G P1 (b)(4) Attachment 3

Habitat Connectivity Adaptive Management Plan

FINAL DRAFT

G P1 (B)(4) ATTACHMENT 3
HABITAT CONNECTIVITY ADAPTIVE MANAGEMENT PLAN

PREPARED FOR:

California Department of Water Resources

PREPARED BY:

ICF
980 9th Street, Suite 1200
Sacramento, CA 95814

October 2025

Contents

Tables

Figures

Acronyms and Abbreviations

Term	Definition
AMP	adaptive management plan
BA	Biological Assessment
BiOp	Biological Opinion
CDFW	California Department of Fish and Wildlife
CEQA	California Environmental Quality Act
covered action	Delta Conveyance Project
CNRA	California Natural Resources Agency
Delta	Sacramento–San Joaquin Delta
DWR	California Department of Water Resources
Final EIR	*Delta Conveyance Project Final Environmental Impact Report*
ITP	Incidental Take Permit
project	Delta Conveyance Project
SWP	State Water Project
USFWS	U.S. Fish and Wildlife Service
WCG	Wildlife Crossing Guilds

1 Introduction

The California Department of Water Resources (DWR) has determined that this Habitat Connectivity Adaptive Management Plan (AMP) for the Delta Conveyance Project (covered action) is consistent with Delta Plan Policy G P1 (b)(4).

1.1 Background

The State Water Project (SWP) water conveyance facilities in the Sacramento–San Joaquin Delta (Delta), including Clifton Court Forebay and the Harvey O. Banks Pumping Plant in the south Delta, enable DWR to divert water from the Delta into the California Aqueduct. The Delta Conveyance Project (project) will construct and operate new conveyance facilities in the Delta that will add to the existing SWP infrastructure. New intake facilities will be constructed in the north Delta along the Sacramento River between Freeport and the divergence with Sutter Slough. The new facilities will also include a tunnel and associated infrastructure that will convey water from the new intakes to existing SWP conveyance facilities in the south Delta. The new facilities will provide alternative locations for diverting water from the Delta and will be operated in coordination with the existing SWP south Delta pumping facilities.

As part of the project, the north Delta diversion facilities will convey water from the Sacramento River to the SWP facilities in the south Delta. DWR will operate the north Delta diversion facilities and the existing south Delta facilities in compliance with state and federal regulatory requirements.

This Habitat Connectivity AMP addresses Mitigation Measure BIO-53: *Avoid and Minimize Impacts on Terrestrial Wildlife Connectivity and Movement*, as described in Volume 1, Chapter 8, *Terrestrial Biological Resources*, of the *Delta Conveyance Project Final Environmental Impact Report* (Final EIR) (California Department of Water Resources 2023c). Mitigation Measure BIO-53 is required to avoid, minimize, and mitigate project-related impacts on wildlife connectivity resources in riparian corridors within the project footprint and includes an adaptive management component. This measure covers the connectivity needs of both special-status and non–special-status terrestrial wildlife.

Consistent with the Delta Plan's adaptive management framework described in Appendix 1B, *Adaptive Management,* of the Delta Plan, this Habitat Connectivity AMP represents the initial stage in the development of the adaptive management process for Mitigation Measure BIO-53. The project is still in the planning process, which includes continued consultation with U.S. Fish and Wildlife Service (USFWS) toward the preparation of a Biological Opinion (BiOp) and Tribal consultation to incorporate Indigenous knowledge. Further detail and updates, including site-specific information, will be added to this Habitat Connectivity AMP as project design and the permitting processes progress. Any revisions adopted as part of the permitting processes will be consistent with Delta Plan G P1 (b)(4) adaptive management standards.

The project's Incidental Take Permit (ITP) and Biological Assessment (BA) include conditions of approval and mitigation measures related to wildlife connectivity, which are provided in Section 4.1, *Relationship to CEQA Impact Analyses and Consultation Effects*, of this document. As of April 10, 2025, the habitat connectivity conditions of approval in the ITP issued on February 14, 2025, do not explicitly include an adaptive management component, but these conditions and measures are included in this Habitat Connectivity AMP for completeness.

1.2 Purpose

The purpose of this Habitat Connectivity AMP is to describe the adaptive management process used to inform and update elements of Mitigation Measure BIO-53, consistent with the Delta Plan's adaptive management framework. Adaptive management allows the best available science to be incorporated into management decisions and actions and to address uncertainties associated with those actions, as well as with system responses to processes like climate change. Specifically, adaptive management provides a means to evaluate the effectiveness of management actions in achieving biological resources objectives by comparing the outcomes to predicted responses and providing the scientific basis for continuing or modifying the action or implementing an alternative action. The remainder of this Habitat Connectivity AMP is organized as follows:

- Section 2, *Scope of Adaptive Management*, describes the focus of adaptive management, including species examined or the ecological area of focus, the spatial scope, and the relationship of the adaptive management process to other project activities and agency programs.
- Section 3, *Adaptive Management Framework*, describes the Habitat Connectivity AMP's high-level approach to adaptive management, including the three main adaptive management periods—Planning, Implementation, and Evaluate and Respond—which are aligned with the phases in Delta Plan Appendix 1B.
- Section 4, *Project Effects and Biological Resources Objectives*, details the effects of project mechanisms on focal species or the ecological area of focus, using a series of conceptual models, and establishes associated biological resources objectives for adaptive management.
- Section 5, *Monitoring*, provides a high-level description of the monitoring conducted to assess progress toward the Habitat Connectivity AMP objectives and improve understanding of uncertainties.
- Section 6, *Performance Measures and Management Response*, describes the performance measures and associated thresholds that define successful progress toward achieving Habitat Connectivity AMP objectives and details management responses that may be implemented if measures and thresholds are not met.
- Section 7, *Communications Program*, describes the public outreach and engagement program that will be in place to communicate project information.
- Section 8, *Governance Framework and Decision-Making Process*, details the framework for agency involvement in administering adaptive management and describes the annual decision-making process for implementing potential management responses.
- Section 9, *References,* provides full reference information for the citations in this document.

2 Scope of Adaptive Management

This Habitat Connectivity AMP details the process for informing additional studies and for modifying project design elements. Adaptive management focuses only on project effects where uncertainties regarding the nature of the effects generally require a characterization of baseline conditions that can be compared with project effects.

2.1 Spatial Scope

For this effort, adaptive management focuses on maintaining contiguous habitat connectivity along riparian banks and corridors within the project area.

2.2 Relationship to Project Activities

Adaptive management activities span multiple project study phases. Section 3 describes the activities associated with each of the three adaptive management periods: Planning, Implementation, and Evaluate and Respond. This section describes the project study phases and the relationship with each adaptive management period.

2.2.1 Project Development and Refinement

If the project is approved after the completion of appropriate environmental permits and approvals, the Project Development and Refinement study phase will occur during the first 1 to 2 years of project implementation (after applicable permits have been obtained), before final design and construction activities. Design elements will include the design of wildlife crossings and other wildlife connectivity features, wildlife habitat contiguity, revegetation plans, and fencing, which will be developed by DWR in coordination with a biologist qualified and experienced in wildlife crossing planning and design.

The Planning period of adaptive management will occur during this project study phase.

2.2.2 Baseline

During the Baseline project study phase, field monitoring studies of wildlife movement (e.g., cameras, tracking), roadkill data, and existing noise and light levels will be conducted in select locations within or near riparian corridors within the project footprint to collect both preconstruction and postconstruction baseline data. These monitoring studies will build on baseline information from existing programs, wildlife movement and roadkill databases, local knowledge, and prior environmental analyses. During this phase, baseline data on riparian habitat conditions at and near sites that will be impacted by project activities will also be conducted. Baseline studies will be conducted before construction to characterize preconstruction baseline conditions and after construction is completed to characterize postconstruction baseline conditions that inform adaptive management. The baseline conditions (preconstruction and postconstruction) will inform trends in study site characteristics and aid analyses in refining potential effects, including those that were initially identified through prior environmental review.

The Planning period (documentation of preconstruction baseline conditions) and the Implementation period of adaptive management will occur during this project study phase.

2.2.3 Project Operations

Monitoring studies will be conducted to inform the adaptive management of relevant design elements previously identified during the project's Project Development and Refinement study phase. Studies will include monitoring wildlife movement (e.g., cameras, tracking), roadkill data, noise and light levels, and riparian habitat conditions to determine exceedance of performance measure thresholds.

Both the Implementation period (implementation of project operations and monitoring studies) and the Evaluate and Respond period of adaptive management will occur during this project study phase.

2.3 Relationship to Agency Programs

DWR will coordinate with state and local agencies and with other organizations that monitor wildlife connectivity and maintain wildlife connectivity databases in the Sacramento–San Joaquin Delta.

3 Adaptive Management Framework

Adaptive management is a science-based, flexible approach to resource management decision-making. The Sacramento–San Joaquin Delta Reform Act of 2009 (SB X7-1) identified adaptive management as the desired approach to reduce the ecological uncertainty associated with the management of the Delta system. An adaptive management and monitoring plan will be prepared for each mitigation site to ensure habitat creation goals are met, consistent with the adaptive framework in Delta Plan Appendix 1B.

This Habitat Connectivity AMP encompasses three major periods: Planning, Implementation, and Evaluate and Respond. This Habitat Connectivity AMP documents all activities associated with the Planning period of adaptive management. This Habitat Connectivity AMP also describes the process expected to be followed during the Implementation period and the Evaluate and Respond period. Figure 1 shows the adaptive management framework that was developed for the Habitat Connectivity AMP following the Delta Plan adaptive management framework (Delta Stewardship Council 2013f:1B-2). The following text describes the high-level activities of each period.

1. Planning Period
    a. Define the problem.
    b. Establish habitat connectivity goals and objectives.
    c. Document preconstruction baseline conditions.

       Develop performance measures and potential management responses to meet habitat connectivity goals and objectives.
2. Implementation Period
    a. Implement project construction.
    b. Document postconstruction baseline conditions and implement monitoring after project operations are implemented.
3. Evaluate and Respond Period
    a. Analyze, synthesize, and evaluate monitoring results on a periodic (e.g., monthly or other timeframe, as needed to meet habitat connectivity objectives) and annual basis.
    b. Communicate current understanding.
    c. Adapt as needed based on information learned.

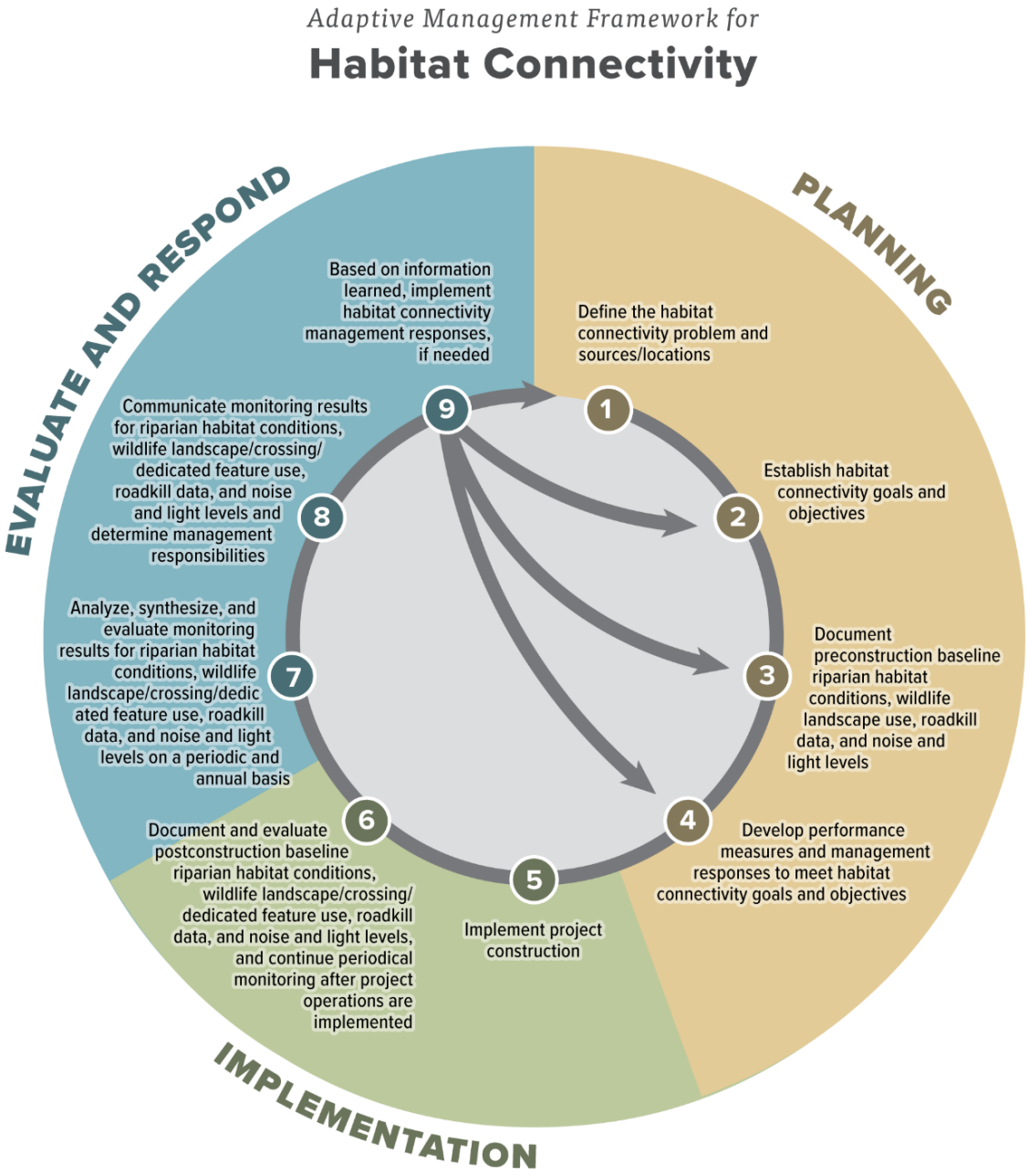

Figure 1. Adaptive Management Framework for Habitat Connectivity

3.1 Planning Period

The Planning period of adaptive management establishes the framework to be followed during the Implementation period and the Evaluate and Respond period once the project is implemented and operating. The Planning period includes the establishment of biological resources objectives—for the purpose of this Habitat Connectivity AMP, these consist of habitat connectivity objectives—the development of a monitoring plan to evaluate the objectives, the establishment of the process for executing adaptive management once the project is in operation, and documentation of preconstruction baseline conditions. Documentation of preconstruction baseline conditions are

described in Section 2.2, *Relationship to Project Activities*, of this document. The field monitoring studies conducted during the preconstruction baseline study phase of the project will allow for the evaluation of project effects on wildlife movement and habitat connectivity by providing a preconstruction baseline comparison of conditions before the project is built. The Planning period's activities are memorialized in this Habitat Connectivity AMP.

3.2 Implementation Period

The Implementation period of adaptive management includes the documentation of postconstruction baseline conditions as described in Section 2.2, *Relationship to Project Activities*, of this document. The field monitoring studies conducted during the postconstruction baseline study phase of the project will allow for the evaluation of project effects on wildlife movement and habitat connectivity by providing a postconstruction baseline comparison of conditions without the project in operation.

3.3 Evaluate and Respond Period

Once the project is constructed and operations are implemented, the Evaluate and Respond period of adaptive management will begin. Activities during this period will include monitoring of conditions assessed during preconstruction and postconstruction baseline studies, periodic and annual analyses of monitoring data, determining whether the performance thresholds for each wildlife movement objective were being exceeded, identifying any potential need for management responses, and implementing management responses as needed to better meet those objectives.

4 Project Effects and Biological Resources Objectives

An adaptive management approach requires explicit, measurable objectives (Williams et al. 2009). Uncertainty about how to achieve objectives motivates adaptive management and drives the design of the monitoring system. Objectives need to be measurable for two purposes: first, to allow for an assessment of progress toward their achievement and, second, to enable performance deviating from the objectives to trigger a change in management direction. Clearly articulating measurable objectives helps to separate adaptive management from trial and error, because the use of objectives directs and justifies the exploration of management options over time. It is important to note the distinction between monitoring in support of the adaptive management plan and the broader project compliance monitoring that will be conducted and described as part of the mitigation monitoring and reporting program and consistent with permit terms. While compliance monitoring will provide information that could ultimately be used to trigger changes to the project and subsequent environmental review, it is more tailored to demonstrating that the project is implemented as described and authorized rather than targeting specific areas of uncertainty (e.g., related to complex biological interactions in response to project operations).

4.1 Relationship to CEQA Impact Analyses and Consultation Effects

The effects analysis in the Final EIR includes a thorough analysis of all project effects on wildlife movement under the California Environmental Quality Act (CEQA). While the Final EIR analyzed the complete range of project effects, this Habitat Connectivity AMP focuses on a narrower subset of

effects with uncertainties regarding the nature of the impact on wildlife movement, specifically with respect to Mitigation Measure BIO-53. Habitat connectivity conditions of approval and mitigation measures developed through consultation with the California Department of Fish and Wildlife (CDFW) as part of the ITP and with USFWS as part of the BA are also listed below in this Habitat Connectivity AMP. As noted in Section 1.1, *Background*, of this document, the habitat connectivity measures in the ITP issued on February 14, 2025, and the BA submitted for consultation on May 15, 2024, do not explicitly include an adaptive management component as of, however, these conditions and measures are included in this Habitat Connectivity AMP for completeness.

Mitigation Measure BIO-53: Avoid and Minimize Impacts on Terrestrial Wildlife Connectivity and Movement

Design and Construction

The following measure will be implemented during project design and construction to avoid and minimize impacts on terrestrial wildlife connectivity and movement. The design and monitoring of the project will be developed and conducted in coordination with an agency-approved biologist qualified and experienced in wildlife crossing and connectivity planning and design. The agency-approved biologist must demonstrate an understanding of the species' ecological, behavioral, and movement needs across Wildlife Crossing Guilds (WCGs) and how to integrate the best design practices available—including measures to avoid and minimize noise, light, and other disturbances that may affect connectivity function—into project plans and specifications. The agency-approved biologist will oversee development and design of wildlife crossing structures, which will include wildlife fencing, as well as all other project elements and roadway features with connectivity requirements and specifications.[1]

- Contiguous habitat connectivity along riparian banks and corridors will be maintained during construction, to the extent feasible, to maintain connectivity at riparian banks and corridors at levees, intakes, and other facilities located along or within riparian banks and corridors. Riparian vegetation and canopy will be avoided and maintained to the maximum extent possible during construction. Design will include wildlife fencing where applicable to prevent wildlife access to construction areas that may be dangerous for wildlife, such as roads and other facilities. Fencing will also be designed and placed in a manner that facilitates wildlife movement through or between the riparian banks and corridors during construction. Feasibility will be determined, and design and maintenance of habitat contiguity and fencing will be developed and overseen by DWR in coordination with a biologist qualified and experienced in wildlife crossing planning and design and will be managed in coordination with the qualified biologist during construction phasing.

Operations

- Contiguous habitat connectivity along riparian banks and riparian corridors will be maintained during operations to maintain connectivity at riparian banks and corridors at levees, intakes, and other facilities located along/within riparian banks and corridors. The native riparian vegetation and canopy in these areas will be maintained to the maximum extent possible during operation. Where maintaining and reestablishing the riparian vegetation and canopy is not possible, plans will include landscaping with native plants that

[1] Mitigation Measure BIO-53 has been revised here to include only measures related to the project (Alternative 5 in the Final EIR); measures relevant only to other alternatives have been removed.

will provide the maximum amount of cover and heterogeneity possible and will also consider the use of other non-vegetative options to provide cover and heterogeneity to facilitate wildlife movement such as rock piles, snags, and human-made materials, such as faux rocks and trees that provide cover, yet are lightweight and not load-bearing. Design will include wildlife fencing where applicable to prevent wildlife access to roads and facilities. Fencing will also be designed and placed in a manner that facilitates wildlife movement through or between the riparian banks and corridors during construction. Design of habitat contiguity, revegetation, and fencing will be developed by DWR in coordination with a biologist qualified and experienced in wildlife crossing planning and design.

- An agency-approved biologist with demonstrated understanding of monitoring and adaptive management techniques used in the field of connectivity ecology, road ecology, and wildlife crossings will oversee operations monitoring of new wildlife crossings, connectivity enhancement measures (e.g., amphibian-friendly roads and curbs), new and modified roadways, and all project elements with potential to affect wildlife connectivity (e.g., project elements along riparian banks). Monitoring will occur for at least 5 years using best practices in the field and will be compiled to inform adaptive management strategies, which may be needed to ensure intended connectivity function and value are being achieved. Monitoring techniques may include wildlife camera monitoring, wildlife tracking, and roadkill monitoring. Monitoring will be conducted over multiple seasons and include considerations and methodologies targeting species across all WCGs as well as listed species. Monitoring will be conducted from locations where access allows.

4.1.1 CDFW Consultation

The ITP includes the following conditions of approval related to wildlife connectivity.

ITP Condition of Approval 11.12

Permittee shall construct roadways that are within Covered Species habitat such that there are no steep curbs, berms, dikes, or median barriers (e.g., k-cuts) that could prevent Covered Species from crossing or exiting the roadway. If curbs are necessary for safety and/or surface runoff, Permittee shall design and construct them to allow Covered Species to walk over them. Large culverts shall be installed for wildlife road under-crossings, to the extent possible, every 500 feet on new access roads to minimize road mortality and isolation on amphibian and reptile Covered Species. Permittee shall provide the number and approximate location(s) of proposed culverts designed for wildlife road under-crossings within the appropriate Construction Phase Authorization Package for CDFW approval. Unless otherwise approved by CDFW due to site-specific constraints, Permittee shall construct road culvert under-crossings using concrete with a natural substrate bottom such as sand, dirt, or gravel. A minimum under-crossing culvert size of six inches shall be used to ensure Covered Species and other wildlife may move across active roadways. Culvert under-crossing tunnels shall use “windows” for new roads within GGS suitable habitat as diurnal snakes are less likely to utilize culvert crossings that mimic burrows. Windows may be made of steel grates or other materials and shall be intermittent in placement. Steel grate windows shall not be placed directly in vehicle wheel pathways, as this would produce a “flashing” of light to dark for the species using the culvert under-crossing and would dissuade the use of the culvert tunnel.

ITP Condition of Approval 11.40 Breeding Habitat Avoidance Near Conserved Lands.

If the Designated Biologist(s) and/or Biological Monitor(s) identifies suitable aquatic breeding habitat within the Project Area south of Byron Highway, Permittee shall demarcate a no-activity buffer of at least 300 feet around the suitable aquatic breeding habitat and avoid Covered Activities within the suitable aquatic breeding habitat and no-activity buffer. Where Covered Activities cannot be avoided within the suitable aquatic breeding habitat or no-activity buffer, Permittee shall restrict Covered Activities to the dry season of July 15 – October 15 (Condition of Approval 11.44). Where suitable aquatic breeding habitat cannot be avoided by 300 feet, Permittee shall notify and coordinate with CDFW to implement site-specific avoidance and minimization measures through the appropriate Phase Authorization Package (Condition of Approval 6.2). Permittee shall consult with CDFW to develop further habitat protection measures at the Bethany Complex site to maintain connectivity between breeding habitat and suitable upland habitat and ensure impacts to breeding habitat are fully avoided. South of Byron Highway, Permittee shall delineate suitable CTS aquatic habitat within areas affected by Covered Activities including preconstruction activities, and SCADA, transmission line, and access road construction and maintenance sites with poly wire or other visible flagging approved by CDFW to demarcate a no-activity buffer of at least 300 feet around suitable breeding habitat.

4.1.2 USFWS Consultation

The BA for the project includes Avoidance and Minimization Measure BIO-24: *Minimize Access Road Impacts on Listed Amphibian Connectivity* to address potential impacts on wildlife connectivity. The BiOp for the project may include additional measures related to wildlife connectivity. Applicable measures will be included here upon the issuance of the BiOp by USFWS.

AMM-24: Minimize Access Road Impacts on Listed Amphibian Connectivity

To minimize impacts on California red-legged frog and California tiger salamander connectivity resulting from the construction of access roads in service to the Bethany Complex facilities, DWR will design and construct new and improved access roads that overlap with modeled California red-legged frog or California tiger salamander habitat.

1. Three water crossings (i.e., culverts or bridges)—a new section of Mountain House Road crossing over Mountain House Creek near the new Grant Line Road interchange, a widened section of Byron Highway crossing over an unnamed channel just south of the new Lindemann Road interchange, and a widened section of Mountain House Road crossing over unnamed channels between sections of the Delta Mendota Canal—will be designed and constructed to meet the following requirements.
    a. Completely span suitable California red-legged frog aquatic habitat.
    b. Maintain natural channel substrates or similar materials.
    c. Size bridges to include upland habitat on at least one side of each channel that is above the bank full width to allow for terrestrial movement and refugia from bank full flows.
    d. Size culverts to a minimum 1.5 feet wide and 3 feet of clearance (Clevenger and Huijser 2011).
2. Four new or improved road segments will be designed and constructed with the listed features: widened Mountain House Road; widened Byron Highway and the new Lindemann

Road interchange; new Mountain House Road section at the Grant Line Road interchange; and the new section of road between Mountain House Road and the Bethany discharge structure.

3. New and widened access road segments will avoid installing curbs, to the extent practicable. If curbs must be installed, curbs will be designed with sloping sides less than 30 degrees (Clevenger and Huijser 2011) to allow amphibian movement across the road.
4. New and widened access road segments will avoid installing median barriers (i.e., k-rails), to the extent practicable. If median barriers cannot be avoided due to public safety concerns, barriers will be outfitted with small openings at ground level to allow amphibian passage.

4.2 Project Effects

Adaptive management is focused on a narrower subset of the impacts described in the Final EIR. Adaptive management generally focuses on project effects where uncertainties exist regarding the nature of the effects, thus requiring a characterization of baseline conditions that can be compared to project effects. Effects that are unlikely to occur or that are expected to have only a negligible impact according to the Final EIR analyses are also not expected to be affected by adaptive management actions and are not included in this Habitat Connectivity AMP.

Project effects on wildlife movement are related to habitat loss and fragmentation, vehicle and train collisions, and other barriers to movement, and these are described in detail under Impact BIO-53: *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* in Final EIR Volume 1, Chapter 13, *Terrestrial Biological Resources*.

- Movement of construction-related equipment and traffic could result in collisions and could increase wildlife mortality.
- Construction of new roads and road improvements could increase traffic volumes, cause habitat fragmentation, create potential movement barriers, and potentially result in increased wildlife mortality from vehicle collisions.
- Construction of new rail spurs on Lower Roberts Island and associated increased rail traffic could result in potential habitat connectivity and wildlife movement barriers and increased wildlife mortality risk from train collisions.
- Construction of the north Delta intakes will remove and fragment riparian habitat along the banks of the Sacramento River, creating movement barriers and potentially increasing wildlife road crossings and wildlife-vehicle collision risk as species attempt to navigate around the facilities.
- Construction of project facilities (e.g., outlet and control structures, park-and-ride facilities, switching stations, RTM areas, and shafts) could result in barriers to species movements and habitat access and to reduced species movement abilities. Construction of project facilities may create wildlife movement barriers and potentially increase at-grade wildlife road crossings and wildlife-vehicle collision risk as species attempt to navigate around the facilities.

4.3 Established Objectives

The Habitat Connectivity AMP objectives listed in the following subsections are tied to the project effect mechanisms described in Section 4.2, *Project Effects*, of this document. See Section 6 of this document for details on performance measures related to each AMP objective.

4.3.1 Objective 1: Maintain and Improve Habitat Connectivity and Minimize Wildlife Mortality Along Public Roadways

Objective 1a: Ensure Wildlife Crossings and Dedicated Wildlife Connectivity Features Function as Anticipated

Functional wildlife crossings, including exclusion and directional wildlife fencing, and project design elements (e.g., connectivity enhancement measures such as amphibian-friendly curbs) that allow at-grade crossings are integral to maintaining and reconnecting habitats fragmented by roads and other barriers to wildlife movement and to minimizing wildlife-vehicle collisions on public roads. Dedicated wildlife connectivity features (e.g., wildlife pathways/corridors around intake structures) and associated exclusion fencing can also help maintain habitat connectivity and minimize wildlife-vehicle collisions through areas of development.

Objective 1b: Maintain and Reestablish Contiguous Riparian Habitat at Levees, Intakes, and Other Facilities in Riparian Habitat

Riparian habitat provides an important corridor for wildlife movement, particularly in areas of agricultural and other development where habitat has been altered substantially from the surrounding landscape.

5 Monitoring

Monitoring is fundamental to adaptive management as a source of data with which to test alternative models and measure progress toward accomplishing management objectives (Williams et al. 2009). Simply put, adaptive management is not possible without effective monitoring. Not only does monitoring track progress toward achieving objectives, but it leads to a reduction in uncertainty and helps to answer the questions that need to be answered to track progress toward achieving the objectives (Williams et al. 2009).

As described in Mitigation Measure BIO-53 in Final EIR Volume 1, Chapter 13, an agency-approved biologist with demonstrated understanding of monitoring and adaptive management techniques used in the field of connectivity ecology, road ecology, and wildlife crossings will oversee operations monitoring of new wildlife crossings, connectivity enhancement measures (e.g., amphibian-friendly roads and curbs), new and modified roadways, and all project elements with potential to affect wildlife connectivity (e.g., project elements along riparian banks). Monitoring will occur for at least 5 years using best practices in the field and will be compiled to inform adaptive management strategies, which may be needed to ensure intended connectivity function and value are being achieved. Monitoring techniques may include wildlife camera monitoring, wildlife tracking, and roadkill monitoring. Monitoring will be conducted over multiple seasons and include considerations

and methodologies targeting species across all WCGs as well as listed species. Monitoring will be conducted from locations where access allows.

6 Performance Measures and Management Response

An aim of this Habitat Connectivity AMP is to guide monitoring and to identify the thresholds that may compose the biological objectives of the project. This chapter summarizes performance measures that identify how the success of the project will be measured, identify areas where unexpected outcomes may arise, and develop potential responses to those outcomes. This section is based on the Habitat Connectivity AMP objectives, listed in Section 4.3, *Established Objectives*, of this document. These objectives will be monitored using various methods described in Section 5 of this document. For each objective, this section details the associated monitoring study, metric, timeframe to evaluate, performance threshold, and potential management responses, with definitions for each described as follows:

- **Associated Monitoring Study:** The monitoring study used to track progress toward achieving the objective.
- **Metric:** The unit of measurement/process needed to track progress toward achieving the objective.
- **Timeframe to Evaluate:** The length of time that the metric will measure to determine whether the objective is being met. Although the evaluation of performance will occur periodically (e.g., monthly) and annually, some performance thresholds will require multiple years of data to detect performance issues.
- **Performance Threshold**: The quantitative threshold for when adaptive management actions will be considered. Adaptive management will occur when the project is shown to have caused a change that surpasses predetermined acceptable values. This threshold value (or range of values) will trigger adaptive management actions that aim to course correct the project back to desired conditions.
- **Potential Management Responses**: The management actions to be considered once a performance threshold is reached. These responses may include additional study, operational changes, or near-field habitat alterations. Additional study could be necessary to further examine the causation of observed effects. Should a performance threshold be exceeded and should the project be suspected as the cause of the exceedance, DWR will work with state and federal agencies to determine the appropriate management response.

Adaptive management actions will consider avoidance and minimization measures from relevant project environmental documents (e.g., EIR, BA) and permits (e.g., ITP) to ensure that no management actions conflict with the requirements of these commitments, especially when commitments could be affected by the timing and location of those actions. For example, if a Swainson's hawk nest is located near an area where adaptive management is needed, all management actions will comply with the conditions of approval related to Swainson's hawk in the ITP. These potential limitations will be addressed in future and site-specific management plans developed for wildlife crossings, fencing, dedicated wildlife connectivity features, and riparian habitat restoration sites.

6.1 Objective 1: Maintain and Improve Habitat Connectivity

6.1.1 Objective 1a: Ensure Wildlife Crossings and Dedicated Wildlife Connectivity Features Function as Anticipated

Associated Monitoring Study

- Postconstruction monitoring studies—including camera monitoring, wildlife tracking, and roadkill studies—of new wildlife crossings, fencing, connectivity enhancement measures (e.g., amphibian-friendly roads and curbs), dedicated wildlife connectivity features (e.g., wildlife pathways/corridors around intake structures), and new and modified roadways will be conducted to determine the effectiveness of the features for target WCGs.
- Visual inspections will be conducted to identify any areas of damaged or obstructed crossings, exclusion (including jump-outs) and directional fencing associated with crossings and dedicated wildlife connectivity features, connectivity enhancement measures, and dedicated wildlife connectivity features.

Metric

- Use of new wildlife crossings and dedicated wildlife connectivity features by target WCGs.
- Wildlife-vehicle collisions at new and improved roadways.
- Physical suitability of wildlife crossings, fencing, connectivity enhancement measures, and dedicated wildlife connectivity features, as determined through visual observations.
- Visual observations of fence damage.

Timeframe to Evaluate

Evaluation of wildlife crossing, fencing, and dedicated wildlife connectivity feature function will occur annually for approximately 5 years but may be subject to modification (e.g., additional years) based on observed conditions. Monitoring studies will be conducted monthly, and intermediate evaluations will also be conducted within each year to determine whether there is a need to improve the functionality of structures, fencing, or other wildlife movement features to improve their efficacy. Monitoring of wildlife crossing structures has shown that wildlife response to crossing construction and/or improvements increases with time since construction because wildlife likely experience a learning curve in terms of adapting to the new conditions (Clevenger and Huijser 2011). Thus, wildlife movement by target WCGs may not be documented within the first or second year of monitoring, even if management response measures—such as trespass-abatement—or vegetation-abatement measures are successful in meeting their intended objectives.

Performance Threshold

- Camera and tracking studies show lack of use by target WCGs (e.g., wildlife approach but do not pass through the crossing).
- Data from monitoring studies (e.g., cameras, tracking, or roadkill studies) show that the design of exclusion fencing to keep wildlife off roadways and directional fencing installed to guide wildlife to crossings is shown to be ineffective or that areas of damaged fencing are observed.

- Data from monitoring studies show an increase in wildlife-vehicle collisions at improved roadways compared to baseline studies.
- Data from monitoring studies show higher-than-anticipated wildlife-vehicle collisions at new roadways as determined by a qualified biologist and based on preconstruction surveys.
- Camera studies or visual observations identify factors that might be affecting wildlife movement (e.g., noise levels, light levels, flooding/inundation of the crossing area, trash, other blockage—trees, downed vegetation—or unauthorized human use/trespass).

Potential Management Responses

- Conduct regular patrols to minimize trespass.
- Pick up minor forms of trash and clear debris and other blockages during monitoring and patrolling activities.
- Repair minor damage to exclusion and directional wildlife fences immediately during monitoring activities.
- Report major forms of trash and debris (e.g., dumped household appliances), other blockages (e.g., downed trees blocking crossing or feature entrances, accumulation of sediment restricting crossing openness), and major fencing damage to project management. Project management will plan and fund repairs, maintenance, and cleanup activities.
    - Coordinate with CDFW to review project-design deficiencies or site conditions (e.g., inundation, vegetation blockage) that may be negatively impacting wildlife movement and identify additional maintenance or management actions to address deficiencies.
    - Remove undesired vegetation and other items that form barriers to movement.
    - Ensure that undesired standing water is drained or pumped from the undercrossing.
    - Maintain the substrate base identified for the crossing (e.g., the desire is to maintain a sandy substrate, but sand is being blown or washed away, and the substrate is becoming rocky).
    - Maintain or replace any structures or items that are placed within the crossings to provide animals with cover as they pass through the crossing (e.g., vegetation piles, rock fields, concrete blocks).
    - Coordinate with a biologist experienced in wildlife crossing planning and design to redesign exclusion (including jump-outs) and directional fencing or identify areas where additional fencing or features are required to facilitate wildlife movement and to reduce potential wildlife-vehicle collisions. This may include adding wildlife crossing warning signage near exclusion fence ends to warn drivers of the hazard of potential wildlife crossing the road.
    - Identify the need for any additional studies or modified protocols that could answer specific questions related to potential deficiencies. These could include:
        - Deploying more cameras to document movement in locations of interest
        - Relocating cameras
        - Increasing or decreasing maintenance schedule
        - Increasing security of equipment

- Addressing other needs or challenges to monitoring that arise

- Implement patrols, alternative fencing, gate, and/or lock-system designs, or consultation with adjacent landowners if unauthorized use/trespass were found to originate off-site.
- Monitor noise and light levels at wildlife crossings and other dedicated wildlife connectivity features at a subset of locations and/or where monitoring studies show that crossings and features are not fully functional and make modifications (e.g., install sound and/or light attenuation structures) to improve functionality at crossings and features where sound and light from anthropogenic sources are inhibiting wildlife movement.
- Assess the appropriateness and efficacy of installing wildlife motion sensors and alert systems (e.g., flashing lights) to alert drivers approaching a section of new and improved roadways with crossing wildlife where monitoring studies show that wildlife-vehicle collisions are increased and/or higher than anticipated and wildlife crossings, fencing, and other dedicated wildlife connectivity features are otherwise functional (e.g., no trash, debris, or other blockages, crossing not inundated or filled with sediment, no openings in directional and wildlife fences).

6.1.2 Objective 1b: Maintain and Reestablish Contiguous Riparian Habitat at Levees, Intakes, and Other Facilities in Riparian Habitat

Associated Monitoring Study

Surveys will be conducted to monitor riparian habitat conditions (i.e., connectivity, structure, composition, and function) at maintained and restored areas.

Metric

Specific metrics to assess the condition of maintained or reestablished riparian habitat will depend on site-specific conditions. Examples of possible riparian habitat metrics include:

- Width, height, and percent cover of riparian canopy and understory
- Percent cover and composition of native riparian tree, shrub, and herbaceous species
- Presence of invasive species
- Survivorship of plantings

Timeframe to Evaluate

The timeframe to evaluate the success of riparian habitat maintenance or reestablishment will depend on site-specific conditions. Evaluations will occur at established intervals where maintenance, new plantings, or use of faux vegetation are required. For example, riparian plantings may be visually assessed annually for approximately 5 years and then every 5 years until 20 years following restoration, depending on the type of riparian habitat (i.e., forest or scrub).

Performance Threshold

Performance thresholds for maintained and reestablished riparian habitat along levees, intakes, and other facilities will depend on site-specific conditions. Site-specific management plans will include performance thresholds for riparian habitat variables that demonstrate the structure, composition, and function of the maintained or restored habitat, such as width, cover, and vegetation species

composition. Performance thresholds and site-specific management plans for reestablished riparian habitat will also include overall health, establishment, and growth of plantings, seed species, and target habitat (Table 1). These thresholds will be based on the best available guidance, such as the *California Riparian Habitat Restoration Handbook* (Riparian Habitat Joint Venture 2009). Examples of common performance thresholds for riparian habitat include the following:

- Habitat monitoring indicates low survival of riparian plantings.
- Riparian canopy cover is less than established thresholds (e.g., 25% canopy cover).
- Percent cover of invasive herbaceous plant species exceeds established thresholds (e.g., 20% cover).

Table 1. Example Habitat Restoration Performance Standards and Year 5 Success Criteria

Parameter	Year 1	Year 2	Year 3	Year 4	Year 5
Native Vegetation Absolute Cover: Minimum native species absolute cover.	N/A	50%	80%	95%	110%
Planting Survivorship: All dead plants and cuttings will be replaced at end of Years 2 and 3. In Years 4 and 5, dead plants and cuttings will be replaced to maintain 90 percent of original planting numbers, unless replaced by native natural recruit of similar type (i.e., native tree recruit replaces tree planting), or site is meeting native cover standards.	N/A	100%	100%	90%	90%
Perennial and Target Invasive Species Absolute Cover: Maximum absolute cover of target invasives: pampas grass, salt cedar, athel tree, palms, and tree tobacco.	N/A	5%	5%	0%	0%
Other Invasive and Nonnative Species Absolute Cover: Maximum absolute cover of other invasive and nonnative plant species.	N/A	5%	5%	5%	5%
Native Species Richness: Number of native species present.	≥ Baseline Assessment				

Potential Management Responses

- Develop a revegetation plan that incorporates local Traditional Ecological Knowledge (e.g., in the seed and plant palettes, in other restoration activities to ensure success of revegetated areas) to maintain and reestablish riparian habitat.
- Revegetate areas of riparian habitat degraded during operation of the project and areas where restoration does not meet performance thresholds.
- Conduct invasive plant management.
- Where maintaining and reestablishing the riparian vegetation and canopy is not possible, establish landscape with native plants that will provide the maximum amount of cover and heterogeneity possible and that provide food and nectar and serve as host plants for common invertebrate pollinator species. Also consider the use of other non-vegetative options to provide cover and heterogeneity to facilitate wildlife movement, such as rock piles, snags, and human-

made materials such as faux rocks and trees that provide cover yet are lightweight and not load-bearing.

7 Communications Program

A communications program based on DWR's existing public outreach and engagement program will be in place to communicate project information. The communications program will provide a framework for communicating data and decision-making to policymakers, managers, interested parties, and the public. Project information will also be conveyed to and coordinated with agency partners, including CDFW and USFWS where relevant. As this Habitat Connectivity AMP is further developed and refined, specific details, such as how resource-specific data are best synthesized and presented, will be added to the communications program.

8 Governance Framework and Decision-Making Process

8.1 Governance Framework

Implementing the Habitat Connectivity AMP will be a collaborative process that will be essential to the successful maintenance of wildlife movement in the project area. Under this Habitat Connectivity AMP, new information gained during implementation will inform future adaptive management decisions within the ranges of criteria and effects analyzed in the Final EIR. The implementing agencies described in Section 8.1.1, *Implementing Agencies*, of this document commit to working through the collaborative process to reach consensus on adaptive management decisions and other management actions to the extent possible and to elevate any disputes over decisions to appropriate levels of officials for each agency. Each agency retains discretion to make decisions as appropriate within its authority after considering the available information. If, as part of the adaptive management process, an operational change—such as replacement of wildlife crossing structures, fencing, signage, and dedicated wildlife connectivity features that will impact listed species habitat—is deemed necessary, further permitting may be required.

8.1.1 Implementing Agencies

California Department of Water Resources

DWR is a state agency within the California Natural Resources Agency (CNRA) charged with responsibility for operating and maintaining the SWP's existing Delta facilities and will be responsible for constructing and operating new north Delta diversion facilities.

California Department of Fish and Wildlife

CDFW is a state agency within the CNRA charged with responsibility for administering the California Endangered Species Act and providing for the conservation of state-listed species and their habitats.

U.S. Fish and Wildlife Service

USFWS is a federal agency within the U.S. Department of the Interior charged with responsibility for administering the federal Endangered Species Act and providing for the conservation of federally listed fresh water and semi-anadromous aquatic and terrestrial species and their habitats.

State Water Project Contractors

The SWP contractors are public agencies that receive water under contract from the SWP. These public water agencies fund operation and maintenance of the existing SWP Delta facilities and will fund a portion of the costs to implement the project.

8.2 Decision-Making Process

DWR will request and consider input and recommendations from technical experts, including experts on Indigenous knowledge, in its decision-making process.

9 References

California Department of Water Resources. 2023c. *Delta Conveyance Project Final Environmental Impact Report*. Volume 1. December. (ICF 103653.0.003.) Sacramento, CA. Prepared by ICF, Sacramento, CA.

- Chapter 8: Groundwater. Available: https://cadwr.app.box.com/s/kmr108flzu5spzszp0sbapuxx9v4slzd. **[DCP.D1.1.00060]**
- Chapter 13: Terrestrial Biological Resources. Available: https://cadwr.app.box.com/s/ny7vkx1rro9kmwonqnkin6hfgu0r8xq8. **[DCP.D1.1.00112]**

Clevenger, A. P., and M. P. Huijser. 2011. *Wildlife Crossing Structure Handbook: Design and Evaluation in North America*. No. FHWA-CFL-TD-11-003. United States. Federal Highway Administration. Central Federal Lands Highway Division. **[DCP.D3.1.02109]**

Delta Stewardship Council. 2013f. Appendix 1B, Adaptive Management. In *The Delta Plan*. Available: https://deltacouncil.ca.gov/pdf/delta-plan/2015-appendix-1b.pdf. **[DCP.D3.3.00013]**

Riparian Habitat Joint Venture. 2009. *California Riparian Habitat Restoration Handbook, Second Edition*. July. Available: https://riverpartners.org/initiatives/riparian-restoration-handbook/. **[DCP.AA2.3.00001]**

Williams, B. K., R. C. Szaro, and C. D. Shapiro. 2009. *Adaptive Management: The U.S. Department of the Interior Technical Guide.* Washington, DC: U.S. Department of the Interior, Adaptive Management Working Group. **[DCP.AA2.1.00102]**