

# Building Gulf Coast Resilience

Lessons from the California WaterFix



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# Building Gulf Coast Resilience: Lessons from the California WaterFix

## Executive Summary

### Background

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The State of California is working to implement a large-scale project — called the “California WaterFix” — to improve water delivery from the Sacramento-San Joaquin Delta to millions of California residents, businesses, and farms and to enhance the health of the Delta ecosystem. The project involves the construction of two large tunnels from the north-end of the Delta to pumping stations at the south-end of the Delta connecting to water supply systems flowing to the San Francisco Bay Area, Southern California, and the Central Valley. Construction of the tunnels will reduce the environmental impacts of California’s water delivery system and enhance the resilience of the Delta and California’s water supply to the impacts of climate change. The project also involves large-scale restoration of the Delta to enhance wetland and riparian ecosystems and improve conditions for endangered species (e.g., salmon and delta smelt).

The size and scope of the California WaterFix project provides many useful and interesting corollaries for some of the larger and more complex Gulf Coast restoration projects. With the California WaterFix, state and federal agencies were able to make advancements in terms of agency coordination, permitting, adaptive management, and accounting for climate resilience in the environmental review process. This case study presents lessons from the California experience on opportunities for expediting permitting and environmental review and

creative application of existing laws and processes to achieve a favorable outcome.

### Lessons and Recommendations

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#### **Coordination and communication is good governance.**

With the WaterFix project, federal and state agency coordination was enhanced by establishing a common goal of improving water deliveries out of the Delta and reducing the environmental impact of the current water delivery system. Agreement on the common goals for the project helped to build a mutually agreed upon foundation for agency engagement and permitting. The WaterFix project also benefited from political leadership and support at the highest levels of government — from California Governor Edmund Gerald “Jerry” Brown, Jr. and federal agency leadership within the Obama administration. Building from this leadership, staff set up interagency coordination teams to ensure regular communication among relevant agencies. This approach creates trust among the organizations, generates efficiencies, enables innovation, and reduces duplication and time needed to complete the work. Finally, California also dedicated funding to provide federal agencies with the resources needed to conduct “pre-consultation” activities with their state counterparts, which guaranteed staff time for early and frequent communication and coordination, in the face of numerous competing demands. For Gulf restoration projects — with numerous agencies involved — similar efforts to keep leadership engaged and informed

will be needed to keep attention on priority projects and to ensure that agency staff have the direction and resources needed to coordinate with other agencies and quickly address problems as they arise. The Gulf Coast states and the federal agencies could look to create similar interagency coordinating teams with staff dedicated to reviewing specific types of projects. And the Gulf Coast states could also consider mechanisms to pay for staff time needed to support pre-consultation activities with federal agencies responsible for issuing permits and completing environmental review.

### **Use environmental review and permitting as a framework for improving project outcomes.**

With the California WaterFix, agencies used the environmental review process to adapt the project design based upon environmental impacts identified during initial stages of analyses. Project proponents viewed these changes as opportunities to improve the project and expedite later permitting, rather than as roadblocks. But the project proponents are not the only ones who need to be flexible. As the WaterFix shows, regulatory agencies provided flexibility by agreeing to stage the numerous permits needed to authorize phases of the project (including Endangered Species Act authorizations and Army Corps permits). The agencies involved with the WaterFix project have proven that tools exist for authorizing different phases of a project as details are clarified — such as later phases of design and engineering, funding sources, and operational components. By phasing permits and environmental review and conducting programmatic reviews and approvals, the agencies overseeing the California WaterFix were able to keep the project moving forward while additional technical details were worked out. However, in taking this “staged approach,” project proponents must also be aware and comfortable with the potential risks that exist when starting construction with late-stage permits still pending. Proponents of Gulf Coast projects could learn from this example

by both being open to adapting project designs based upon environmental and regulatory considerations and by seeking phased environmental reviews and permitting from federal regulators for larger-scale projects with more complicated compliance considerations.

### **Consider adaptive management throughout project design and allocate appropriate funding to maintain monitoring.**

Adaptive management will likely be a critical element of many of the Gulf restoration projects and should be incorporated into the project design as early as possible, as was done with the WaterFix. Funding for the monitoring needed to implement robust adaptive management should be available in the overall project budget or funded through another dedicated source. Adaptive management for large-scale operational projects is uncommon, and agencies permitting and operating these projects will have to become comfortable acting on the best data available, even in light of uncertainty and potential litigation risk.

### **Account for climate change resilience in project alternatives.**

Many recent National Environmental Policy Act analyses address how a project will contribute to climate change and how the project may be affected by climate change impacts. However, the robust analysis of how the California WaterFix project will affect system resilience and the adaptability of the region as a whole in light of climate change is fairly unique. It provides an excellent example of how restoration projects in the Gulf Coast states might assess the need for wetland restoration projects in light of projected sea-level rise and other climate impacts. It also shows how project proponents can consider how climate change will affect the region and ecosystems if no action is taken and compare that “no-action alternative” to the beneficial conditions that will be created by implementing the project.

## Background

The “California WaterFix” is a large-scale infrastructure project designed to carry fresh water from the Sacramento River — *under* the Sacramento-San Joaquin Delta — to existing intake stations in the south Delta. The project is being developed to improve water delivery to millions of California residents, businesses, and farms, while reducing the environmental impacts caused by the current water withdrawals from this important ecosystem. The project is being designed to address water quality, environmental, seismic, and climate change threats to the state’s water supply.

Currently, water management in Northern California consists of a vast array of dams, reservoirs, aqueducts, and pumping stations that provide flood control and energy generation in the north, as well as water exports to more arid regions of the state south of the Delta. Two separate, yet coordinated, projects make up this array of infrastructure: The State Water Project (SWP), run by the California Department of Water Resources (DWR), and the Central Valley Project (CVP), run by the federal Bureau of Reclamation (Reclamation). These systems are old and inefficient. Additionally, controversy about these systems has existed for decades due to the environmental impacts of removing significant amounts of fresh water from the Delta ecosystem, which have only amplified as water demand has increased. One specific point of concern is the pumping activities in the south Delta. Pumping operations are known to cause reverse flow in the nearby rivers, affecting wetlands and riparian habitats, as well as threatened and endangered species, such as salmon and delta smelt.

The California WaterFix consists of two large tunnels running from just south of Sacramento to the existing pumping stations in the Clifton Court Forebay. Each tunnel will be about 40 feet in diameter and run for about 30 miles underground.<sup>1</sup>

The project will deliver water to 25 million people in San Francisco and cities in Southern California and it will also supply water to three million acres of farmland and related industries.<sup>2</sup> The cost of the project is currently estimated at \$17 billion and will be paid for by the public water agencies, which deliver water to municipal users and farms.<sup>3</sup>

The project will also include measures to mitigate environmental impacts from the construction and operation of the tunnels. New intake structures and fish screens will reduce impacts to endangered fish species in the Delta, and the tunnels will remove water from high up in the system, which will mitigate the harmful reverse flows in the south Delta river systems.<sup>4</sup> The water agencies benefiting from the project will fund acquisitions and conservation easements to protect 13,000 acres of land and will restore 2,300 acres of habitat.<sup>5</sup> The state will also restore more than 30,000 acres of critical Delta habitat under the California EcoRestore program, funded primarily through Proposition 1 (in addition to the cost of the tunnel project noted above).<sup>6</sup>

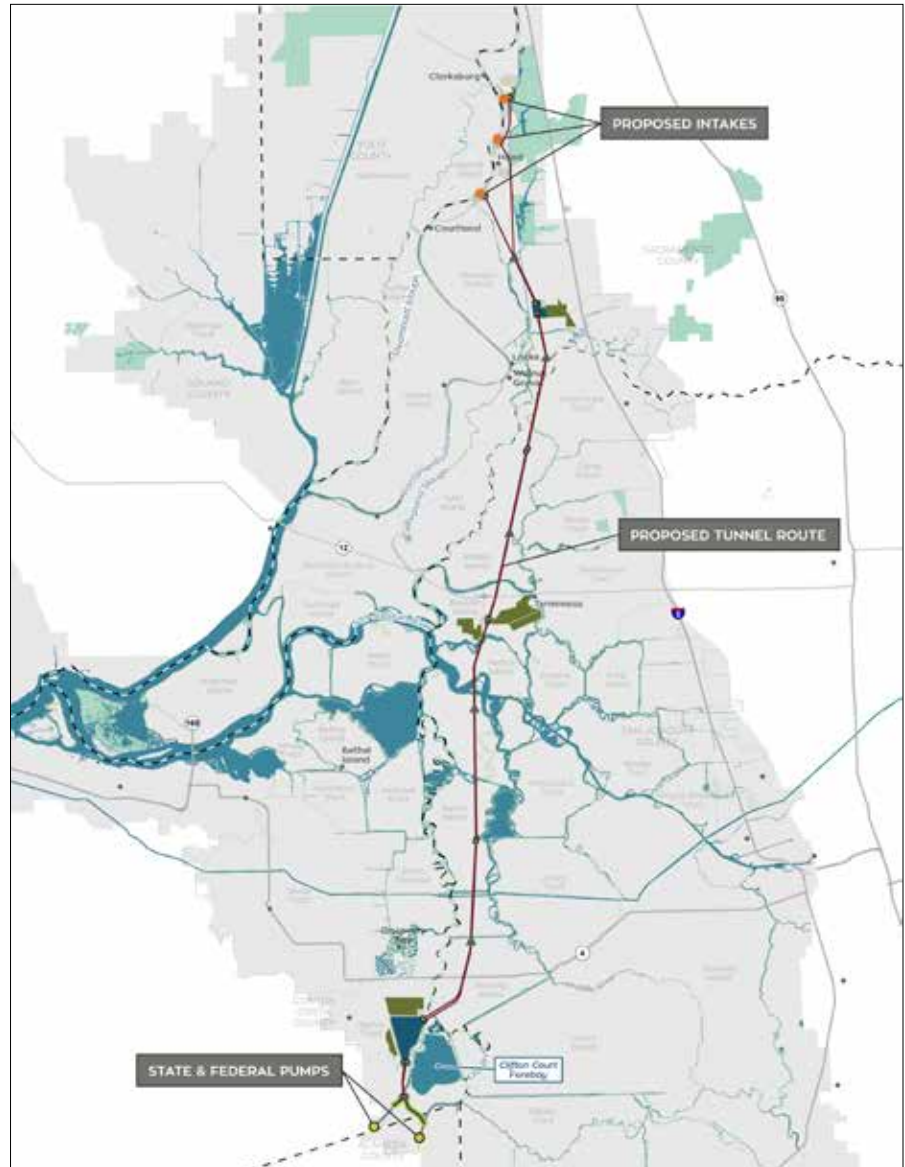
Because of the scale and complexity of the WaterFix project, both in number of agencies involved and the number of permits needed, it can provide useful lessons learned for upcoming large-scale restoration activities proposed for the Gulf of Mexico. While the California WaterFix project has faced significant obstacles, the state’s process for developing the project presents useful lessons for improving coordination across agencies and levels of government and for streamlining environmental review and permitting. The project also shows how environmental review and compliance can be used to improve the design of a project and evaluate how a project will contribute to improving the overall resilience of a region to the impacts of climate change. These lessons will be critical for proponents of Gulf Coast restoration projects that will require similar coordination across federal agencies and that will benefit from analysis of their resilience benefits.

## Legal Context

### Environmental Review and Permitting

As a complex infrastructure project, the WaterFix project is subject to environmental review and permitting requirements under both state and federal laws. Many of the same federal laws that apply to the Deepwater Horizon (DWH) restoration projects, are also implicated by the California WaterFix.

- **National Environmental Policy Act (NEPA)** — NEPA requires consideration of the potential environmental and other impacts of federally authorized and funded projects.<sup>7</sup> Similarly, under the **California Environmental Quality Act (CEQA)**, state actions also require environmental review under CEQA, the state equivalent to NEPA.<sup>8</sup>
- **Endangered Species Act (ESA)** — Federal agencies must determine if a project “may impact” species listed as threatened or endangered through consultation with the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (FWS) (Section 7 consultation).<sup>9</sup> If so, a Biological Opinion (BO) is required to assess whether the project will “adversely impact” the species or its critical habitat. If it is found that the project could harass or harm (i.e., “take”) a listed species, an Incidental Take Statement is required. California also has its own, **California State Endangered Species Act (CESA)**,



Map of the Proposed California WaterFix Project.

The official California WaterFix map (as of June 2018) displays the project’s proposed intakes, tunnel route, and state and federal pumps.

Credit: California Natural Resources Agency



which requires state agencies to similarly consider impacts to species listed on the state list of threatened and endangered species, which can be more inclusive than the federal list.<sup>10</sup>

- **Rivers and Harbors Act (RHA)** — Section 10 of the RHA requires a permit to conduct work and build structures within navigable waters; Section 14 of the RHA (“408 permit”) requires a permit for the permanent or temporary alteration or use of any existing federal civil works project.<sup>11</sup>
- **Clean Water Act (CWA)** — Section 404 of the CWA requires a federal permit for dredging and filling activities in “waters of the United States.” Under Section 401, a state must certify that dredging and filling activities are consistent with that state’s Water Quality Standards.<sup>12</sup>

## Agency Roles

The California WaterFix project requires substantial coordination among numerous federal and state agencies to complete the necessary reviews and permitting processes, and ultimately for ongoing operations and adaptive management.

### Federal Agencies

- **Department of the Interior’s Bureau of Reclamation (Reclamation)** — Reclamation operates the Central Valley Water project in coordination with the State of California and is the lead agency for NEPA review of the California WaterFix Project.
- **Army Corps of Engineers (Corps)** — The Corps is a cooperating agency for NEPA and has asked Reclamation to act on its behalf for ESA Section 7 consultations. The Corps also issues permits to evaluate the project for compliance with Sections 10 and 408 of the Rivers and Harbors Act and Section 404 of the Clean Water Act.
- **National Oceanic and Atmospheric Administration’s National Marine Fisheries Service (NMFS)** — NMFS is a cooperating agency for NEPA and issues the Biological Opinion and Incidental Take Statement regarding impacts to Chinook salmon, green sturgeon, and California Central Valley steelhead under the ESA.
- **Department of the Interior’s U.S. Fish and Wildlife Service (FWS)** — FWS is a cooperating agency for NEPA and issues the Biological Opinion and Incidental Take Statement regarding impacts to threatened delta smelt under the ESA.

### State Agencies

- **Department of Water Resources (DWR)** — DWR currently operates the State Water Project and is the project applicant for purposes of obtaining federal permits. It is also the lead agency for complying with CEQA.
- **State Water Resources Control Board (SWRCB)** — SWRCB will provide water quality certification under Section 401 of the CWA.
- **California Fish and Game** — Fish and Game will review the project for impacts to species listed under the CESA.

## Lessons Learned

While discussions about how to fix water conveyance in the Delta have been ongoing for decades, Gov. Jerry Brown made finding a solution to the dual goals of water supply and environmental health of the Delta a priority when he took office in 2010. The state, with the deadline of finding and implementing a solution by the end of the Governor’s current term in 2018, engaged with the federal agencies to plan and permit this massive

### Memorandum of Understanding (MOU) on Coordination for the High-Speed Rail

The California WaterFix interagency coordination was never formally defined, but it has been for other projects. For example, U.S. Department of Transportation, California High-Speed Rail Authority, U.S. Environmental Protection Agency, and the Army Corps of Engineers signed a MOU for coordination on the California High-Speed Rail project. This document spelled out roles, the staging of different decisions, coordination, and a process to elevate issues to leadership. These types of agreements can take time in the beginning of a project to draft and approve, but often create certainty and reduce hurdles and misunderstandings as a project progresses. Staff interviewed for this project indicated that this type of formal agreement is often helpful to the process and can be worth the extra effort upfront.

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project within five years. Progress is a result of significant interagency coordination, flexibility, and a commitment to adaptive management. Additionally, the project provides a useful test case about how to incorporate climate change impacts throughout project delivery.

### Interagency Coordination

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The WaterFix project affects water deliveries, navigation, endangered species, natural habitats, and public safety. As such, five major state and federal agencies have roles to play — all guided by different statutes — in the design and implementation of the project. To ensure timely completion, the state and federal agencies realized early on that significant effort would be needed to coordinate the analysis and staging of each of the required permits. This was achieved by engaging people throughout each agency’s decisionmaking process and chain of command.

Most importantly, the Governor himself was engaged and clear about his priority to complete the project. He worked directly with the Deputy Secretary of the Interior, as well as other federal agency heads, to secure their commitment to the project at the outset. The Governor and Interior Deputy Secretary Mike Connor announced the accelerated project together on April 20, 2015, further showing their joint commitment to getting this project done in a timely manner.<sup>13</sup>

No formal agreement exists among the parties about roles and responsibilities, but the agencies’ early agreement to work together was essential to

meeting an accelerated timeline. Senior leadership in Washington, D.C. were updated weekly by staff in the region on progress and potential problems. Robust engagement at the staff level in the region was also essential and enabled through an interagency program management team that included the project proponents and state and federal regulatory staff. This team had numerous standing meetings each week where they discussed the current issues, the status and progress of the assessments, and opportunities to coordinate data collection and document generation.

Garnering this level of federal agency engagement is often difficult due to tight budgets and competing demands. In the California WaterFix example, dedicated staff time was possible because of funds provided by the state for early coordination — or what is called pre-consultation under NEPA and other laws.

### Flexibility and Adaptability within the Environmental Review Process

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Although opponents often characterize NEPA as a hindrance, the California WaterFix example shows how NEPA can be used to improve the design of a project. Much of the project’s progress to date can be attributed to the state embracing the NEPA process in two key aspects. First, state agencies accepted and incorporated significant public input as a way to build understanding of — and greater support for — the project. Second, the agencies were open to allowing the project to evolve to address environmental impacts identified in the initial stages of environmental review.



Existing Federal and State Storage and Conveyance Systems in California. This map shows existing water facilities and state and federal projects along the length of the Sacramento and San Joaquin Rivers that could affect the California Water Fix project. Credit: Bureau of Reclamation, U.S. Department of the Interior

In fact, significant changes to the project were made during early-stages of the NEPA and ESA processes through robust back-and-forth dialogues with state and federal staff. Rather than assuming an adversarial stance between proponent and permittee, each viewed environmental review as a way to improve the project and to expedite later permitting steps. State agencies also wanted a project that would not later be found to jeopardize endangered species, so they were open to making changes early on in project design that would mitigate impacts to listed species. Because mitigation measures were identified early, the ESA-related analyses that came later (e.g., the Biological Opinions) were faster and easier to complete. Following the completion of the Biological Assessment, additional design and operational changes were made to the project. However, about 80 to 90 percent of these changes were technical clarifications rather than significant issues, meaning that significant new analyses were only needed on a few items, thus streamlining the latter stages of the process.

Additionally, large projects can often get held up due to gaps in funding, changes in design specifications, changes in agency staffing, or just administrative processes. However, the California WaterFix project has repeatedly found innovative ways to keep the project moving even when these types of issues arise.

### Mixed Programmatic Approach Under the Endangered Species Act

With a project as complex as the California WaterFix, late-stage construction and operational details are often not as well defined as the earlier design and construction elements. Yet, federal agencies are required to assess impacts over the life of the project under environmental statutes. For example, under ESA Section 7, both NMFS and FWS need to be consulted to determine whether construction and operations of the project will “jeopardize” species included on the endangered species list (i.e., Section 7 consultation). The agencies had sufficient detail needed to assess potential impacts to

listed species or critical habitat for the early stages of the WaterFix project; but not enough detail to fully complete project-level analyses for later stages of the project. To acknowledge this uncertainty, but enable earlier stages to commence, NMFS and FWS implemented a novel “mixed programmatic approach” to stage their evaluations of impacts through tiered Biological Opinions.<sup>14</sup> For the parts of the project that were well defined, each agency conducted Section 7 consultation as usual, approved those activities, and provided “take” authorizations where needed. For the activities that lacked sufficient detail to complete a project-level analysis, a framework programmatic analysis was completed.<sup>15</sup> For example, in the NMFS Biological Opinion, activities assessed at a framework-programmatic-level included: (1) compensatory mitigation for temporary, permanent, and ongoing operational impacts; (2) habitat restoration; (3) monitoring; and (4) adaptive management of several aspects of the proposed action. As these later activities become more defined, the effects to species and critical habitat will be further addressed by either subsequent consultations or through reinitiation of the original Section 7 consultation, and “take authorizations” will not be approved until these later, more detailed, consultations occur.

This approach generates more risk for the project proponent, since some phases of the project will begin before it is known exactly how later construction and operations will be permitted under the ESA. In fact, the Biological Opinions are already being challenged in court, due to lack of detail related to mitigation measures, among other issues.<sup>16</sup> Yet, legal challenges to Biological Opinions and permits for projects of this size are not uncommon. In the meantime, employing this approach has successfully allowed the state to continue to move the project forward even as later project designs are finalized.



**Federally endangered San Joaquin Kit Fox.**

The San Joaquin kit fox, is one federally listed endangered species located in the Sacramento-San Joaquin River ecosystem. The fox is the smallest fox in North America.

Credit: B. “Moose” Peterson, Fish and Wildlife Service, U.S. Department of the Interior



**Federally threatened Delta Smelt.**

The delta smelt is one federally-listed threatened species located in the Sacramento-San Joaquin River ecosystem.

Credit: B. “Moose” Peterson

### Staging Army Corp Permits

Because the project involves alterations to the Delta levee system, a Corps “civil works project,” the WaterFix requires permits from the Army Corps of Engineers under Section 408 of the Rivers and Harbors Act. The Army Corps has issued guidance<sup>17</sup> requiring that the Section 408 assessment of alterations to a federal civil works project occur before other Corps permit consultations (i.e., those required by Section 10 of the Rivers and Harbors Act and Section 404 of the Clean Water Act). Again, the final design for the California WaterFix project has not been decided, which limits the ability of the Corps to evaluate the effects the alterations to the levee system will have on the public interest — a requirement of 408 permit review. To avoid delaying the project, the Corps agreed to a phased review of the WaterFix project. Phase 1 of the project includes early actions that will not affect the levees. In doing this, the Army Corps is able to provide an initial 404 permit on just these Phase 1 activities. Going forward, DWR will complete detailed engineering designs, as well as a detailed analysis related to effects on the levees (i.e., the Corps civil works project) and indirect hydraulic effects before applying for 408 and 404 permits at later project phases. Phasing projects and the issuance of Corps permits is becoming standard practice for large-scale, long-term projects, as a similar phased approach is being used for the California High-Speed Rail, another large-scale construction project in the state spanning several jurisdictions, federal and state agencies, and environmental laws.

### Adaptive Management

Adaptive management is a key component of operations of the California WaterFix project, and will similarly be critical for many of the large-scale restoration projects in the Gulf of Mexico. Projects in the Gulf region can learn from the detailed California WaterFix Adaptive Management Framework,<sup>18</sup> the agreement defining roles and

responsibilities,<sup>19</sup> and the commitment the agencies have made to implementing it, including funding the necessary science and monitoring to inform changes in operations within regulatory bounds.

Agencies have been using adaptive management for water operations in the California Delta — to varying degrees of success — for over a decade. California’s Delta Reform Act of 2009 identified adaptive management as the desired approach to reduce the ecological uncertainty associated with the management of the Sacramento-San Joaquin Delta system.<sup>20</sup> An adaptive management approach will also be a priority for operating the California WaterFix once it has been completed. However, because the WaterFix will not be operational for many years, much uncertainty remains about how an adaptive management approach will play out. Additionally, adaptive management at this scale is rare, so it will likely take years or decades to optimize operations.

Yet, this project benefits from the fact that these same agencies (and often the same staff) have been working together for years on adaptive management of the current SVP and CVP. This has not been an easy task, especially with the recent severe drought in California. For example, in 2016 after several years of poor results for endangered species, the operating agencies included temperature criteria for the Shasta reservoir to help determine when and if water should be released into the system<sup>21</sup> and implemented rapid genetic testing to determine the presence of endangered species.<sup>22</sup> Both of these changes used real-time data to inform operational decisions, but also took fine tuning over time to ensure that changes in operations based on these criteria had the intended management outcomes.

Ultimately, adaptive operations and management in the current SVP and CVP have been subject to extensive litigation from environmental groups and the water agencies. However, this history is beneficial in the sense that the agencies

are accustomed to acting even in the face of uncertainty and litigation risk. Often for agencies that have not had to face this reality, litigation risk can lead to “analysis paralysis.” Becoming comfortable with litigation risk — and learning how to minimize it to the greatest extent possible — is an important aspect of undertaking adaptive management for any large-scale project, including the restoration efforts happening in the Gulf Coast states.

### **Using NEPA to Consider Climate Change Adaptation Benefits**

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The California WaterFix project also provides a useful example of how to include climate change in environmental reviews. As with a number of the diversion and wetland projects in the Gulf Coast states, the need for the California WaterFix project is driven, in part, by projected climate impacts to the region and the state’s water supply. As such, climate change was a consideration that helped define and drive the design of the project, rather than just an issue that was included in a review after the fact.

California has been a national leader in assessing climate risks to natural resources and infrastructure. Long-standing studies have shown that sea-level rise will cause salt water to push farther back into the Delta ecosystem, an effect called salt water intrusion.<sup>23</sup> Fresh water flowing out of the Delta is needed to keep the saline water away from freshwater ecosystems and the current pumping stations. Yet, scientists have also projected that climate change will result in more precipitation falling as rain (and lower winter snowpack), resulting in more intense and shorter duration river flows into the Delta.<sup>24</sup> Taken together, sea-level rise and changing flows into the Delta will likely mean that a greater percentage of the total fresh water available will be needed to maintain the salinity barrier where it currently is today — potentially resulting in significantly less water available for exports to farms and cities.<sup>25</sup> These changes will

make management of Delta salinity increasingly difficult in future years. The need to address this looming issue is one of the major driving forces in developing the project.

When it came to assessing the different project alternatives for the purposes of NEPA, agencies accounted for climate change impacts in three distinct ways.<sup>26</sup> First, they assessed how the project itself could contribute to climate change, meaning how construction activities and habitat alterations would either increase or decrease greenhouse gas emissions. Second, they assessed how the project itself could be affected by climate change impacts. And third — and most importantly — they assessed how the project would affect the “resiliency and adaptability” of the Delta region to the effects of climate change.

In this context, “resiliency and climate change adaptability” means the ability of the Delta region to continue providing freshwater supplies, while also maintaining or improving ecosystem conditions, in light of projected climate change impacts. Almost all of the different alternatives of the project were shown to increase the resiliency of the Delta over the timeframes analyzed (2025 and 2060). Specifically, the preferred alternative of the project was found to provide resilience and adaptation benefits over the “no-action alternative,” meaning that the system as a whole will be more resilient to future climate impacts if the new tunnels are constructed than it would be if the current SVP and CVP projects continue to operate as is. The state CEQA analysis (akin to the federal NEPA analysis) states that the no-project alternative is not the superior alternative due to several concerns, including climate change.<sup>27</sup> As a result, consideration of future impacts to the state’s water supply and Delta ecosystems helped to justify implementation of the project over the status quo.

## Timeline of Events

### Phase I Consultation

2013\*–2017

**2013:** Biological Assessment (BA) process begins.

**April 20, 2015:** Governor Jerry Brown and Deputy Secretary of Interior Mike Connor “unveil plans that accelerate restoration of the Delta’s ecosystem and fix the state’s aging water infrastructure.”

**July 2015:** Recirculated Draft Environmental Impact Report (EIR)/Supplemental Draft EIS is released for public comment.

**August 27, 2015:** Change petition submitted to the State Water Resources Control Board (SWRCB).

**September 9, 2015:** Clean Water Act (CWA) Section 404 permit application submitted to the Army Corps of Engineers (Corps).

**August 2, 2016:** California Department of Water Resources (DWR) and U.S. Bureau of Reclamation (Reclamation) release final BA.

**October 2, 2016:** DWR requests incidental take permit from California Department of Fish and Wildlife.

**December 22, 2016:** DWR and Reclamation release final EIR/EIS naming the WaterFix as the preferred alternative.

**June 26, 2017:** U.S. Fish and Wildlife Service (FWS) and National Marine Fisheries Service (NMFS) release Biological Opinions (BiOps).

**July 21, 2017:** DWR signs Notice of Determination.

### Phase I Permitting

Near Term  
(through 2018)

Reclamation signs Record of Determination (ROD).

Corps issues CWA Section 404 permit for Phase I.

SWRCB issues change permit.

Construction on Phase I begins (**projected fall 2018**).

### Final Design and Permitting

Long Term  
(through 2023)

Full design completed (**anticipated 2023**).

Corps issues additional CWA Section 404 and Rivers and Harbors Act (RHA) Section 408 permits.

FWS and NMFS issue tiered Biological Opinions to address “programmatic” issues in current (2017) BiOps.

\* Note that planning for new water delivery infrastructure in California actually started in 2006. Several years were spent on developing a Habitat Conservation Plan (HCP) for the ESA consultations under Section 10<sup>28</sup> rather than Section 7. This timeline starts when the decision was made to move to a traditional Section 7 consultation, but much of the data and analysis developed during the HCP was used in the new process, so it is difficult to assess exactly how long this project would take if started without this foundation in 2013.

## Recommendations

### Agency Coordination

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#### Engage agency and political leadership.

The accelerated timeline of the California WaterFix project was ensured through consistent, high-level interest and, therefore, high-level engagement at both the state and federal levels. The relationships between the Governor and the federal department heads were essential for setting an accelerated project approval timeline and ensuring progress towards that goal. Weekly briefings for agency leadership in Washington, D.C., and state agency briefings to the Governor, continued to signal the importance of this work to regional agency staff. And because leadership was well aware of the details of the project, it also had the knowledge to quickly resolve issues that were elevated to its attention.

#### Establish interagency coordination teams that meet regularly.

Standing project-specific meetings between state and federal partners in the region helped to improve communications, build trust, and avoid duplication of effort. With the California Water-Fix project, state and federal agencies used weekly meetings to ensure that the work, data, and technical analyses that were being completed by one agency were shared and used to inform the work of other agencies. These meetings were also used to quickly resolve or elevate problems. Consistency of the staff involved also proved to be critical; delays occurred when staff rotated on or off the project.

#### Provide funding to support pre-consultation.

The State of California is paying for federal agency staff time to support pre-consultation.<sup>29</sup> Pre-consultation often proves invaluable for ensuring that the project design and alternatives can be feasibly

permitted at later stages of project review. During pre-consultation, regulators can help proponents avoid regulatory pitfalls, identify baseline data needs, and identify project changes to enable easier permitting and compliance with environmental requirements. Funding for federal agency staff provided by the project proponents can help to ensure that sufficient staff time is available for robust pre-consultation.

### Environmental Review and Permitting

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#### Be open to evolving the project design.

The State of California came into the permitting process open to making necessary changes through the coordination process described above. The state saw both the NEPA and ESA processes as opportunities to make the project better and more responsive to the requirements of those laws. Too often, project proponents have already put in significant time and effort on project design by the time they engage federal agencies. When that happens, all of the time spent in the review process is seen as a hold up, rather than as a fundamental part of improving the project design. As the California project shows, such early interagency coordination and project design flexibility are critical in easing and speeding the permit review process. Additionally, because of the changes the state made based on federal agency feedback, there have been no late-stage surprises to date in terms of permit requirements or additional mitigation measures for endangered species. Ideally, for the project proponent to get the most out of the process, *all* federal agencies need to be part of the discussion at early stages of project design.



### **Pursue phased approaches to environmental review and permitting.**

Both the State of California and the federal agencies have been innovative in their approaches to phasing the planning, permitting, and construction of this decades-long project. Even within existing federal laws, agency practices, and funding constraints, all parties were able to work together to advance early stages of work, as later stages are still being finalized.

## **Adaptive Management**

### **Use adaptive management and operations to minimize impacts and meet environmental requirements.**

Adaptive management is going to be a critical element of many of the Gulf restoration projects and should be incorporated into the project design as early as possible. As the California WaterFix project shows, a commitment to adaptive management is an essential component of project design, and funding for the monitoring needed for robust adaptive management needs to be accounted for in the overall project budget. Additionally, the California project and some of the Gulf projects — namely the sediment diversions in Louisiana — share the fact that adaptive management for large-scale projects is uncommon. Agencies permitting and operating these projects are going to have to be comfortable acting on the best data available, despite the uncertainty and potential litigation risk.

## **Climate Change and NEPA**

### **Account for how a project will enhance resilience to climate change in environmental review documents.**

Many recent NEPA analyses address how a project will contribute to climate change and how the project may be affected by climate change impacts.<sup>30</sup> However, the robust analysis of how the

California WaterFix project will affect system resilience and the adaptability of the region as a whole in light of climate change is fairly unique. It provides an excellent example of how Gulf restoration projects can assess the need for wetland restoration projects in light of sea-level rise and other climate impacts. It also shows how project proponents can consider the climate change impacts to a region or system if no action is taken and compare that to the beneficial conditions that will be created by implementing the project.

## **Conclusion**

The California WaterFix still has many issues and hurdles to overcome before it can be implemented and the full suite of lessons from the process can be realized. However, the process has shown that with flexibility and adaptability, state and federal agencies can find pathways to move complex projects forward within the confines of existing federal laws. The process has also demonstrated that early-stage coordination between state and federal agencies can improve the design of the project and smooth permitting at later stages. Additionally, by considering climate change, project proponents can ensure that a project will provide robust solutions across a range of climate scenarios and will effectively enhance the resilience of the regions and ecosystems benefitting from these projects.

## Endnotes

- 1 Cal. Nat. Res. Agency, State of Cal., *Outreach Materials*, CAL. WATERFIX: RELIABLE. CLEAN. WATER., <https://www.californiawaterfix.com/resources/outreach-materials/> (last visited May 11, 2018).
- 2 *Id.*
- 3 *Id.*
- 4 *Id.*
- 5 *Id.* In 2014, California passed Proposition 1, a \$7.5 billion water bond, to fund improvements to the state’s drought-challenged water systems, including for surface and groundwater storage, ecosystem and watershed protection and restoration, and drinking water protection. *Financial Assistance Funding – Grants and Loans: Proposition 1*, STATE WATER RES. CONTROL BD., CAL. ENVTL. PROT. AGENCY (last updated Apr. 3, 2018), [https://www.waterboards.ca.gov/water\\_issues/programs/grants\\_loans/proposition1.shtml](https://www.waterboards.ca.gov/water_issues/programs/grants_loans/proposition1.shtml).
- 6 Cal. Nat. Res. Agency, State of Cal., *A State-of-the-Art Solution*, CAL. WATERFIX: RELIABLE. CLEAN. WATER., <https://www.californiawaterfix.com/resources/outreach-materials/> (last visited May 11, 2018).
- 7 National Environmental Policy Act, 42 U.S.C. §§ 4321 *et seq.*
- 8 California Environmental Quality Act, CAL. PUB. RES. §§ 21000 *et seq.*
- 9 Endangered Species Act, 16 U.S.C. §§ 1531 *et seq.*
- 10 California State Endangered Species Act, CAL. FISH & GAME CODE §§ 2050 *et seq.*
- 11 Rivers and Harbors Act of 1899, 33 U.S.C. §§ 401 *et seq.*
- 12 Clean Water Act, 33 U.S.C. §§ 1362 *et seq.*
- 13 Office of Governor Edmund G. Brown, Jr., *State, Federal Leaders to Accelerate Delta Habitat Restoration, Proceed with Water Infrastructure Fix*, CA.GOV (Apr. 30, 2015), <https://www.gov.ca.gov/2015/04/30/news18940/>.
- 14 *See generally* NAT’L MARINE FISHERIES SERV., NAT’L OCEANIC & ATMOSPHERIC ADMIN., U.S. DEP’T OF COMMERCE, CALIFORNIA WATERFIX BIOLOGICAL OPINION (June 16, 2017), *available at* [http://www.westcoast.fisheries.noaa.gov/publications/Central\\_Valley/CAWaterFix/WaterFix%20Biological%20Opinion/cwf\\_final\\_biop.pdf](http://www.westcoast.fisheries.noaa.gov/publications/Central_Valley/CAWaterFix/WaterFix%20Biological%20Opinion/cwf_final_biop.pdf); U.S. FISH & WILDLIFE SERV., U.S. DEP’T OF THE INTERIOR, BIOLOGICAL OPINION FOR THE CALIFORNIA WATERFIX (June 23, 2017), *available at* [https://www.fws.gov/sfbaydelta/HabitatConservation/CalWaterFix/documents/Final\\_California\\_WaterFix\\_USFWS\\_Biological\\_Opinion\\_06-23-2017.pdf](https://www.fws.gov/sfbaydelta/HabitatConservation/CalWaterFix/documents/Final_California_WaterFix_USFWS_Biological_Opinion_06-23-2017.pdf).
- 15 A “mixed programmatic” action is defined by 50 C.F.R. § 402.02.
- 16 *WaterFix Case Documents*, NATURAL RES. DEFENSE COUNCIL, <https://www.nrdc.org/resources/complaints-challenging-waterfix-biological-opinions-northern-district-california> (last visited May 11, 2018).

- 17 U.S. ARMY CORPS OF ENGINEERS, U.S. DEP'T OF THE ARMY, POLICY AND PROCEDURAL GUIDANCE FOR PROCESSING REQUESTS TO ALTER U.S. ARMY CORPS OF ENGINEERS CIVIL WORKS PROJECTS PURSUANT TO 33 U.S.C. § 408 (Sept. 30, 2015), *available at* [http://www.publications.usace.army.mil/Portals/76/Publications/EngineerCirculars/EC\\_1165-2-216.pdf?ver=2016-06-28-100552-103](http://www.publications.usace.army.mil/Portals/76/Publications/EngineerCirculars/EC_1165-2-216.pdf?ver=2016-06-28-100552-103).
- 18 ADAPTIVE MANAGEMENT PROGRAM FOR THE CALIFORNIA WATERFIX AND CURRENT BIOLOGICAL OPINIONS ON THE COORDINATED OPERATIONS OF THE CENTRAL VALLEY AND STATE WATER PROJECTS, *available at* [http://www.californiawaterfix.com/wp-content/uploads/2017/10/ProposedFinalAdaptiveManagementProgram\\_BA.pdf](http://www.californiawaterfix.com/wp-content/uploads/2017/10/ProposedFinalAdaptiveManagementProgram_BA.pdf).
- 19 AGREEMENT FOR IMPLEMENTATION OF AN ADAPTIVE MANAGEMENT PROGRAM FOR PROJECT OPERATIONS, *available at* [http://www.californiawaterfix.com/wp-content/uploads/2017/10/AMP\\_FinalAgreementforImplementation\\_BA.pdf](http://www.californiawaterfix.com/wp-content/uploads/2017/10/AMP_FinalAgreementforImplementation_BA.pdf).
- 20 *Cal. SB-1 Public Resources (2009-2010) Chap. 5*, CAL. LEGISLATIVE INFO. (approved by Governor on Nov. 12, 2009), [http://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill\\_id=200920107SB1&search\\_keywords](http://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=200920107SB1&search_keywords).
- 21 Letter from David G. Murillo, Reg'l Dir., Mid-Pacific Reg'l Office, Bureau of Reclamation, U.S. Dep't of the Interior, to William W. Stelle, Jr., Reg'l Adm'r, West Coast Region, Nat'l Marine Fisheries Serv., Nat'l Oceanic & Atmospheric Admin., U.S. Dep't of Commerce, Request to Engage in Adaptive Management Provision of 2009 Biological Opinion for the Reasonable and Prudent Alternative (RPA), section 11.2.1.2 (Aug. 2, 2016), *available at* [http://www.westcoast.fisheries.noaa.gov/publications/Central\\_Valley/Water%20Operations/bureau\\_of\\_reclamation\\_s\\_request\\_for\\_shasta\\_rpa\\_adjustments\\_-\\_august\\_2\\_\\_2016.pdf](http://www.westcoast.fisheries.noaa.gov/publications/Central_Valley/Water%20Operations/bureau_of_reclamation_s_request_for_shasta_rpa_adjustments_-_august_2__2016.pdf); Letter from William W. Stelle, Jr., Reg'l Adm'r, West Coast Region, Nat'l Marine Fisheries Serv., Nat'l Oceanic & Atmospheric Admin., U.S. Dep't of Commerce, to David G. Murillo, Reg'l Dir., Mid-Pacific Reg'l Office, Bureau of Reclamation, U.S. Dep't of the Interior, Request to Engage in Adaptive Management Provisions for RPA 11.2.1.2 (Aug. 17, 2016), *available at* [http://www.westcoast.fisheries.noaa.gov/publications/Central\\_Valley/Water%20Operations/nmfs\\_response\\_to\\_reclamation\\_s\\_request\\_for\\_shasta\\_rpa\\_adjustments\\_-\\_august\\_17\\_\\_2016.pdf](http://www.westcoast.fisheries.noaa.gov/publications/Central_Valley/Water%20Operations/nmfs_response_to_reclamation_s_request_for_shasta_rpa_adjustments_-_august_17__2016.pdf).
- 22 Letter from Ronald Milligan, Operations Manager, Central Valley Operations Office, Bureau of Reclamation, U.S. Dep't of the Interior, to Maria Rea, Supervisor, Central Valley Office, Nat'l Marine Fisheries Serv., U.S. Dep't of Commerce, Rapid Genetic Analysis of the Central Valley Project (CPV) and State Water Project (SWP) Salvaged Chinook Salmon in Water Year (WY) 2017 (Oct. 20, 2016) (procedure for implementing rapid genetic analysis of CVP and SWP salvaged older juvenile Chinook salmon enclosed), *available at* [http://www.westcoast.fisheries.noaa.gov/publications/Central\\_Valley/Water%20Operations/Operations,%20Criteria%20and%20Plan/reclamation\\_s\\_request\\_to\\_implement\\_rapid\\_genetic\\_analysis\\_in\\_wy\\_2017\\_-\\_october\\_20\\_\\_2016.pdf](http://www.westcoast.fisheries.noaa.gov/publications/Central_Valley/Water%20Operations/Operations,%20Criteria%20and%20Plan/reclamation_s_request_to_implement_rapid_genetic_analysis_in_wy_2017_-_october_20__2016.pdf).
- 23 Daniel R. Cayan et al., Climate Change Projections of Sea Level Extremes Along the California Coast (scientific paper), *available at* [http://meteora.ucsd.edu/cap/pdf/files/sealevel\\_climaticchange\\_jul2006\\_cayanetal.pdf](http://meteora.ucsd.edu/cap/pdf/files/sealevel_climaticchange_jul2006_cayanetal.pdf); DAN CAYAN ET AL., PROJECTING FUTURE SEA LEVEL: A REPORT FROM THE CALIFORNIA CLIMATE CHANGE CENTER § 6.0, p. 34 (Mar. 2006), *available at* <http://www.energy.ca.gov/2005publications/CEC-500-2005-202/CEC-500-2005-202-SF.PDF>.
- 24 DELTA STEWARDSHIP COUNCIL, STATE OF CAL., THE DELTA PLAN ch. 3, p. 72 (2013) ("A More Reliable Water Supply"), *available at* [http://deltacouncil.ca.gov/sites/default/files/documents/files/CH\\_03\\_2013.pdf](http://deltacouncil.ca.gov/sites/default/files/documents/files/CH_03_2013.pdf); U.S. Env'tl. Prot. Agency, What Climate Change Means for California (EPA 430-F-16-007) (Aug. 2016) (agency one-pager), *available at* <https://www.epa.gov/sites/production/files/2016-09/documents/climate-change-ca.pdf>.

- 25 Delta Stewardship Council, Delta Plan Summary and New Scientific Findings for Delta Plan Update Concerning Storage, Conveyance, and Operation 9-11 (Oct. 2015) (presented at a council meeting as “a summary of scientific information contained in the current Delta Plan (2013) relevant to water supply, including storage, conveyance, and their operation, the ecosystem, and climate change”), available at <http://deltacouncil.ca.gov/sites/default/files/2017/07/2017-7-10-2017-02-24-Mtg-Item-12-Att-ch-2-Sum.pdf>; Dale Kasler & Ryan Sabalow, *How Climate Change Could Threaten the Water Supply for Millions of Californians*, THE SACRAMENTO BEE (June 30, 2017), <http://www.sacbee.com/news/local/article158679214.html>.
- 26 See BUREAU OF RECLAMATION, U.S. DEP’T OF THE INTERIOR & CAL. DEP’T OF WATER RES., FINAL ENVIRONMENTAL IMPACT REPORT/FINAL ENVIRONMENTAL IMPACT STATEMENT, BAY DELTA CONSERVATION PLAN/CALIFORNIA WATERFIX ch. 29 (Dec. 2016) (“Climate Change”), available at [http://baydeltaconservationplan.com/Libraries/Dynamic\\_Document\\_Library/Final\\_EIR-EIS\\_Chapter\\_29\\_-\\_Climate\\_Change.sflb.ashx](http://baydeltaconservationplan.com/Libraries/Dynamic_Document_Library/Final_EIR-EIS_Chapter_29_-_Climate_Change.sflb.ashx).
- 27 See CAL. DEP’T OF WATER RES., CALIFORNIA WATERFIX: CALIFORNIA ENVIRONMENTAL QUALITY ACT FINDINGS OF FACT AND STATEMENT OF OVERRISING CONSIDERATIONS 60 (July 2017), available at [http://baydeltaconservationplan.com/Libraries/Dynamic\\_Document\\_Library/CWF\\_CEQA\\_Findings\\_of\\_Fact\\_and\\_SOC\\_for\\_website\\_7\\_17\\_17.sflb.ashx](http://baydeltaconservationplan.com/Libraries/Dynamic_Document_Library/CWF_CEQA_Findings_of_Fact_and_SOC_for_website_7_17_17.sflb.ashx). For NEPA, the identification of “environmentally preferable” alternatives is completed in the Record of Decision, which is still pending.
- 28 A Habitat Conservation Plan (HCP), under Section 10(a)(1)(B) of the Endangered Species Act, allows the National Marine Fisheries Service and U.S. Fish and Wildlife Service to work with **non-federal** entities (compared to the Section 7 process required for federal agencies) to conserve the ecosystems upon which listed species (including those that are candidates proposed for listing) depend for their recovery. HCPs are planning documents submitted with an incidental take permit application that describe the anticipated effects of a project on a proposed taking; how a project proponent will minimize or mitigate those impacts through the project; and how a HCP will be funded. HCPs require a NEPA analysis and are legally binding when part of an incidental take permit. For more information about HCPs, see *Habitat Conservation Plans: Overview*, U.S. FISH & WILDLIFE SERV.: ENDANGERED SPECIES (last updated Dec. 13, 2017), <https://www.fws.gov/endangered/what-we-do/hcp-overview.html>.
- 29 The Department of the Interior was granted authority to accept “donations” for these types of activities under the Fish and Wildlife Coordination Act (16 U.S.C. § 661). This authority was extended to the National Oceanic and Atmospheric Administration through Reorganization Plan No. 4 of 1970, Section 1.
- 30 JESSICA WENTZ, SABIN CTR. FOR CLIMATE CHANGE LAW, COLUMBIA L. SCH., *ASSESSING THE IMPACTS OF CLIMATE CHANGE ON THE BUILT ENVIRONMENT UNDER NEPA AND STATE EIA LAWS: A SURVEY OF CURRENT PRACTICES AND RECOMMENDATIONS FOR MODEL PROTOCOLS ii & ch. 4* (Aug. 2015), available at <http://columbiaclimatelaw.com/files/2016/06/Wentz-2015-08-Climate-Change-Impact-on-Built-Environment-.pdf>.

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