



Regular Meeting

AGENDA

PARADISE CUT BYPASS EXPANSION AND MULTI-BENEFIT PROJECT ADVISORY COMMITTEE MEETING

City of Lathrop City Council Chamber | 390 Towne Centre Drive |
Lathrop, California 95330

April 21, 2025

11:30 am – 1:00pm (light lunch provided)

Advisory Committee Members:

Darren Suen, San Joaquin Area Flood Control Agency

John Herrick, South Delta Water Agency

Sarah Puckett, American Rivers

Ilene Macintire, City of Tracy

Nick Mussi, Reclamation District 1, 2, 544, 2089

Bob Pombo, Reclamation District 2095

Alexis Stevens, Reclamation District 2058, 1007

Susan Dell'Osso, Reclamation District 2062

Jesus Esparza, Department of Water Resources (non-voting)

Andrea Buckley, Central Valley Flood Protection Board (non-voting)

Lauren Damon, Delta Conservancy (non-voting)

1. Administrative Matters (P. Marchand/L. Randall) (10 minutes)
 - A. Roll call
 - B. Introduction of Darren Suen, Executive Director of SJAFCA
 - C. Approve 12/2 Meeting Summary (Attachment A) **[Possible Action]**
2. Recommend approval of updated Paradise Cut Bypass Expansion and Multi-Benefit Project Engagement Strategy to SJAFCA (Attachment B) **[Possible Action]** (P. Marchand/M. Weymiller) (5 minutes)
 - A. Updates to Engagement Strategy (Attachment B1)
3. Paradise Cut Feasibility Study Update (G. Prasad/R. Reinhardt) (35 minutes)
 - A. Receive update on the Paradise Cut Feasibility Study (Attachment C)
 - B. Chapter 5: Formulation of Preliminary Alternatives (Attachment D)



4. Operations and Maintenance (O&M) discussion (R. Reinhardt) (15 minutes)
5. SJAFCA Update (G. Prasad) (10 minutes)
6. California Department of Water Resources, Central Valley Flood Protection Board, and Sacramento-San Joaquin Delta Conservancy Updates (5 minutes)
7. Advisory Committee Comments (5 minutes)
8. Public Comments (5 minutes)
9. Adjournment

Virtual Attendance:

To JOIN via ZOOM

Link to meeting: <https://us02web.zoom.us/j/85984957040?from=addon>

Meeting ID: 859 8495 7040

No passcode

To DIAL IN by phone: +1 646 931 3860

DRAFT
SUMMARY

Paradise Cut Bypass Expansion And Multi-Benefit Project
Advisory Committee Meeting
City of Lathrop
December 2, 2024 | 11:30 AM – 1:00 PM

Committee Members (Present):

Chris Elias, San Joaquin Area Flood Control Agency
John Herrick, South Delta Water Agency
Sarah Puckett, American Rivers
Ilene Macintire, City of Tracy
Bob Pombo, Reclamation District 2095
Alexis Stevens, Reclamation District 2058, 1007
Susan Dell'Osso, Reclamation District 2062
Jesus Esparza, Department of Water Resources (non-voting)
Andrea Buckley, Central Valley Flood Protection Board (non-voting) (via Zoom)
Lauren Damon, Sacramento – San Joaquin Delta Conservancy (non-voting)

Committee Members (Absent):

Nick Mussi, Reclamation District 1, 2, 544, 2089

Other In-Person Attendees:

Glenn Prasad, SJAFCA
Leanne Randall, SJAFCA
Petrea Marchand, Consero Solutions
Laura Duffy, Consero Solutions
Ric Reinhardt, Wood Rodgers
Melissa Weymiller, LWA
Dominick Gulli, RD 1607
Pam Forbus, RD 5
Paul Marchini, RD 1
Greg Pombo, RD 2058
Avery Livengood, HDR

Zoom Attendees:

Phil Balmat, San Joaquin County Resources Conservation District
Nick Prichard, RD 2058
Alan Coon, RD 2064
Pat Kelly (Affiliation Unknown)
Will Anderson, State Water Resources Control Board
Patricia Flores Yrarrazaval, Orange County Environmental Justice
Daniel DeGraaf, RD 2085 and 2095
Sylvia Razniak, SJAFCA
Becky Money, MBK Engineers

Steve Sinnock, KSN

HIGHLIGHTS

Administrative Matters

- J. Herrick, Advisory Committee Chair, called the meeting to order.
- L. Randall called the roll and established a quorum. Advisory Committee members John Herrick, Sarah Puckett, Ilene Macintire, Andrea Buckley (attended on Zoom), Jesus Esparza, Susan Dell'Osso, Alexis Stevens, Lauren Damon, Bob Pombo, and Chris Elias were present. Nick Mussi was absent.
- L. Duffy read out the list of Zoom attendees.
- J. Herrick said the first item on the agenda was to approve the October 15, 2024 Advisory Committee meeting summary (Attachment A). Motion: S. Puckett, second S. Dell'Osso. Motion passed 7-0; 1 absent.

Receive and File Final Decision Recommendation Framework (Attachment B)

- J. Herrick said the San Joaquin Area Flood Control Agency (SJAFCA) approved the final Decision Recommendation Framework (Attachment B) and is providing the final Framework to the Advisory Committee for informational purposes. He said no action was required for this item.
- The Advisory Committee received and filed the final Decision Recommendation Framework.

Public Outreach Update

- P. Marchand provided an overview of primary audience meetings since October 15, 2024. She said SJAFCA approved the Paradise Cut Bypass Expansion and Multi-Benefit Project Engagement Strategy. She said the outreach team held meetings with reclamation districts in October at which the engineers requested an early meeting with the Technical Team to provide input early into development of alternatives. She said this second meeting occurred in November. She said the group also met with the Sacramento-San Joaquin Delta Conservancy. She said the outreach team has an initial meeting with staff from the State Water Resources Control Board in December.
- P. Marchand said the outreach team drafted a Frequently Asked Questions (FAQ) document (Attachment C), included in the meeting packet for the Advisory Committee's review and feedback.
- P. Marchand asked if there were any comments or questions about public outreach thus far or the FAQ document.
- P. Marchand said the next update is on the engagement strategy schedule and budget, which is included with a staff report as Attachment D. She said the staff report had two additional attachments, Attachment D1, which is the schedule and budget for the engagement strategy requested at the October Advisory Committee and Attachment D2, which is the draft engagement strategy. The engagement strategy is now final since SJAFCA approved the engagement strategy after the project team sent out the Advisory Committee agenda and materials. She said there is an action for the Advisory Committee associated with this item, which is to recommend the engagement schedule and budget to the SJAFCA Board of Directors. She said she would like to modify this action to recommend an action to

SJAFCA instead of the SJAFCA Board of Directors, since Chris Elias as Executive Director will make this decision.

- P. Marchand provided background on the status of the engagement strategy. She said the engagement strategy approved by SJAFCA represents the “gold standard” for the engagement strategy, which includes meetings added by the Advisory Committee and the Project Team to ensure interested parties have sufficient input into project development. She said as stated in the engagement strategy assumptions, the engagement strategy is a living document which SJAFCA can modify based on the availability of funding, as shown on this slide. The staff report lays out the details regarding the additional funds needed to implement the gold standard for the engagement strategy. She said SJAFCA is recommending a silver standard for the engagement strategy, which involves eliminating Consero assistance with outreach on the draft feasibility study report in November/December 2025, in part because the project team assumes interested parties will have reached an agreement on a preferred alternative by this time. If not, the South Delta Water Agency and SJAFCA staff will conduct all remaining outreach without Consero assistance. She said Consero has also offered to donate \$5,000 for any needed assistance at the end of the process not covered by the existing contract. She said finally, SJAFCA recommends paying for any of Wood Rodgers time through the entire engagement strategy process with contingency, since Wood Rodgers did not originally budget for participation in outreach meetings. However, due to the complexity of this project, the team may need to balance the need for Wood Rodgers engagement with the need to complete the deliverables identified in the DWR funding agreement.
- P. Marchand said if SJAFCA identifies additional resources for engagement in the coming months, they may recommend adding back some engagement assistance. She said if the Advisory Committee approves the proposed change to the engagement strategy schedule and budget, Consero will modify the engagement strategy schedule presented in the packet as Attachment D1 and seek SJAFCA approval. She asked if there were any questions.
- J. Herrick said it would be easy for South Delta Water Agency to do outreach in that fall of 2025.
- A. Stevens asked to clarify the “silver standard approach” meant Consero would not be involved with outreach efforts in fall of 2025. P. Marchand confirmed.
- J. Herrick said this is a look to make sure there is sufficient budget for engagement through Phase 3. He said the action before the Advisory Committee is to recommend the engagement strategy schedule and budget to SJAFCA, with the budget changes presented on the slide, specifically South Delta Water Agency and SJAFCA will partner to complete any engagement needed on the Draft Feasibility Report in November/December 2025 without Consero assistance, Consero will donate \$5,000, and SJAFCA will fund Wood Rodgers participation through the engagement process through Project contingency. SJAFCA also would like to note that if SJAFCA identifies additional funds, SJAFCA may consider adding additional consultant assistance back into the last phase of the engagement strategy process.
- Motion: S. Dell’Osso, second: Sarah Puckett. Motion passed 7-0; 1 absent.

Feasibility Study Update (Attachment E)

- R. Reinhardt from Wood Rodgers and A. Livengood from HDR provided an update on the feasibility study. R. Reinhardt said this is an informational item for the Advisory Committee that does not require action. He said the goal is to provide a preview of the first four chapters of the feasibility study, which the Advisory Committee will receive for review on December 16, 2024. He reviewed the outline of the feasibility study chapters (Introduction, Inventory and Forecast, Problems and Opportunities, Goals and Objectives, Formulation of Preliminary Alternatives, and Evaluation and Comparison of Final Array of Alternatives). A. Livengood described Chapter 1 (Introduction). She said the team updated the study area map in Chapter 1 to reflect comments: the team added in the reach of Old River between the San Joaquin River and Middle River, added Tom Paine Slough, and expanded Grant Line Canal and Fabian Bell Canal to cover the whole canal.
- A. Livengood said Chapter 2 (Inventory and Forecast) is the longest chapter the group will receive. She said this chapter is an inventory and forecast of critical resources (physical, demographic, economic, social, etc.) to set the context for the problems and opportunities under consideration in the planning area. She said this section will also summarize the preliminary findings of modelling and the technical analyses that have been done to date. She said that includes things like sedimentation, channel capacity, flood hazards, biological resources, etc. She said Chapter 3 (Problems and Opportunities) takes what was discussed in Chapter 2 and identifies problems (existing undesirable conditions) and opportunities (chance to create a future desirable condition). She said Chapter 4 (Goals and Objectives) describe the goals (desired end state of the Project) and objectives (more specific and narrowly defined ways to achieve goals) of the Project. She said the team has not made changes to the Goals and Objectives since the Advisory Committee approved them in August 2024. She said the new item in Chapter 4 is a summary of the key constraints to achieving the goals and objectives, for example, long term operations and maintenance.
- R. Reinhardt said the chapters have three technical appendices. Anchor QEA prepared the first appendix, which examines sedimentation rates in the downstream channels. He said Anchor QEA's analysis looked at historic bathymetry and determined accumulation rates over time. He said findings show, and as the team has heard from interested parties, that the portion of the Delta in question has been experiencing sedimentation increases for decades. He asked if there were questions. S. Puckett asked what was causing the sedimentation. R. Reinhardt said he did not recall that element of the appendix, but the information will be in the packet for the Advisory Committee's review. S. Dell'Osso said the map image looks like it does not cover the whole study area and asked if the intent was to include the whole study area in the analysis. R. Reinhardt said the ESA analysis (second appendix) covers the riverine portion of the system. He said there is a handoff point at Old River where ESA's analysis ends and Anchor QEA's analysis begins.
- R. Reinhardt said the second appendix is ESA's analysis of sediment transport. He said ESA conducted a sediment transport model looking at sediment coming down the system and how sedimentation rates are expected to change (comparing

existing conditions to without-project conditions). R. Reinhardt showed slides titled “South Delta Reaches with Threatened Diversions and Relatively High Sedimentation Rates” and “Sediment Transport Proportion and Rate.” R. Reinhardt asked if there were questions. L. Damon asked if ESA expects this will have an effect on water temperature. R. Reinhardt said in this case, the team is looking at large flood event and he said he does not think the team anticipates there would be an effect on temperature in a large flood event. He said the primary concern with temperature is with lower flows and the Project is not anticipated to have a substantive effect on temperature. He said this is an important part of the water quality discussion. L. Damon said water quality will be an important metric with the dredging aspect for habitat related reasons, which might be outside the scope of this analysis. R. Reinhardt said the water quality elements of Chapters 1-4 touch on temperature.

- R. Reinhardt reviewed the “Climate Change Hydrology” slide and asked for staff recommendations on which five flood events the team should analyze as part of the study. He said the feasibility study team is using a planning horizon set in 2072 to match the future climate change and sea level rise assumptions from the 2022 Central Valley Flood Protection Plan. He said another important metric is the design of the Mossdale Urban Flood Risk Reduction (UFRR) study. He said the team is using flows at Vernalis; he said this is a good metric for understanding the differences between alternatives. He said for the Lathrop-Manteca study, the U.S. Army Corps of Engineers is using a 2085 sea level rise and flow at Vernalis similar to the existing 200-year (98,000 cfs at Vernalis). R. Reinhardt said the team is scoped to look at five runs but needs guidance paring down from seven runs. He listed six runs the team is evaluating: 1955 design flow, 1997 flood event (including failures that occurred during event), 100-year (does not include levee breaks, only overtopping), existing 200-year (97,000 cfs at Vernalis) with existing conditions sea level, existing 200-year with Central Valley Flood Protection Plan 2072 sea level rise (what River Islands used), and 200-year with 2022 Central Valley Flood Protection Plan 2072 midlevel climate change hydrology (306,000 cfs at Vernalis) and 2022 Central Valley Flood Protection Plan sea level rise. He said in addition, SJAFA had also asked the team to add the Mossdale UFRR run. R. Reinhardt said the team proposes to eliminate two runs: the 1997 event, since it is similar to the 100-year event, and the existing 200-year with Central Valley Flood Protection Plan 2072 sea level rise. He asked for input and said the staff recommendation is to proceed with the five runs the feasibility study team is scoped for.
- S. Puckett asked why the team would eliminate existing 200-year with Central Valley Flood Protection Plan 2072 sea level rise instead of the existing 200-year (97,000 cfs at Vernalis) with existing conditions sea level rise. R. Reinhardt said the team wants to compare changes to existing conditions. He said it is not “apples to apples” to take today’s 200-year hydrology and 2072 sea level rise. He said ideally, the team would carry all seven runs forward but to meet the budget they need to carry five forward. He said it is important to have the 200-year existing with existing sea level rise and because the 1997 is almost identical to the 100-year it makes sense to eliminate.
- J. Herrick said his reaction is to include the 1997 run, but the 1997 run had levee

breaks. He said he felt removing the 1997 run was appropriate. He said the Paradise Cut Management Team discussed this at length. He said he understands the limitations and the reasons the scenarios were chosen.

- S. Dell'Osso said she likes the 1997 scenario with levee breaks because it illustrates an actual occurrence but she understands the rationale for dropping it. R. Reinhardt asked if there was a levee break in Reclamation District 2095 in 1997. B. Pombo confirmed. R. Reinhardt said because of the changes the Project would make where the levee breaks occurred, there is a rationale for excluding it. B. Pombo said the levee broke in 1997 on the Manteca side a few days later. He said even if 2095 does not break, it still could break on the other side. S. Dell'Osso said she is not proposing the feasibility study team do not exclude it, but she wanted to state River Islands has used it many times.
- R. Reinhardt asked for other comments.
- J. Esparza said he asked the modelers from DWR who were involved in the 2017 and 2022 Central Valley Flood Protection Plan updates and they agreed with R. Reinhardt's proposal.
- G. Prasad said the group has chosen events that capture 300,000 cfs (ultimate flow), 200,000 cfs (existing 200-year at Vernalis), and 100,000 cfs. He said the runs also connect to different regulating agencies. For example, the Mossdale UFRF study run aligns with DWR's design standard for urban levee compliance along Mossdale. He said the selected flows make sense from a hydrologically standpoint and a regulatory standpoint.
- J. Herrick said he has come full circle on what should be analyzed in different forms. He said the analysis is not to determine if anyone will be flooded in the future under a particular event; the analysis is to see what the benefits are of a proposed project. He said the most realistic way to do it is to look at increments of flood flows and see how the Project affects those.
- R. Reinhardt shared the review schedule. He said the Paradise Cut Consultant Team is in the process of resolving Technical Review Panel comments. He said he went through all the comments from the Technical Review Panel and said he did not see anything to worry about for Chapters 1-4, Anchor QEA's report, or MBK's report. He said the Technical Review Panel provided more significant comments on ESA's sediment transport report, so that is where the Consultant Team will focus the bulk of its attention. He said after the team addresses Paradise Cut Management Team comments, the Consultant Team will send the deliverables to the Advisory Committee for review on December 16th, with Advisory Committee review needing to be completed by January 3.
- R. Reinhardt discussed next steps. He said as the team wraps up Chapters 1-4, the team will develop a list of measures and screening criteria and form into alternatives. He said a measure is a feature of an alternative. He said the scope includes up to eight preliminary alternatives, including the no action, which will be narrowed down through the screening process. He said the next deliverable up for Advisory Committee review is the Development of Preliminary Alternatives. R. Reinhardt asked the Advisory Committee for other guidance for what the team should be considering as part of alternatives formulation.

- J. Herrick said there was further technical information provided at the recent Paradise Cut Management Team meeting and the group had good discussions. He said he asked staff to not include some of the technical materials for this meeting. He said the consultants have done a good job. He said some potential alterations to the Project might not fly too well with the public. He said he did not want to present them right now so different landowners, organizations, and interests would not get upset. He said analyses of different alternatives include different possibilities for dredging. He emphasized the interests he represents and the delicate balance needed for this Project. He said you can come up with different approaches to dredging but any substantial deviation from a systemwide dredging program is going to cause problems and reduce local agency support for the Project. He said in his view, the alternatives need to focus on things similar to the existing proposed project. He said the Project is in the feasibility study stage. He said ideally the next step is CEQA; so there are mandatory elements to consider in the alternatives. He said ideally the group does not go off on an idea that may seem good but would ultimately disrupt fragile support for the Project. He said right now the districts downstream are only tentatively in support, so substantial changes would be challenging.
- J. Herrick asked for comments from Advisory Committee members.
- S. Puckett said one of the measures she would like to see is the number of acres of habitat. R. Reinhardt said yes and asked if there was a type of habitat she was interested in. S. Puckett said in general and it would be nice to see a breakdown of different habitats (floodplain, riparian, etc.) **(ACTION)**. J. Herrick said South Delta has identified some potential habitat opportunities; he asked if those could be included at this stage. He said there is an island he is talking to a landowner about. R. Reinhardt asked if this was in the Resource Conservation District (RCD) memo as a potential restoration opportunity. J. Herrick said yes. R. Reinhardt said the team will consider opportunities from the RCD memo **(ACTION)**.
- J. Herrick said this is the time to comment to provide consultants with direction.
- M. Weymiller noted the team looked at something different than the minimum viable alternative because the feasibility study stage has funding to research potential issues for which funding was not available in previous stages. She said one potential issue is the cost of the Project. J. Herrick said those are the kinds of analyses we hope consultants bring up. He said the railroad is an issue everyone is considering. He said he and C. Elias have discussed how to align the Project with existing railroad plans.
- S. Puckett asked if the consultant team would develop the eight alternatives by the next Advisory Committee meeting in April. R. Reinhardt said his team will work with the Paradise Cut Management Team this month to develop the list and then will flush out the alternatives with the engineering team. He said the team will release Chapter 5, which has the preliminary alternatives, in April.
- B. Pombo said unless there is a way to get more water through under or around the railroad, RD 2095 will be unable to support the Project.
- J. Herrick said it is his intent that discussions with reclamation districts are ongoing so they are aware of what is and is not being considered.

- J. Herrick asked for public comments.
- D. Gulli, engineer, said he felt it was fundamentally flawed to think levees will act as weirs. He said once they start acting as a weir, the backside will erode and the levees will break. He said we know from history that during high water events the levees break. He said he does not understand how the team can make the assumption the water will just flow over it. J. Herrick asked if D. Gulli was referring to the assumption of overflows at high flows for the modelling or the specifics of a new weir itself. D. Gulli said he was discussing the modelling. He said from history, a levee does not act as a weir. He said it happened in 1997 and will happen again. He said in 2017, water was rising on Bob Pombo's levee and it looked like a big problem. He said the problem is due to lack of additional funding for protection there. He said to assume a levee will act as a weir is not viable.
- J. Herrick said he agrees, though the challenge is how to analyze different higher flow events with the Project. He said good, bad, ugly or distaste, this is what modelers say you must look at to consider changing conditions. D. Gulli said he wanted to respectfully disagree. He said you may not be able to predict where the levee will break, but it is going to break at x feet wide. He said it is predictable and the U.S. Army Corps of Engineers manual has procedures for how to predict levee breaks. He said when it is a sand levee, it will erode a lot faster. J. Herrick said he is not arguing; you can take the U.S. Army Corps model and try to predict a break, but there are so many unknowns.
- A. Coon (Zoom) said Reclamation District 2064 remains concerned about Airport Way Bridge. He said there has been sediment stored there for four to five decades and it is a serious problem. He said he would like to see an option in the alternative.
- R. Reinhardt asked to clarify which waterway. J. Herrick said A. Coon was referring to the San Joaquin River at Airport Way Bridge. J. Herrick said the South Delta Water Agency is exploring ways to address the issue but deferred to consultant team about whether this can be part of the alternatives **(ACTION)**. J. Herrick said upstream dredging was not part of the original plan, so they will see what they can do, but this is an important comment.
- J. Herrick asked for online comments. No online comments.

SJAFCA Update

- G. Prasad provided an update from SJAFCA. He said SJAFCA had their Board meeting in September and the Board authorized Chris Elias, Executive Director, to finalize documents and make policy level decisions in collaboration with the Paradise Cut Management Team and the Advisory Committee. With that authority, C. Elias finalized the Decision Recommendation Framework and the Engagement Strategy. He said at last SJAFCA Board meeting, the Board discussed the Project as part of its portfolio of projects to combat climate change. He said the Project is part of SJAFCA's Strategic Plan and is priority action #13 for SJAFCA. He said the SJAFCA Strategic Plan is available on the SJAFCA website, if anyone is interested in how SJAFCA thinks of Paradise Cut in relation to other work.
- G. Prasad said Restore the Delta recently coordinated a meeting for SJAFCA and the Delta Stewardship Council to understand restoration opportunities in our community. He said several agencies listed in the Project engagement strategy

attended. He said SJAFCA spoke about numerous restoration opportunities on the San Joaquin River for the Mossdale Project and advocated for Paradise Cut. He said this was received well. He said the Delta Stewardship Council asked SJAFCA to provide a briefing to their Board **(ACTION)**.

- He said SJCOG is also in the engagement strategy. He said the Project would affect transportation infrastructure, so continued coordination with SJCOG is important.
- G. Prasad said SJAFCA recently received a Regional Flood Management Program (RFMP) grant (funded through the CVFPB). He said this funding will help him provide input to the Board.

Department of Water Resources, Central Valley Flood Protection Board Update, and Delta Conservancy Updates

- No updates from DWR or CVFPB.
- L. Damon (Delta Conservancy) provided an update on Proposition 4. L. Damon said voters approved Proposition 4 in November. She said she expects the soonest any solicitations will be out is July 2025, though it could take longer.

Advisory Committee Member Comments

- J. Herrick asked if there were any comments from the Advisory Committee.
- B. Pombo asked consultants to share a map of where habitat restoration would occur once they determine where it will take place at the next Advisory Committee meeting **(ACTION)**. R. Reinhardt said a map will be included in the preliminary alternatives he will present on at the next meeting.
- S. Puckett asked if G. Prasad and C. Elias would keep the Paradise Cut Management Team and the Advisory Committee apprised of future RFMP meetings so people can participate **(ACTION)**.

Public Comments

- J. Herrick asked if there were any public comments in person.
- J. Herrick asked if there were any public comments online.

2025 Meetings

- P. Marchand shared the 2025 Advisory Committee meeting schedule: April 21, 2025; August 25, 2025; September 22, 2025; December 15, 2025.

Adjournment

- J. Herrick adjourned the meeting at 12:59 PM.

STAFF REPORT

To: Paradise Cut Advisory Committee

From: Glenn Prasad, SJAFCA
Ric Reinhardt, Wood Rodgers
Melissa Weymiller, LWA
Petrea Marchand, Consero Solutions

RE: Recommend approval of updated Paradise Cut Bypass Expansion and Multi-Benefit Project Engagement Strategy to SJAFCA

Date: April 21, 2025

RECOMMENDED ACTION:

Recommend approval of updated Paradise Cut Bypass Expansion and Multi-Benefit Project Engagement Strategy to San Joaquin Area Flood Control Agency (SJAFCA)

BACKGROUND:

On October 15, 2025, the Advisory Committee recommended approval of the Paradise Cut Bypass Expansion and Multi-Benefit Project Engagement Strategy (Engagement Strategy) to SJAFCA. On November 26, 2025, SJAFCA approved the Engagement Strategy.

DISCUSSION:

SJAFCA and the consultant team recommends updating the Paradise Cut Bypass Expansion and Multi-Benefit Project (Project) Engagement Strategy (Attachment B1). To allow the Advisory Committee to provide input on the Paradise Cut Bypass Expansion and Multi-Benefit Project Feasibility Study's (Paradise Cut Feasibility Study) evaluation and comparison of alternatives earlier in the process, the SJAFCA and the consultant team recommend moving the August 25, 2025 Advisory Committee Meeting to July 14, 2025. This will allow the Advisory Committee and reclamation districts to provide input to SJAFCA and DWR on the draft evaluation and comparison of alternatives before the Technical Team finalizes the Evaluation and Comparison of Alternatives Memorandum.

SJAFCA will not provide the Advisory Committee the full Evaluation and Comparison of Alternatives Memorandum for review. Instead, SJAFCA will provide the Advisory Committee with a summary of the evaluation and alternatives comparison results to review at least five days before the July 14, 2025 Advisory Committee meeting. The Advisory Committee will provide feedback on the summary of the draft evaluation and comparison of alternatives at the July 14, 2025 Advisory Committee meeting. The Advisory Committee will see the full Evaluation and Comparison of Alternatives Memorandum in November as part of the draft Paradise Cut Bypass Expansion and Multi-Benefit Project Feasibility Report (Feasibility Report). SJAFCA and the

Technical Team will provide an overview of the draft Feasibility Report at the September 22, 2025 Advisory Committee meeting. With this new approach, the Advisory Committee both will provide input on the evaluation and comparison of alternatives earlier in the process and also will retain the opportunity to review the draft Feasibility Report from November 19, 2025 to December 10, 2025).

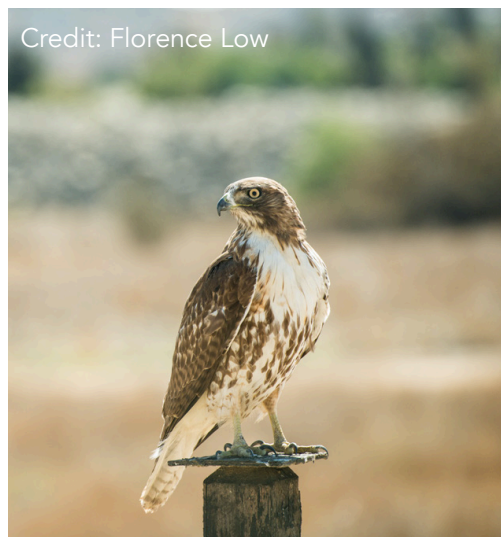
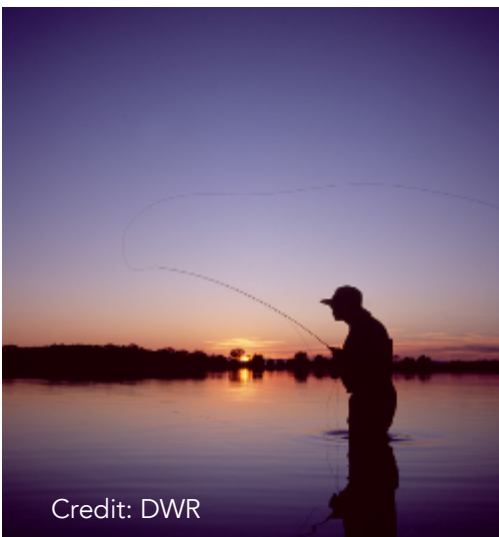
FISCAL IMPACT:

The recommended action does not have a fiscal impact as all costs are covered by previously approved contracts.

Paradise Cut Bypass Expansion and Multi-Benefit Project (Phase 3)

ENGAGEMENT STRATEGY

Approved by SJAFCA on November 26, 2024



Paradise Cut Bypass Expansion and Multi-Benefit Project (Phase 3) Engagement Strategy

The Paradise Cut Bypass Expansion and Multi-Benefit Project (Phase 3) Engagement Strategy (“Engagement Strategy”) will guide efforts to engage interested parties in the completion of a feasibility study, including development of a preferred alternative for the Paradise Cut Bypass Expansion and Multi-Benefit Project (Project). The Engagement Strategy aligns with the requirements outlined in the Phase 3 agreement (2023 Agreement) between the San Joaquin Area Flood Control Agency (SJAFCA) and the California Department of Water Resources (DWR), which provides funding for the feasibility study and associated community engagement. SJAFCA will oversee implementation of the Engagement Strategy with assistance from the Paradise Cut Management Team and the Paradise Cut Consultant Team, as described in the Decision Recommendation Framework.

PROJECT TEAM

The Project Team consists of the Paradise Cut Consultant Team, the Paradise Cut Management Team, the Project Advisory Committee, SJAFCA, and DWR. The Paradise Cut Bypass Expansion and Multi-Benefit Decision Recommendation Framework located on the SJAFCA web site describes individual members of the group which comprise the Project Team. SJAFCA also is contracting with Consero Solutions for facilitation services, Larsen, Wurzel, and Associates for project management support, and Wood Rodgers for completion of the Project feasibility study. Wood Rodgers is subcontracting with River Partners, MBK Engineers, ICF, HDR, Anchor QEA, and Environmental Science Associates. The Project Team is responsible for Engagement Strategy implementation and each organization on the team will execute specific tasks.

ASSUMPTIONS

The Engagement Strategy assumes SJAFCA will work with the consultant team and the Advisory Committee to meet all goals and objectives, although this Engagement Strategy does not assign the work to a particular organization, company, or individual. The Engagement Strategy also assumes sufficient budget to complete this work. The Engagement Strategy is a living document, however, and SJAFCA will update the Engagement Strategy if budget constraints or other conditions necessitate changes.

AUDIENCES

The primary and secondary audiences are the focus of community engagement related to the Project, so the Engagement Strategy is tailored to ensure feedback from these audiences is integrated into key Project deliverables and they receive robust Project updates at regular intervals.

Primary Audiences

The Project Team will actively solicit feedback from primary audiences listed in Engagement Strategy and incorporate any reasonable feedback into the feasibility study, as well as provide regular Project updates.

- 1) The San Joaquin Area Flood Control Agency
- 2) The Project Advisory Committee, consisting of SJAFCA, the South Delta Water Agency, four representatives from RDs (three downstream of Paradise Cut and RD 2095), a representative from a local municipality, and American Rivers or another non-profit selected by American Rivers, as well as three non-voting members, the Central Valley Flood Protection Board, the California Department of Water Resource, and the Sacramento-San Joaquin Delta Conservancy
- 3) The 19 reclamation districts affected by the Project, both upstream and downstream of the Project, organized into small groups by geographic location, as well as engineering firm/legal representation, as follows:

Group 1	Group 2	Group 3	Group 4
RD 17	RD 1	RD 2064	RD 684
RD 404	RD 2	RD 2085	RD 1007
RD 524	RD 544	RD 2095	RD 2058
RD 773	RD 2062		RD 2094
	RD 2075		RD 2096
	RD 2089		
	RD 2107		

- 4) Landowners with property for which easements or fee title acquisition may be necessary to construct the Project
- 5) Tribal leaders and representatives of Tribes with an affiliation to the Project site (in coordination with the California Department of Water Resources and Central Valley Flood Protection Board's Tribal Liaisons)

- 6) The California Department of Water Resources (the State Water Project Division, The Flood Projects Office, and the Integrated Water Resources Management Division)
- 7) The Central Valley Flood Protection Board, as the lead state agencies implementing the Central Valley Flood Protection Plan
- 8) Sacramento-San Joaquin Delta Conservancy
- 9) U.S. Fish and Wildlife Service and the California Department of Fish and Wildlife (permitting agencies which also are responsible for regulatory oversight responsibility of the San Joaquin County Multi-Species Habitat Conservation and Open Space Plan)
- 10) U.S. Army Corps of Engineers (Sacramento District)
- 11) San Joaquin County Flood Control and Water Conservation District (San Joaquin County)
- 12) San Joaquin Council of Governments (San Joaquin County Multi-Species Habitat Conservation and Open Space Plan)
- 13) Banta-Carbona Irrigation District
- 14) California State Water Resources Control Board
- 15) Union Pacific
- 16) Delta Stewardship Council
- 17) Delta Protection Commission

Secondary Audiences

The Project Team will provide regular Project updates to secondary audiences, as well as answer questions.

- 1) United States Bureau of Reclamation

- 2) Federal Emergency Management Agency
- 3) California Wildlife Conservation Board and other potential funding agencies
- 4) State and federal legislators
- 5) Eastern San Joaquin Groundwater Basin Authority
- 6) Tracy Subbasin Groundwater Basin Authority
- 7) San Joaquin County, including the Board of Supervisors, the Planning Department, Office of Emergency Services, and the Water Resources Department
- 8) City of Manteca, including the City Council
- 9) City of Lathrop, including the City Council
- 10) San Joaquin Resource Conservation District
- 11) Greater San Joaquin County Regional Water Coordinating Committee (IRWM region)
- 12) Caltrans District 10
- 13) Local non-profit or advocacy organizations with an interest in the Project, such as Restore the Delta
- 14) Educational institutions such as University of California, Davis/ Merced, Delta College, et. al.
- 15) Upstream water agencies such as Modesto Irrigation District, Turlock Irrigation District, Oakdale Irrigation District, South San Joaquin Irrigation District, Merced Irrigation District et.al.
- 16) General public, including local landowners and environmental stewards

GOALS AND OBJECTIVES

Community engagement goals and objectives ensure the Project Team agrees on and is held accountable for completing specific, measurable, achievable, realistic, and time-bound community engagement work.

GOAL 1: Establish shared understanding of the term “feasible” project with local and state decisionmakers prior to starting the feasibility study

Objective 1-1: Secure feedback from primary audiences on the Engagement Strategy, study area, Project goals, and Project objectives in October 2024.

Objective 1-2: Present suggested definition of “feasible” and refine “feasible” definition in collaboration with primary audiences in October 2024.

GOAL 2: Communicate Project updates consistently and with sufficient detail

Objective 2-1: Create an updated Project overview by September 2024.

Objective 2-2: Complete virtual newsletter every six months through December 2025 for primary and secondary audiences.

Objective 2-3: Update SJAFCA web site page with Project information every six months consistent with release of virtual newsletter for primary and secondary audiences.

Objective 2-4: Complete draft of Frequently Asked Questions by November/December 2024 and update document every six months or as needed.

Objective 2-5: Develop an environmental justice engagement process by winter 2024/2025.

Objective 2-6: Develop a Tribal engagement process in coordination with DWR and the CVFPB by winter 2024/2025.

GOAL 3: Secure feedback on preliminary and final Project alternatives

Objective 3-1: Implement Tribal and environmental justice related engagement process led by DWR and the CVFPB.

Objective 3-2: Send letters to reclamation districts encouraging them to comment on selected draft deliverables in December 2024 ~~and March 2025~~.

Objective 3-3: Meet as needed with representatives from primary audiences in spring 2025 to secure feedback on the Draft Alternatives Formulation and Screening Technical Memorandum (Chapter 5).

Objective 3-4: Present Draft Alternatives Formulation and Screening Technical Memorandum (Chapter 5) to the Advisory Committee and SJAFCa in ~~May/June~~ April/May 2025.

Objective 3-5: ~~Host a virtual workshop Meet in person~~ with reclamation districts ~~in organized small groups~~ to secure feedback on the Draft Alternatives Formulation and Screening Technical Memorandum (Chapter 5) in ~~February~~ April/May 2025. These meetings will take place during the Advisory Committee review period.

Objective 3-6: Present ~~the draft alternatives evaluation and comparison of alternatives final alternatives, including the preferred alternative, and as part of the draft Evaluation and Comparison of Alternatives Memo~~ to the Advisory Committee and SJAFCa in ~~August/September~~ July 2025.

Objective 3-7: ~~Meet in person~~ Host a virtual workshop with reclamation districts ~~in organized small groups~~ to secure feedback on the summary of the draft ~~Evaluation and Comparison of Alternatives Memo, including the preferred alternative evaluation and comparison of alternatives,~~ in ~~August/September~~ July 2025. ~~These meetings will take place during the Advisory Committee review period.~~

Objective 3-8: Meet as needed with other representatives of primary audiences in late summer 2025 to secure feedback on the summary of the draft ~~evaluation and comparison of alternatives~~ Evaluation and Comparison of Alternatives Memo.

Objective 3-9: Preview the Draft Feasibility Report with the Advisory Committee and SJAFCa in September 2025.

Objective 3-910: Host a public workshop for primary and secondary audiences to secure feedback on the ~~draft alternatives evaluation and comparison of alternatives~~ Evaluation and Comparison of Alternatives Memo, including the preferred alternative, in September/October 2025.

Objective 3-1011: Present the Draft Feasibility Report to the Advisory Committee and SJAFCA in ~~late December~~ 2025.

Objective 3-1112: Meet in person with reclamation districts in organized small groups to secure feedback on Draft Feasibility Report in late 2025. These meetings will take place during the Advisory Committee review period.

Objective 3-1213: Host a public workshop for primary and secondary audiences to secure feedback on the Draft Feasibility Report in late 2025.

GOAL 4: Secure DWR, CVFPB, SJAFCA, and broad local reclamation district support for a preferred Project alternative, as well as Phase 4 funding requests

Objective 4-1: Communicate the outcome of support for a feasible project in all outreach materials and future funding requests.

Objective 4-2: Present to selected reclamation district Board of Directors once SJAFCA approves the preferred alternative to formally request their support for the preferred alternative and funding for Phase 4.

Objective 4-3: Secure letter of support or other official indicator of support from DWR, CVFPB, SJAFCA and reclamation districts for the preferred alternative and funding for Phase 4 by February 2026 (joint letter preferred, individual letters acceptable).

SCHEDULE

The schedule will ensure the Project Team engages the community and secures input on key deliverables consistent with the timeline in the 2023 Agreement.

- **September 2024:** Complete updated project overview (DONE)
- **October 2024:** Introduce primary audiences to the Project and seek feedback on study area, goals and objectives, and engagement strategy (DONE)
- **November/December 2024:** Complete Frequently Asked Questions (DONE)

- **December 2024:** Send out letter to reclamation districts regarding opportunity to review interim deliverables **(DONE)**
- **December 2024:** Advisory Committee meeting (December 2, 2024) **(DONE)**
- **January/February 2025:** First virtual newsletter **(DONE)**
- **January/February 2025:** Update Project page on SJAFCA website **(DONE)**
- ~~March 2025: Send out letter to reclamation districts regarding opportunity to review interim deliverables~~
- February 2025: Meetings with primary audiences regarding Draft Alternatives Formulation and Screening Technical Memorandum (Chapter 5) (DONE)
- **April 2025:** 10-day review period (April 2, 2025 – April 15, 2025) for Draft Alternative Formulation and Screening Technical Memorandum (Chapter 5)
- **April 2025:** Advisory Committee meeting (April 21, 2025)
- ~~February/April/May 2025: Meetings with primary audiences regarding Draft Alternatives Formulation and Screening Technical Memorandum (Chapter 5)~~
- **June/July 2025:** Second virtual newsletter
- June/July 2025: Update Project page on SJAFCA website
- July 2025: Advisory Committee meeting (July 14, 2025)
- ~~August 2025: 10-day review period (August 6, 2025 – August 20, 2025) for final Evaluation and Comparison of Alternatives Memo~~
- ~~August 2025: Advisory Committee meeting (August 25, 2025)~~
- ~~August/September-July 2025: Meetings with primary audiences regarding the final Evaluation and Comparison of Alternatives Memo summary of the draft evaluation and comparison of alternatives~~
- **September 2025:** Advisory Committee meeting to receive preview of the -Draft Feasibility Report (September 22, 2025)
- **September/October 2025:** Public workshop #1
- **November/December 2025:** 10-day review period (November 19, 2025 – December 10, 2025) for Draft Feasibility Report
- **November/December 2025:** Meetings with primary audiences regarding Draft Feasibility Report
- **December 2025:** Advisory Committee meeting (December 15, 2025)
- **December 2025:** Public workshop #2
- **December 2025:** Third virtual newsletter
- **December 2025:** Update Project page on SJAFCA website

STAFF REPORT

To: Paradise Cut Advisory Committee

From: Darren Suen, San Joaquin Area Flood Control Agency
Glenn Prasad, San Joaquin Area Flood Control Agency
Ric Reinhardt, Wood Rodgers
Melissa Weymiller, LWA
Petrea Marchand, Consero Solutions

RE: Receive update on the Paradise Cut Feasibility Study

Date: April 21, 2025

RECOMMENDED ACTION:

Receive update on the Paradise Cut Feasibility Study

BACKGROUND:

On February 21, 2025, the Paradise Cut Feasibility Study Technical Team (Technical Team) met with reclamation district representatives to receive input on seven preliminary alternatives and the screening and evaluation criteria to reduce the seven alternatives to three alternatives for further technical evaluation. The Technical Team provided the reclamation districts a week after the meeting to provide additional comments. All reclamation districts present provided verbal comments during the workshop and four reclamation districts (RD 2096, RD 2064, RD 2062, and RD 2107) provided comments in writing for the Technical Team to consider.

On March 6, 2025, at the Paradise Cut Management Team meeting, Sarah Puckett (American Rivers and Advisory Committee Vice-Chair) and David Pesavento with the California Department Water Resources discussed replacing one of the three selected alternatives with an alternative which includes an expanded weir and more ecosystem restoration. The Paradise Cut Management Team ultimately decided to move forward with the Technical Team's three alternatives with the assumption the Technical Team could add habitat restoration to the alternatives later in the Feasibility Study process.

On March 13, 2025, SJAFCA staff and the Technical Team presented to the SJAFCA Board of Directors on the Paradise Cut Feasibility Study, including the three alternatives selected for further technical evaluation. At this meeting, Sarah Puckett (American Rivers and Advisory Committee Vice-Chair) requested that SJAFCA consider replacing one of the alternatives with an alternative with an expanded weir and more ecosystem restoration than the three alternatives originally recommended. Ms. Puckett sent an email to the SJAFCA Executive Director and the PCMT after the SJAFCA Board meeting requesting SJAFCA not recommend Alternative 2 for further evaluation and instead evaluate Alternative 6 or 7. SJAFCA's Executive Director

coordinated with John Herrick and DWR. Based on that collaboration, SJAFCA's Executive Director decided to remove Alternative 4 from the three alternatives and add a combination of Alternative 6 and 7. The new alternative contains the following elements:

- Alternative 6 with a new weir expanded to 2,000 ft (instead of 1,000 ft)
- Add a 500 ft opening in the Union Pacific Railroad rail line that is on the north side of I-5. This would result in both Union Pacific Railroad lines having 500 ft openings.
- Excavate the high bench under I-5.
- Remove the Four Corners setback levees from the alternative.

The Technical Team updated Chapter 5: Formulation of Preliminary Alternatives to describe these changes and distributed the revised Chapter 5 to the Advisory Committee for review on April 2, 2025. The Technical Team requested the Advisory Committee provide feedback by April 15, 2025.

DISCUSSION:

The Technical Team will provide an overview of Chapter 5 at the April 21st Advisory Committee meeting. Chapter 5 provides an overview of the seven preliminary alternatives, the screening criteria and the results of the analysis, and the three final alternatives to move forward for further technical evaluation.

FISCAL IMPACT:

The recommended action does not have a fiscal impact as all costs are covered by previously approved contracts.

CONSISTENCY WITH PROJECT OBJECTIVES

The recommended alternatives are consistent with the project objectives to reduce catastrophic flood risk for communities including Lathrop, Manteca, and Stockton; protect farms from uncontrolled flooding; restore and improve the quantify, diversity, and connectivity of riverine, floodplain, riparian, and wetland habitat for native fish and wildlife; and improve irrigation intake reliability and waterway navigability.

Chapter 5. Formulation of Preliminary Alternatives

This chapter describes the management actions considered for the formulation of preliminary alternatives; the management actions that make up each of the seven preliminary alternatives; and the process used to evaluate and compare preliminary alternatives, to inform selection of the final array of alternatives.

5.1 Management Actions

A management action is a structural or non-structural measure, strategy, or activity that can be implemented at a specific location to contribute to one or more Project objectives. Management actions are the building blocks of alternatives (DWR 2014).

5.1.1 Identification of Management Actions

Management actions were identified from the following past studies.

- **California Department of Water Resources (DWR) (2017). *Draft Basin-Wide Feasibility Study (BWFS), San Joaquin Basin*. March 2017.** The BWFS considered a variety of weir configurations, including expanding the existing Paradise Cut weir up to 1,000 feet upstream or downstream along the San Joaquin River or adding a new 1,000-foot upstream weir on the San Joaquin River near the Banta Carbona Irrigation District canal. Alternative restoration concepts associated with the new upstream weir included ongoing agricultural production, conservation of working lands to support special status species, or restoring riparian habitat within the entire footprint of the new upstream floodway. The BWFS considered modifying the east Union Pacific Railroad (UPRR) crossing by adding 10 culverts to the embankment or expanding the existing bridge opening.
- **American Rivers (2019). *Conceptual Design Technical Memo: Paradise Cut Expansion Project. Prepared for the Sacramento-San Joaquin Delta Conservancy and San Joaquin County Resource Conservation District (RCD)*. April 9, 2019.** As discussed in Chapter 1, the preferred plan resulting from the Phase 2 studies was the Minimum Viable Project (MVP), which included five miles of dredging along Grant Line Canal and Old River; a new 1,000-foot upstream weir, improvements to the Deuel Vocational Institution levee; levee setbacks on the left bank of Paradise Cut between the east and the west UPRR crossing, levee degradates where levees are set back, a 250-foot opening in the east UPRR crossing, and habitat restoration within the expanded bypass footprint. Hydraulic modeling prepared for the MVP showed that the new upstream weir would lower flood stages on the San Joaquin River along downstream urban levees as well as upstream of Paradise Cut, where prior levee breaches have occurred. Other conceptual designs discussed in this report featured the following management actions: a 2,000-foot upstream weir; downstream levee setbacks on the left bank of Paradise Cut at the Kisst Dairy, Bend 16, and downstream of Bend 16; and 500-foot openings in the east UPRR crossing, I-5, and west UPRR crossings.
- **San Joaquin County RCD (2023). *Proposed Strategies to Address Concerns of Landowners and Reclamation Districts Downstream of the Paradise Cut Expansion and South Delta***

Restoration Project. Prepared for San Joaquin Area Flood Control Agency (SJAFC)A). May 4, 2023. At the conclusion of Phase 2, the San Joaquin County RCD prepared a memo to capture local input on the 2019 concept design and to recommend additional management actions downstream of Paradise Cut for future consideration in this Phase 3 feasibility study. The RCD memo recommended up to 25 miles of dredging on Fabian and Bell Canal, Old River, Middle River, Tom Paine Slough, and Paradise Cut to support the reliable functioning of water supply intakes along these channels.

The RCD memo identified a variety of management actions to address concerns with downstream impacts of the Project, including:

- downstream levee erosion protection (using either rip rap or vegetative methods);
- levee geometry improvements;
- seepage berms and cutoff walls;
- setback levees; and
- ecological setback levees (also referred to as ecological levee rehabilitation or green levees).

The RCD defined ecological setback levees as actions to reduce downstream flood risk by using dredged material to widen levees, create seepage berms behind existing levees, or provide a foundation for new setback levees; building new setback levees behind existing levees; planting trees and other vegetation on the original levees; and breaching the original levees to permit floodwaters to enter the expanded floodplain areas. These management actions were identified for levees within the Four Corners area, where Paradise Cut flows into Old River and Grant Line Canal via numerous interconnected sloughs. Levees along Reclamation District (RD) 2058 (Pescadero), RD 2089 (Stark), and RD 2062 (Stewart Tract) were specifically identified for consideration of the ecological levee setback concept.

The RCD memo identified a variety of management actions to enhance, restore, or create habitat, including:

- creation of shallow aquatic or channel margin habitat along the southern edge of Grant Line Canal (from Tracy Road Bridge to Doughty Cut);
- enhancing habitat on upper Tom Paine Slough;
- restoring a 100-acre in-channel island adjacent to Salmon Slough; and
- erosion protection of in-channel islands in Grant Line Canal, Fabian and Bell Canal, Old River, and Middle River.

Other proposed management actions included removal of water hyacinth and curly leaf pondweed; reestablishing flows in Salmon Slough; and altering flows in Paradise Cut to allow more river inflows.

The Phase 3 feasibility study technical team (study team), Paradise Cut Management Team (PCMT), Advisory Committee, and interested parties identified the following additional management actions.

- Spot dredging in the immediate vicinity of water supply intakes impacted by sedimentation on the San Joaquin River near Airport Way;
- Spot dredging in the immediate vicinity of water supply intakes impacted by sedimentation of downstream channels in the study area;
- A dredge extent that includes all downstream channels in the study area; and
- Operable gates to limit flow entering Paradise Cut via a new upstream weir.

In addition, the study team compiled a list of habitat restoration opportunities within the San Joaquin River floodplain upstream and downstream of Paradise Cut weir, drawing on information from Phase 1 of the Project (American Rivers 2018), the Mossdale Urban Flood Risk Reduction Study (Peterson Brustad, Inc. 2021), and the ongoing Lathrop and Manteca Feasibility Study (Lathrop/Manteca Study).¹ These habitat restoration opportunities are identified from north to south, below.

- Setback RD 17 levees and restore floodplain habitat on the right bank of the San Joaquin River at Weston Ranch (Site A), located between river miles (RM) 44.7-46.2.
- Improve channel margin habitat at up to four sites (Sites 2, 5, 6 [B], and 9) on the right bank of the San Joaquin River, located between RM 48 to 53, near Lathrop.
- Breach the right bank levee on the San Joaquin River and restore more than 150 acres of seasonal floodplain habitat between RM 52.6-54.1 (Site 8).
- Improve 2.5 miles of the riparian corridor on the left bank of San Joaquin River (RM 53.4 to 56) at RD 2062.
- Restore riparian forest, seasonal wetland, and upland habitats adjacent to the RD 17 dryland levee at Walthall Slough, between RM 57.4-58.3 (Site 13).
- Create riparian forest, aquatic habitat, and upland habitat on the left bank of the San Joaquin River at RD 2107, between RM 56.7-57.7 (Sites 14 and 16).
- Improve aquatic habitat at an oxbow on the right bank of the San Joaquin River across from Paradise Cut Weir (Site 17E), located between RM 57.6-57.8.
- Restore riparian and scrub habitat at Bass Lake, between RM 60.1-60.5 (Site H), also known as Eagal Lakes.
- Improve and restore riparian forest, riverine, and oak savannah habitat within the Circle Lake oxbow on the right bank of the San Joaquin River, between RM 60.1-61.8 (Site I).
- Breach the right bank State Plan of Flood Control (SPFC) levee on the San Joaquin River and significantly regrade existing agricultural land to restore oak savannah, riparian forest, and seasonal wetland habitat between RM 61.8-64.4 (Site K).

¹ Site names and references from previous and ongoing studies are retained here, for consistency.

- Restore approximately 50 acres of riparian habitat on the right bank of the San Joaquin River near Cabral Island (Site L), located between RM 64.1-65.2.
- Restore approximately 60 acres of riparian habitat adjacent to the training levee on the left bank of the San Joaquin River, between RM 63.3-66.4 (Site M).
- Restore an in-channel island within the San Joaquin River between RM 66.7-67.6 (Site N).
- Degrade a training levee at the Coconino oxbow on the left bank of the San Joaquin River to enhance riparian habitat between RM 68.2-69.4 (Site O).

Management actions to setback levees in additional reaches within the study area were also identified based on the requirements of Delta Plan Ecosystem Restoration Policy 4 (ER P4). ER P4 requires that projects that include actions to construct new levees or substantially rehabilitate or reconstruct existing levees along Paradise Cut, Old River, Middle River, and lower San Joaquin River, *“must evaluate and where feasible [sic] incorporate alternatives, including the use of setback levees, to increase floodplains and riparian habitats”* (Cal. Code Regs., tit. 23, § 5008). While the Project is not explicitly a “levee project,” it may include construction of new levees or substantial rehabilitation or reconstruction of existing levees along the applicable channels to contain flows within new or expanded floodways and/or to mitigate hydraulic impacts of changes in peak flows. Early consideration of setback levees could facilitate future demonstration of consistency with this policy, should it be deemed applicable.

5.1.2 Screening of Management Actions

Table 5-1 lists the management actions that were screened out of consideration. Management actions were screened out based on the following five criteria:

- A. The action has already been implemented, is proposed to be implemented, or has been foreclosed upon by other projects.
- B. The action does not meaningfully support Project objectives.
- C. The action would add significant cost for limited/no additional benefit to Project objectives.
- D. The action is redundant with or included in another management action.
- E. The action is limited by one or more planning constraints.

The sections that follow provide more detail on the rationale used to screen management actions within each category.

1 **Table 5-1. Management actions screened out.**

Management Action Category	Management Action	Screening Criteria
Dredging	Spot dredging around impacted intakes in downstream channels	B
	Spot dredging on the San Joaquin River at the Airport Way bridge	B
	Dredging along five miles of Old River and Grant Line Canal	B*
	Dredging along 25 miles of downstream channels	D
	Dredging all downstream channels within the study area	C
Control Structures	Adding operable gates to the new upstream weir	C
Levee erosion protection and improvements	Erosion protection (rip rap, vegetation methods)	C*
	Geometry improvements, seepage berms, cutoff walls	C*
Levee setbacks and degradés	Ecological levee setbacks on RD 2062 (Stewart Tract)	A
	Ecological levee setbacks on channels downstream of Four Corners	C*
Modifications to Crossings	Adding culverts to the east UPRR crossing	D
	Expand the existing east UPRR bridge opening by 250 feet	E
	Expand the existing east UPRR bridge opening by 500 feet	E
San Joaquin River floodplain habitat restoration	Setback RD 17 levees and restore floodplain habitat on the right bank of the San Joaquin River at Weston Ranch (Site A)	E
	Restore seasonal floodplain habitat on the right bank at RM 52 (Site 8)	A
	Create a 2.5-mile riparian corridor on the left bank at RD 2062	A
	Restore riparian habitat at Walthall Slough (Site 13)	A
	Restore existing floodplains on the left bank at RD 2107 (Sites 14, 16)	A
Aquatic or channel margin habitat creation in downstream channels	Creating aquatic or channel margin habitat around the confluence of Paradise Cut and Old River	B, D
	Creating aquatic or channel margin habitat on the south bank of Grant Line Canal, Tracy Road to Doughty Cut	B, C
Protection and restoration of in-channel islands	Implementing erosion protection on Grant Line Canal and Fabian and Bell Canal in-channel islands	B
	Implementing erosion protection on Old/Middle River in-channel islands	B
Other	Enhancing or restore habitat along upper Tom Paine Slough	C
	Removing water hyacinth and curly leaf pondweed	D
	Removing invasives and add control structure on Salmon Slough	B
	Enabling river inflows to Paradise Cut outside of high flow events	B

2 Notes: Management actions with an asterisk (*) were screened out of consideration for the formulation of preliminary
3 alternatives but will be considered for mitigation of hydraulic impacts. These include: 5 miles of dredging on Old River
4 and Grant Line Canal; levee erosion protection; levee geometry, stability, and seepage improvements; and ecological
5 levee setbacks on channels downstream of the Four Corners area.

6 **Dredging**

7 The Project concepts that were developed during Phase 2 included five miles of dredging along Old
8 River and Grant Line Canal (American Rivers 2019). The primary purpose of this dredge extent was
9 to mitigate for the hydraulic effects of an enlarged Paradise Cut bypass on downstream levees

(American Rivers 2019). While the five-mile dredge extent might have value as hydraulic mitigation, it would not satisfy the Phase 3 Project objectives because on its own, it would not meaningfully reduce flood risk, restore ecosystems, or enhance water supply reliability.

The other more limited spot dredging approaches were screened out because, similar to the five-mile dredge extent, they would not satisfy the Phase 3 Project objectives. While spot dredging could temporarily improve the ability of water supply intakes to function, the dredged areas would likely fill quickly with the accumulated sediment remaining in adjacent areas and would not provide a meaningful improvement in water supply reliability over time.

The dredge extent that includes all downstream channels in the study area was screened out because it would add unnecessary cost for no additional benefit, as large reaches of Grant Line Canal are already at sufficient depth to draw water for irrigation. The 25-mile dredge extent recommended by the San Joaquin County RCD (2023) was screened out because the 39-mile dredge extent is reflective of the area that needs to be dredged to achieve the Project objectives.

Control structures

During initial Phase 3 outreach, a local RD representative requested that any management actions that include a new upstream weir consider designing the weir with operable gates. The purpose of the operable gates would be to limit flow through the upstream weir to a rate that can be accommodated by design capacity of the bypass. This management action was considered, but ultimately screened out, because it would introduce significant capital and operations and maintenance (O&M) costs to the Project without providing additional benefit to achieving the Project objectives.

As the existing Paradise Cut Bypass design capacity is assumed to be restored in the future without-project condition, a control structure with this limitation on flow would negate one of the primary Project objectives, which is to utilize an expanded bypass to reduce the risk of catastrophic flooding on the lower San Joaquin River. As noted in Chapter 4, hydraulic impacts of increased flow through an expanded Paradise Cut bypass will need to be mitigated in accordance with State and federal regulations.

The purpose of other bypass weirs in the Central Valley flood risk management system is to limit flows on the mainstem river, rather than to limit flows through the bypass. For example, the operational objective of the Sacramento Weir is to limit flow in the Sacramento River to the maximum feasible design capacity of the Sacramento River Channel below the weir. In these cases, the additional cost may be justified due to the flood risk management benefits provided.

Levee erosion protection and improvements

Erosion protection, geometry improvements, and seepage and stability improvements to existing downstream levees were screened out due to the high cost of these actions relative to their contribution to Project objectives. In addition, if such levee improvements were deemed substantial rehabilitation, the Delta Plan policy ER P4 requires that the use of setback levees be evaluated and incorporated, where feasible. If setback levees are feasible in the same locations, they could contribute more toward the Project's flood risk management and ecosystem restoration objectives, while also supporting consistency with ER P4. Although erosion protection and levee improvements were screened out as management actions for the formulation of preliminary alternatives, these actions will be considered for mitigation of the hydraulic effects of the Project.

Levee setbacks and degrades

If the Project were to include levee improvements in the locations identified by San Joaquin County RCD, implementing the improvements as setback levees would support consistency with the Delta Plan policy ER P4. Depending on the extent of the setbacks, these could contribute meaningfully to Project objectives by conveying flow out of Paradise Cut and to opening up new floodplain space for habitat restoration. The San Joaquin County RCD specifically identified levees in the Four Corners area, at the confluence of Old River and Paradise Cut, for application of the ecological levee setback concept. The study team also considered levee setbacks downstream of the Four Corners area to potentially support local reuse of dredge material and consistency with Delta Plan policy ER P4.

Ecological levee setbacks on RD 2062 were ultimately screened out because River Islands development has already constructed setback levees on RD 2062, and degrading of the existing SPFC levees on RD 2062 is included in the future without project condition. Additionally, levee setbacks downstream of Four Corners were screened out of consideration as Project elements because constructing new levees to protect rural agricultural areas would add significant cost without meaningfully contributing to Project objectives. However, levee setbacks downstream of the Four Corners will be considered for mitigation of hydraulic impacts.

On RD 2058 and RD 2089, some levee reaches may be constrained by existing infrastructure and vegetation. As discussed in Chapter 4, infrastructure and vegetation on the landside of existing levees, including drainage and irrigation systems, pumps, water supply intakes, buildings, and mature trees, could make setback levees and other levee improvements cost prohibitive. However, at this stage, there is insufficient information to screen out specific locations and define a feasible alignment. Therefore, ecological setback levees in the Four Corners area, on RD 2058 and RD 2089, were carried forward for inclusion in the preliminary alternatives at a conceptual level. Setbacks along these levees could range from the minimal footprint illustrated in RCD (2023) that allows for planting the degraded levee, up to a more extensive footprint that would shift more than 400 acres of land from either tract into the floodplain.

Modifications to crossings

A variety of management actions were identified that would modify the east UPRR rail crossing over Paradise Cut, including the addition of culverts, a 250-foot expansion in the existing opening, and a 500-foot expansion in the existing opening. The expanded openings were screened out after investigation into the UPRR requirements identified the need to construct a temporary shoofly track, which would result in a new bridge needing to be constructed to maintain train service during construction of the Project. A shoofly track that connects to the existing rail bridge would meet the curve requirements of UPRR, while a longer shoofly track to replacing bridge access would not.

In place of the expanded opening, the study team identified a new management action that would add an opening between the left bank rail abutment and the left bank setback levee. A 250-foot option and a 500-foot option were identified, to align with the scale of management actions that were screened out. The management action that would add culverts to the rail embankment was deemed redundant with the new openings and was screened out.

San Joaquin River floodplain habitat restoration

The following habitat restoration sites were screened out of consideration:

- Weston Ranch (Site A) was screened out because of potential transfer of risk concerns related to large-scale setbacks of the RD 17 levee and feasibility constraints, including liability and maintenance.
- Site 8 was screened out because the northern end of the site has already been reconnected to the floodplain and restored, while the City of Lathrop has approved development plans at the southern end of the site.
- A 2.5-mile reach on left bank of the San Joaquin River at RD 2062 was screened out because American Rivers is pursuing a project at this location, with funding from the Delta Conservancy.
- Sites 13, 14, and 16 were screened out because they are included in the locally preferred plan for the Lathrop/Manteca Study.

Aquatic or channel margin habitat creation in downstream channels

Management actions that would create or restore aquatic habitat in downstream channels, including at the confluence of Paradise Cut and Old River and along the south bank of Grant Line Canal, between Tracy Road and Doughty Cut were screened out because it is not desirable to attract special status fish species to downstream channels that flow towards the SWP/CVP export pumps. The Project does target habitat restoration along the San Joaquin River for aquatic species, but not within the identified downstream channels.

Management actions that would create or restore channel margin habitat in setback areas at the confluence of Paradise Cut and Old River are covered by the levee setback management actions carried forward. Management actions that would create or restore channel margin habitat along the south bank of Grant Line Canal were screened out as Project elements due to cost, as the identified reach of Grant Line Canal is not within the 39-mile dredge extent.

Protection and restoration of in-channel islands

Similarly, the San Joaquin County RCD identified a variety of management actions on islands within downstream channels. While one of these – restoration of the 100-acre in-channel island adjacent to Salmon Slough, was carried forward – the others were screened out. The management actions that were screened out were focused on erosion protection of in-channel islands through the placement of dredged material. These management actions would not meaningfully contribute to Project objectives of restoring habitat and ecosystems and could have a negative effect on water supply reliability and on flood capacity in some downstream channel locations, by reintroducing available sediment within the channel flow area.

Other

Other management actions identified by San Joaquin County RCD that were screened out of consideration included enhancing or restoring habitat along upper Tom Paine Slough. Restoring habitat along upper Tom Paine Slough could benefit terrestrial species but could trigger a variety of regulatory requirements that would add significant cost to the Project without added benefit to the flood risk management or water supply reliability objectives.

Invasive species removal could be a byproduct of management actions that restore channel depths (such as dredging), so removing water hyacinth and curly leaf pondweed was screened out as an independent action.

Finally, management actions that would enhance flows in Salmon Slough and Paradise Cut outside of high flow events were screened out because they would not meaningfully contribute to Project objectives related to flood risk management. Although such actions could potentially improve water quality and aquatic habitat conditions, water quality improvement is not a Project objective, and this Project does not target restoration for aquatic species in downstream channels, because it is not desirable to attract special status fish species to downstream channels that flow towards the SWP/CVP export pumps. And while increased flows could support water supply reliability, meaningfully increasing flows would require actions to alter flows outside of the Project study area, which is outside of the scope of the Project.

5.2 Preliminary Alternatives

Alternatives are groupings of management actions that, together, are intended to fulfill the Project goals and objectives, while accounting for the constraints (DWR 2014), as defined in Chapter 4.

5.2.1 Formulation of Preliminary Alternatives

The management actions that met the initial screening criteria were grouped into distinct preliminary Project alternatives. While each management action might have addressed only one or two Project objectives on its own, grouping them with complementary management actions allowed for the formulation of complete alternatives that, together, strive to address all of the Project objectives. Since the 39-mile dredge extent was the only management action carried forward to address the water supply reliability Project objective, the study team included 39 miles of dredging in all seven alternatives.

The study team used the Minimum Viable Project concept from Phase 2 (hereafter, referred to as the Phase 2 Plan) as a starting point for formulating preliminary alternatives. The Phase 2 Plan (Alternative 3) was adjusted to incorporate the 39-mile dredge extent identified to improve water supply reliability for downstream intakes, as requested by the South Delta Water Agency.

Because UPRR requirements were identified early in the planning process as a potential cost and schedule constraint, three alternatives (Alternatives 1, 2, and 4) were formulated that avoid management actions within the UPRR right of way. By the same logic, if the Project *does* include management actions within the UPRR right of way, the added cost and time to create a larger opening in the rail embankment could be outweighed by the added hydraulic benefit. Therefore, three alternatives were formulated to include a larger 500-foot opening in the eastern rail embankment (Alternatives 5, 6, and 7). Two of the alternatives with 500-foot openings were modeled after concepts from the Phase 2 study: the Modified CVFPP (Alternative 5) and the Potential Maximum Project (hereafter, referred to as the Maximum Plan) (Alternative 7).

Potential restoration actions along the San Joaquin River upstream and downstream of Paradise Cut weir are considered “separable” elements that do not affect the hydraulic performance or design of the flood risk management actions and water supply reliability management actions and were

therefore considered separately from the preliminary alternatives. These include restoration opportunity sites A, 2, 5, 6(B), 9, 17E, H, I, K, L, M, N, and O (see Figure 5-8 in Section 5.2.2).

5.2.2 Description of Preliminary Alternatives

This section includes detailed descriptions of the preliminary alternatives with corresponding maps. As all of the preliminary alternatives include the same 39-mile dredging extent and the potential for ecosystem restoration at the same set of sites on the San Joaquin River, the descriptions and figures below focus on the other, distinguishing features of each alternative. The dredging extent and the San Joaquin River restoration opportunity sites that are common to all of the preliminary alternatives are depicted in Figure 5-8. The management actions that comprise each preliminary alternative are identified in Table 5-2.

Alternative 1. Minimum Plan A: Minimum Plan A (Alternative 1) is shown in Figure 5-1. This alternative would not modify any of the rail or road crossings over Paradise Cut. This alternative would extend the existing Paradise Cut weir upstream along the San Joaquin River. Levees on the left bank of Paradise Cut would be set back from the extended weir to the west UPRR crossing (in RDs 2095 and 2058). In addition, the right bank levee (in RD 2107) would be set back from the east UPRR crossing to I-5. Where levees are set back, the existing Paradise Cut levee would be degraded. The new floodway areas would be restored to create habitat for target terrestrial species.

Alternative 2. Minimum Plan B: Minimum Plan B (Alternative 2) is shown in Figure 5-2. This alternative would not modify any of the rail or road crossings over Paradise Cut. This alternative would extend the existing Paradise Cut weir downstream along the San Joaquin River. Levees on the right bank of Paradise Cut (in RD 2107) would be set back from the weir to the east UPRR crossing. Levees on the left bank (in RD 2095 and 2058) would be set back downstream of the east UPRR crossing. Where levees are set back, the existing Paradise Cut levee would be degraded. The new floodway areas would be restored to create habitat for target terrestrial species.

Alternative 3. Phase 2 Plan: The Phase 2 Plan (Alternative 3) is shown in Figure 5-3. This alternative is based on the MVP from Phase 2, which added a new 1,000-ft long weir on the San Joaquin River, upstream of Paradise Cut, and added a 250-ft opening in the east UPRR crossing. Levees on the left bank of Paradise Cut (in RD 2095 and 2058) would be set back from the Deuel Vocational Institution to the east UPRR crossing, and from the east UPRR crossing to just beyond the west UPRR crossing. The existing Paradise Cut levee would be degraded from the east UPRR crossing to just beyond the west UPRR crossing. The new floodway areas would be restored or farmed to create habitat for target terrestrial species.

Alternative 4. Modified Phase 2 Plan: The Modified Phase 2 Plan (Alternative 4) is shown in Figure 5-4. This alternative is identical to the Phase 2 Plan (Alternative 3), except that it excludes the east UPRR rail opening and includes additional downstream setback levees. In place of the east UPRR rail opening, the existing Paradise Cut left bank levee would be degraded from the existing Paradise Cut weir to the east UPRR crossing, allowing flow from the new upper weir to enter the existing bypass. The additional downstream levee setbacks include a setback levee on the left bank of

Paradise Cut at Kist Dairy (in RD 2058), and ecological levee setbacks along RD 2058 and RD 2089 levees, within the Four Corners area. Existing levees would be degraded. The new floodway areas would be restored or farmed to create habitat for target terrestrial species.

Alternative 5. Modified Central Valley Flood Protection Plan (CVFPP): The Modified CVFPP (Alternative 5) is shown in Figure 5-5. This alternative is based on the Modified CVFPP plan from Phase 2, which added a new 1,000-ft long weir on the San Joaquin River upstream of Paradise Cut and added a 500-ft opening in the east UPRR crossing. Levees on the left bank of Paradise Cut (in RD 2095 and 2058) would be set back from the new weir to the Deuel Vocational Institution, from the Deuel Vocational Institution to the east UPRR crossing, and from the east UPRR crossing to up to and just beyond the west UPRR crossing. The existing Paradise Cut levee would be degraded from the east UPRR crossing to just beyond the west UPRR crossing. The new floodway areas would be restored or farmed to create habitat for target terrestrial species.

Alternative 6. Phase 2 Plan Plus: The Phase 2 Plan Plus (Alternative 6) is shown in Figure 5-6. This alternative is an enlarged version of the Phase 2 Plan (Alternative 3). Instead of a new 250-ft opening in the east UPRR crossing, this alternative has a new 500-ft opening. This alternative includes the levee setbacks that are included in the Phase 2 Plan (Alternative 3), as well as setbacks along the left bank of Paradise Cut at the Kist Dairy, Bend 16, downstream of Bend 16 (in RD 2058), and along RD 2058 and RD 2089 levees within the Four Corners area. The existing Paradise Cut levee would be degraded from the east UPRR crossing to the confluence with Old River. The existing RD 2058 and RD 2089 levees would be degraded where levees are set back. The new floodway areas would be restored or farmed to create habitat for target terrestrial species. In addition, the 100-acre in-channel island near Salmon Slough would be restored as habitat for target terrestrial species.

Alternative 7. Maximum Plan: The Maximum Plan is shown in Figure 5-7. This alternative is an enlarged version of the Potential Maximum Plan (PMP) from Phase 2, which added a new 2,000-ft long weir along the San Joaquin River upstream of Paradise Cut and added 500-ft openings in the east UPRR crossing, I-5, and the west UPRR crossing. This alternative includes the same levee setbacks and degrades as the Phase 2 Plan Plus (Alternative 6), including those at Kist Dairy, at Bend 16, downstream of Bend 16, and in the Four Corners area. The new floodway areas would be restored to create habitat for target terrestrial species. The 100-acre in-channel island near Salmon Slough would be restored as habitat for target terrestrial species.

Alternative 8. No action: This alternative is identical to the future without-project condition.

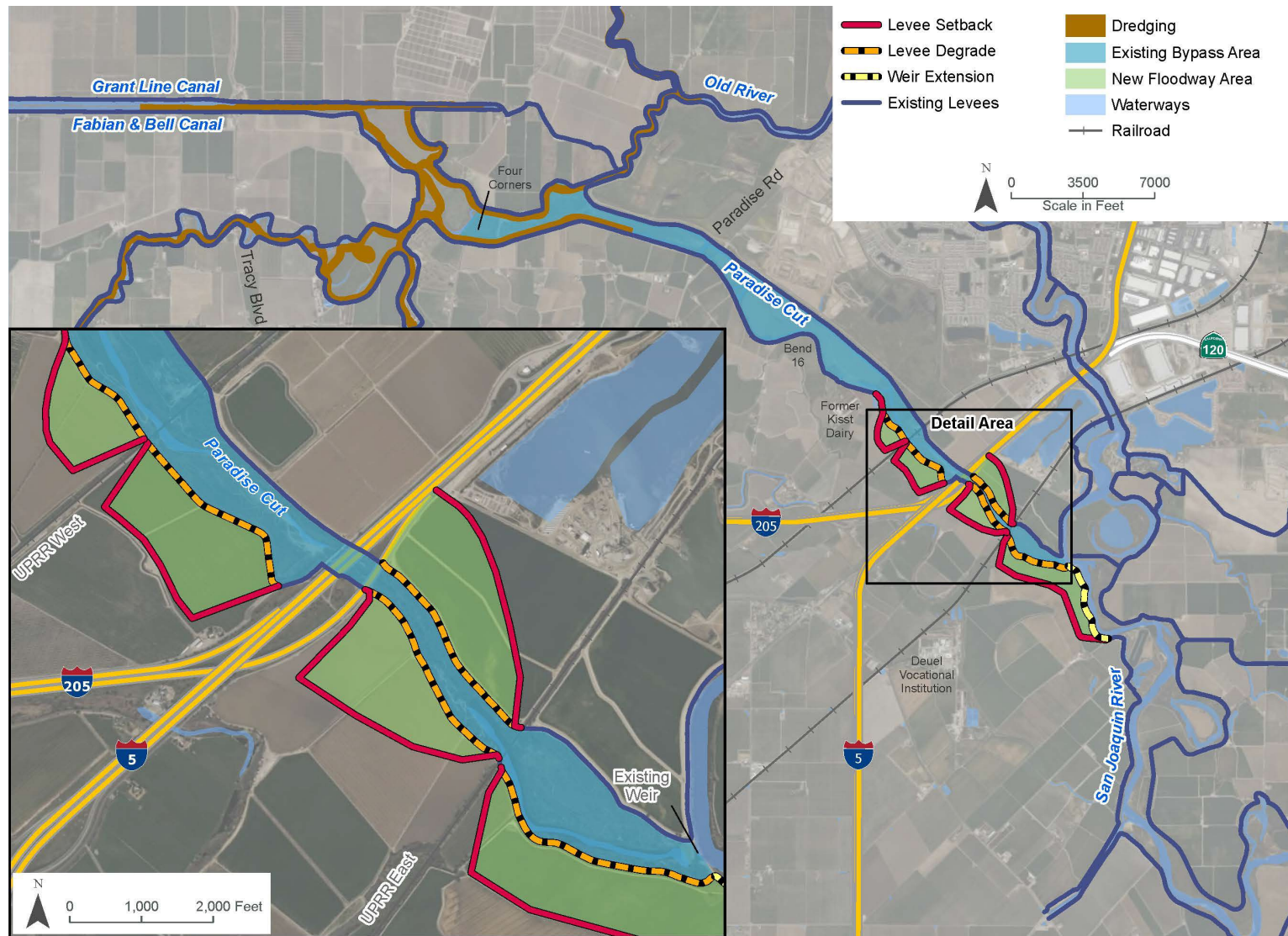


Figure 5-1. Minimum Plan A (Alternative 1)

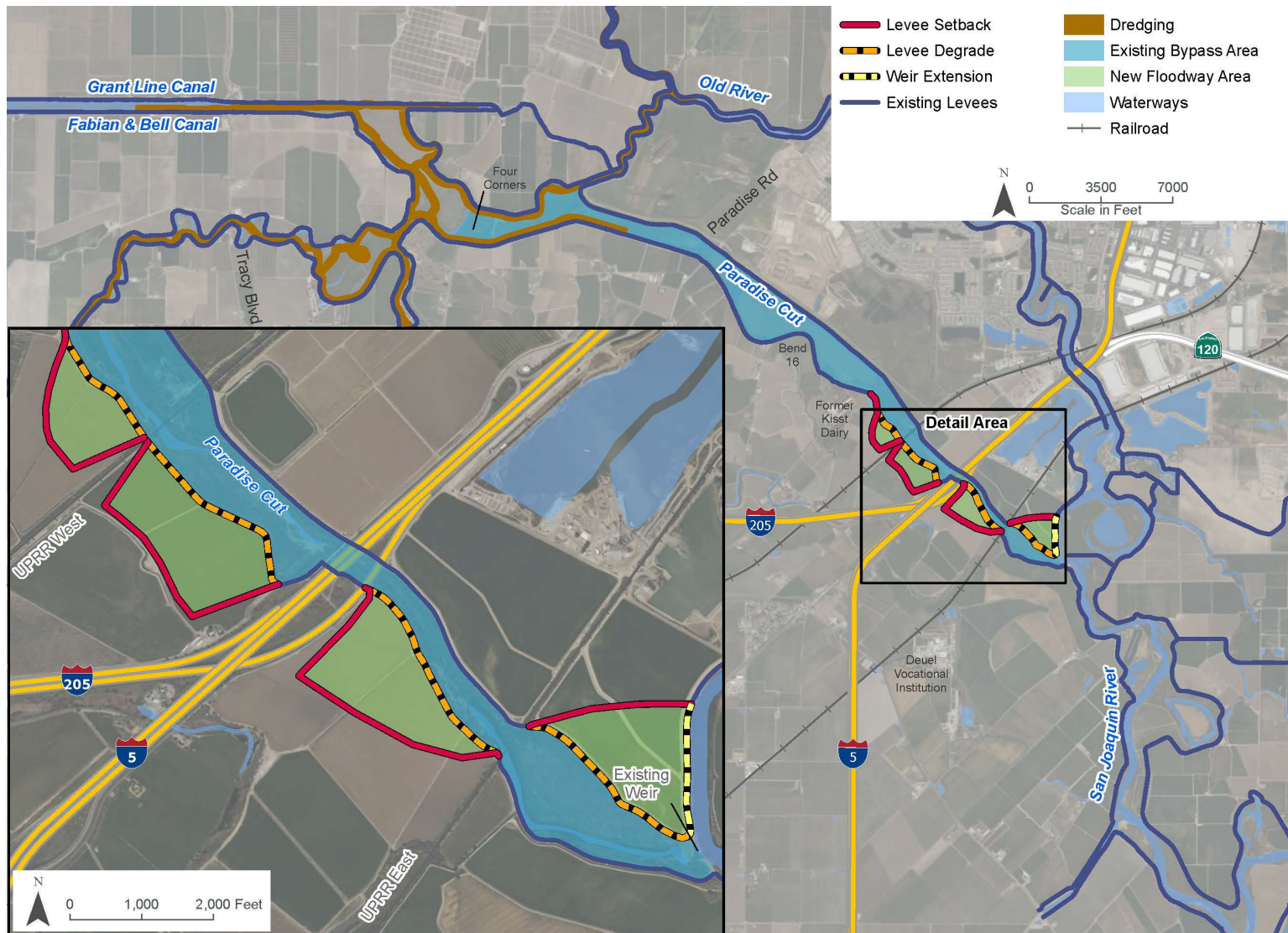


Figure 5-2. Minimum Plan B (Alternative 2)

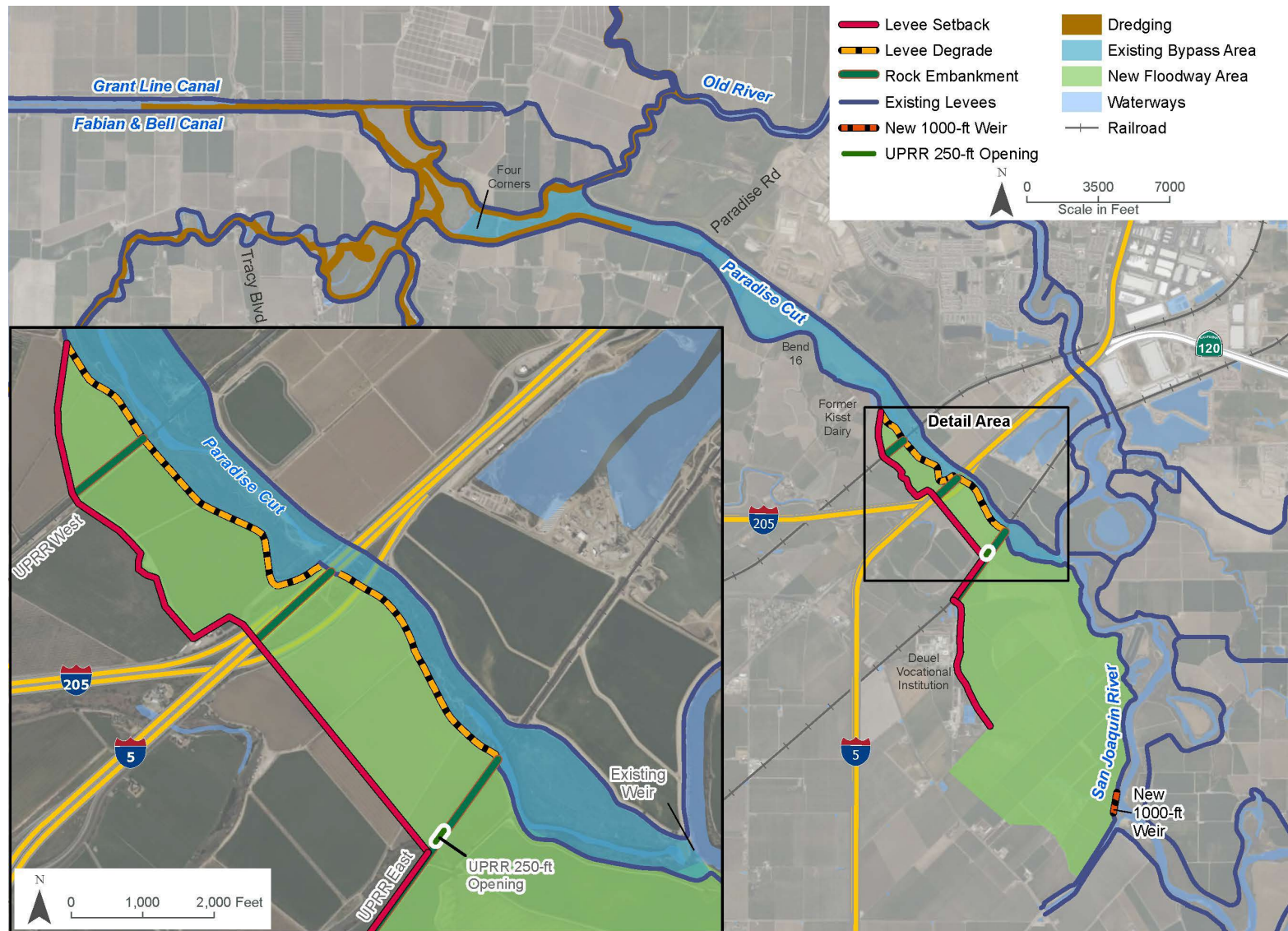


Figure 5-3. Phase 2 Plan (Alternative 3)

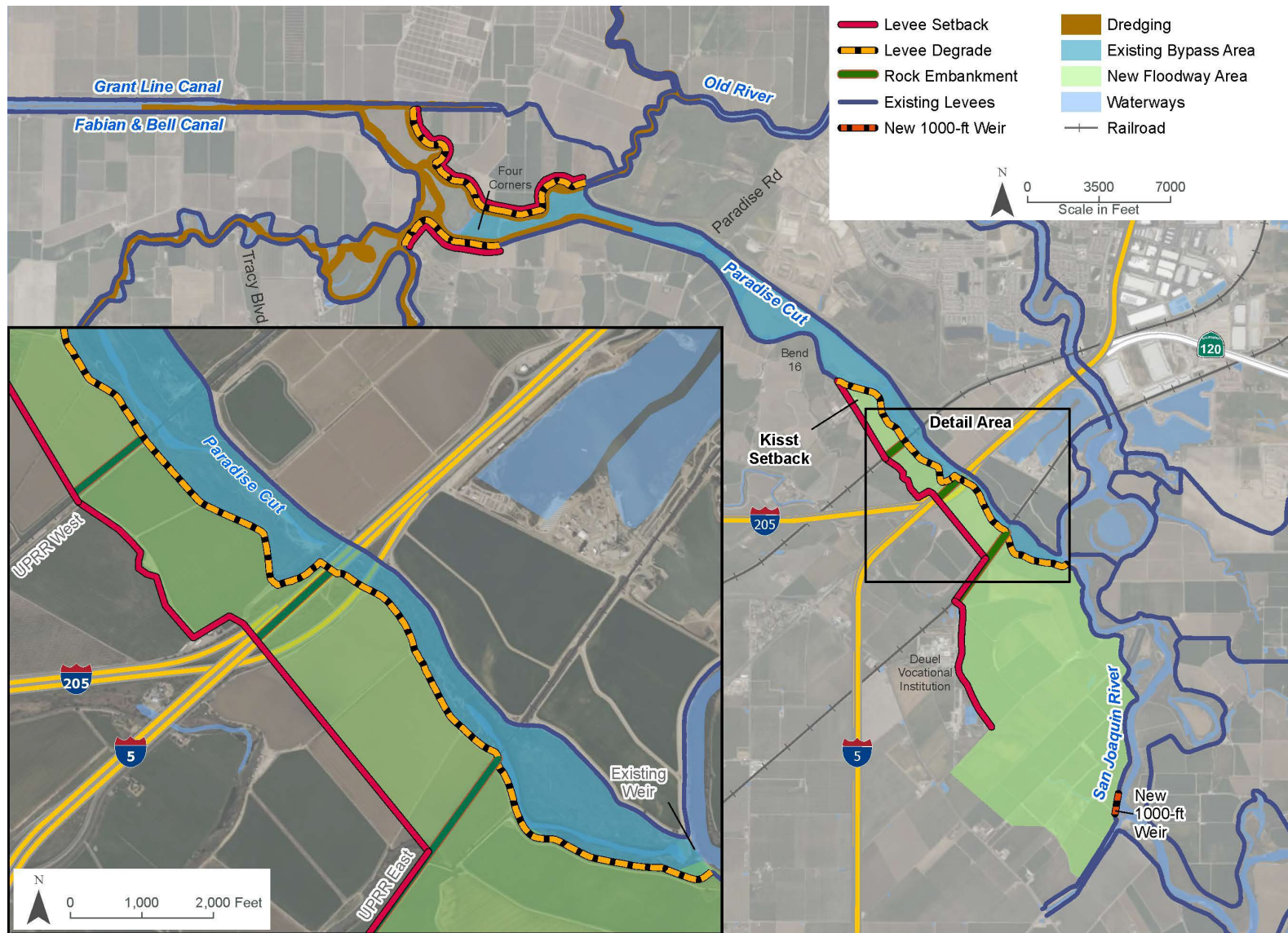


Figure 5-4. Modified Phase 2 Plan (Alternative 4)

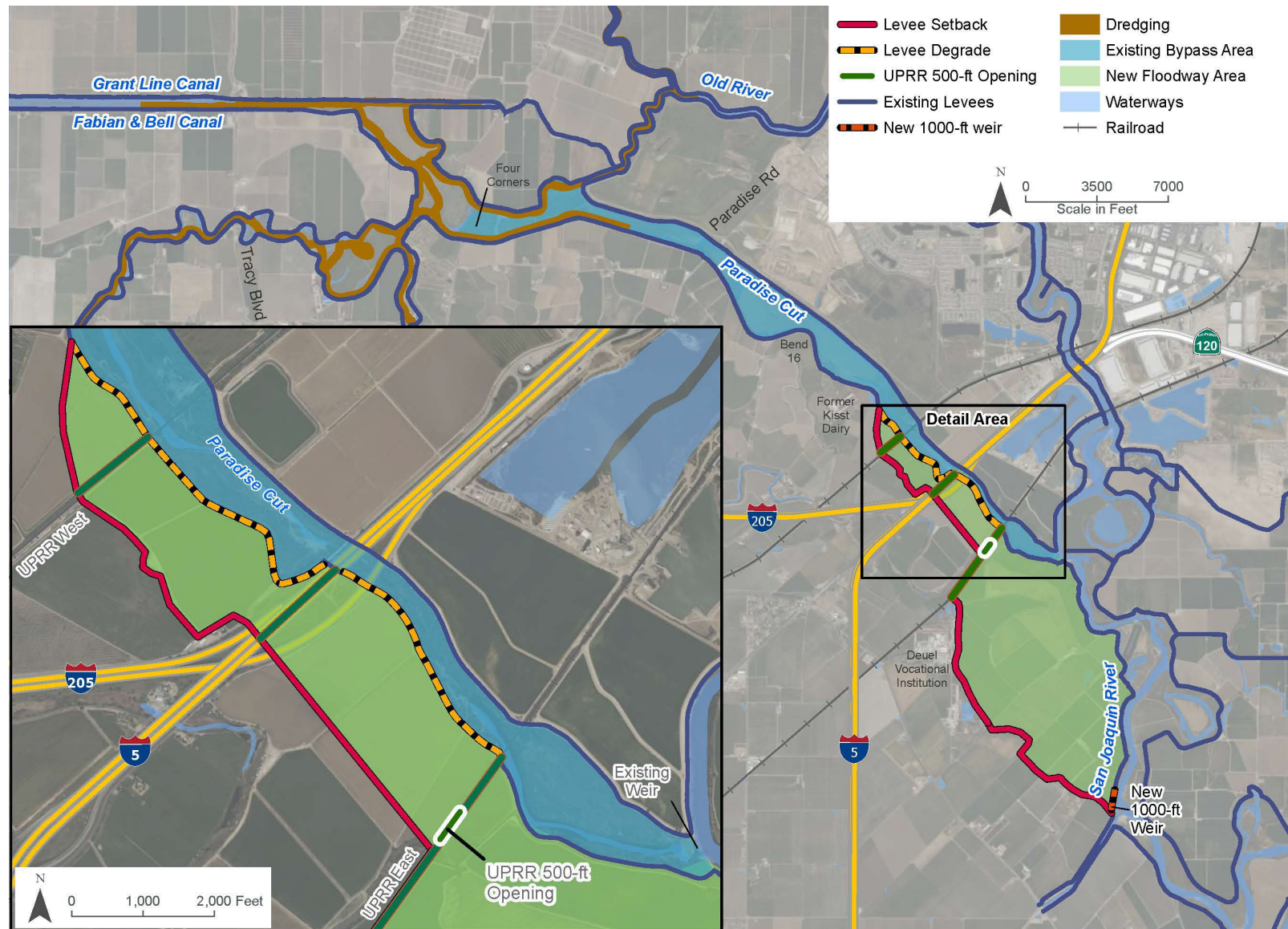


Figure 5-5. Modified CVFPP (Alternative 5)

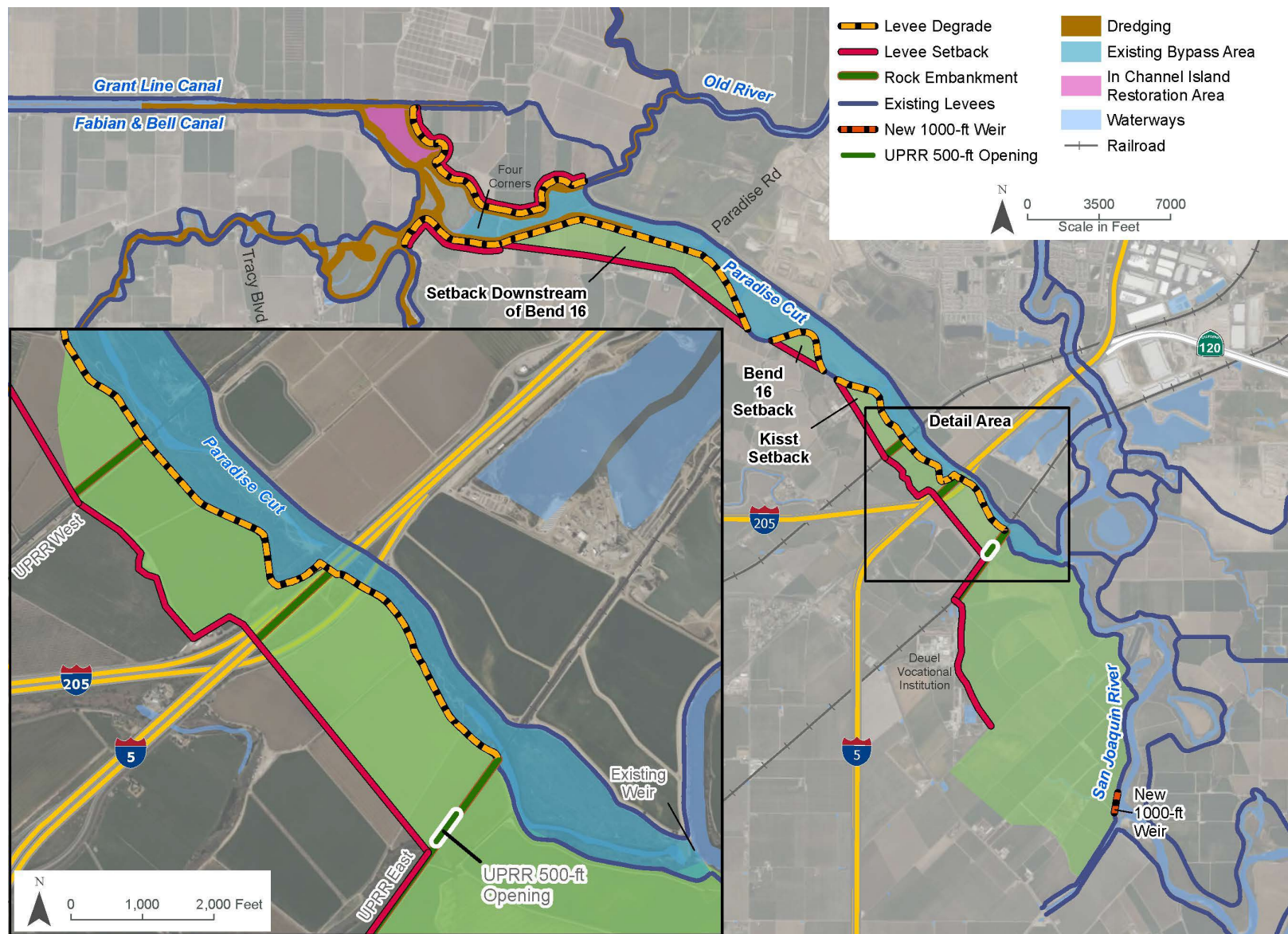


Figure 5-6. Phase 2 Plan Plus (Alternative 6)

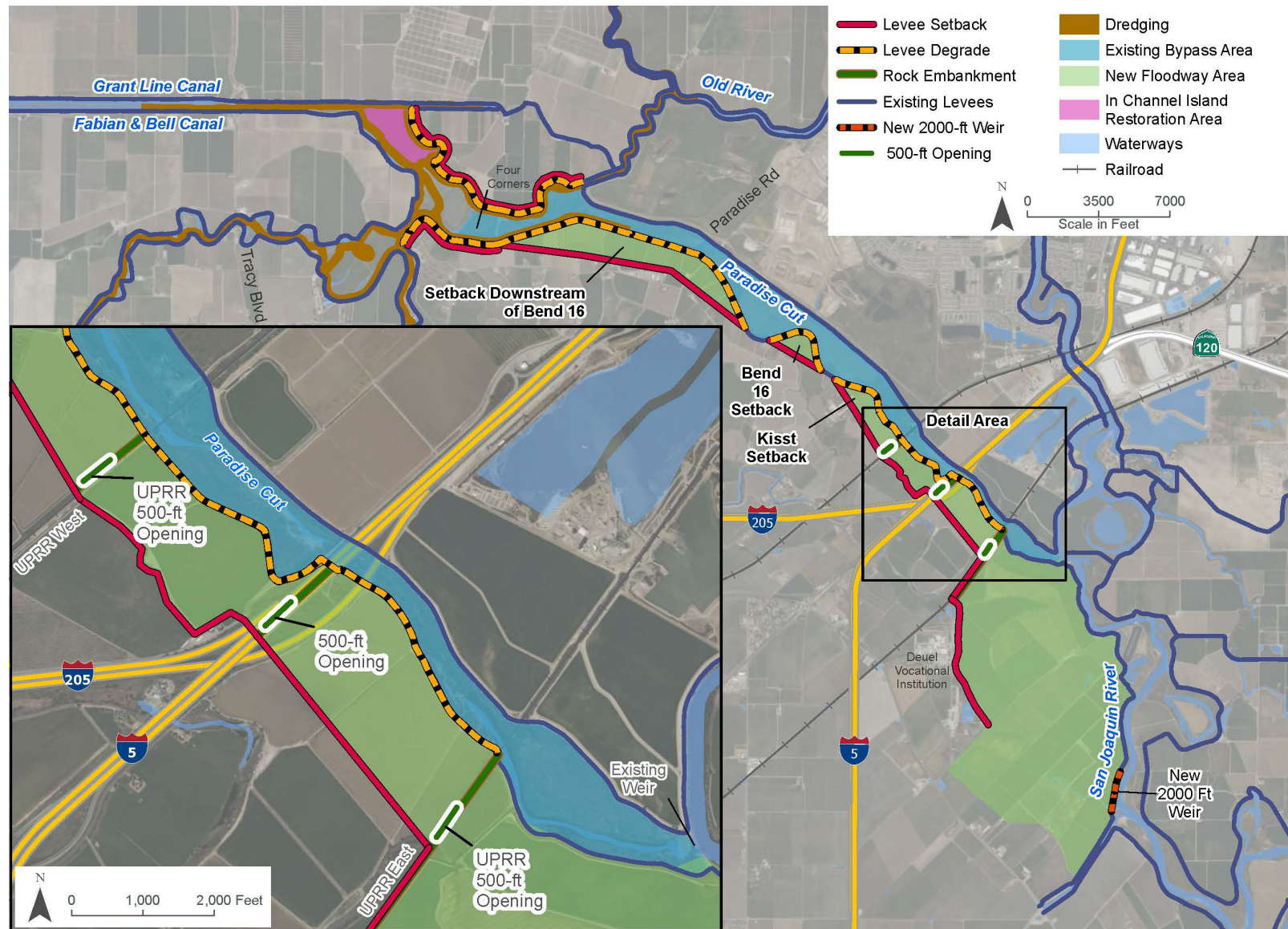


Figure 5-7. Maximum Plan (Alternative 7)

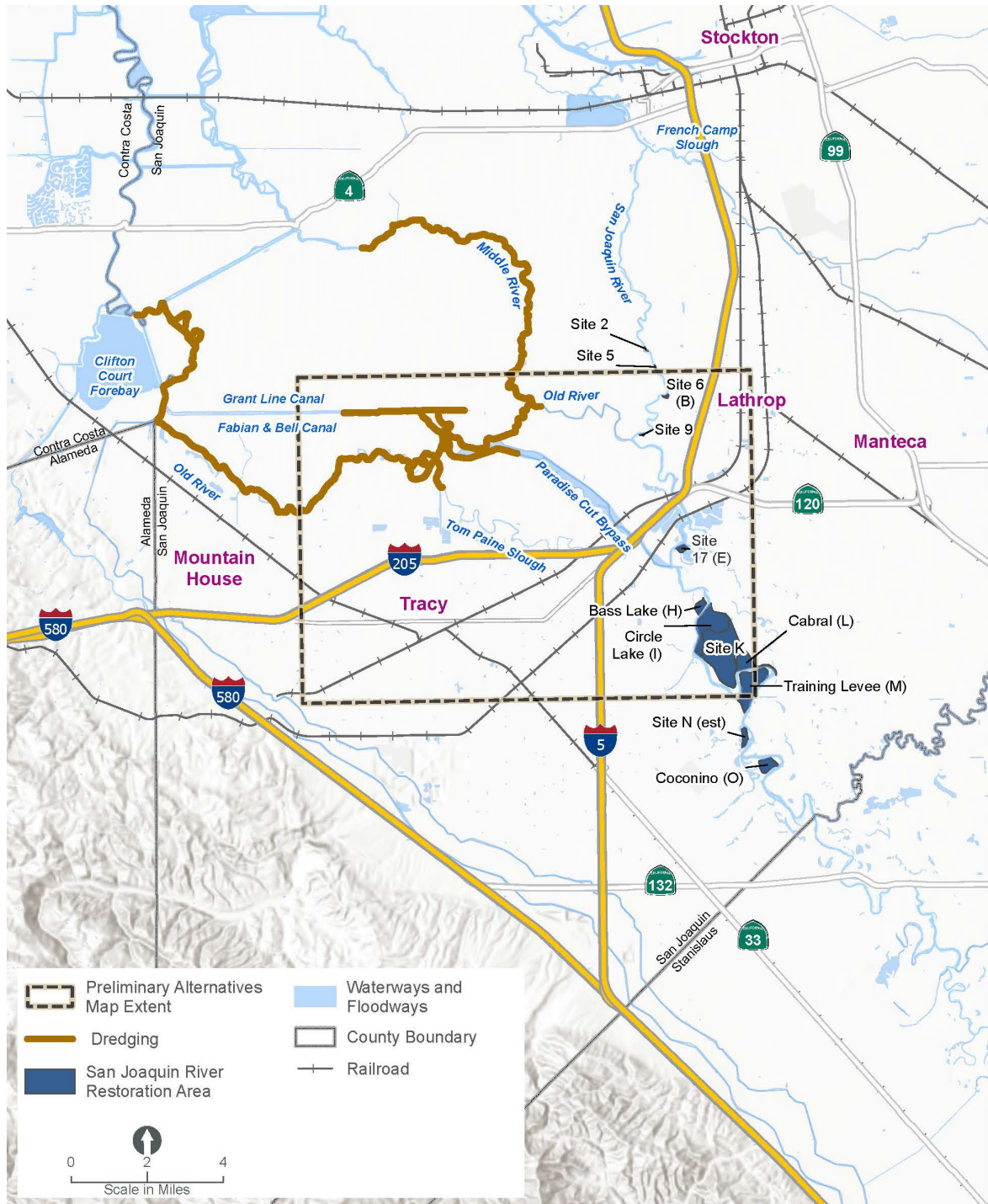


Figure 5-8. Management actions common to all preliminary alternatives

1 **Table 5-2. Summary of Management Actions Included in Preliminary Alternatives**

Management Actions Category	Specific Management Action / Location	PRELIMINARY ALTERNATIVES						
		Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6	Alternative 7
		Minimum Plan A	Minimum Plan B	Phase 2 Plan	Modified Phase 2 Plan	Modified CVFPP	Phase 2 Plan Plus	Maximum Plan
CHANNEL RESTORATION								
Dredging	39-mile extent	X	X	X	X	X	X	X
FLOOD RISK MANAGEMENT								
Weirs	Expand existing weir upstream on San Joaquin River	X						
	Expand existing weir downstream on San Joaquin River		X					
	New upstream weir - 1,000 ft			X	X	X	X	
	New upstream weir - 2,000 ft							X
Levee setbacks and degrades	Degrade and setback right bank levee, extended weir to east UPRR (RD 2107)		X					
	Degrade and setback right bank levee, east UPRR to I-5 (RD 2107)	X						
	Degrade left bank levee, existing weir to east UPRR (RD 2095)				X			
	Degrade and setback left bank levee, extended weir to east UPRR (RD 2095)	X						
	Degrade and setback left bank levee, east UPRR to I-5 (RD 2095)	X	X	X	X	X	X	X
	Degrade and setback left bank setback levee, I-5 to west UPRR (RD 2058)	X	X	X	X	X	X	X
	Degrade and setback left bank levee at Kisst Dairy (RD 2058)				X		X	X
	Degrade and setback left bank levee at Bend 16 (RD 2058)						X	X
	Degrade and setback left bank levee downstream of Bend 16 (RD 2058)						X	X
	Degrade and setback levees in the Four Corners area (RD 2058 and RD 2089)				X		X	X
	Setback and/or improve Deuel Vocational Institution levee (RD 2095)	X	X	X	X	X	X	X
	Create a setback levee upstream of Deuel Vocational Institution (RD 2095)					X		
Modifications to crossings	Create a new 250 ft opening in the east UPRR crossing			X				
	Create a new 500 ft opening in the east UPRR crossing					X	X	X
	Create a new 500 ft opening in the I-5 crossing							X
	Create a new 500 ft opening in the west UPRR crossing							X
ECOSYSTEM RESTORATION								
San Joaquin River floodplain habitat restoration ²	Restore habitat within the San Joaquin River floodplain (12 sites)	X	X	X	X	X	X	X
Paradise Cut floodplain habitat restoration	Restore habitat or conserve working lands for habitat within new levee setback areas	X	X	X	X	X	X	X
	Conserve working lands for habitat within floodway area below the new upstream weir			X	X	X	X	
	Restore habitat within floodway area below the new upstream weir							X
Protection and restoration of in-channel islands	Restore habitat on 100-acre in-channel island near Salmon Slough						X	X

2 ² Twelve different sites along the San Joaquin River were carried forward as opportunities to restore floodplain habitat (depicted in Figure 5-8, above) and grouped into one action in the table. These floodplain habitat restoration sites along the San Joaquin River are neither explicitly included nor excluded from the preliminary alternatives. The restoration opportunities will be considered separately for inclusion in the preferred alternative.

5.2.3 Evaluation of Preliminary Alternatives

The seven preliminary alternatives were evaluated to inform the selection of a final array of three Project alternatives. The evaluation considered each alternative's contribution to the Project objectives, the anticipated cost of the alternative, and the potential for the alternative to be scaled up to meet future needs. Input from the PCMT and Advisory Committee emphasized that a scalable Project could allow more costly or complex Project elements to be phased in over time and could help the region adapt to changing flood risk due to climate change.

The Project objectives are defined in Chapter 4 of this report and are restated in Table 5-3. The metrics used to assign scores for each criterion were dependent on the conceptual level of information available for each of the preliminary alternatives. For example, the relative flood risk reduction provided by each preliminary alternative can be understood using changes in stage on the San Joaquin River, at head of Old River, for the 1955 design flood, whereas there is insufficient information available from past studies to use changes in stage at other locations on the San Joaquin River or for other events (e.g., 200-year flood hydrology). The relative potential to improve habitat quantity, diversity, and connectivity can be inferred from the land area that would be available for management actions that conserve, create, or restore habitat, but there is insufficient information available for each preliminary alternative to determine the specific type of habitat restored.

For costs, the evaluation considered both the relative capital cost of each alternative, as well as potential losses in RD revenue that fund O&M. As discussed in Chapter 4, there are numerous constraints to expanding the Paradise Cut Bypass, including existing infrastructure, buildings, access roads, and potential environmental contamination on the landside of levees. Capital costs would include real estate costs; costs to mitigate for impacts to existing infrastructure, buildings, and access; and environmental remediation.

With regard to O&M funding, benefit assessments are typically the principal source of revenue for RDs and other Local Maintaining Agencies (LMAs) to fund levee O&M. Benefit assessments are charges levied on property owners to pay for a service or improvement that provides a benefit to real property, such as the service of operating and maintaining flood risk management infrastructure to reduce flood risk. A new upstream weir and/or setback levees that place lands in the floodway and reduce the assessable land in the RD would result in a loss of RD revenue from local assessments. Where RD revenue is lost due to reduced assessments, another funding source would need to be identified to make up the shortfall so that the RD can meet its O&M obligations.

Evaluation criteria are summarized in Table 5-3.

Table 5-3. Criteria and metrics used to evaluate preliminary alternatives.

No.	Criterion	Proxy or metric
1	How well does the alternative contribute to the Project objectives?	
1a	Reduce catastrophic flood risk for communities including Lathrop, Manteca, and Stockton	Relative stage reduction on the San Joaquin River, at head of Old River, using the design flood event (1955 design)
1b	Protect farms from uncontrolled flooding	Relative stage reduction (or increase) on Paradise Cut at the UPRR east crossing and at Paradise Road, using the design flood event (1955 design)
1c	Restore and improve the quantity, diversity, and connectivity of riverine, floodplain, riparian, and wetland habitat for native fish and wildlife	A preliminary estimate of acreage within the new floodway footprint (including new levee setback areas and the new upstream floodway) that could be conserved as working lands or restored for habitat
1d	Improve irrigation intake reliability and waterway navigability	Irrigated farmland acreage reliant on water supply intakes that have restored channel depths
2	What is the anticipated cost of the alternative?	
2a	Capital cost	Relative cost based on miles of new levees, miles of levee degrade (including weirs), number and size of openings in rail and road crossings, real estate costs, soil cleanup and remediation, mitigation, including compensatory mitigation, and other soft costs
2b	Potential loss in RD revenue	Relative area of new floodway footprint, where benefit assessments that fund O&M would be reduced or eliminated.
3	Is the alternative scalable to meet future flood risk management and ecosystem needs?	
3a	Is the alternative scalable/adaptable?	Does the alternative preclude future addition or expansion of a new upper weir and/or downstream setbacks? (yes/no)

Each of the preliminary alternatives was assigned a qualitative score for each criterion. The scoring relied on available information from past studies, preliminary hydraulic modeling prepared during the formulation of the preliminary alternatives, and input from the PCMT. Because the extent of the ecological levee setbacks in the Four Corners area was not defined for the preliminary alternatives, the effects of this management action on the Project objectives and on cost was not accounted for in the evaluation scoring.

The evaluation results are summarized in Table 5-4, below. Note that some criteria (e.g., contribution to Project objectives) use the “High” or “Highest” rating to indicate a positive or more preferred result, while others (e.g., capital cost) use “High” or “Highest” to indicate a negative or less preferred result.

1 **Table 5-4. Evaluation results**

No.	Criteria	Preliminary Alternatives						
		1	2	3	4	5	6	7
		Minimum Plan A	Minimum Plan B	Phase 2 Plan	Mod-Phase 2 Plan	Mod-CVFPP	Phase 2 Plan Plus	Maximum Plan
1	Contribution to Project Objectives							
1a	Relative stage reduction on the San Joaquin River, at head of Old River, in the 1955 flood <i>(higher scores mean more stage reduction)</i>	High Stage reduction is comparable to Phase 2 Plan	Medium Stage reduction benefits are less than Phase 2 Plan and Minimum Plan A	High Provides highest stage reduction benefits without a 2,000-ft upper weir	High Stage reduction is slightly less than Phase 2 Plan	High Stage reduction is comparable to Phase 2 Plan	High Stage reduction is comparable to Phase 2 Plan	Highest Provides 3/4-ft more stage reduction than the Phase 2 Plan due to longer upper weir
1b	Relative stage reduction (or increase) on Paradise Cut at the UPRR east crossing and at Paradise Road, in the 1955 flood <i>(higher scores have the least adverse impacts on stage)</i>	Low Stage is lower above UPRR east than the Phase 2 Plan, but increases by more than 0.5-ft at Paradise Road	Low Stage is lower above UPRR east than the Phase 2 Plan, but increases by more than 0.5-ft at Paradise Road	High Stage is lower above UPRR east and increases by less than 1/10-ft at Paradise Road	Highest Stage is lower above UPRR east and the Kisst setback could reduce stage slightly at Paradise Road	Medium While there is no stage reduction above UPRR east, the increase at Paradise Road is less than Minimum Plans A and B	High Comparable stage reduction to Phase 2 Plan above UPRR east, and lower stages below Paradise Road due to downstream setbacks	Medium Stage is 1-ft lower above UPRR east than Phase 2 Plan due to larger openings, but higher at Paradise Road. Could be offset by downstream setbacks
1c	Potential habitat restoration acreage <i>(higher scores have more potential for habitat restoration)</i>	Low An estimated 350 acres within new levee setback areas could be conserved as working lands or restored for habitat	Lowest An estimated 200 acres within new levee setback areas could be conserved as working lands or restored for habitat	Medium An estimated 260 acres within new levee setback areas and 1,650 acres in the new upstream floodway (a total of 1,910 acres added to the floodway) could be conserved as working lands or restored for habitat	High An estimated 320 acres within new levee setback areas and 1,650 acres in the new upstream floodway (a total of 1,970 acres added to the floodway) could be conserved as working lands or restored for habitat	Medium An estimated 260 acres within new levee setback areas and 1,650 acres in the new upstream floodway (a total of 1,910 acres added to the floodway) could be conserved as working lands or restored for habitat	Highest An estimated 750 acres within new levee setback areas and 1,650 acres in the new upstream floodway (a total of 2,400 acres added to the floodway) could be conserved as working lands or restored for habitat	Highest An estimated 750 acres within new levee setback areas and 1,650 acres in the new upstream floodway (a total of 2,400 acres added to the floodway) could be conserved as working lands or restored for habitat
1d	Irrigated farmland reliant on water supply intakes that have restored channel depths	High An estimated 28,300 acres of irrigated farmland would benefit	High An estimated 28,300 acres of irrigated farmland would benefit	High An estimated 28,300 acres of irrigated farmland would benefit	High An estimated 28,300 acres of irrigated farmland would benefit	High An estimated 28,300 acres of irrigated farmland would benefit	High An estimated 28,300 acres of irrigated farmland would benefit	High An estimated 28,300 acres of irrigated farmland would benefit
2	Cost							
2a	Relative cost based on miles of new levees, miles of levee degrade (including weirs), number and size of openings in rail and road crossings, real estate, soil cleanup and remediation, mitigation, including compensatory mitigation, and other soft costs <i>(lower scores mean lower costs)</i>	Low Costs limited to an estimated 8 miles of new or degraded levees and minimal real estate acquisition	Lowest (Most Affordable) Costs limited to an estimated 5 miles of new or degraded levees and minimal real estate acquisition	High Costs include an estimated 6 miles of new or degraded levees, 250-ft opening in the UPRR east crossing, and significant real estate acquisition	Medium Costs include an estimated 7 miles of new or degraded levees and significant real estate acquisition and remediation costs	High Costs include an estimated 7 miles of new or degraded levees, 500-ft opening in the UPRR east crossing, and significant real estate acquisition	High Costs include an estimated 9 miles of new or degraded levees, 500-ft opening in the UPRR east crossing, and significant real estate acquisition and remediation costs	Highest (Least Affordable) Costs include ten miles of new or degraded levees, three enlarged rail/road openings, and significant real estate acquisition and remediation costs
2b	Relative area of new floodway footprint, where benefit assessments would be reduced or eliminated <i>(lower scores mean lower revenue impacts)</i>	Low An estimated 350 acres would have reduced or eliminated assessments	Lowest An estimated 200 acres would have reduced or eliminated assessments	Medium An estimated 1,910 acres would have reduced or eliminated assessments	High An estimated 1,970 acres would have reduced or eliminated assessments	Medium An estimated 1,910 acres would have reduced or eliminated assessments	Highest An estimated 2,400 acres would have reduced or eliminated assessments	Highest An estimated 2,400 acres would have reduced or eliminated assessments

No.	Criteria	Preliminary Alternatives						
		1	2	3	4	5	6	7
		Minimum Plan A	Minimum Plan B	Phase 2 Plan	Mod-Phase 2 Plan	Mod-CVFPP	Phase 2 Plan Plus	Maximum Plan
3	Scalability							
3a	Does the alternative preclude future addition or expansion of a new upper weir and/or downstream setbacks? <i>(yes/no)</i>	Yes The left-bank setback levee upstream of the UPRR east precludes future expansion of the bypass via a new upstream weir	No Additional left-bank setback levees, openings, and/or a new upstream weir could be added in the future	No Additional left-bank setback levees, openings, and/or an upstream weir extension could be added in the future	No Additional left-bank setback levees, openings, and/or an upstream weir extension could be added in the future	No Additional left-bank setback levees, openings, and/or an upstream weir extension could be added in the future	No Additional openings, and/or an upstream weir extension could be added in the future	No Additional weir extensions and levee setbacks and degrades could be considered in the future, but were not identified in this feasibility study

5.2.4 Comparison of Preliminary Alternatives

Contribution to Project objectives compared to the Phase 2 Plan

Four of the preliminary alternatives, including Minimum Plan A (Alternative 1), Modified Phase 2 Plan (Alternative 4), the Modified CVFPP (Alternative 5), and the Phase 2 Plan Plus (Alternative 6) perform as well as the Phase 2 Plan (Alternative 3) in terms of stage reductions at head of Old River for the 1955 design flood event (Criterion 1a). Preliminary modeling indicates that Minimum Plan B (Alternative 2) provides less stage reduction relative to the Phase 2 Plan (Alternative 3). Modeling prepared in Phase 2 indicates that the Maximum Plan (Alternative 7) provides greater stage reduction than the Phase 2 Plan (Alternative 3).

Despite the similarities in performance of the Phase 2 Plan (Alternative 3), Minimum Plan A (Alternative 1), Modified Phase 2 Plan (Alternative 4), the Modified CVFPP (Alternative 5), and the Phase 2 Plan Plus (Alternative 6) at the head of Old River, the alternatives' relative performance within and downstream of Paradise Cut (Criterion 1b) are markedly different. For the 1955 design flood event, the Phase 2 Plan (Alternative 3) would reduce flood stages upstream of the eastern UPRR crossing and would increase stage by less than 2 inches at Paradise Road (American Rivers 2019). Relative to the Phase 2 Plan (Alternative 3), Minimum Plan A (Alternative 1) would have greater stage reduction at the east UPRR crossing but would also have a more significant increase in stage at Paradise Road. Therefore, the Phase 2 Plan (Alternative 3) performs better than Minimum Plan A (Alternative 1) within Paradise Cut. The Modified CVFPP (Alternative 5) would increase stages at Paradise Road more than the Phase 2 Plan (Alternative 3), due to the larger 500-foot opening in the east UPRR crossing (American Rivers 2019) but would have less impact compared to Minimum Plan A (Alternative 1). It is assumed that the effects of the 500-foot opening on stages at Paradise Road would be offset under the Phase 2 Plan Plus (Alternative 6) because of the additional levee setbacks at Kisst, Bend 16, and downstream of Bend 16. Relative to the Phase 2 Plan (Alternative 3), the Modified Phase 2 Plan (Alternative 4) has a greater stage reduction at the eastern UPRR crossing and no effects on stage at Paradise Road. Therefore, the Modified Phase 2 Plan (Alternative 4) performs better than the Phase 2 Plan (Alternative 3) in terms of stage changes within Paradise Cut.

Although the Maximum Plan (Alternative 7) performs better than the Phase 2 Plan (Alternative 3) in terms of stage reduction at head of Old River, it performs worse than the Phase 2 Plan (Alternative 3) in terms of downstream stage impacts (Criterion 1b). Based on modeling prepared under Phase 2, the Maximum Plan (Alternative 7) would have greater stage reduction than the Phase 2 Plan (Alternative 3) at the east UPRR crossing but would also have a more significant increases in stage at Paradise Road and further downstream. Stage increases on the downstream end of Paradise Cut could be lessened by the inclusion of ecological levee setbacks in the Four Corners area, depending on the extent of those setbacks, though this effect was not accounted for in the evaluation.

Although detailed restoration concepts were not formulated for the preliminary alternatives, the new land area between levees and within the floodway – where habitat could be restored or supported by working lands – varies considerably across alternatives. Based on this metric for Criterion 2c, Minimum Plan B (Alternative 2) has the lowest potential for habitat restoration, as it has the least acreage within new floodway footprint, followed closely by Minimum Plan A (Alternative 1). The Phase 2 Plan (Alternative 3), Modified Phase 2 Plan (Alternative 4), Modified CVFPP (Alternative 5), Phase 2 Plan Plus (Alternative 6), and Maximum Plan (Alternative 7) all have

significantly greater potential for habitat restoration than Minimum Plans A and B (Alternatives 1 and 2) due to the new upstream floodway created by the addition of the new upstream weir. The Modified Phase 2 Plan (Alternative 4) has slightly more potential than the Phase 2 Plan (Alternative 3) and Modified CVFPP (Alternative 5) because it includes the Kisst Setback. The Phase 2 Plan Plus (Alternative 6) and the Maximum Plan (Alternative 7) have the greatest potential for habitat restoration due to the additional downstream levee setback areas (Bend 16, and downstream of Bend 16) added to the floodway. The exact acreage available is dependent on the extent of the ecological levee setbacks in the Four Corners area, which is not accounted for in the acreage estimates. In addition, the Phase 2 Plan Plus (Alternative 6) and the Maximum Plan (Alternative 7) include habitat restoration on an in-channel island adjacent to Salmon Slough that is approximately 100 acres in size; this acreage is not accounted for in the restoration metric because it is already located within the floodway.

All of the preliminary alternatives have a high contribution to water supply reliability (Criterion 1d) because all seven alternatives, including the Phase 2 Plan (Alternative 3), would deepen 39 miles of channels. Water supply reliability is not a distinguishing factor among the preliminary alternatives.

Comparison of alternatives with similar contributions to Project objectives

Preliminary alternatives that provide similar contributions to the Project objectives were grouped for comparison. Because the groupings represent roughly equivalent Project benefits, comparing the cost (Criteria 2a and 2b) of each alternative within a group provides a qualitative understanding of the expected relative cost of those benefits. Scalability (Criterion 3) and additional information from past studies and input from the PCMT supplemented the qualitative cost comparisons.

Minimum Plans

Minimum Plans A and B (Alternatives 1 and 2) provide similar contributions to the Project objectives. Minimum Plan A (Alternative 1) performs better for stage reduction on the San Joaquin River at head of Old River and has slightly more potential for habitat restoration within new levee setback areas. However, Minimum Plan A (Alternative 1) precludes the addition of a new upstream weir to expand the bypass in the future (Criterion 3).

Minimum Plan B (Alternative 2) comprises fewer new setback levee miles and would require less land acquisition than Minimum Plan A (Alternative 1) and is therefore expected to have a lower capital cost (Criterion 2a). The smaller footprint also means that Minimum Plan B's (Alternative 2's) impact on RD revenue (Criterion 2b) would be less than Minimum Plan A (Alternative 1).

Elements of Minimum Plan A (Alternative 1) that do not preclude future adaptation could be considered for incorporation to Minimum Plan B (Alternative 2) to bring its contribution to stage reduction on the San Joaquin River at head of Old River in line with that of Minimum Plan A (Alternative 1). For example, degrading and setting back the right bank levee between the east UPRR crossing and I-5 (RD 2107) could be incorporated into Minimum Plan B (Alternative 2) to improve its contribution to stage reduction on the San Joaquin River at head of Old River (Criterion 1a), without impacting the ability to add a new upstream weir in the future (Criterion 3).

Both Minimum Plans A and B (Alternatives 1 and 2) result in significant stage increases within Paradise Cut, at Paradise Road. Incorporating one or more of the downstream setback levees present in other alternatives could help to convey flow through Paradise Cut and reduce this effect. This would also provide more area for potential habitat restoration. For example, the Modified Phase 2 Plan (Alternative 4), which also does not modify the east UPRR crossing, performs better than the Minimum Plans (Alternatives 1 and 2) within Paradise Cut and with regard to ecosystem restoration due to its larger setback areas and the inclusion of the Kisst setback.³

Recommendation: The study team recommends that the Final Array include an alternative based on Minimum Plan B (Alternative 2) because it is relatively lower cost and does not preclude the future addition of a new upstream weir. The study team recommends the addition of the right bank setback levee between the east UPRR crossing and I-5 and the addition of downstream setbacks at Kisst Dairy and Bend 16 to improve the performance of this alternative for Criteria 1a, 1b, and 1c.

Plans with a new upstream weir, modified crossings, and no downstream setbacks

During Phase 2, the MVP was formulated as a more cost-efficient alternative to the Modified CVFPP (Alternative 5) (American Rivers 2019). During Phase 2, both alternatives were found to provide equivalent downstream stage reduction on the San Joaquin River at head of Old River (Criterion 1a). However, the Modified CVFPP (Alternative 5) was deemed more costly (Criterion 2a) because it included an additional setback levee between the new upstream weir and the Deuel Vocational Institution and because it would enlarge the opening in the east UPRR crossing by 500-feet (American Rivers 2019). In contrast, the MVP omitted the upstream setback levee and narrowed the opening in the east UPRR to 250 feet. As no new modeling of the Modified CVFPP (Alternative 5) was prepared in Phase 3, these comparisons from Phase 2 are assumed to carry forward.

However, in Phase 3, these alternatives were updated to shift the location of the opening in the east UPRR crossing westward, adjacent to the new setback levee to meet UPRR requirements for the temporary shoofly track. The primary cost of adding the opening is the construction of a shoofly track to maintain service during construction of the Project. Therefore, there may be limited cost savings achieved by narrowing the opening to 250 feet rather than the 500-foot option included in the Modified CVFPP (Alternative 5). Additionally, the 250-foot opening could make future expansion of the bypass more costly, as expanding the opening to 500 feet in the future would require fresh design and construction of a temporary shoofly track. Therefore, the Modified CVFPP (Alternative 5) is considered more scalable than the Phase 2 Plan.

The Modified CVFPP would increase stages at Paradise Road (Criterion 1b) more than the Phase 2 Plan (Alternative 3), due to the larger 500-foot opening in the east UPRR crossing (American Rivers 2019). Incorporating one or more of the downstream setback levees (Kisst, Bend 16, downstream of Bend 16) present in other alternatives could help to convey the additional flow through the 500-foot

³ Both Kisst Dairy and the land within Bend 16 are owned by the same landowner, who has communicated a willingness to sell if the whole of each parcel is included. Therefore, in order to minimize subdivision of the parcels, the Kisst setback and Bend 16 setback are both recommended for inclusion in Minimum Plan B, as part of the Final Array.

opening, to mitigate stage increases within Paradise Cut. This would also provide more area for potential habitat restoration.

Recommendation: The study team recommends that the Final Array include an alternative based on the Phase 2 Plan (Alternative 3) because it was determined to be relatively less costly (Criterion 2a) than the Modified CVFPP (Alternative 5). The study team recommends replacing the 250-foot opening with a 500-foot opening in the east UPRR crossing for improved scalability (Criterion 3) and adding downstream setbacks at Kist Dairy and Bend 16 to improve the performance of this alternative for Criteria 1b and 1c.

Plans with downstream levee setbacks

The Modified Phase 2 Plan (Alternative 4), Phase 2 Plan Plus (Alternative 6), and Maximum Plan (Alternative 7) all include downstream levee setbacks: all three include the Kist setback and the ecological levee setbacks in the Four Corners area, and the Phase 2 Plan Plus (Alternative 6) and Maximum Plan (Alternative 7) also include setbacks at Bend 16 and downstream of Bend 16. The potential for habitat restoration is greater with the latter two plans because of these additional setback areas.

Hydraulic modeling prepared during Phase 2 indicated that the setbacks at Kist, Bend 16, and downstream of Bend 16 have no effect on stage reduction on the San Joaquin River at head of Old River (Criterion 1a) (American Rivers 2019). However, these setbacks do provide for smaller stage increases (or in some instances, they reduce stages) within Paradise Cut (Criterion 1b), by providing more capacity to convey flow through Paradise Cut and into Old River. These setbacks also provide additional space in which habitat restoration activities could be implemented (Criterion 1c).

The three alternatives that include downstream levee setbacks are distinguished by their other elements; namely the size of the new upstream weir and the modifications to crossings within Paradise Cut. The Maximum Plan (Alternative 7) provides the greatest stage reduction on the San Joaquin River at head of Old River (Criterion 1a) because it includes a larger, 2,000-foot upstream weir. The Modified Phase 2 Plan (Alternative 4) and Phase 2 Plan Plus (Alternative 6) provide similar stage reduction on the San Joaquin River to the Phase 2 Plan (Alternative 3) because all include the 1,000-foot upstream weir.

Within Paradise Cut, the Maximum Plan (Alternative 7) results in greater stage increases at Paradise Road (Criterion 1b) due to the additional flow conveyed into Paradise Cut and the additional openings in the rail and road crossings. The Modified Phase 2 Plan (Alternative 4) has a greater stage reduction at the eastern UPRR crossing and no effects on stage at Paradise Road. It is assumed that the Phase 2 Plan Plus (Alternative 6) would have similar effects because the 500-foot opening in the east UPRR crossing would be offset by the additional levee setbacks at Bend 16 and downstream of Bend 16.

Both the Modified Phase 2 Plan (Alternative 4) and the Phase 2 Plan Plus (Alternative 6) are considered scalable (Criterion 3) because they would not preclude future expansion of the bypass to achieve the Maximum Plan (Alternative 7). The Maximum Plan (Alternative 7) is also scalable should future projects contemplate additional setback areas or weir widening. Of these three alternatives, the Modified Phase 2 Plan (Alternative 4) is expected to have relatively lower costs (Criterion 2)

1 without the significant cost of modifying the east UPRR crossing and with fewer setback levees to
2 construct. The Phase 2 Plan Plus (Alternative 6) and Maximum Plan (Alternative 7) would provide
3 greater contributions to the habitat restoration objective (Criterion 1c).

Recommendation:

At a meeting with RD representatives on February 21, 2025, representatives of SDWA, RD 2058, and RD 2089 highlighted several concerns with the ecological levee setbacks concept in the Four Corners area, including impacts to existing landside infrastructure and impacts to district revenues and operations. Based on the overwhelming opposition to the ecological levee setbacks concept in the Four Corners area, this management action was deemed infeasible and is recommended to be removed from further consideration in the Final Array.

Input provided by the Technical Review Panel (TRP) and PCMT in February and March 2025 indicated a preference to carry forward an alternative that provided greater opportunities for habitat restoration and flood stage reduction (Criterion 1a, 1b and 1c) relative to the Modified Phase 2 Plan (Alternative 4). As a result, the study team recommends that the Final Array include an alternative based on the Phase 2 Plan Plus (Alternative 6), with the following modifications:

- removal of the ecological levee setbacks concept in the Four Corners area;
- a new upstream weir that is 2,000 ft (instead of 1,000 ft);
- an additional levee degrade on the left bank of Paradise Cut between the existing weir and the east UPRR crossing; and
- the addition of a 500 ft opening in the west UPRR crossing.

Final Array of Alternatives

Based on the evaluation and comparison of the preliminary alternatives, the study team recommends the following Final Array of Alternatives, with the refinements noted above:

1. Minimum Plan B (Alternative 2), with an additional right bank setback between the east UPRR crossing and I-5, and the addition of downstream setbacks at Kist Dairy and Bend 16.
2. Phase 2 Plan (Alternative 3), with the addition of downstream setbacks at Kist Dairy and Bend 16, and a 500-foot opening in the east UPRR crossing.
3. Phase 2 Plan Plus (Alternative 6), without ecological levee setbacks in the Four Corners area, and with a new 2,000-ft upstream weir, an additional levee degrade between the existing weir and the UPRR east crossing, and a 500-ft opening at the west UPRR crossing.

The study team recommends exploring optimizing the flood risk management benefits and cost of these plans during the conceptual design process, by refining setback levee alignments and tie-ins and analyzing the sensitivity of stages in Paradise Cut to sediment removal upstream and downstream of I-5.