT Mitigation Measure (CMM-UT-a,f,g)

1. **Wastewater Control Measures:**
    i. Obtain and comply with all necessary permits and regulations related to discharging wastewater, including but not limited to, regional water board waste discharge requirements and State Water Board Order No. 2022-0057-DWQ (Construction General Permit), which requires the applicant to address such items as employee wastewater generated during construction and spill containment and cleanup.
    ii. Water quality regulatory compliance measures (CMM-WQ-a–j: 1).
    iii. Place portable chemical toilets for the duration of construction. Wastewater will be pumped from these portable toilets and then hauled to and disposed of at permitted facilities in accordance with both county and state regulations.
2. **Water Supply:** Water used for construction must be pursuant to a valid water right or contract with a water provider. If a source of recycled water is available, use recycled water for nonpotable construction demand.
3. **Nonhazardous Solid Waste Disposal:**
    i. Regulatory Compliance: Comply with the California Integrated Waste Management Act (AB 939 [Sher], Statutes of 1989, as amended; Pub. Resources Code, § 41780) for the disposal of nonhazardous solid waste.
    ii. Construction Waste Recycling Plan: Prepare and implement a construction waste recycling plan for reuse/recycling of construction waste. The plan will identify the type of recyclable construction and demolition debris to be recycled (e.g., concrete, steel/metals, cardboard), the method of on-site handling of this debris, and the diversion facility that will receive this recyclable debris. The plan will emphasize source reduction measures, followed by recycling and composting methods, to ensure that construction and demolition waste generated by the project is managed consistent with applicable statutes and regulations. In accordance with the California Green Building Standards Code and local regulations, the plan will specify that all trees, stumps, rocks, and associated vegetation and soils and 50 percent of all other nonhazardous construction and demolition waste be diverted from landfill disposal. The plan will be prepared in coordination with the applicable local waste management district.
4. **Utility Services:** Mitigate impacts of construction that could result in the interruption of utility services.

i. Coordinate Planned Power Outages: Coordinate any planned power outages, as necessary, and notify potentially affected utility users of temporary loss of electricity.

ii. Identify Existing Underground Utilities and Telecommunication Lines prior to Excavation. Coordinate with the area utility or service provider to identify existing underground utilities and telecommunication lines at excavation sites prior to construction and avoid or relocate them. Relocate utilities prior to project construction to ensure continued access and utility service through the project area and vicinity. Restore any interrupted/disconnected utility services promptly.

B. Dam Removal UT Mitigation Measures

1. **Feasibility Study:** Potential impacts on utility infrastructure affected by dam removal must be considered and addressed prior to dam removal in a feasibility study. The feasibility study will identify locations of utility infrastructure that would be affected by dam removal. In addition, project proponents will confirm utility infrastructure locations through consultation with utility service providers and predemolition field surveys.
2. **Dam Removal WQ Mitigation Measures** (7.21 MM-WQ-a–j: G)
3. **Solid Waste Disposal:**

   i. Identify off-site locations and haul distances for backfill materials and for disposal of waste materials.

   ii. Implement procedures for hazardous waste generation and disposal (CMM-HAZ-a–h: 1).

   iii. Implement a construction waste recycling plan (CMM-UT-a,f,g: 3). Where feasible, concrete from dam removal will be reused or disposed of on site.

7.21.3 Summary of Impacts

Table 7.21-1 provides a summary of potentially significant, less-than-significant, and beneficial impacts from implementation of physical habitat restoration and other ecosystem projects. Mitigation measures to avoid, minimize, or offset potentially significant environmental impacts are also identified in Table 7.21-1. Where no environmental impact would result from implementation of these projects, this is also identified in the table.

Table 7.21-1. Impact and Mitigation Measure Summary—Habitat Restoration and Other Ecosystem Projects

Impact	Impact Conclusions	Proposed Mitigation
AESTHETICS		
Impact AES-a: Have a substantial adverse effect on a scenic vista **Impact AES-b:** Substantially damage scenic resources, including, but not limited to trees, rock outcroppings, and historic buildings within a state scenic highway **Impact AES-c:** Substantially degrade the existing visual character or quality of the site and its surroundings **Impact AES-d:** Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area	**Potentially Significant** ***Common Construction***[a] Construction may physically damage scenic resources, introduce large construction equipment, remove vegetation, stockpile materials, create dust, or add new sources of lighting and glare Permanent installation of artificial elements (e.g., riprap), solar panels, and/or security and safety lighting	**7.21 MM-AES-a–d: Mitigate impacts on visual resources** **A. Construction AES Mitigation Measures (CMM-AES-a–d)** 1. Project Siting and Design 2. Screen Construction Areas 3. Spoil Disposal Areas 4. Dust Control Measures (CMM-AQ-a–e: 3) 5. Waste Management and Material Control Measures (CMM-WQ-a–j: 4) 6. Light and Glare Minimization 7. Construction BIO Mitigation Measures: Avoid Vegetation Disturbance (CMM-BIO-a–f: 9), Revegetation Plan (CMM-BIO-a–f: 11) and Revegetation Monitoring and Reporting (CMM-BIO-a–f: 12)
	Physical Habitat Restoration Long-term changes to the quality of visual resources from the addition of hardscape elements (e.g., fence, bench, erosion control structures), additional or modified water infrastructure (e.g., water storage structures and associated delivery lines), or gravel augmentation	**B. Physical Habitat Restoration AES Mitigation Measures** 1. Project Design 2. Physical Habitat Restoration BIO Mitigation Measures (7.21 MM-BIO-a–f: C)
	Fish Passage Improvements Changes in a scenic vista from dam removal Large areas of bare sediment and rock could be exposed in previously inundated areas after reservoir drawdown and removal	**C. Dam Removal AES Mitigation Measures** 1. Project Planning 2. Dam Removal BIO Mitigation Measures (7.21 MM-BIO-a–f: E) 3. Revegetation Plan

Impact	Impact Conclusions	Proposed Mitigation
	Less than Significant/No Impact	
	Invasive Aquatic Vegetation Control	—
	Temporary and short duration use of mechanical harvester equipment and areas of vegetation decay after herbicide use	
	Minimal increase of glare from removal of vegetation and return of open water	
	Beneficial	
	Physical habitat restoration could enhance the visual character or quality of an area and improve views from a scenic vista by returning disturbed areas to a more natural state	—
	Invasive aquatic vegetation control could improve the visual character and quality of surface waters and improve views from a scenic vista by returning clogged waterways to open water	
AGRICULTURE AND FOREST RESOURCES		
Impact AG-a: Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to nonagricultural use **Impact AG-b:** Conflict with existing zoning for agricultural use or conflict with a Williamson Act contract **Impact AG-c:** Conflict with existing zoning for, or cause rezoning of forest land (as defined in Public Resources Code Section 12220(g)), timberland (as defined by Public Resources Code Section 4526), or timberland zoned Timberland Production (as defined by Government Code Section 51104(g))	**Potentially Significant**	
	Common Construction [a] Construction activities could remove vegetation and/or topsoil; introduce invasive weeds; restrict access to or interfere with use of agricultural land; disturb utilities and infrastructure serving agriculture; and disturb soil in development footprints, borrow/spoils areas or staging areas (e.g., soil compaction resulting from heavy equipment storage or soil stockpiling)	**7.21 MM-AG-a–e: Mitigate impacts on agriculture and forest resources** **A. Construction AG Mitigation Measures (CMM-AG-a–e)** 1. Project Siting and Design 2. Invasive Species Control Measures 3. Postconstruction Best Management Practices 4. Protect Agricultural Soils 5. Agricultural Mitigation Consistent with County and Local Jurisdiction Requirements 6. Avoid or Minimize Impacts on Forest and Timberland
	Physical Habitat Restoration Long-term or permanent changes to agriculture resources due to project siting (i.e., convert the	**B. Physical Habitat Restoration AG Mitigation**

Impact	Impact Conclusions	Proposed Mitigation
Impact AG-d: Result in the loss of forest land or conversion of forest land to non-forest use **Impact AG-e:** Involve other changes in the existing environment which, due to their location or nature, could result in conversion of farmland to non-agricultural use or conversion of forest land to non-forest use	land to nonagricultural uses or conflict with existing zoning or with Williamson Act contracts) Incidental impacts on adjacent agricultural lands (e.g., seepage issues on adjacent land, herbicide use on invasive plant species)	**Measures** 1. Project Siting and Design 2. Agricultural Land Easements 3. Compatible Agricultural Practices 4. Monitor for Seepage 5. Consistency with Local and Regional Land Use Plans 6. Invasive Aquatic Vegetation Control BIO Mitigation Measures (7.21 MM-BIO-a–f: G2)
	Fish Passage Improvements Reduced or altered availability of water supplies for crop irrigation from dam removal Agricultural diversion headworks downstream of a dam could experience siltation or otherwise be affected during reservoir drawdown Reservoir removal could affect legal users of water if a diverter is dependent on the reservoir or reservoir infrastructure	**C. Dam Removal AG Mitigation Measure** 1. Dam Removal WQ Mitigation Measures (7.21 MM-WQ-a–j: G)
	Invasive Aquatic Vegetation Control Incidental impacts on adjacent agricultural lands from herbicide use	**D. Invasive Aquatic Vegetation Control AG Mitigation Measures** 1. Invasive Aquatic Vegetation Control BIO Mitigation Measures (7.21 MM-BIO-a–f: G2)
	Beneficial Restoration projects could benefit agriculture by reducing soil erosion, recharging groundwater, providing natural pest control and water quality buffers Reservoir drawdown and dam removal could increase agricultural opportunities on currently inundated lands Increase in forest land following dam removal due to revegetation of previously inundated lands with woody species Clearing invasive aquatic vegetation could	——

Impact	Impact Conclusions	Proposed Mitigation
	benefit agricultural resources because these plants can interfere with irrigation intakes	
AIR QUALITY		
Impact AQ-a: Conflict with or obstruct implementation of the applicable air quality plan **Impact AQ-b:** Violate any air quality standard or contribute substantially to an existing or projected air quality violation **Impact AQ-c:** Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors) **Impact AQ-d:** Expose sensitive receptors to substantial pollutant concentrations **Impact AQ-e:** Create objectionable odors affecting a substantial number of people	**Potentially Significant** ***Common Construction*** [a] Construction activities could generate fugitive dust and emissions from fuel combustion in heavy construction equipment and vehicles Inadvertent dispersal of *Coccidioides* spores (responsible for Valley fever) and asbestos into the environment ***Physical Habitat Restoration*** Objectionable odors sometimes associated with wetlands could affect nearby land uses, such as the closest recreational facilities and residential uses ***Fish Passage Improvements*** Earthy or hydrogen sulfide odors may be evident during or immediately following reservoir drawdown for dam removal Substantial particulate emissions due to fugitive dust generated from blasting and cut-and-fill activities for dam removal Windblown dust from exposure of sediment deposits remaining in the reservoir footprint after dam removal	**7.21 MM-AQ-a–e: Mitigate impacts on air quality** **A. Construction AQ Mitigation Measures (CMM-AQ-a–e)** 1. Regulatory Compliance 2. Emission Reduction Measures 3. Dust Control Measures 4. Valley Fever Control Measures 5. Asbestos Control Measures 6. Health Risk Assessment 7. Minimize Construction-Related Traffic and Equipment Use 8. Blasting Operations and Safety Plan (CMM-GEO-a–e: 7) for fugitive dust control **B. Odor Control Measures** **B. Odor Control Measures** **C. Dam Removal AQ Mitigation Measures** 1. Site-Specific Dust Control Plan 2. Revegetation Plan (7.21 MM-BIO-a–f: E3) 3. Odor Control Measures (7.21 MM-AQ-a–e: B)

Impact	Impact Conclusions	Proposed Mitigation
	Less than Significant	
	Fish Passage Improvements	—
	TCDs could result in short-term objectionable odors, such as from hydrogen sulfide, from an increase in the quantity of cool water pulled from deeper areas of a reservoir	
	Dam removal could reduce power production if hydropower facilities are dismantled, resulting in increased criteria pollutant emissions at other power facilities or requiring construction and operation of a new powerhouse	
	Invasive Aquatic Vegetation Control	—
	Emissions associated with chemical trucks, mechanical harvesters, haul trucks, and/or boats	
	Temporary odors associated with herbicide spraying	
	Beneficial	
	Physical Habitat Restoration	—
	Physical habitat restoration projects on agricultural lands could benefit air quality by reducing emissions associated with active agricultural operations	
BIOLOGICAL RESOURCES		
Impact BIO-a: Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service	**Potentially Significant**	
	Common Construction [a]	**7.21 MM-BIO-a–f: Mitigate impacts on biological resources**
	Construction projects could be located in a sensitive natural community, habitat for special-status species, wetlands, wildlife corridors, or waterways	**A. Construction BIO Mitigation Measures (CMM-BIO a–f)**
Impact BIO-b: Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, or	Direct or indirect harm (including mortality) to special-status species and associated habitat from movement of heavy machinery where such species occur	1. Regulatory Compliance 2. Preconstruction Surveys 3. Avoid, Minimize, or Compensate for Impacts on Sensitive Natural Communities 4. Avoid, Minimize, or Compensate for Impacts on Special-Status Species
	Disturbance of special-status species through construction noise, physical vibration, and direct	

Impact	Impact Conclusions	Proposed Mitigation
regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service **Impact BIO-c:** Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marshes, vernal pools, coastal wetlands, etc.) through direct removal, filling, hydrolgical interruption, or other means **Impact BIO-d:** Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites **Impact BIO-e:** Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance **Impact BIO-f:** Conflict with the provisions of an adopted habitat conservation plan, natural community conservation plan, or other approved local, regional, or state habitat conservation plan	removal of structures that provide habitat Introduction or spread of invasive vegetative species through the movement of topsoil, fill, gravel, and construction equipment Removal of riparian vegetation and disturbance to wetlands to facilitate heavy equipment movement and other construction activities Release of sediment and possibly hazardous materials (e.g., oil or gas from construction equipment) into waterbodies from construction on or near waterways Creation of noise and vibration that could harm fish from activities such as pile driving, blasting, or use of other construction equipment Release of concrete particles from blasting to surface waters could disturb terrestrial wildlife and harm fish Take of special-status fish species could result from construction and installation of cofferdams (resulting in fish stranding) or fish rescue in a dewatered area (seining, electrofishing) Some construction projects may conflict with adopted Habitat Conservation Plans (HCP) or Natural Community Conservation Plans (NCCP)	5. Environmental Awareness Training 6. Incorporate Protection Measures for In-Water Construction 7. Avoid or Minimize Impeding Access to Established Native Resident or Migratory Wildlife Corridors or Native Wildlife Nurseries for Fish or Wildlife Species during Construction 8. Invasive Species Control Measures 9. Avoid Vegetation Disturbance 10. Staging Areas 11. Revegetation Plan 12. Revegetation Monitoring and Reporting 13. Compliance with HCPs and NCCPs 14. Construction WQ Mitigation Measures (CMM-WQ-a–j) 15. Avoid or Minimize Lighting and Glare Effects 16. Dust Control Measures (CMM-AQ-a–e: 3) 17. Construction NOI Mitigation Measures: Noise-Reduction Measures (CMM-NOI-a,b,d–f: 2) and Vibration-Reduction Measures (CMM-NOI-a,b,d–f: 3) 18. Blasting Operations and Safety Plan (CMM-GEO-a–e: 7)
	Physical Habitat Restoration Loss of riparian habitat and large trees Adversely affect species by changing habitat types from some habitat restoration projects (e.g., non-tidal aquatic habitats to tidal aquatic habitats, conversion of agriculture land to native riparian habitat) Creation of barriers such as shallow puddles leading to fish stranding from floodplain drainage	**B. Approval by State and Federal Fisheries Agencies** • NMFS' programmatic restoration biological opinion to facilitate implementation of restoration projects in the Central Valley • CDFW's *California Salmonid Stream Habitat Restoration Manual* • NMFS' *Guidelines for Salmonid Passage at Stream Crossings*

Impact	Impact Conclusions	Proposed Mitigation
	Facilitation of methylmercury production and subsequent bioaccumulation in fish and other wildlife species from the creation of freshwater wetlands and floodplains Increased predation on sensitive fish species that use shallow-water floodplain habitats from floodplain restoration Application of toxic herbicides and pesticides from increased invasive plant species and creation of mosquito habitat could adversely affect aquatic and terrestrial species Effects on fish spawning from addition of course sediment and various in-channel activities of gravel augmentation projects Mortality of salmon and steelhead embryos and alevins due to gravel placement Effects on salmon and salmon redds due to increased turbidity and sedimentation due to gravel placement	• NMFS' *Fish Screening Criteria for Anadromous Salmonids* • NMFS' *Science Base and Tools for Evaluating Stream Engineering, Management, and Restoration Proposals* **C. Physical Habitat Restoration BIO Mitigation Measures** 1. Restoration Strategy 2. Adaptive Management 3. Biological Goals 4. Avoid Fish Stranding 5. Vegetation Management 6. Physical Habitat Restoration WQ Mitigation Measures (7.21 MM-WQ-a–j: E) 7. Invasive Species Control 8. Gravel Augmentation BIO Mitigation Measures 9. Approval by State and Federal Fisheries Agencies (7.21 MM-BIO-a-f: B)
	Fish Passage Improvements Improperly designed fish passage projects can obstruct and injure fish species (e.g., incorrect velocities of fish screens can impinge fish) Increase depth of warm epilimnion in reservoir by drawing down the depth of the thermocline from operation of TCDs Introduction of special-status species to inhospitable habitat and/or creation of conditions to allow previously blocked invasive species upstream from fishways and dam removal projects Elevated suspended sediment concentrations resulting from the release of sediment stored behind a dam can adversely affect or cause mortality of sensitive life stages of special-status	**D. Fish Passage BIO Mitigation Measures** 1. Consultation with Fish and Wildlife Agencies 2. TCD Design 3. State Water Board Approval 4. Approval by State and Federal Fisheries Agencies (7.21 MM-BIO-a-f: B) **E. Dam Removal BIO Mitigation Measures** 1. Project Planning 2. Regulatory Compliance 3. Revegetation Plan 4. Dam Removal WQ Mitigation Measures (7.21 MM-WQ-a–j: G)

Impact	Impact Conclusions	Proposed Mitigation
	fish, amphibians and reptiles, as well benthic macroinvertebrates occurring downstream of dam removal sites.; subsequent sedimentation could adversely affect salmonid spawning areas Sediments from dam removal can contain toxic pollutants (e.g., metals or bioaccumulative compounds including legacy pesticides and methylmercury) Sediment may temporarily deposit in pools and other slack water areas (e.g., eddies), at tributary confluences, and potentially along channel margins High levels of sediment and turbidity can adversely affect aquatic ecosystems by reducing photosynthetic activity, reducing food availability, burying habitat, and directly harming organisms Supersaturation of nitrogen gas (water containing more dissolved gas than normal) can occur when a reservoir is drawn down too quickly Dam removal would change reservoir to riverine habitat, which could alter habitat availability for some aquatic and terrestrial species	
	Predatory Fish Control Cause turbidity and startling of native fish from direct methods of predatory fish control (e.g., electrofishing, hook-and-line fishing, passive trapping) and active capture methods (e.g., trawls, beach seines) Inadvertant capture of and harm to native fish from capture methods (e.g., hook-and-line, traps, and electrofishing)	**F. Predatory Fish Control BIO Mitigation Measures** 1. Regulatory Compliance 2. BMPs for Hook-and-Line Sampling 3. Selective Capture 4. Fish Handling
	Invasive Aquatic Vegetation Control Harm from direct contact with workers and equipment or if plant fragments are left to	**G. Invasive Aquatic Vegetation Control BIO Mitigation Measures** 1. Physical-Control Methods

Impact	Impact Conclusions	Proposed Mitigation
	propagate Harm to sensitive habitats, plants, and wildlife species from use of herbicides	2. Chemical-Control Methods
	Beneficial	
	Physical Habitat Restoration Physical habitat restoration projects that complement flow actions (e.g., creation of floodplain and tidal shallow-water habitat) would generally be expected to improve habitat conditions for native species such as Chinook salmon and steelhead Change in some habitat types from some habitat restoration projects to benefit some plant and animal species (e.g., non-tidal aquatic habitats to tidal aquatic habitats, conversion of agriculture land to native riparian habitat) Improve the quality and extent of riparian habitat and wildlife access to habitat by removing invasive vegetation and substantially increasing the total riparian area Restoration of long stretches of riparian habitat would restore and enhance habitat for native and migratory corridor species	—
	Fish Passage Improvements New or improved fish screens would reduce impingement and entrainment at diversions New or improved fishways would improve passage conditions for adult Chinook salmon and steelhead and provide greater access to upstream habitat TCDs would be expected to support cooler temperatures downstream of dams and thereby create migration, spawning, and rearing conditions beneficial for Chinook salmon and steelhead and other native cold water species Dam removal projects would be expected to	

Impact	Impact Conclusions	Proposed Mitigation
	benefit anadromous salmonids by restoring access to historical habitat that is currently blocked by impassible dams ***Predatory Fish Control*** Removal or modification of human-made structures may allow fish to access more and better habitat and decrease predation ***Invasive Aquatic Vegetation Control*** Improved habitat for native aquatic species by allowing regrowth of native plant species and improving water quality (e.g., increasing dissolved oxygen levels)	
CULTURAL RESOURCES		
Impact CUL-a: Cause a substantial adverse change in the significance of a historical resource as defined in § 15064.5 **Impact CUL-b:** Cause a substantial adverse change in the significance of an archaeological resource pursuant to § 15064.5 **Impact CUL-c:** Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature I**mpact CUL-d:** Disturb any human remains, including those interred outside of formal cemeteries	**Potentially Significant** ***Common Construction*** [a] Ground-disturbing activities, including deep excavation, could damage archaeological sites or historic built environment resources or degrade unknown buried or near-surface cultural resources Changes in topography, hydrologic patterns, and soil movement could degrade or otherwise affect near-surface archaeological or built environment resources Construction activities could alter the appearance of a historic resource from dust interacting with an object's surface, which could cause damage or chemical alteration Temporary or permanent visual obstructions from the presence of large-scale equipment, machinery, and vehicles could diminish the integrity of cultural resources Unauthorized removal or vandalism of cultural resources could occur if construction enables access to cultural sites that were not previously known or accessible	**7.21 MM-CUL-a–d: Mitigate impacts on cultural resources** **A. Construction CUL Mitigation Measures (CMM-CUL-a–d)** 1. Regulatory Compliance 2. Preconstruction Surveys for Historical, Archaeological, and Paleontological Resources, Cultural Landscapes, and Traditional Cultural Properties 3. Cultural Resources Management Plan 4. Unanticipated Discovery Measures 5. Oversight and Monitoring of Construction Activities 6. Worker Cultural Resources Sensitivity Training 7. Dust Control Measures (CMM-AQ-a–e: 3) 8. Construction NOI Mitigation Measures: Noise-Reduction Measures (CMM-NOI-a,b,d–f: 2) and Vibration-Reduction Measures (CMM-NOI-a,b,d–f: 3)

Impact	Impact Conclusions	Proposed Mitigation
	Access to cultural resources during construction could be reduced and thereby prevent or impair visits to cultural resources by people with a religious or cultural connection to the resource Vegetation clearing, generation of dust, and visual obstructions from the presence of large-scale equipment, machinery, and vehicles could result in impacts on cultural resources that have an associated landscape or other visual component that contributes to their significance, such as a sacred landscape or historic trail Pile driving could cause vibration that could physically damage or alter nearby historic built environment resources or linear features	9. Construction Site Security Measures (CMM-HAZ-a–h: 7) 10. Construction AES Mitigation Measures: Project Siting and Design (CMM-AES-a–d: 1) and Screen Construction Areas (CMM-AES-a–d: 2)
	Fish Passage Improvements Older structures that would be removed or modified from TCD and dam removal projects could be eligible for listing in the National Register of Historic Places or California Register of Historic Places Reservoir drawdown prior to dam removal could result in shifting, erosion, and exposure of known or as-yet-unrecorded previously submerged cultural resources or human remains **Less than Significant**	**B. Fish Passage CUL Mitigation Measures** 1. Historic Dams and Structures 2. Project Planning 3. Cultural Resources Management Plan 4. Coordination with General or Resource Management Plan 5. Human Remains
	Physical Habitat Restoration Operation of restoration areas would have a very low potential to affect cultural resources because operations would be along the riverbank and channels	—
	Invasive Aquatic Vegetation Control Operations would involve limited ground-disturbing activities and therefore would have a low potential for disturbing any known or as-yet-unrecorded cultural resources	—

Impact	Impact Conclusions	Proposed Mitigation
ENERGY AND GREENHOUSE GAS EMISSIONS		
Impact EN-a: Adversely affect the reliability of California's electric grid **Impact EN-b:** Result in inefficient, wasteful, and unnecessary energy consumption **Impact GHG-a:** Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment **Impact GHG-b:** Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases	**Potentially Significant** ***Common Construction*** [a] Temporary increase in energy demand from heavy construction equipment (e.g., trucks or barges, earthmoving equipment, and power tools) for actions such as excavating, grading, transporting materials, and transporting construction workers to and from the work sites Generation of GHG emissions from heavy construction equipment, haul trucks, and worker vehicles Construction activities could remove vegetation that acts to sequester GHGs (e.g., trees) GHG emissions from construction could conflict with an applicable GHG plan, policy, or regulation	**7.21 MM-EN-a,b/GHG-a,b: Mitigate energy and GHG emissions impacts** **A. EN/GHG Mitigation Measures (CMM-EN-b/GHG-a,b)** 1. Regulatory Compliance 2. GHG Emission Reduction Measures 3. Construction AQ Mitigation Measures: Regulatory Compliance (CMM-AQ-a–e: 1), Emission Reduction Measures (CMM-AQ-a–e: 2), and Minimize Construction-Related Traffic and Equipment Use (CMM-AQ-a–e: 7)
	Fish Passage Improvements Removing a hydropower dam could result in increased GHG emissions from replacing the renewable source of power with a non-renewable alternate source (including GHG-emitting fossil fuels)	**B. Dam Removal EN/GHG Measures** 1. Feasibility Studies 2. Renewable Energy 3. Increase Power Generation
	Less than Significant ***Physical Habitat Restoration*** Periodic use of heavy equipment to replenish gravel at gravel augmentation sites	—
	Invasive Aquatic Vegetation Control Use of vehicles (e.g., chemical trucks, haul trucks, boats, and/or worker vehicles) and mechanical harvester equipment during vegetation control activities	—
	Beneficial Operation of physical habitat restoration projects could reduce net GHG emissions by	—

Impact	Impact Conclusions	Proposed Mitigation
	establishing, restoring, and enhancing tidal and freshwater wetlands, which provide more trees and plants that sequester carbon	
GEOLOGY AND SOILS		
Impact GEO-a: Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving: rupture of a known earthquake fault, strong seismic ground shaking, seismic-related ground failure including liquefaction, or landslides **Impact GEO-b:** Result in substantial soil erosion or the loss of topsoil **Impact GEO-c:** Be located on a geologic unit or soil that is unstable or that would become unstable as a result of the project and potentially result in an onsite or offsite landslide, lateral spreading, subsidence, liquefaction, or collapse I**mpact GEO-d:** Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property **Impact GEO-e:** Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems in areas where sewers are not available for the disposal of waste water	**Potentially Significant** Construction activities could occur in areas known to have seismic activity or experience landslides, or could be located on expansive soil or on a geologic unit or soil that is unstable or would become unstable due to construction Construction activities could occur in areas underlain by soft or loose soils, where high groundwater or seepage may be present, and on sloping grounds Ground disturbance could expose geologic materials or soil, destabilize the material, and cause soil erosion or loss of topsoil Construction activity that involves blasting could trigger landslides on unstable slopes and expose construction workers or members of the public to the risk of injury or death ***Physical Habitat Restoration*** Intended levee breaching could result in loss of topsoil and soil erosion ***Fish Passage Improvements*** Large dam removal projects could result in hillslope instability in reservoir rim areas and erosion of slope sediments during reservoir drawdown The rate of reservoir drawdown could induce potential landslides along the reservoir margins or a slope failure of an embankment dam and cause additional erosion and sedimentation downstream	**7.21 MM-GEO-a–e: Mitigate geology and soils impacts** **A. Construction GEO Mitigation Measures (CMM-GEO-a–e)** 1. Regulatory Compliance 2. Project Siting and Design 3. Assurance of No Fault Traces 4. Geology and Soils Management Measures 5. Construction WQ Mitigation Measures: Regulatory Compliance (CMM-WQ-a–j: 1) and Erosion Control, Sedimentation Control, and Soil Stabilization Measures (CMM-WQ-a–j: 3) 6. Septic System Management Measures 7. Blasting Operations and Safety Plan 8. Protect Agricultural Soils (CMM-AG-a–e: 4) **B. Physical Habitat Restoration GEO Mitigation Measure** **C. Dam Removal GEO Mitigation Measures** 1. Feasibility Studies 2. Sediment Management and Monitoring Plan

Impact	Impact Conclusions	Proposed Mitigation
	Beneficial ***Physical Habitat Restoration and Other Ecosystem Projects*** Planting and growth of native vegetation from habitat restoration activities and returning areas to a more natural state would decrease erosion and stabilize soils Enhanced in-channel projects designed to restore degraded rivers include bank stabilization measures that could reduce erosion	—
HAZARDS AND HAZARDOUS MATERIALS		
Impact HAZ-a: Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials **Impact HAZ-b:** Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment **Impact HAZ-c:** Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school **Impact HAZ-d:** Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment **Impact HAZ-e:** For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety	**Potentially Significant** ***Common Construction*** [a] Accidental release of hazardous materials from construction activities requiring the transport, use, or disposal of hazardous materials (e.g., fuel, motor oil, hydraulic fluid, solvents, cleaners, sealants, welding flux, paint, paint thinner) Safety hazards could occur from rock thrown and scattered from use of explosives Exposure to or the spread of toxic chemicals from excavation during construction that disturb areas with existing soil or groundwater contamination (i.e., asbestos or lead-based paint from existing building materials or stored liquid paints, solvents, and household or industrial-strength maintenance chemicals and cleaners) Underground infrastructure (e.g., natural gas pipelines, utility lines) within a project area could be encountered during excavation and could result in hazards to the public or environment if damaged Disturbance of soils containing *Coccidioides* spores may expose workers and people adjacent to construction sites to these fungal spores in fugitive dust	**7.21 MM-HAZ-a–h: Mitigate hazards and hazardous materials impacts** **A. Construction HAZ Mitigation Measures (CMM-HAZ-a–h)** 1. Measures for Transport, Use, or Disposal of Hazardous Materials 2. Project Siting 3. Demolition Measures 4. Herbicide and Pesticide Use 5. Hazardous Materials and Work Site Safety Training 6. Emergency Response Plan 7. Construction Site Security 8. Construction near Airports 9. Fire Prevention and Management Plan 10. Asbestos Control Measures (CMM-AQ-a–e: 5) 11. Valley Fever Control Measures (CMM-AQ-a–e: 4) 12. Blasting Operations and Safety Plan (CMM-GEO-a–e: 7) 13. Septic System Management Measures (CMM-

Impact	Impact Conclusions	Proposed Mitigation
hazard for people residing or working in the project area **Impact HAZ-f:** For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area **Impact HAZ-g:** Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan **Impact HAZ-h:** Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands	Accidental hazardous materials spills from airborne materials (e.g., gases, asbestos particles) or through ignition of flammable liquids or vapors during construction activities could occur within 0.25 mile of a school Impairment of emergency response services' access or interfering with emergency evacuation by rerouting traffic during construction and increased need for emergency service providers during construction due to accidental releases of hazardous materials, work site fires, and vehicular accidents due to construction-related changes in traffic Wildfire risk from the use of electrical or gas-powered equipment, flammable materials (e.g., fuels, solvents), and/or explosives during construction Safety hazards from project components, such as buildings or construction equipment, that encroach on airspace of airport runways Stagnant water present in construction areas during the wet season could create new disease vector habitat (i.e., mosquito habitat) that require application of pesticides Faulty installation or inadequate operation and maintenance of underground or aboveground storage tanks for bulk fuel storage may result in surface water and groundwater contamination, the potential for fire and explosion, exposure of the public to raw sewage, and daylighting of wastewater at the ground surface	GEO-a–e: 6) 14. Mosquito Control Measures 15. Installation and Operation of Underground and Aboveground Storage Tanks 16. Installation and Maintenance of Plumbing in Public Restrooms
	Physical Habitat Restoration Exposure of application crews and the public to toxic chemicals from accidental release or improper use or storage of herbicides Increase in transmission of mosquito-borne diseases (e.g., West Nile virus) and application of	**B. Physical Habitat Restoration HAZ Mitigation Measures** 1. Herbicide Application Control Measures 2. Mosquito Abatement Control Measures 3. Mitigate Potential Impacts on Air Traffic Safety

Impact	Impact Conclusions	Proposed Mitigation
	pesticides from creating favorable conditions to mosquitos Restoration of floodplain, riparian, and tidal habitat in proximity to existing airport flight zones could increase bird-aircraft strikes Increase in vegetation could cause an increase in the risk of wildland fire by increasing the fuel load Wildfire risk could increase due to an increased number of cars and people visiting larger habitat restoration projects	4. Wildfire Prevention Plan 5. Roadway Detour Plan (7.21 MM-TRA-a,b,d–f: B1) 6. Physical Habitat Restoration WQ Mitigation Measures (7.21 MM-WQ-a–j: E)
	Fish Passage Improvements Thermal curtains and associated structures could pose a physical safety hazard (e.g., collision) to recreationists in the vicinity of TCDs Remaining portions of a dam after dam removal could represent hazards to the public Construction-related traffic could cause hazards on existing transportation infrastructure (e.g., roadways, bridges, and culverts) en route to a dam removal site Demolition and disposal of structures containing hazardous materials such as lead, asbestos, treated wood, coating contaminants (e.g., lead-based paint), batteries, chemicals, petroleum products, PCBs, and mercury could result in hazards to the public or the environment through accidental release Dust from drilling and cutting into large quantities of concrete during construction activities could pose a hazard to the public or the environment Additional traffic from commuting workers, hauling of large equipment, and disposal of wastes during construction could temporarily result in interference with an adopted emergency response plan or emergency	**C. Fish Passage Improvements HAZ Mitigation Measure** 1. Signage and Buoys for Temperature Control Curtains **D. Dam Removal HAZ Mitigation Measures** 1. Project Planning 2. Hazardous Materials Management Plan 3. Dam Removal WQ Mitigation Measures (7.21 MM-WQ-a–j: G) 4. Fire Management Plan

Impact	Impact Conclusions	Proposed Mitigation
	evacuation Removal of reservoirs could increase the public's risk of loss, injury, or death associated with wildfires if other sources of water or means of fire suppression are not readily available; and increase a source of wildfire fuel in the form of dead trees and other vegetation around the former reservoir shoreline	
	Predatory Fish Control Electrofishing operations, if not implemented safely, could result in electrocution of nearby swimmers	**E. Predatory Fish Control HAZ Mitigation Measure** 1. Electrofishing Safety Best Management Practices
	Invasive Aquatic Vegetation Control Exposure of application crews and the public to toxic chemicals from accidental release or improper use of herbicides	**F. Invasive Aquatic Vegetation Control BIO Mitigation Measures** for chemical control (7.21 MM-BIO-a–f: G2)
HYDROLOGY AND WATER QUALITY—SURFACE WATER AND GROUNDWATER		
Impact WQ-a: Violate any water quality standards or waste discharge requirements **Impact WQ-b:** Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted) **Impact WQ-c:** 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 which would result in substantial erosion	**Potentially Significant** ***Common Construction*** [a] Construction could contribute polluted runoff and sediment to nearby water bodies In-water construction can cause temporary sediment disturbance and resuspension, which may cause increased turbidity, siltation, and bioavailability of sediment-associated pollutants Accidental release of pollutants that could enter storm drains or streams; pollutants include petroleum products (e.g., fuel, oil, grease from vehicles and equipment), paving materials (e.g., concrete and asphalt), other materials used or stored on site (e.g., paint, adhesives, and solvents), and project waste (e.g., litter, debris, hazardous and liquid waste) Use of herbicides to control invasive plant	**7.21 MM-WQ-a–j: Mitigate impacts on hydrology and water quality** **A. Construction WQ Mitigation Measures (CMM-WQ-a–j)** 1. Regulatory Compliance 2. Project Siting and Design 3. Erosion Control, Sedimentation Control, and Soil Stabilization Measures 4. Waste Management and Material Control Measures 5. In-Water Placement of Materials, Structures, and Operation of Equipment 6. Stream-Crossing, Culvert, and Bridge Projects 7. Groundwater Protection Measures

Impact	Impact Conclusions	Proposed Mitigation
or siltation on- or off-site **Impact WQ-d:** Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site **Impact WQ-e:** Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff **Impact WQ-f:** Otherwise substantially degrade water quality **Impact WQ-g:** Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map **Impact WQ-h:** Place within a 100-year flood hazard area structures which would impede or redirect flood flows **Impact WQ-i:** Expose people or structures to a significant risk of loss, injury, or death involving flooding, including flooding as a result of the failure of a levee or dam **Impact WQ-j:** Inundation by seiche, tsunami, or mudflow	species could affect water quality and violate water quality standards if improperly applied or stored Faulty installation or inadequate operation and maintenance of underground or aboveground storage tanks for bulk fuel storage may result in surface water and groundwater contamination and release of raw sewage, which could affect groundwater and surface water quality Improper siting of septic systems could result in adverse water quality effects Localized degradation of groundwater quality could result from temporary, short-term constructions activities Blasting, saw-cutting, and hydraulic hammering could release concrete and other particles into surface waters, which could violate water quality standards and/or affect aquatic resources Construction activities may lower local groundwater through dewatering; dewatered groundwater of poor quality could increase turbidity, dissolved solids, nutrients, metals, or other constituents if discharged to a surface waterway Construction could substantially alter drainage patterns of a project site and thereby cause erosion, siltation, or flooding on site or off site Construction activities could change the on-site land slopes across which drainage flows, which could alter the flow rates, directions, water surface elevations, or velocities of runoff that enters or originates on the construction site Activities such as grading, vegetation removal, soil compacting, and paving could increase land surface imperviousness and affect water quality by creating surfaces where pollutants (e.g., petroleum products from vehicles) can	8. Drainage and Flood Protection Measures 9. Construction GEO Mitigation Measures: Blasting Operations and Safety Plan (CMM-GEO-a–e: 7) and Septic System Management Measures (CMM-GEO-a–e: 6) 10. Construction BIO Mitigation Measures (CMM-BIO-a–f) 11. Construction HAZ Mitigation Measures: Herbicide and Pesticide Use (CMM-HAZ-a–h: 4), Installation and Operation of Underground and Aboveground Storage Tanks (CMM-HAZ-a–h: 15), and Installation and Maintenance of Plumbing in Public Restrooms (CMM-HAZ-a–h: 16) **B. Approval by State and Federal Fisheries, Flood-Control, and Water Resources Agencies** **C. Project Siting and Design of Habitat Restoration and Other Ecosystem Projects** **D. Waste Discharge Requirements**

Impact	Impact Conclusions	Proposed Mitigation
	accumulate and later be washed into waterways Project sites may be located within a 100-year flood hazard area or in areas subject to inundation by seiche, tsunami, or mudflow	
	Physical Habitat Restoration Geomorphic changes from habitat restoration could increase long-term rates of erosion or sedimentation Placement of fill and gravel has the potential to release turbidity and existing contaminants from in-channel sediment into the water column Increased turbidity and release of contaminants from gravel mining in or near streams Habitat restoration projects could alter the existing drainage pattern of the site or area and, if improperly designed, alter hydrology and/or increase erosion and sedimentation Possible exceedance of sediment and turbidity objectives from large-scale restoration projects Operation of habitat restoration projects (i.e., tidal, floodplain, riparian) could direct water through restoration areas with contaminated soils and organic material Altered salinity from tidal restoration Formation of harmful algal blooms from algae produced at restoration project sites Mobilized potentially contaminated sediment from dredging activities Potential to increase methylmercury formation or temperature effects from increased floodplain inundation	**E. Physical Habitat Restoration WQ Mitigation Measures** 1. Restoration Strategy 2. Adaptive Management 3. Levee Protection 4. Dredging Plan 5. Minimize Impacts on Infrastructure 6. Contaminant Evaluation 7. Monitor Groundwater Levels 8. Gravel Augmentation WQ Mitigation Measures 9. Harmful Algal Bloom Mitigation 10. Approval by State and Federal Fisheries, Flood-Control, and Water Resources Agencies (7.21 MM-WQ-a–j: B) 11. Project Siting and Design of Habitat Restoration and Other Ecosystem Projects (7.21 MM-WQ-a–j: C) 12. Waste Discharge Requirements (7.21 MM-WQ-a–j: D)
	Fish Passage Improvements Fishways aligned in a straight line without bends have high velocities down the center at moderate to high flows, which can cause erosion downstream of the fishway if the channel is	**F. Fish Passage WQ Mitigation Measures** 1. Consultation with Fish and Wildlife Agencies 2. Fish Passage BIO Mitigation Measures (7.21 MM-BIO-a–f: D)

Impact	Impact Conclusions	Proposed Mitigation
	narrow or if the fishway is aligned toward a bank TCDs could change the distribution of water temperature in reservoirs and dissolved oxygen concentration of water discharged downstream Increased sediment, contaminants (e.g., PCBs, chlorinated pesticides, mercury), erosion, turbidity, and reduction in dissolved oxygen levels downstream from dam removal Decrease of groundwater levels and a corresponding decrease in production rates in some existing wells from dam removal Changes to the downstream channel geometry, reduction of conveyance capacity, or destabilized infrastructure after increase in deposition and erosion from dam removal Substantial increase in flood flows and release of sediments from dam removal Short-term increase flooding from reservoir drawdown and dam removal Long-term changes in water quality from removal of a barrier An increase in the 100-year floodplain from removal of a large dam or reservoir	3. Approval by State and Federal Fisheries, Flood-Control, and Water Resources Agencies (7.21 MM-WQ-a–j: B) 4. Project Siting and Design of Habitat Restoration and other Ecosystem Projects (7.21 MM-WQ-a–j: C) 5. Waste Discharge Requirements (7.21 MM-WQ-a–j: D) **G. Dam Removal WQ Mitigation Measures** 1. Project Planning 2. Regulatory Compliance 3. Sediment Management and Monitoring Plan 4. Revegetation Plan 5. Dam Removal BIO Mitigation Measures (7.21 MM-BIO-a–f: E) 6. Dam Removal HAZ Mitigation Measures (7.21 MM-HAZ-a–h: D) 7. Dam Removal GEO Mitigation Measures (7.21 MM-GEO-a–e: C) 8. Control Concrete Dust (7.21 MM-AQ-a–e: C1) 9. Flood Control Measures 10. Performance Monitoring and Adaptive Management 11. Approval by State and Federal Fisheries, Flood-Control, and Water Resources Agencies (7.21 MM-WQ-a–j: B) 12. Project Siting and Design of Habitat Restoration and other Ecosystem Projects (7.21 MM-WQ-a–j: C) 13. Waste Discharge Requirements (7.21 MM-WQ-a–j: D)

Impact	Impact Conclusions	Proposed Mitigation
	Invasive Aquatic Vegetation Control Disturbance of channel substrate, increase in surface water turbidity, and low dissolved oxygen from mechanical plant removal Direct water quality effects from use of herbicides **Less than Significant**	**H. Invasive Aquatic Vegetation Control WQ Mitigation Measures** 1. Reduce Dead Vegetation in Channel 2. Limit Herbicide Use in Water
	Predatory Fish Control Substrate disturbance from direct predatory fish removal methods (e.g., setting up/retrieving nets or traps) **Beneficial**	—
	Physical Habitat Restoration Physical habitat restoration projects would provide increased quality and availability of native habitat (e.g., floodplain habitat) that, in combination with a more natural flow regime, would be expected to benefit native species and ecosystems Riparian and floodplain restoration projects could increase groundwater recharge Restoration projects that support native vegetation benefits water quality by filtering and retaining sediment, nutrients, and some pollutants Increased riparian vegetation, particularly riparian trees, provide shade that can reduce water temperature Large restoration projects could provide additional flood storage space and reduce flood stage in the main waterway	—
	Fish Passage Improvements New or improved fish screens would reduce impingement and entrainment at diversions Fishways would improve passage conditions for	

Impact	Impact Conclusions	Proposed Mitigation
	adult Chinook salmon and steelhead and provide greater access to upstream habitat TCDs would be expected to support cooler temperatures downstream of dams and thereby create migration, spawning, and rearing conditions beneficial for Chinook salmon and steelhead and other native cold water species Dam removal projects would be expected to benefit anadromous salmonids by restoring access to historical habitat that is currently blocked by impassible dams ***Invasive Aquatic Vegetation Control*** Invasive aquatic vegetation control efforts can benefit water quality by removing hyacinth and Brazilian waterweed, which clog waterways, increase sedimentation, reduce turbidity, and create low dissolved oxygen conditions	
LAND USE AND PLANNING		
Impact LU-a: Physically divide an established community **Impact LU-b:** Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect **Impact LU-c:** Conflict with any applicable habitat conservation plan or natural community conservation plan	**Potentially Significant** ***Common Construction*** [a] Temporary effects on existing land uses from activities such as ground clearing, increased traffic, noise, dust, and human activity, as well as by changes in the visual landscape Construction may temporarily physically divide an established community primarily by cutting off access to roadways or bridges Siting permanent facilities within an established community (e.g., distribution pipelines and other infrastructure) could create physical barriers that could divide the community Siting and construction could result in a permanent change in land use that could conflict with land use plans, policies, or regulations, depending on the location, configuration, and magnitude of the project	**7.21 MM-LU-a,b: Mitigate land use impacts** **A. Construction LU Mitigation Measures (CMM-LU-a–c)** 1. Regulatory Compliance 2. Project Siting and Design 3. Traffic Management Plan (CMM-TRA-a,b,d–f: 3)

Impact	Impact Conclusions	Proposed Mitigation
	Physical Habitat Restoration Projects could include actions, such as levee breaching and road removal, that could isolate communities from services and markets or cut off access to properties Some habitat restoration projects could be incompatible with land use designations, such as plans with exclusive agricultural designations	**B. Physical Habitat Restoration LU Mitigation Measures** 1. Project Siting and Design 2. Develop New Habitat on Public Lands 3. Compensate for Loss or Reduction in Environmental Value
	Fish Passage Improvements Removal of dams could physically divide communities; new land use and zoning designations may need to be determined for areas previously inundated by the reservoirs	**C. Dam Removal LU Mitigation Measures** 1. Feasibility Study 2. Minimize Community Disruption Due to Hauling/Disposing of Construction Waste 3. Dam Removal TRA Mitigation Measures (7.21 MM-TRA-a,b,d–f: C) 4. Dam Removal REC Mitigation Measures (7.21 MM-REC-a,b: C)
MINERAL RESOURCES		
Impact MIN-a: Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state **Impact MIN-b:** Result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan	**Potentially Significant** ***Common Construction*** [a] Construction activities could occur in areas with active natural gas, oil, or aggregate production or with the potential to contain untapped reserves of those resources and restrict access Construction demand for aggregate and/or cement for construction projects could exceed local supplies	**7.21 MM-MIN-a,b: Mitigate impacts on mineral resources** **A. Construction MIN Mitigation Measures (CMM-MIN-a,b)** 1. Project Siting and Design 2. Aggregate Use 3. Access to Extraction Sites 4. Implement the California Department of Conservation's Geologic Energy Management Division's (CalGEM) Recommendations
	Less than Significant ***Physical Habitat Restoration*** Depletion of mineral resources (specifically aggregate) from gravel augmentation would not be substantial	—

Impact	Impact Conclusions	Proposed Mitigation
NOISE		
Impact NOI-a: Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies **Impact NOI-b:** Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels **Impact NOI-d:** A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project **Impact NOI-e:** For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels **Impact NOI-f:** For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels	**Potentially Significant** ***Common Construction*** [a] Construction would result in temporary noise and groundborne vibration from the use of heavy construction equipment (e.g., excavators, bulldozers, pile drivers, jackhammers), drilling, and blasting Noise-sensitive receptors may be exposed to noise levels in excess of established standards or to a substantial increase in ambient noise Project sites may be located near a public or private airport or airstrip and temporarily expose construction crew to excessive noise levels	**7.21 MM-NOI-a,b,d–f: Mitigate noise and vibration impacts** **A. Construction NOI Mitigation Measures (CMM-NOI-a,b,d–f)** 1. Regulatory Compliance 2. Noise-Reduction Measures 3. Vibration-Reduction Measures 4. Blasting Operations and Safety Plan (CMM-GEO-a–e: 7) 5. Construction near Airports (CMM-HAZ-a-h: 8)
	Less than Significant ***Predatory Fish Control*** Nets or other entrapment devices set up or use of boats for capture by fish trawl nets	—
	Invasive Aquatic Vegetation Control Mechanical harvester or herbicide application by aircraft would be intermittent and of short duration	—
Impact NOI-c: A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project	**Less than Significant** ***Physical Habitat Restoration and Other Ecosystem Projects*** Long-term operation and maintenance may include occasional repair activities and vehicular trips for periodic inspections, monitoring, and evaluation, which would not create or expose people to an excessive or substantial permanent increase in noise or vibration	—

Impact	Impact Conclusions	Proposed Mitigation
POPULATION AND HOUSING		
Impact POP-a: Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure) **Impact POP-b:** Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere **Impact POP-c:** Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere	**No Impact** ***Physical Habitat Restoration and Other Ecosystem Projects*** Habitat restoration and other ecosystem projects would not involve construction of new homes or businesses, extension of roads, other infrastructure, or other actions that may directly or indirectly induce substantial population growth in an area.	—
PUBLIC SERVICES		
Impact PS-a: Result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services: fire protection, police protection, schools, parks, or other public facilities	**Less than Significant** Physical habitat restoration and other ecosystem projects facilities would not result in increases in housing or in population and therefore would not create a need for additional schools, parks, or other public facilities**.** Construction activities could result in temporary, short-term increased response times for fire, police, and other emergency responders due to increased construction traffic and potential road closures and detours Construction activities could result in temporary increases in the number of fire, police, or emergency medical provider service calls in the vicinity of work sites related to emergencies related to construction; but calls are not expected to be large enough or frequent enough to affect response times beyond the regular variation experienced by providers of emergency services	—

Impact	Impact Conclusions	Proposed Mitigation
RECREATION		
Impact REC-a: Impact REC-a: Increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated **Impact REC-b:** Include recreational facilities or require the construction or expansion of recreational facilities that might have an adverse physical effect on the environment	**Potentially Significant** ***Common Construction*** [a] Recreationists could be affected by construction-related traffic, visual impacts, water quality effects, noise, fugitive dust, and exhaust emissions from heavy equipment; restricted access to recreational facilities could result in physical deterioration of alternative locations and facilities	**7.21 MM-REC-a,b: Mitigate impacts on recreation** **A. Construction REC Mitigation Measures (CMM-REC-a,b)** 1. Project Siting and Design 2. Maintain Access to Existing Recreational Facilities during Construction 3. Coordinate with Public and Private Recreation Providers 4. Rehabilitate or Restore Degraded Recreational Facilities or Provide Replacement Recreational Facilities 5. Construction AES Mitigation Measures (CMM-AES-a-d) 6. Construction AQ Mitigation Measures (CMM-AQ-a-e) 7. Construction WQ Mitigation Measures (CMM-WQ-a-j) 8. Construction NOI Mitigation Measures (CMM-NOI-a,b,d-f) 9. Construction TRA Mitigation Measures (CMM-TRA-a,b,d-f)
	Physical Habitat Restoration Habitat restoration projects that require levee breaching, construction of setback levees, and floodplain expansion could adversely affect marinas and other land-based recreational facilities and infrastructure Permanent removal of marinas and other recreation facilities and infrastructure could displace recreationists to other locations	**B. Physical Habitat Restoration REC Mitigation Measures** 1. Project Siting and Design 2. Compensation for Unavoidable Long-Term Impacts

Impact	Impact Conclusions	Proposed Mitigation
	Fish Passage Improvements Dam removal projects could result in the long-term loss of existing opportunities for reservoir-based recreation activities and could affect flow-dependent activities such as whitewater rafting in river reaches downstream of a reservoir's removal location Dam removal projects could displace recreationists to other locations **Less than Significant**	**C. Dam Removal REC Mitigation Measures** 1. Project Planning 2. Coordination with Public Recreation Providers 3. Compensate for Impacts on Recreational Facilities
	Fish Passage Improvements Increases in turbidity during reservoir drawdown and sediment flushing periods could temporarily reduce visibility for boaters, swimmers, and fisherpersons The placement of certain types of TCDs (e.g., a thermal curtain) in a reservoir could result in a reduction in reservoir area that would otherwise be available for recreational users	—
	Predatory Fish Control Removal of recreational and sport fish from rivers could result in a reduction in recreational and sport fishing opportunities Removal or modification of structures that provide types of recreational opportunities, such as a small, abandoned dam that creates a swimming hole, could displace recreationists to other areas suitable for swimming **Beneficial**	—
	Physical Habitat Restoration Habitat restoration projects would generally be expected to improve conditions for native fish, resulting in improved fishing opportunities for native species Floodplain restoration projects could provide improved habitat for both wetland and upland	—

Impact	Impact Conclusions	Proposed Mitigation
	game species, which would provide improved hunting and birdwatching opportunities for recreationists Riparian restoration and enhanced in-channel complexity projects could provide improved canoeing and kayaking opportunities by creating a more natural, varied, and dynamic riverine setting in some locations. Large restoration projects could include interpretive facilities or signage related to the ecological history and restoration of the site, which would enhance the recreational experience in the long term Removal of thick aquatic vegetation may allow increased boat access to areas that previously were not accessible	
TRANSPORTATION AND TRAFFIC		
Impact TRA-a: Conflict with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including, but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit **Impact TRA-b:** Conflict with an applicable congestion management program, including, but not limited to level of service standards and travel demand measures, or other standards established by the county congestion management agency for designated roads or highways **Impact TRA-d:** Substantially increase hazards due to a design feature (e.g., sharp	**Potentially Significant** ***Common Construction*** [a] Construction activities could result in temporary and short-term increases in traffic due to additional vehicles (e.g., construction vehicles, construction workers' personal vehicles) on roads near project sites and relocating roads, which would cause new rerouted traffic at an intersection not designed to accommodate additional traffic Construction activities may result in degradation of roads from haul trucks or trips required for fill transport Temporary relocation, closure, or complete removal of existing bicycle and pedestrian paths and trails could occur during construction Projects requiring in-channel construction activities could temporarily obstruct boat navigation and cause boat traffic delays; construction equipment, such as dredges and	**7.21 MM-TRA-a,b,d–f: Mitigate transportation impacts** **A. Construction TRA Mitigation Measures (CMM-TRA-a,b,d–f)** 1. Regulatory Compliance 2. Avoid and Minimize Interference with Transportation Networks 3. Traffic Management Plan 4. Restore Damaged Transportation Facilities 5. Waterway Traffic Control Plan 6. Road and Bridge Design

Impact	Impact Conclusions	Proposed Mitigation
curves or dangerous intersections) or incompatible uses (e.g., farm equipment) **Impact TRA-e:** Result in inadequate emergency access **Impact TRA-f:** Conflict with adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance or safety of such facilities	cofferdams, could temporarily obstruct boat traffic Construction projects may result in roads being temporary blocked, rerouted, or altered, which could affect emergency access Permanent relocation of road segments could require changes that could increase or introduce a hazard to vehicles traveling on that segment	
	Physical Habitat Restoration Larger habitat restoration projects, including floodplain restoration, could result in inundation of roads that could impede use and cause traffic congestion at intersections or on certain roadway segments	**B. Physical Habitat Restoration TRA Mitigation Measures** 1. Roadway Detour Plan 2. Protection of Rail Lines
	Fish Passage Improvements Construction-related traffic from dam removal projects may affect local residential and recreational traffic; existing transportation infrastructure (e.g., roadways, bridges, culverts) en route to the dam sites may require improvements over their current conditions Removal of dams that provide river crossings may require construction of a new bridge to meet local traffic demands upon its removal	**C. Dam Removal TRA Mitigation Measures** 1. Project Planning 2. Road Design 3. Dam Removal WQ Mitigation Measures, including incorporation of any special accommodations for road infrastructure into engineering designs (7.21 MM-WQ-a–j: G1) 4. Dam Removal LU Mitigation Measures, including the consideration of transportation in feasibility studies on existing and future land use designations once the dam is removed (7.21 MM-LU-a,b: C1) 5. Dam Removal REC Mitigation Measures, including the consideration of transportation impacts and needs associated with recreation facilities (7.21 MM-REC-a,b: C)
	Less than Significant	
	Invasive Aquatic Vegetation Control Invasive aquatic vegetation would result in a few limited additional vehicle trips associated with a relatively small number of workers commuting	—

Impact	Impact Conclusions	Proposed Mitigation
	to sites Neither chemical nor mechanical invasive aquatic vegetation control would substantially increase transportation hazards or result in inadequate emergency access	
Impact TRA-c: Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks	**No Impact** Physical Habitat Restoration and Other Ecosystem Projects Habitat restoration and other ecosystem projects would not result in a change in air traffic patterns because no airport facilities are proposed, and there would be no increase in demand for air travel as a result of implementing these types of projects	—
UTILITIES AND SERVICE SYSTEMS		
Impact UT-a: Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board **Impact UT-f:** Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs **Impact UT-g:** Comply with federal, state, and local statutes and regulations related to solid waste	**Potentially Significant** ***Common Construction*** [a] Construction sites could generate stormwater runoff that discharges sediment and other pollutants Wastewater from construction could include wastewater from sanitation facilities used by construction crews or wastewater generated directly from construction-related activities Construction activities require water supply for construction workers on site, manufacture and curing of concrete and mortar, testing for waterproofing, cleaning, dust control, and other activities Construction of facilities could temporarily increase the volume of solid waste (e.g., soil, vegetative material, construction debris) disposed of at landfills Construction activities could temporarily disrupt existing electric and natural gas utilities and telecommunication lines and damage utility	**7.21 MM-UT-a,f,g: Mitigate impacts on utilities and service systems** **A. Construction UT Mitigation Measures (CMM-UT-a,f,g)** 1. Wastewater Control Measures 2. Water Supply 3. Nonhazardous Solid Waste Disposal 4. Utility Services

Impact	Impact Conclusions	Proposed Mitigation
	poles or snag suspended utility lines	
	Fish Passage Improvements	
	Dam removal projects could affect public utilities if water pipelines or electrical transmission lines cross the dam or reservoir or by the loss of a source of hydroelectric power	**B. Dam Removal UT Mitigation Measures**
	Dam removal would generate substantial volumes of solid waste, including excavated material and demolition debris (e.g., concrete, treated wood, other waste), that would require landfill disposal	1. Feasibility Study 2. Dam Removal WQ Mitigation Measures (7.21 MM-WQ-a–j: G) 3. Solid Waste Disposal
Impact UT-b: Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects **Impact UT-c:** Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects **Impact UT-d:** Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed **Impact UT-e:** Result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments	**Less than Significant** Physical Habitat Restoration and Other Ecosystem Projects Physical habitat restoration and other ecosystem projects would not require the construction of new or expanded wastewater treatment facilities or result in the determination of a wastewater treatment provider that there is inadequate capacity to serve the projects because these projects would not discharge wastewater Physical habitat restoration and other ecosystem projects would not require construction of new storm water drainage facilities or expansion of existing facilities Some habitat restoration projects could initially require a water supply for newly planted vegetation once construction is completed or for temporary irrigation needs in dry years until vegetation is sufficiently established	—

[a] Predatory fish control using capture methods and invasive aquatic vegetation control do not involve construction and therefore would not result in potentially significant impacts from construction.
PCBs = polychlorinated biphenyls; TCD = temperature control device

7.21.4 References Cited

7.21.4.1 Common References

^Agency for Toxic Substances and Disease Registry (ATSDR). 2015. *Where is Asbestos Found?* July 17. Available: https://www.atsdr.cdc.gov/noa/where_is_asbestos_found.html. Accessed: October 6, 2020.

^American Rivers. 2002. *The Ecology of Dam Removal: a Summary of Benefits and Impacts*. Washington, DC.

^California Department of Fish and Wildlife (CDFW). 2008. *California Aquatic Invasive Species Management Plan.*

^California Department of Fish and Wildlife (CDFW). 2013. *Aquatic Invasive Species Decontamination Protocol.* October 16.

^California Department of Fish and Wildlife (CDFW). 2016a. *Aquatic Invasive Species Disinfection/Decontamination Protocols (Northern Region).*

^California Department of Parks and Recreation, Division of Boating and Waterways (CDBW). 2006. Egeria densa *Control Program Second Addendum to 2001 Environmental Impact Report with Five-Year Program Review and Future Operations Plan*. U.S. Department of Agriculture. Sacramento, CA.

^California Department of Transportation (Caltrans). 2020. *Technical Guidance for Assessment and Mitigation of the Hydroacoustic Effects of Pile Driving on Fish*. October.

^California Department of Transportation (Caltrans). 2022. *Highway Design Manual*. 7th Edition.

^California Department of Water Resources (DWR). 2013. *Technologies for Passing Fish at Large Dams*. Draft. State of California Natural Resources Agency. FloodSAFE Environmental Stewardship and Statewide Resources Office. June. Available: https://cawaterlibrary.net/wp-content/uploads/2017/05/lg_dam.pdf. Accessed: June 29, 2023.

^California Environmental Protection Agency and California Air Resources Board (CalEPA and CARB). 2011. *Compliance Offset Protocol Urban Forest Projects*.

^California Invasive Plant Council (Cal-IPC). 2012. *Preventing the Spread of Invasive Plants: Best Management Practices for Land Managers*. 3rd edition.

^Cavallo, B., J. Merz, and J. Setka. 2012. Effects of Predator and Flow Manipulation on Chinook Salmon (*Oncorhynchus tshawytscha*) Survival in an Imperiled Estuary. *Environmental Biology of Fish*. DOI 10.1007/s10641-012-9993-5.

^Center for Hearing and Communication. 2019. *Common Environmental Noise Levels.* Available: http://chchearing.org/noise/common-environmental-noise-levels/. Accessed: March 1, 2019.

^Central Valley Regional Water Quality Control Board (Central Valley Water Board). 2010. *Sacramento–San Joaquin Delta Estuary TMDL for Methylmercury*. Final Staff Report. April. Prepared by M. Wood, C. Foe, J. Cooke, and L. Stephen.

^Clinkenbeard, J., and F. Guis. 2018*. Map Sheet 52 Aggregate Sustainability in California and Companion Report*. Updated 2018.

^Delta Conservancy. 2015. *Delta Restoration Network*. Available: https://web.archive.org/web/20171205073349/http://deltaconservancy.ca.gov:80/delta-restoration-network-0/. Accessed: August 14, 2020.

^Delta Stewardship Council (DSC). 2011. *Delta Plan Program Environmental Impact Report*. Draft. Sacramento, CA.

^Federal Transit Administration (FTA). 2018. *Transit Noise and Vibration Impact Assessment Manual*. FTA Report No. 0123.

^Fisheries Hydroacoustic Working Group (FHWG). 2008. *Agreement in Principle for Interim Criteria for Injury to Fish from Pile Driving Activities.*

^Greenfield, B. K., G. S. Siemering, J. C. Andrews, M. Rajan, S. P. Andrews Jr., and D. F. Spencer. 2007. Mechanical Shredding of Water Hyacinth (*Eichhornia crassipes*): Effects on Water Quality in the Sacramento-San Joaquin River Delta, California. *Estuaries and Coasts* 30:627–640.

^Jeffres, C. A., J. J. Opperman, and P. B. Moyle. 2008. Ephemeral Floodplain Habitats Provide Best Growth Conditions for Juvenile Chinook Salmon in a California River. *Environmental Biology of Fishes* 83:449–458.

^Li, H., G. A. Lamberti, T. N. Pearsons, C. K. Tait, and J. L. Li. 1994. Cumulative Effects of the Riparian Disturbances along High Desert Trout Streams of the John Day Basin, Oregon. *Transactions of the American Fisheries Society* 123:627–640.

^Marvin-DiPasquale, M., C. N. Alpers, and J. A. Fleck. 2009. *Mercury, Methylmercury, and Other Constituents in Sediment and Water from Seasonal and Permanent Wetlands in the Cache Creek Settling Basin and Yolo Bypass, Yolo County, 2005–06*. Open File Report 2009-1182.

^New Hampshire Department of Environmental Services (NHDES). 2010. *Rock Blasting and Water Quality Measures That Can Be Taken to Protect Water Quality and Mitigate Impacts*. Prepared by B. Kernen, DES Drinking Water Source Protection Program.

^Poff, N. L. and D. D. Hart. 2002. How Dams Vary and Why It Matters for the Emerging Science of Dam Removal. *BioScience* 52(8):659–668.

^San Francisco Estuary Institute–Aquatic Science Center (SFEI-ASC). 2016. *A Delta Renewed: A Guide to Science-Based Ecological Restoration in the Sacramento-San Joaquin Delta.* Prepared for the California Department of Fish and Wildlife and Ecosystem Restoration Program. A Report of SFEI-ASC's Resilient Landscapes Program, Publication #799, San Francisco Estuary Institute-Aquatic Science Center, Richmond, CA. Version 1.3, published November 2016.

^Sommer, T. R., M. L. Nobriga, W. C. Harrell, W. Batham, and W. Kimmerer. 2001a. Floodplain Rearing of Juvenile Chinook Salmon: Evidence of Enhanced Growth and Survival. *Canadian Journal of Fisheries and Aquatic Sciences* 58:325–333.

^Sommer, T., B. Harrell, M. Nobriga, R. Brown, P. Moyle, W. Kimmerer, and L. Schemel. 2001b. California's Yolo Bypass: Evidence That Flood Control Can Be Compatible with Fisheries, Wetlands, Wildlife, and Agriculture. *Fisheries* 26(8):6–16.

^State Water Resources Control Board (SWRCB). 2012. OWTS Policy. *Water Quality Control Policy for Siting, Design, Operation, and Maintenance of Onsite Wastewater Treatment Systems*.

^U.S. Army Corps of Engineers (USACE). 2020. *Dredging – the Permit Process*. Dredged Material Management Office. San Francisco District. San Francisco, CA.

^U.S. Environmental Protection Agency (USEPA). 2007. *National Management Measures to Control Nonpoint Source Pollution from Hydromodification.* EPA 841-B-07-002. July.

^Weaver, W., E. Weppner, and D. Hagans. 2015. *Handbook for Forest, Ranch, and Rural Roads: a Guide for Planning, Designing, Constructing, Reconstructing, Upgrading, Maintaining, and Closing Wildland Roads*. April. Prepared for Mendocino Resource Conservation District, Ukiah, CA.

7.21.4.2 Section References

Alpers, C. N., C. Eagles-Smith, C. Foe, S. Klasing, M. Marvin-DiPasquale, D. Slotton, and L. Winham-Myers. 2008. *Sacramento-San Joaquin Delta Regional Ecosystem Restoration Implementation Plan—Ecosystem Conceptual Model: Mercury*. Sacramento, CA: Delta Regional Ecosystem Restoration Implementation Plan.

American Fisheries Society. 2008. *Fisheries Safety Handbook*. Professional Safety Committee of the American Fisheries Society. December. Bethesda, MD.

Bigham, G. N., K. J. Murray, Y. Masue-Slowey, and E. A. Henry. 2016. Biochemical Controls on Methylmercury in Soils and Sediments: Implications for Site Management. *Integrated Environmental Assessment and Management* 13(2):249–263.

Bunte, K. 2004. *State of the Science Review: Gravel Mitigation and Augmentation below Hydroelectric Dams—a Geomorphological Perspective*. Engineering Research Center, Colorado State University. Report submitted to the Stream Systems Technology Center, USDA Forest Service. Fort Collins, CO.

California Department of Fish and Game (CDFG). 2007. *Findings of Fact of the California Department of Fish and Game as a Responsible Agency for a Funding Approval for the Battle Creek Salmon and Steelhead Restoration Project*. March 14.

California Department of Fish and Wildlife (CDFW). 2010. *California Salmonid Stream Habitat Restoration Manual*. Appendix S: Fish Screen Criteria. May.

California Department of Parks and Recreation, Division of Boating and Waterways (CDBW). 2009. *Programmatic Environmental Impact Report, Volume I – Chapters 1 to 7, Water Hyacinth Control Program*. November 30. Final. Page 5-12. Sacramento, CA. With Technical assistance from NewPoint Group. Sacramento, CA.

California Department of Parks and Recreation, Division of Boating and Waterways (CDBW). 2018. *AIPCP Programmatic Environmental Impact Report*. Final. Aquatic Invasive Species Programs. January 24. Sacramento, CA.

California Department of Parks and Recreation, Division of Boating and Waterways (CDBW). 2023a. *Floating Aquatic Vegetation.* Available: https://dbw.parks.ca.gov/?page_id=28995. Accessed: June 15, 2023.

California Department of Parks and Recreation, Division of Boating and Waterways (CDBW). 2023b. *Submersed Aquatic Vegetation.* Available: https://dbw.parks.ca.gov/?page_id=28994. Accessed: June 15, 2023.

California Department of Water Resources (DWR). 2007. *North Delta Flood Control and Ecosystem Restoration Project Environmental Impact Report*. Draft. Prepared by Jones & Stokes. November. Sacramento, CA.

Central Valley Regional Water Quality Control Board (Central Valley Water Board). 2019. *The Water Quality Control Plan (Basin Plan) for the California Regional Water Quality Control Board Central Valley Region*. Fifth Edition. Revised February 2019.

Eagles-Smith, C. A., J. J. Willacker Jr., and C. M. Flanagan Pritz. 2014. *Mercury in Fishes from 21 National Parks in the Western United States—Inter- and Intra-Park Variation in Concentrations and Ecological Risk.*

Fleming, E. J., E. E. Mack, P. G Green, and D. C. Nelson. 2006. Mercury Methylation from Unexpected Sources: Molybdate-Inhibited Freshwater Sediments and an Iron-Reducing Bacterium. *Applied and Environmental Microbiology* 72(1):457–464.

Flosi, G., S. Downie, J. Hopelain, M. Bird, R. Coey, and B. Collins. 2010. *California Salmonid Stream Habitat Restoration Manual*. Fourth Edition.

Gilmour, C., D. Krabbenhoft, W. Orem, and G. Aiken. 2004. *2004 Everglades Consolidated Report Appendix 2B-1: Influence of Drying and Rewetting on Hg and S Cycling in Everglades and STA Soils.*

Greiner, J. L. and J. A. Davis 2010. Water Quality in South San Francisco Bay, California: Current Condition and Potential Issues for the South Bay Salt Pond Restoration Project. *Reviews of Environmental Contamination and Toxicology* 206:115–147.

International Conference of Building Officials. 1994. *Uniform Building Code*. Volume 2: Structural Engineering Design Provisions. May 1. Whittier, CA.

Kjelland, M. E., C. M. Woodley, T. M. Swannack, and D. L. Smith. 2015. A Review of the Potential Effects of Suspended Sediment on Fishes: Potential Dredging-Related Physiological, Behavioral, and Transgenerational Implications. *Environ Syst Decis* 35:334–350.

Maher, W., F. Krikowa, M. Ellwood, D. Helmig, and R. Sun. 2020. Mercury Cycling in Australian Estuaries and Near Shore Coastal Ecosystems: Triggers for Management. *Elementa: Science of the Anthropocene* 8.

Mitchell, C. P. J. and C. C. Gilmour. 2008. Methylmercury Production in a Chesapeake Bay Salt Marsh. *Journal of Geophysical Research: Biogeosciences* 113(G2).

National Marine Fisheries Service (NMFS). 1997. *Fish Screening Criteria for Anadromous Salmonids*. January. Southwest Region.

National Marine Fisheries Service (NMFS). 2011. *Anadromous Salmonid Passage Facility Design.* July. NMFS Northwest Region. Portland, OR.

National Marine Fisheries Service (NMFS). 2018. Endangered Species Act Section 7(a)(2) Biological Opinion, and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response and Fish and Wildlife Coordination Act Recommendations for the NOAA

Restoration Center's Program to Facilitate Implementation of Restoration Projects in the Central Valley of California. August 31.

National Marine Fisheries Service (NMFS). 2023. *NOAA Fisheries Guidelines for Salmonid Passage at Stream Crossings*. Southwest Region. Original Issue Date: September 2001. Addendum Issue Dates: September 2019 and February 2023.

O'Neal, M. D. and F. W. Gius. 2018. *Mineral Land Classification: Concrete Aggregate in the Greater Sacramento Area Production-Consumption Region*. California Geological Survey Special Report 245.

Podar, M., C. C. Gilmour, C. C. Brandt, A. Soren, S. D. Brown, B. R. Crable, A. V. Palumbo, A. C. Somenahally, and D. A. Elias. 2015. Global Prevalence and Distribution of Genes and Microorganisms Involved in Mercury Methylation. *Science Advances* 1(9):e1500675.

Resource Management Associates (RMA). 2012. *Numerical Modeling in Support of Bay Delta Conservation Plan Tidal Marsh Assumptions Sensitivity Analysis.* July. Attachment 5 to Section D of Appendix 5A to the *2016 Bay Delta Conservation Plan/California WaterFix Final EIR/EIS.*

San Francisco Bay Regional Water Quality Control Board (San Francisco Bay Water Board). 2019. *San Francisco Bay Basin (Region 2) Water Quality Control Plan (Basin Plan*).

Skidmore, P. B., C. R. Thorne, B. L. Cluer, G. R. Pess, J. M. Castro, T. J. Beechie, and C. C. Shea. 2011. *Science Base and Tools for Evaluating Stream Engineering, Management, and Restoration Proposals*. NMFS-NWFSC-112. Accessed: May 9, 2022.

State Water Resources Control Board (SWRCB). 2018. *Environmental Impact Report for the Lower Klamath Project License Surrender*. Draft. State Clearinghouse No. 2016122047. December. Prepared by Stillwater Sciences, Berkeley, CA.

State Water Resources Control Board (SWRCB). 2022a. State Water Resources Control Board Order WQ 2022-0048-DWQ Order for Clean Water Act Section 401 Water Quality Certification and Waste Discharge Requirements for Restoration Projects Statewide. Final. August 16.

State Water Resources Control Board (SWRCB). 2022b. *State Water Resources Control Board Restoration Projects Statewide Order: Program Environmental Impact Report.* Consolidated Final—main body. With technical assistance from ESA. August 16.

Tanner, C., L. Windham-Myers, J. Fleck, K. Tate, S. McCord, and B. Linquist. 2016. The Contribution of Rice Agriculture to Methylmercury in Surface Waters: a Review of Data from the Sacramento Valley, California*. Journal of Environmental Quality* 2017(46):133–142.

U.S. Army Corps of Engineers, U.S. Environmental Protection Agency, San Francisco Bay Conservation and Development Commission, and San Francisco Bay Regional Water Quality Control Board (USACE et al.). 2001. *Long-Term Management Strategy for the Placement of Dredged Material in the San Francisco Bay Region—Management Plan 2001.* July.

U.S. Bureau of Reclamation (Reclamation). 2006. *Fish Protection at Water Diversions—A Guide for Planning and Designing Fish Exclusion Facilities*. April. Denver, CO.

U.S. Bureau of Reclamation (Reclamation). 2009. *Record of Decision: American Basin Fish Screen and Habitat Improvement Project, Sutter and Sacramento Counties, California, Final Environmental*

Impact Statement/Environmental Impact Report. April. U.S. Department of the Interior, Bureau of Reclamation, Mid-Pacific Region.

U.S. Bureau of Reclamation (Reclamation). 2014a. *Pocket Guide to Screening Small Water Diversions—a Guide for Planning and Selection of Fish Screens for Small Diversions*. August. Prepared by B. Mefford, P.E., Denver Technical Service Center. Denver, CO.

U.S. Bureau of Reclamation (Reclamation). 2014b. *Piscine Predators and Control Measures: Application to In-River Structures in the San Joaquin River Restoration Area*. January.

U.S. Bureau of Reclamation (Reclamation). 2017. *Dam Removal Analysis Guidelines for Sediment*. December. Bureau of Reclamation, Technical Service Center, Denver, CO.

U.S. Bureau of Reclamation and California Department of Fish and Game (Reclamation and CDFG). 2008. *American Basin Fish Screen and Habitat Improvement Project Environmental Impact Statement/Environmental Impact Report*. Final. State Clearinghouse No. 2003092006. June 10. Prepared by U.S. Department of the Interior, Bureau of Reclamation, Mid-Pacific Region, Division of Resource Management, Sacramento, CA and California Department of Fish and Game, North Central Region, Rancho Cordova, CA.

U.S. Bureau of Reclamation and California State Water Resources Control Board (Reclamation and SWRCB). 2005. *Battle Creek Salmon and Steelhead Restoration Project Final Environmental Impact Statement/Environmental Impact Report*. With technical assistance from Jones & Stokes. July. Sacramento, CA.

U.S. Department of Transportation (USDOT). 2019. *Construction Noise Handbook*. Chapter 9, *Construction Equipment Noise Levels and Ranges*. Federal Highway Administation, Office of Planning, Environment, & Realty.

U.S. Society on Dams (USSD). 2015. *Guidelines for Dam Decommissioning Projects*. Prepared by the USSD Committee on Dam Decommissioning. July.

Wheaton, J. M., G. B. Pasternack, and J. E. Merz. 2004. Spawning Habitat Rehabilitation – I. Conceptual Approach and Methods. *International Journal of River Basin Management* 2:(1):3–20.

Windham-Myers, L., J. A. Fleck, J. T. Ackerman, M. Marvin-DiPasquale, C. A. Striker, W. A. Heim, P. A. M. Bachand, C. A. Eagles-Smith, G. Gill, M. Stephenson, and C. N. Alpers. 2014. Mercury Cycling in Agricultural and Managed Wetlands: a Synthesis of Methylmercury Production, Hydrologic Export, and Bioaccumulation from an Integrated Field Study. *Science of the Total Environment.*