Plan to Minimize Impacts on Adjacent Landowners
Ecosystem Restoration and Floodwater Attenuation Project, Stanislaus County California

Purpose and Program Background

The Safe Drinking Water, Clean Water, Watershed Protection, and Flood Protection Act of March 2000 (Proposition 13) created the Flood Protection Corridor Program (Program). The California Safe Drinking Water, Water Quality and Supply, Flood Control, River and Coastal Protection Act of 2006 (Proposition 1E) allocated additional funds to the Program. The Program is authorized to fund projects providing non-structural approaches to flood management, including the acquisition and restoration of wildlife habitat and agricultural land preservation. Proposition 13 requires the Department of Water Resources to ensure that a plan to minimize the impacts on adjacent landowners is prepared prior to acquiring any interest in land using funds from the Flood Protection Corridor Program (California Water Code Section 79041, Division 26, Chapter 5, Article 2.5). The plan must include an evaluation of the impact on floodwaters, the structural integrity of affected levees, diversion facilities, current and historic agricultural practices on the project site and in the vicinity, timber extraction operations, and an evaluation with regard to the maintenance required for any facilities that are proposed to be constructed or altered.

*Section 79041 states:
Prior to acquiring an easement or other interest in land pursuant to this article, the project shall include a plan to minimize the impact on adjacent landowners. The plan shall include, but not be limited to, an evaluation of the impact on floodwaters, the structural integrity of affected levees, diversion facilities, customary agricultural husbandry practices, and timber extraction operations, and an evaluation with regard to the maintenance required of any facilities that are proposed to be constructed or altered.

Department of Water Resources' Interest in Providing Funds to Develop the Ecosystem Restoration and Floodwater Attenuation Project

The Flood Protection Corridor Program has awarded River Partners $3,171,344 to restore native riparian habitats and floodplain connectivity on the US Fish and Wildlife Service's (USFWS) San Joaquin River National Wildlife Refuge (SJRNWR) in Stanislaus County. The Ecosystem Restoration and Floodwater Attenuation Project, San Joaquin River (ERFA Project) will benefit the state of California by reducing flood risk liability, enhancing the ecosystem and reducing operation and maintenance costs on the San Joaquin River by:

- Improving flood management
- Reducing floodwater levels in the San Joaquin River at peak flow
- Permanently providing over 1,535 acres of floodwater attenuation
- Improving water quality and reliability
- Providing an off main-channel sediment deposition site during peak flows
- Reducing the risk of fish entrapment
- Increasing groundwater recharge potential
- Providing 551 acres of restored or enhanced habitat harboring threatened and endangered species, Neotropical birds, waterfowl and upland game birds

Other positive attributes of the ERFA project include:

- Increasing educational opportunities for our communities
- Supporting the Lower Tuolumne River Parkway & other regional efforts to enhance environmental quality and public safety

The project, located on the San Joaquin River's left bank, builds on the earlier work funded by the Department of Water Resources (DWR), CALFED, California Wildlife Conservation Board (WCB), USFWS, US Department of Agriculture Natural Resources Conservation Service (NRCS), US Bureau of Reclamation (USBR), and the United States Army Corps of Engineers (USACE) to restore habitat and improve flood management on the SJRNWR. The project will create 551 acres of restored or enhanced riparian habitat on the floodplain within the SJRNWR and provide 1,535 acres for transient floodwater storage.

In 2006, a flood event breached the berm on the West Stanislaus Irrigation District (WSID) Intake Canal allowing floodwater to enter the SJRNWR's Hagemann Tract (Cells II, III & IV). A 36" pipe at the lower end of Cell IV drains the entire Hagemann Tract. The pipe is small, relative to the amount of water that accumulates behind it. Drainage of the site after the 2006 event took four months. This poses several risks to migratory fish. The first risk is that the small pipe does not provide enough current (flow) to signal the fish where or how to exit the ponded water. The second risk is that over the course of four months (the time that it takes to drain), water temperatures behind the levee can become lethal to salmonids. To remedy this problem, River Partners is proposing to install two additional 72" gated drain pipes and replace the old 36" pipe with a 36" gated drain pipe through the levee in former Reclamation District 2100. This action will provide sufficient flow out of project Cells II, III and IV to signal the fish which direction to exit the floodplain safely. The enhanced drainage will allow water to flow back into the River before water temperatures climb to lethal levels.

The gated drain pipes will remain open during flood events to allow for inundation of the site to benefit fish and wildlife as well as to provide additional floodway capacity for this reach of the San Joaquin River. This inundation also provides the benefit of equalizing pressure from floodwaters on either side of the levees, reducing the potential for unplanned levee breaching and undesirable erosion and scour. Future development at the site may include installation of a weir that would function in tandem with the gated pipes to optimize regional peak flood stage reduction by managing the timing of site inundation. The installation of such a weir and the operating plan for the gates on the drain pipes to accomplish such managed inundation are out of the scope of the current project.

Without taking this type of action, the USFWS may be required to stop fish entrapment by permanently eliminating floodwater entrance on the SJRNWR, which would disconnect the river from its floodplain and remove over 1,535 acres of floodwater attenuation from the San Joaquin River system.

In 2013, River Partners commissioned a hydraulic study for the ERFA project. The goals of the study were three-fold:

1) update the prior hydraulic modeling that had been conducted by the USACE, USFWS, USBR, DWR, and Environmental Science Associates (ESA – formerly Philip Williams and Associates) to reflect current conditions and identify the location and configuration of appropriate drainage features to minimize fish

entrainment hazards and prevent the accumulation of floodwaters for long duration on the SJRNWR without precluding the future development of the site for peak flood stage reduction;

2) develop an approach to floodplain reconnection that balances the interests of various stakeholders (funders, regulators, adjacent landowners, water districts, and other stakeholders) and is consistent with the goals of the USFWS for management of the SJRNWR; and

3) evaluate the potential to use the site for optimized peak flood stage reduction through managed transitory floodwater storage including identification of location and configuration of a water control structure to optimize transitory storage and preparation of conceptual drawings for this structure.

In addition to providing 1,535 acres of floodwater attenuation, the ERFA project will also restore habitat on 75 acres in Cell I contributing to previously funded habitat restoration on 75 acres and enhancement work on 73 acres of this cell. Located south of the WSID Intake Canal and on slightly higher ground than Cells II, III and IV, Cell I currently provides about 110 acres[1] of floodwater attenuation to the ERFA project.

By ensuring a permanent reconnection of the River to its historic floodplain, the project will provide an additional 1,535 acres for off-channel sediment deposition during peak flows. This will improve water quality, reduce sediment loading in the river's main channel and thereby reduce flood risk and lower floodway maintenance costs.

Located on the SJRNWR, the ERFA project will restore or enhance 551 acres of riparian habitat within the River's historic floodway, and outside of the State's designated floodway. This will be a significant contribution to the 1,700 acres of riparian habitat and wetlands that have already been (or are currently being) restored on the SJRNWR by River Partners and will benefit a number of threatened and endangered species, including but not limited to the riparian brush rabbit, the riparian woodrat, the least Bell's vireo, Swainson's hawk, valley elderberry longhorn beetle, Chinook salmon, and steelhead trout, as well as Neotropical birds, waterfowl and upland game birds.

Once restored, the 551-acre project will reduce fish entrapment risk and support efforts to reestablish salmonids in the San Joaquin River (as part of the Friant Dam Settlement). Along with neighboring conservation properties, the ERFA project site will become an important wildlife habitat location in California's Central Valley.

[1] As the 110 acres of floodwater attenuation in Cell I is currently available, we are not counting that area as part of the additional 1,535 acres of transient floodwater storage capacity provided by the ERFA project.

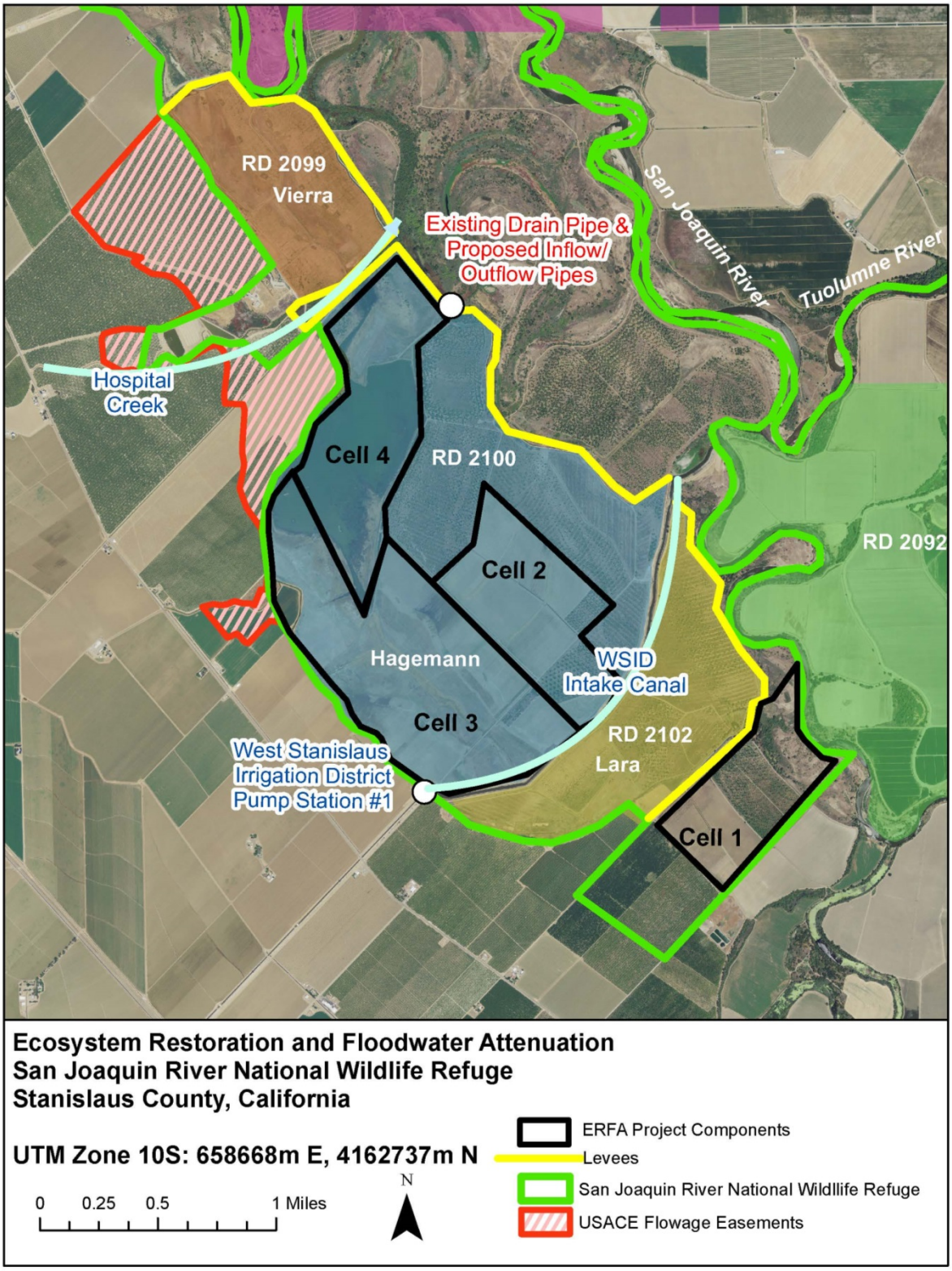

Figure 1. Location Map: Ecosystem Restoration and Floodwater Attenuation Project, Stanislaus County

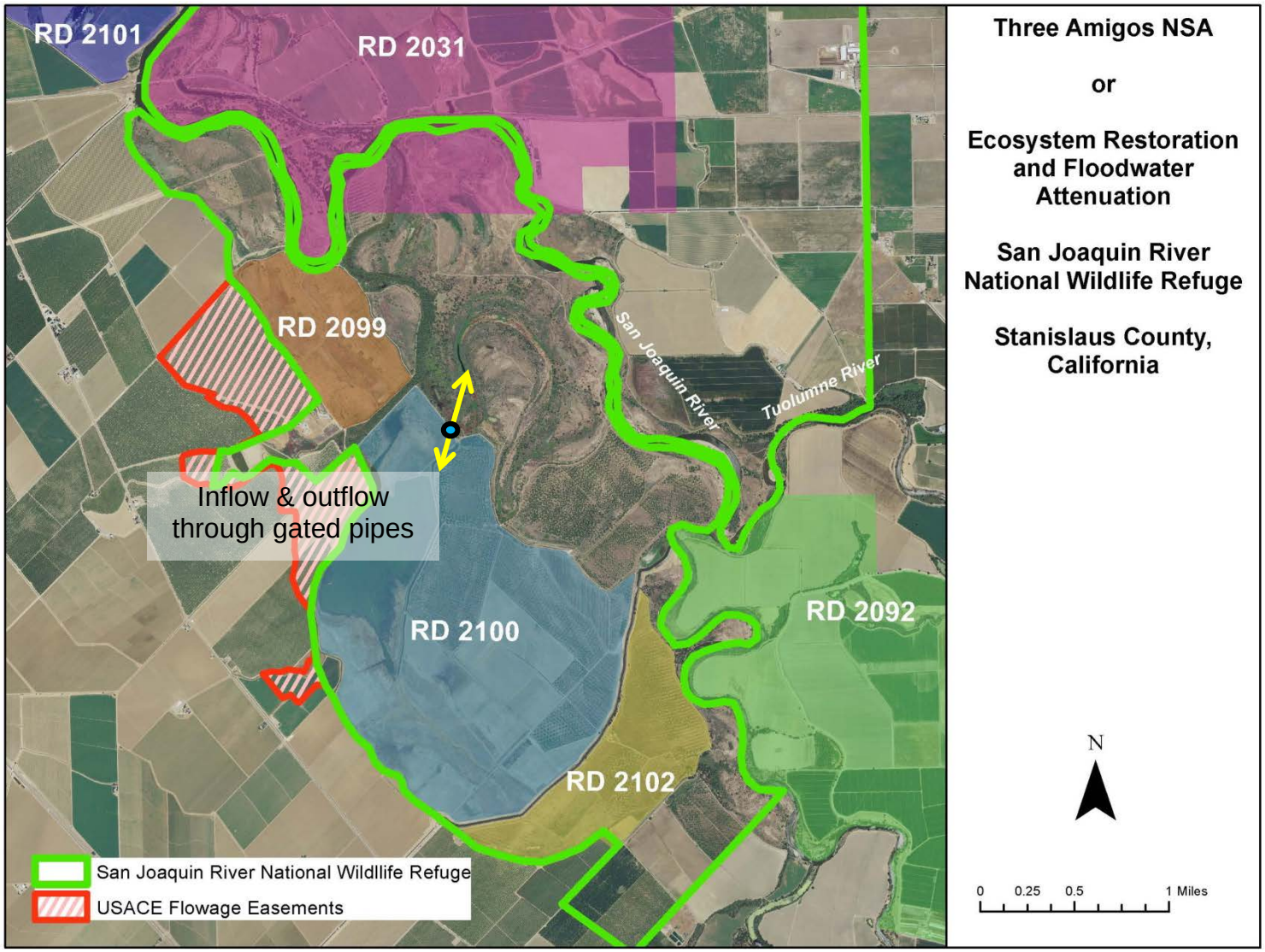

Figure 2. ERFA Project Preferred Alternative for Floodplain Reconnection at the SJRNWR

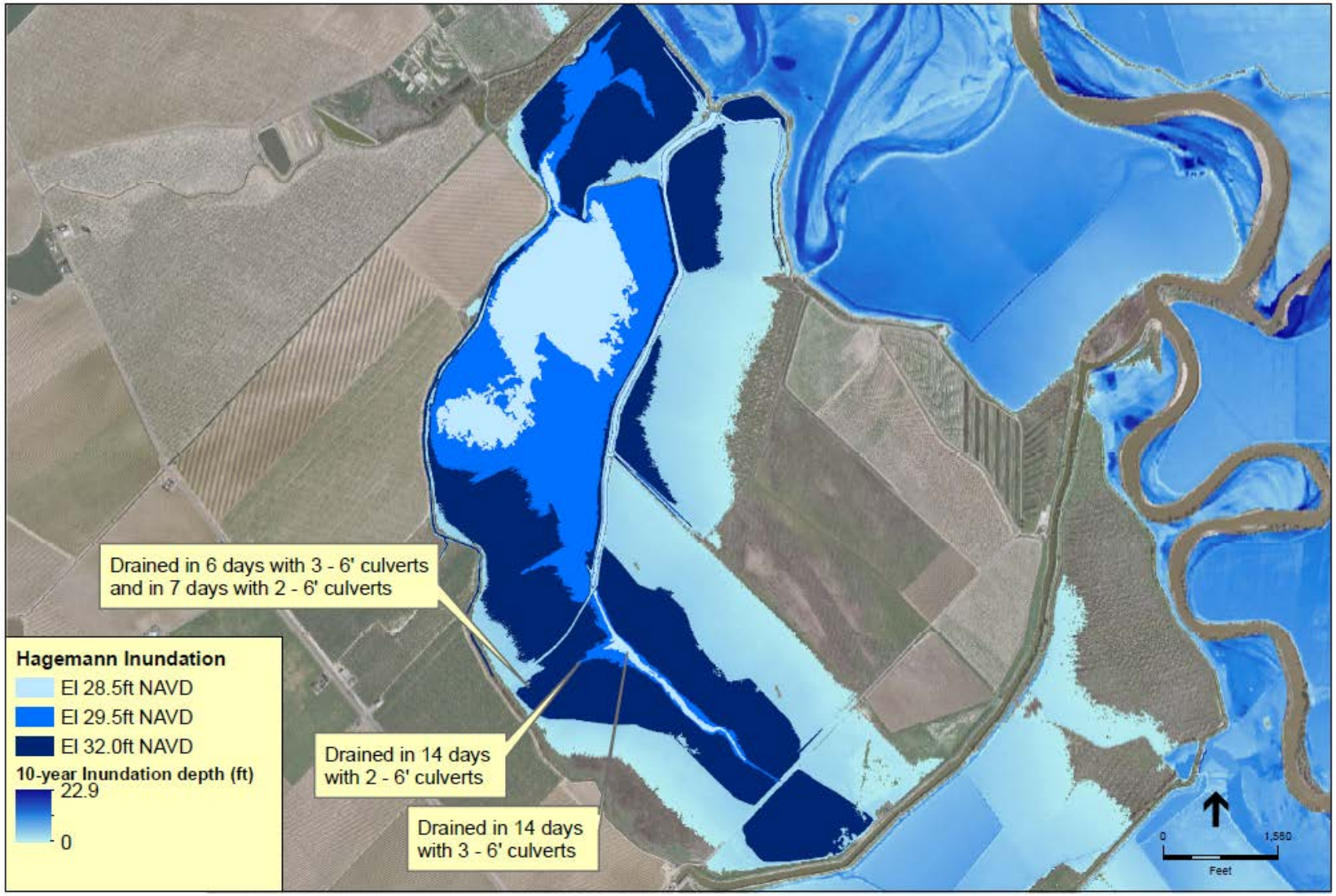

Figure 3. ERFA Project Preferred Alternative Area of Inundation and Draw-down Modeling (ESA 2015)

Evaluation of Impact of Project on Floodwaters

ESA (2015) evaluated the effects of the proposed restoration and floodplain reconnection on floodwaters. Based on these analyses, floodplain reconnection would not result in negative impacts to flood management and may even provide some benefits. The hydraulic study identified that the installation of two additional gated inflow/outflow pipes at the proposed location (see Figures 1 and 2) would accomplish near-term project objectives most efficiently, without precluding future site improvement for optimized peak flood attenuation. The study also identifies allocation and configuration of a water control structure that could be installed in the future, which is out of the scope of the current project, to optimize peak flood attenuation on site while eliminating adverse impacts to external stakeholders. A summary of the hydraulic analysis is provided below but the workplan and final report should be consulted for further details.

The hydraulic analysis team prepared a draft workplan for the project and convened a stakeholder meeting on 21 October 2013 to discuss the approach to modeling and evaluation, specifically reviewing potential drainage and reconnection configurations with project stakeholders. Specific considerations that were incorporated into the hydraulic study for the ERFA project as a result of this stakeholder meeting include: 1) summarization and synthesis of concerns for the project related to the WSID Intake Canal and future fish screening project; 2) categorization of project alternatives relative to WSID Intake Canal and fish screen concerns; 3) selection of a structural alternative for modeling analysis; and 4) consideration of floodplain reconnection including the Vierra Tract of the SJRNWR.

The workplan was finalized in January 2014 (ESA, 2014). After finalization of the workplan, additional comments were received from WSID (23 January 2014), and the modeling team and River Partners met with WSID (12 February 2014) to further articulate avoidance measures for project interaction with WSID's Intake Canal and fish screen project. The results of that articulation guided the evaluation of the location of potential water control structures to avoid any interaction with the WSID Intake Canal.

The hydraulic study for the ERFA project was completed in March 2015 (ESA, 2015). Primary results of the study included:

1. Relative to no SJRNWR flooding, the baseline condition provides a 9% reduction in flows for a 35,000 cubic feet per second (cfs) flood event (0.5-ft flood stage reduction) measured at Maze Road Bridge;
2. A passive breach condition provides a 6% reduction in peak flows for a 35,000 cfs flood event (0.3-ft flood stage reduction);
3. The optimized water control structure can provide a 10% reduction in peak flows for a 35,000 cfs flood event (0.8-ft flood stage reduction);
4. The installation of two additional 6-ft diameter gated pipes through the RD 2100 levee will:
    a. minimize fish entrainment hazards and prevent the accumulation of floodwaters for long duration on the SJRNWR,
    b. provide a passive inflow location for floodwaters to equalize water pressure on either side of the levees, minimizing potential for unplanned levee breaches and undesirable erosion and scour within the project site, and not preclude potential future site development to optimize peak floodwater attenuation.

Flow dynamics into and out of the project area are limited by river stage – the fastest inundation of the site matches the stage increase of the increasing limb of the hydrograph of the San Joaquin River

including contributions from the Tuolumne River. The fastest draw-down of flood waters from the site matches the stage decrease of the declining limb of the regional flood hydrograph. The modeled hydrographs are provided below. The project would enhance drainage from the site from the current condition of approximately 4 months to complete drainage (as observed in 2006) to the improved condition of 14 days to complete drainage (see Figure 4).

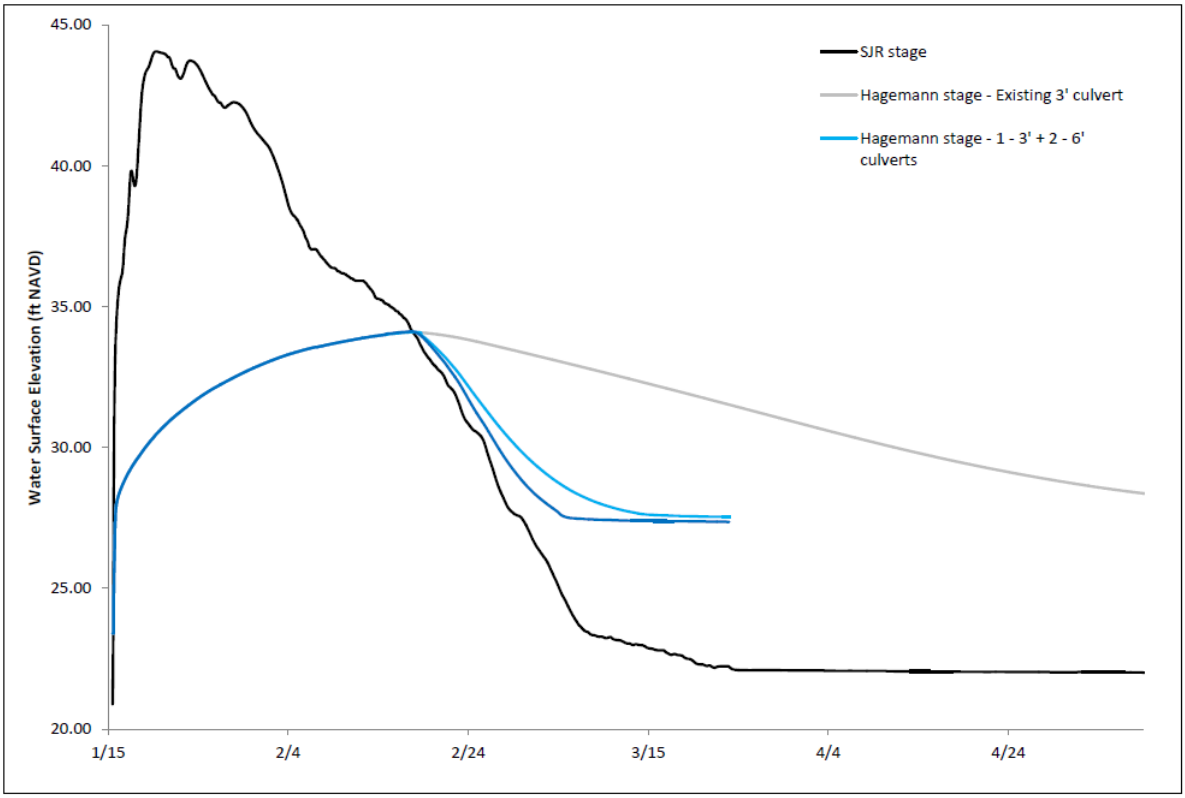

Figure 4. 10-year recurrence interval flood event at the SJRNWR (ESA 2015)

According to the project hydraulic analysis, inflow to the site from the additional gated pipes would provide up to 1,200 acres of inundated floodplain habitat during an approximately 10-year recurrence interval "small flood" event. Inflow to the site during a flood event in which flow in the San Joaquin River exceeds 11,000 cfs is generally provided through unplanned breaching of the berms along the banks of the WSID Intake Canal, therefore additional inflow to the site from the project would augment the current site conditions, back-filling from the north up to 1,535 acres that would otherwise flood from the south. In addition to providing ecological benefits to the site, this backfilling also equalizes hydraulic pressure on either side of the levees and berms that ring the project area, reducing the potential for unplanned levee failure and undesirable erosion and scour.

<u>Evaluation of Impact on Structural Integrity of Affected Levees</u>

Since 1998, when the USFWS purchased all lands within Reclamation Districts 2099, 2100, and 2102 for the purposes of non-structural flood control and habitat enhancement, the affected levees no longer provide flood protection to adjacent lands. The levees were intended to reduce the frequency of inundation on adjacent farmlands which are now all in federal ownership and managed for flood-compatible wildlife habitat. Currently, the levees artificially impound floodwaters which damages

wildlife habitat values at the SJRNWR. Because the levee is not necessary for flood protection, the effects associated with installation of gated inflow/outflow pipes are not considered impacts to the structural integrity of the levee.

Evaluation of Impacts on Diversion Facilities

The project is adjacent to the WSID pumping facility, referred to as "Pump Station #1". This facility draws San Joaquin River water over 2 miles through an earthen canal across the project area, delivering irrigation water to over 22,000 acres of farmland west of the San Joaquin River. This canal is currently the largest unscreened diversion from the San Joaquin River, and is costly to maintain due to frequent sedimentation at the intake canal's mouth. WSID has been working with the USFWS Anadromous Fish Restoration Program, CalFED's Ecosystem Restoration Program and USFWS Refuge staff to develop plans to replace the canal with a diversion that is screenable against fish entrainment, and designed to minimize operations and maintenance costs.

Pump Station #1 was retrofitted with a flood headwall to protect the facility from flooding (1% exceedance probability) as part of the USACE Non-Structural Alternative Flood Control Project in this region following the 1997 floods (USACE, 1998). In 2013, WSID undertook a pump station renovation project, reconfiguring Pump Station #1 on high ground adjacent to the old location and headwall. Any possible effects of the restoration of riparian habitats and the installation of gated inflow/outflow pipes in the RD 2100 levee will not impact this facility as it is now located at higher elevation than flood stage (the pump deck is situated at 42.1 feet NGVD29 as compared to the top of levee which is 41 feet NGVD29).

Current plans to screen the WSID Intake Canal against possible fish entrainment are uncertain. It is possible that the best configuration for the screening would be installation of a cone-screen at the mouth of the current alignment of the canal. It is unknown if the preferred screening configuration would have an effect on floodwaters. It is likely that future flood events will produce high water stage in the WSID Intake Canal regardless of the preferred screening configuration as has been the case historically. This project will provide positive drainage through the inflow/outflow pipes at the H2 location to attract anadromous fish to out-migrate from the project area as the floodwaters recede, thus working in tandem with potential future screening to promote fish recovery and minimizing fish entrainment in the project area. During smaller flood events (i.e. the ecologically-relevant flows modeled in ESA, 2015) waters inundating the site from the inflow/outflow pipes will not enter the WSID Intake Canal due to site topography limitations, but instead will drain back off the site through the same pipes. For these reasons, the project is expected to be consistent with future plans to screen the WSID Intake Canal despite considerable uncertainty.

The banks of the WSID Intake Canal are flanked by large mounds of dredge tailings collected from the Canal during maintenance dredging undertaken by the WSID. These mounds or berms have historically breached during high water events, providing floodwaters entrance to the project area from the Intake Canal. WSID reports that the erosion associated with these breaches causes access problems as the dredge piles also serve as dirt access roads for the Intake Canal. Through the back-filling effect provided by the inflow/outflow pipes, this project will reduce the potential for the berms flanking the WSID Intake Canal to erode or scour as previously observed. In prior flood events, water levels have risen within the WSID Intake Canal and not on adjacent lands, creating enough pressure on the berms flanking the WSID Intake Canal to cause them to breach and erode until floodwater stage equalizes on both sides of the banks. This project will alleviate this issue by providing an alternative means of equalizing the hydraulic

pressure on either side of the berms. Riparian vegetation restoration within Cells II and III may also act to slow wave action during high water events, further protecting the berms from undesirable wind-wave erosion.

Evaluation of Impacts on Current and Historic Agricultural Practices on the Project Site and in the Vicinity

Habitat restoration as proposed will occur on lands that have lain fallow since 1997. Prior hydraulic analysis and real estate transactions undertaken by the USFWS, NRCS and USACE have identified and compensated all potentially-effected landowners for increased flood risk associated with the project. Habitat restoration and installation of gated inflow/outflow pipes as proposed will not impact current or historic agricultural practices on the project site or in the vicinity, and may even reduce flood stage for agricultural lands downstream.

Evaluation of Impacts on Timber Extraction Operations

There are no timber extraction operations in the area or vicinity of the Project.

Evaluation of Impacts with Regard to Maintenance

Long-term maintenance of the project will be performed by the USFWS. Maintenance is expected to include occasional improvements to maintain drainage pipes through the RD 2100 levee, as well as occasional treatment of weeds within the floodplain. These activities are standard maintenance tasks undertaken throughout the SJRNWR today. Funding for such maintenance will be provided by the USFWS.

Conclusion

Implementation of the ERFA Project by River Partners will not adversely impact adjacent landowners, facilities, or impact adjacent landowners' agricultural productivity. Immediately upon completion of the project, USFWS will assume maintenance responsibilities for the property including securing the property from theft, vandalism and trespassing; and managing vegetation for the benefit of wildlife, while maintaining flood conveyance capacity.

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