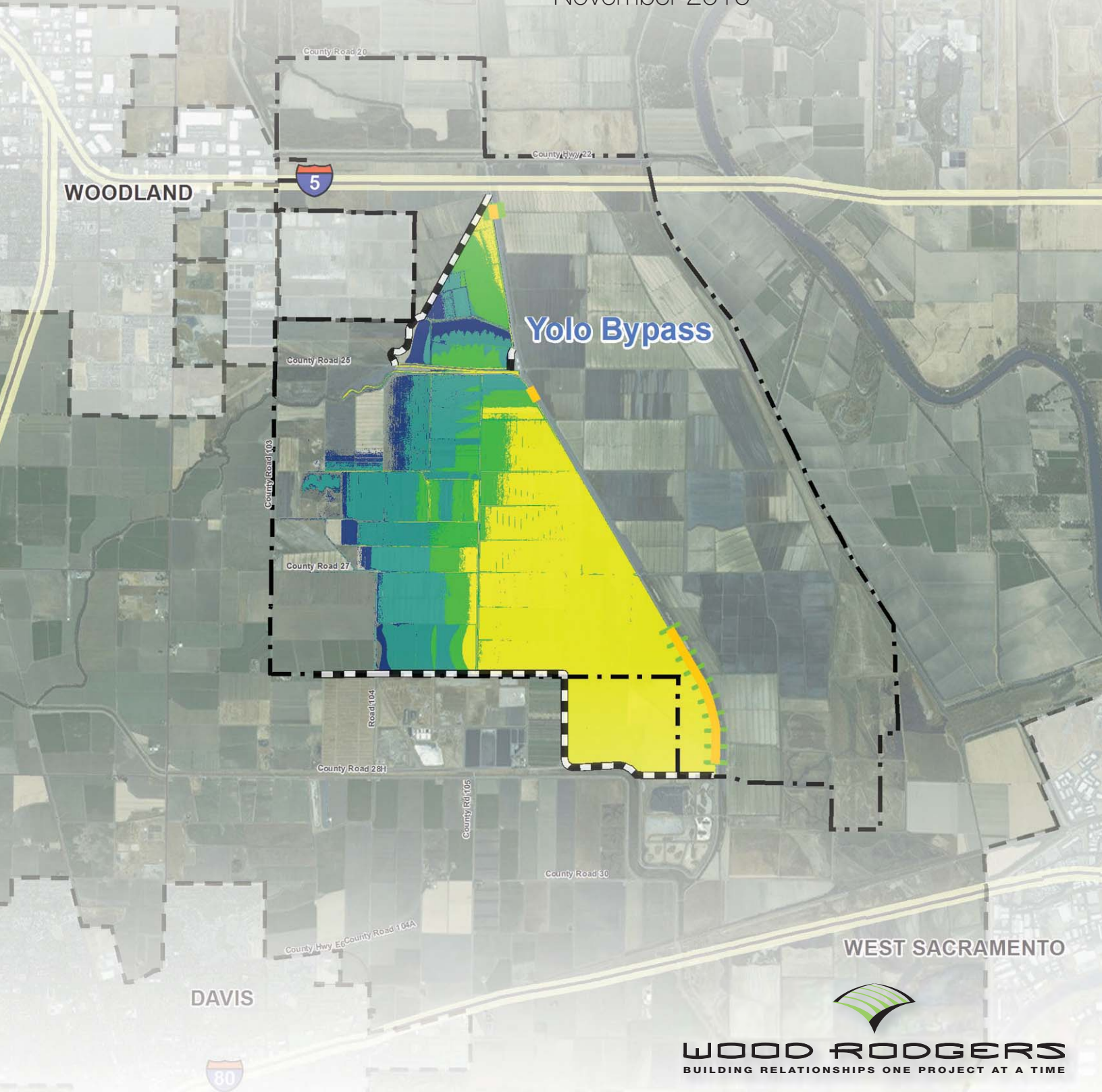


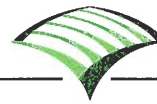
Reconnaissance Study for  
**Conaway Levee Setback and  
Transitory Storage Project**

November 2016



WEST SACRAMENTO

DAVIS



# Letter of Transmittal

**WOOD RODGERS**  
DEVELOPING INNOVATIVE DESIGN SOLUTIONS

**Date:** November 4, 2016  
**To:** Conaway Preservation Group  
**Attn:** Mr. Mike Hall, General Manager  
**Address:** 45332 County Road 25  
**City:** Woodland **State:** CA **ZIP:** 95776  
**Phone:** (530) 308-0681  
**From:** Mr. Jay S. Punia, P.E. *Jay S. Punia*  
 (916) 503-5093  
**Re:** Conaway Levee Setback and Transitory Storage Project Report

**Job No.** 8552.001

**We are sending you:**  
**via:** USPS

**We are sending you:**

Exhibits     Plans  
 Reports     Maps  
 Specifications  
 Copies  
 Contract/Change Order  
 Other: See Below

**These are transmitted as checked below:**

- Approval     Final Submittal     As Requested     Review/Comment

Copies	Description
1	Conaway Levee Setback and Transitory Storage Project Report (Bound Hard Copy)
1	Electronic (PDF)

**Comments:**

cc: Mr. Bob Thomas

\\woodrogers.loc\productiondata\jobs\jobs\8552\_conaway\_ranch\8552.001\_conaway\_on-call\_svcs\civil\docs\reports\rd 2035 setback levee and transitory\_storage project\lot\_hall-20161103.doc

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## **I. INTRODUCTION**

In August of 2015, the Conaway Preservation Group (CPG) contracted with Wood Rodgers, Inc. (Wood Rodgers) to preliminarily evaluate a project to construct transitory storage within Conaway Ranch for attenuating peak flows at the Yolo Bypass in Yolo County, California. The project would involve the construction of a new setback levee through Conaway Ranch to replace the Yolo Bypass West Levee; the construction of new weirs at the existing Yolo Bypass West Levee for passing water into and out of Conaway Ranch; the construction of new levees just north of the Willow Slough Bypass to protect Yolo County and City of Davis infrastructure; and the construction of new levees and features necessary to protect the Conaway Ranch corporate yard. The proposed Conaway Setback Levee and Transitory Storage Project (Project) is shown on **Figure 1** (attached).

## **II. BACKGROUND**

The U.S. Army Corps of Engineers (USACE), California State Department of Water Resources (DWR), City of Woodland, City of Davis, and City of West Sacramento are contemplating several regional projects in the area of the Yolo Bypass and Conaway Ranch to address existing flood and transportation related problems. The projects are currently at the planning level and will seek to do the following:

1. Increase the frequency of inundation for the Yolo Bypass.
2. Identify opportunities to increase the capacity of the Yolo Bypass by setting back the east and west Yolo Bypass levees.
3. Protect the City of Woodland and surrounding areas from Cache Creek flooding.
4. Rehabilitate the West Levee of the Yolo Bypass.
5. Remove the Sierra Northern Railroad Trestle from across the Yolo Bypass.
6. Relocate rail facilities regionally between the Cities of West Sacramento, Davis, and Woodland.

A full description of these projects is beyond the scope of this document; however, the geographic location of Conaway Ranch presents an opportunity for the Conaway Preservation Group to partner with these agencies in order to advance many of these initiatives.

In addition, by way of recent initiatives and grant-funded programs, the DWR is interested in increasing transitory storage (areas where floodwaters can be stored in an extreme flooding event) within the Sacramento River Flood Control Project. The DWR is also seeking to advance new aquifer storage and recovery projects to enhance groundwater recharge in the region. Lastly, restoring ecosystem functionality and enhancing environmental habitat remain high priorities for

both the DWR and the Central Valley Flood Protection Board (CVFPB). In light of these interests, Conaway Ranch developed the Project in collaboration with the City of Woodland, which seeks to set back the West Levee of the Yolo Bypass to provide transitory storage and potentially provide groundwater recharge within Conaway Ranch. The Project would also enhance existing environmental restoration areas located within Conaway Ranch.

### **III. PROJECT DESCRIPTION**

The proposed Project would modify the existing Yolo Bypass West Levee and construct new levees west of Conaway Ranch. The goal of the Project is to introduce transitory storage at Conaway Ranch totaling 72,000 acre-feet at a time when the system is at peak flood stage, or more frequently if desired.

To provide connection to the Yolo Bypass, the Yolo Bypass West Levee would be degraded in three locations, as shown on Figure 1. Two inlets are proposed in the system: one north of County Road 25 and the remnant channel of Willow Slough, approximately 750 feet in length; and one south of County Road 25 and the remnant channel of Willow Slough, approximately 800 feet in length. The reason for two inlets is that County Road 25 and Willow Slough represent a high point in the terrain, with the land north of the roadway draining to the north, and the land south of the roadway draining to the south. Both inlets are required to introduce inundation over the area set aside for transitory storage. The northern 750-foot inlet weir also serves as an outlet weir, allowing stored volume to return to the Yolo Bypass when the stage in the Yolo Bypass subsides. There is flexibility in the proposed Project to increase or decrease the elevation of these weirs in order to adjust the return period of flooding into the transitory storage area. If completely degraded to the elevation of the surrounding lands, the inlet weirs could allow for inundation of Conaway Ranch at the same frequency of the western area of the Yolo Bypass (approximately every other year). The optimal height of the weir would be established in coordination with the DWR and other stakeholders during subsequent phases of the Project. For the northern inlet/outlet weir, if a weir setting above full degrade is desired, culverts with positive closure devices would be installed beneath the weir to allow drainage of the northern area below the elevation of the weir.

An outlet weir approximately 7,500 feet in length would also be constructed at the Yolo Bypass near the southern boundary of Conaway Ranch, which would serve to drain the area once flows in the Yolo Bypass have subsided. The combination of the outlet weir and culverts with positive closure devices can be configured to hold the water for longer periods than the duration of elevated flows in the Yolo Bypass to enhance other benefits attributable to the Project.

At the western end of the Project, a new setback levee would be constructed to replace the Yolo Bypass West Levee and provide protection to the City of Woodland, Interstate 5 (I-5), and other infrastructure west of the Yolo Bypass. This setback levee would be in a position to align with the regional rail relocation project noted above. The new levee would tie into the existing

Yolo Bypass West Levee at the location where I-5 crosses the Yolo Bypass. It would continue southwest to a point where the urban area of Woodland is no longer threatened. This setback levee would become a part of the Sacramento River Flood Control Project (federal project levee), replacing the existing Yolo Bypass West Levee.

A new levee would also be constructed north of the Willow Slough Bypass channel to protect the City of Davis Wastewater Treatment Plant, Yolo County solid waste landfill, and Davis Wetlands (if necessary). The new southern levee of the Project would connect with the Willow Slough Bypass North Levee near the outfall of the Willow Slough Bypass into the Yolo Bypass.

A number of internal (non-federal project) levees and other Project features would be required to maintain the agricultural production of the area and protect Conaway Ranch infrastructure as discussed in Section VI-B below.

The Conaway Setback Levee and Transitory Storage Project would result in approximately 72,000 acre-feet of flood storage in the area of Conaway Ranch.

#### **IV. HYDRAULIC ANALYSIS**

Hydraulic analysis of the Project and its potential benefits are based on hydrology and hydraulic modeling provided by the USACE Sacramento District to support the Lower Cache Creek Feasibility Study (LCCFS) and adapted for the purposes of this Project. Hydrologic modeling is based on the USACE and DWR joint Central Valley Hydrology Study (CVHS), completed in 2013. For the LCCFS, the USACE Sacramento District provided a set of scaled inflow hydrographs based on the 1964 storm pattern to simulate coincident flooding in the Cache Creek system. Although this CVHS storm pattern differs from what is currently being used in the state's Basin-wide Feasibility Studies, it was considered to be the best available data at this time and provides reasonable order-of-magnitude estimates of peak flow and flood volumes. The hydraulic analysis is expected to be updated in the future to adopt the CVHS storm pattern and scaling consistent with other regional planning efforts.

The base hydraulic model used in this analysis is a modified version of the USACE Common Features HEC-RAS model. The model extents were truncated by the USACE Sacramento District staff to focus on features relevant to the LCCFS, including the Yolo Bypass and adjacent floodplains. Wood Rodgers performed additional refinements to the model geometry representing floodplain storage to reflect updated LiDAR terrain surveys collected in 2008 by DWR as part of the Central Valley Floodplain Evaluation and Delineation (CVFED) Program. All elevations in the model are referenced to the North American Vertical Datum of 1988 (NAVD 88) in units of feet.

## **V. PROJECT BENEFITS**

The primary purpose of the Project is to increase transitory storage within the Sacramento River system and therefore reduce the peak flood stage in the Yolo Bypass. A complete listing of the Project benefits includes the following:

- Reduction in 200-year Yolo Bypass Stage
- Potential Groundwater Recharge
- Elimination of Required Yolo Bypass West Levee Rehabilitation
- Protection of Regional Public Infrastructure
- Potential to Enhance Existing Habitat Easements
- Compatibility with Regional Rail Relocation

Discussion on each of these benefits is included in the sections below.

### **A. Reduction in 200-Year Yolo Bypass Stages**

The primary benefit of introducing transitory storage at Conaway Ranch is a reduction in the 200-year Yolo Bypass stage. As shown in **Figure 2** (attached), reductions in the 200-year stage would be accomplished between the limits of the Fremont Weir and the Sacramento Bypass. The maximum reduction in the stage would be approximately 0.3 foot, occurring downstream of County Road 25 at the southern inlet weir.

### **B. Potential Groundwater Recharge**

As a result of California's ongoing drought and regional water use, land subsidence has been a significant issue in Yolo County, including for the Conaway Ranch area. The introduction of groundwater recharge may serve to slow the rate of land subsidence currently being experienced in the area.

Wood Rodgers has reviewed existing well borings within Conaway Ranch and the Natural Resources Conservation Services (NRCS) soil survey to understand the composition of subsurface stratigraphy and potential for groundwater recharge. Potentially, there are two groundwater aquifers present beneath Conaway Ranch. An upper aquifer is present in the range of 10 to 90 feet below the ground surface. A deeper aquifer is present at a depth of 200 to 350 feet below ground surface. It is not known at this time how well these two aquifers are connected or if recharge of the upper aquifer under direct application of the floodwaters will provide sufficient groundwater to recharge the deeper aquifer. A separate study is recommended to better characterize the aquifers present and their connectivity. This groundwater recharge potential will be assessed in a future phase of the study.



### **C. Elimination of Required Yolo Bypass West Levee Rehabilitation**

Between 2011 and 2015, the DWR evaluated the West Levee of the Yolo Bypass as part of its Urban Levee Evaluation (ULE) and Non-Urban Levee Evaluation (NULE) Programs. These evaluations documented that the levee has seepage, slope stability and other deficiencies. Without remediation, the levee does not meet current USACE and DWR levee standards. A breach of the Yolo Bypass West Levee during a 200-year event would result in the floodplain depicted on **Figure 3** (attached). Industrial and commercial properties (including the Walgreens Distribution Center, La Tourangelle, and Hewitt Packard) would be inundated at shallow depths. City of Woodland infrastructure, including the East Main Pump Station, South Canal Pump Station, Water Pollution Control Facility (WPCF), and East Regional Pond would also be inundated. Many of these facilities provide flood protection against interior flooding. The DWR has estimated that the cost to fix the Yolo Bypass West Levee would be approximately \$120 million to \$160 million.

If accepted as a replacement for the Yolo Bypass West Levee, the setback levee would become a part of the State Plan of Flood Control Levee. The existing West Levee of the Yolo Bypass would be maintained only to the extent necessary to ensure stability of the Project as designed and for use in supporting ongoing Conaway Ranch agricultural operations.

### **D. Protection of Regional Public Infrastructure**

The existing Yolo Bypass West Levee provides flood protection to both urban and non-urban areas of the City, as well as to critical transportation facilities (I-5 and the Sierra Northern Railway). A map of the area that would be inundated as a result of a breach in the Yolo Bypass West Levee, is shown on Figure 3. Interstate 5 represents a major evacuation corridor for the region and, if the roadway should become impassable, a serious risk to life-safety may occur. The proposed Project would provide flood protection to these critical transportation facilities.

### **E. Potential to Enhance Existing Habitat Easements**

At the western limits of Conaway Ranch, several existing habitat easements exist, including a Tri-Colored Blackbird easement along Willow Slough, a Swainson's Hawk easement at the southwest corner of the area, and a Giant Garter Snake easement at the City of Davis wetlands in the southeast corner of the area. The proposed Project is compatible with all of these easements and, for some, may enhance the performance of the easement in providing habitat value. These existing easements are shown on **Figure 4** (attached).

The proposed Project would also provide an opportunity to set aside easements for aquatic species. Additional studies would be conducted during subsequent phases of the Project to more precisely determine the potential for enhancement of habitat easements.

## **F. Compatibility with Regional Rail Relocation**

Yolo County and the cities of Davis, Woodland and West Sacramento have been evaluating the economic and flood control benefits of relocating existing rail facilities within their boundaries (Regional Rail Relocation Project). A conceptual plan to replace the existing Sierra North Railway Trestle across the Yolo Bypass with a new line that extends between Woodland and Davis (through Conaway Ranch) has been prepared and is currently under evaluation. Both the LCCFS and the proposed Conaway Setback Levee and Transitory Storage Project are configured to allow for possible rail relocation should the Regional Rail Relocation Project be advanced in the future. The proposed alignments for the new setback levee west of Conaway Ranch (proposed by the Project) and the alignment of the embankment north of the City (proposed as part of the LCCFS) are situated to align with the Regional Rail Relocation Project. **Figure 5** (attached) shows an overview of the alignments of these regional projects.

## **VI. PROJECT COSTS**

A number of initial and longer-term costs are associated with the proposed Project. These costs can be broken down into the following categories:

- Setback Levee Construction and Yolo Bypass West Levee Modification
- Conaway Ranch Infrastructure Protection
- Agricultural Production Losses
- Increased Operation and Maintenance

All costs in this report are presented in 2016 dollars. Where costs were presented on an annual basis, they were capitalized over a 10-year period with an interest rate of three percent and then discounted back to a present value (in 2016 dollars) using compounding interest formulas. A contingency amount of 30 percent was included on all construction-related items, with the exception of pump station modifications and land acquisition. No contingency is included for land acquisition as the land value is well established. For pump stations, a 50-percent contingency is included due to the greater uncertainty in requirements relating to these facilities. The total Project costs include Planning, Engineering, and Design at eight percent; Environmental Mitigation at ten percent; and Construction Management at six percent.

A description of each cost type, and the assumptions and methods used by Wood Rodgers to determine them, are described in the subsections below.

### A. Levee Construction and Yolo Bypass Modification

Capital construction costs for the Project include modification of the existing Yolo Bypass West Levee to construct inlet and outlet weir structures, the construction of a new setback levee west of the Yolo Bypass, the construction of a new ring levee at the Conaway Ranch headquarters buildings, and the construction of new or enhanced levees at the Yolo County landfill, City of Davis Wastewater Treatment Plant, and City of Davis wetlands.

Levee construction and modification costs were developed using unit costs and quantities estimates for site clearing, borrow excavation and hauling, embankment fill, culvert and bridge structures, and roadway construction. Unit costs were determined based upon recent contractor bid summaries for applicable improvement projects in Northern California. Where recent bid tabulations were not available, cost-determination publications, such as *RS Means' Heavy Construction Cost Data*, were used to develop costs. A wind and wave analysis should be prepared in a later phase to confirm this freeboard amount.

In order to estimate construction earthwork quantities for the major project features, the embankments were preliminarily designed using AutoCAD Civil 3D, and three-dimensional earthwork models were developed. Top-of-levee heights were established to coincide with the 200-year water surface elevation (WSE) plus three feet.

Detailed cost estimates for the capital construction costs are included in **Appendix A** (attached). A summary of the estimated costs is provided in **Table 1** below.

**Table 1 – Summary of Levee Construction and Modification Costs**

Lands	Environmental Mitigation	Utilities & Relocations	Earthwork	Planning, Engineering and Design	Construction Management	Total Estimated Project Cost
\$2,557,000	\$4,472,000	\$4,893,000	\$29,510,000	\$3,315,000	\$2,486,000	\$47,233,000

### B. Conaway Ranch Infrastructure Protection

To maintain the functionality of Conaway Ranch as a highly productive agricultural operation, a number of enhancements to Conaway Ranch infrastructure are required. These infrastructure improvements were considered to be a one-time cost and would need to be completed before the Project begins. Infrastructure improvements consist of improvements to pump stations, wells, and structures. These improvements are discussed below, and an exhibit showing the infrastructure improvements is provided as **Figure 6** (attached).

New Levees – To protect the Conaway Ranch headquarters and corporate yard, a local levee (non-project levee) is required west of the Yolo Bypass encircling the Conaway Corporate Yard. Costs for this levee were estimated as part of the levee construction and modification costs (see Item A, above).

Pump Stations – There are several pump stations within Conaway Ranch lands that will need to be modified to be above the 200-year floodplain created by the Project. The Road 27 and Road 28 Pump Stations are currently used for pumping interior drainage into the Yolo Bypass. Pumping of this internal drainage will not be necessary if the Project is put into effect, because the culverts installed as part of the Project would allow gravity drainage into the Yolo Bypass once elevated water levels in the Bypass recede. Therefore, it was assumed that the only cost for these stations would be the cost associated with their demolition. The cost for replacement of the Herbie’s Place Pump Station was estimated as part of the utilities and relocations portion of the cost estimate for the overall Project.

The 13 Pump Station is a small lift pump station consisting of two pumps near the intersection of County Road 27 and County Road 103. It is used to lift water from the canal into the adjacent field for irrigation purposes. This pump station would be within the 200-year floodplain if the Project is implemented, so modifications would be necessary. Costs for demolition of the old pump station, along with construction of the new pump station and the cost for new pumps was estimated and can be found in **Appendix B** (attached).

Detailed cost estimates for the pump stations’ modifications are presented in Appendix B and a summary of the estimated costs is provided in **Table 2** below.

The 7 Pump Station is a six-pump lift station (with two pumps on the north side of County Road 24 and four pumps on the south side of County Road 25) used to lift water from one irrigation canal to another along Country Road 25. This pump station would need to be raised above the 200-year floodplain. The estimated costs to remove this pump station from the 200-year floodplain can be found in Appendix B.

**Table 2 – Summary of Pump Station Modification Costs**

<b>Facility Name</b>	<b>Cost</b>	<b>Contingency</b>	<b>Total Estimated Project Cost</b>
Road 27	\$35,000	\$17,000	\$52,500
Road 28	\$35,000	\$17,000	\$52,500
13	\$215,000	\$107,500	\$322,500
7	\$1,140,000	\$540,000	\$1,710,000
Herbie’s Place <sup>1</sup>	\$350,000	\$105,000	\$455,000

<sup>1</sup>. Modification to Herbie’s Place Pump Station was estimated and included as part of the overall project construction cost estimate (Appendix A). It is shown here in Table 2 for information, but it is not included as part of the infrastructure improvement costs to avoid double-counting the cost of its modifications.

Agricultural Wells – Existing irrigation wells also need to be modified to protect electrical components. A list of the wells that will require modification can be found in **Table 3** below, and all well locations can be found in Figure 6.

**Table 3 – Wells Impacted by the Transitory Storage Project**

Well Name	Elevation Raise	Base Cost for Each Well	Cost to Raise Well 1 ft	Cost to Raise Well	Contingency (30%)	Total Cost
12W-1	2.0	\$90,295	\$1,100	\$92,495	\$27,749	\$120,244
12W-2	2.0	\$90,295	\$1,100	\$92,495	\$27,749	\$120,244
13W-3	2.5	\$90,295	\$1,100	\$93,045	\$27,914	\$120,959
17W-3	9.5	\$90,295	\$1,100	\$100,745	\$30,224	\$130,969
1W-3	0.0	\$0	\$1,100	\$0	\$0	\$0
20W-1	12.0	\$90,295	\$1,100	\$103,495	\$31,049	\$134,544
20W-2	14.5	\$90,295	\$1,100	\$106,245	\$31,874	\$138,119
21W-3	15.0	\$90,295	\$1,100	\$106,795	\$32,039	\$138,834
24W-1	0.0	\$0	\$1,100	\$0	\$0	\$0
31W-1	13.5	\$90,295	\$1,100	\$105,145	\$31,544	\$136,689
6W-2	9.5	\$90,295	\$1,100	\$100,745	\$30,224	\$130,969
7W-1	6.5	\$90,295	\$1,100	\$97,445	\$29,234	\$126,679
7W-2	4.0	\$90,295	\$1,100	\$94,695	\$28,409	\$123,104
7W-4	8.0	\$90,295	\$1,100	\$99,095	\$29,729	\$128,824
7W-4S	9.5	\$90,295	\$1,100	\$100,745	\$30,224	\$130,969
7W-5	0.0	\$0	\$1,100	\$0	\$0	\$0
8W-1	9.0	\$90,295	\$1,100	\$100,195	\$30,059	\$130,254
<b>TOTAL</b>				<b>\$1,393,380</b>	<b>\$418,014</b>	<b>\$1,811,394</b>

Each of these wells will need to be elevated at least two feet above the 200-year floodplain. A unit cost was developed using bid documents provided to Wood Rodgers by Mike Carson Development, a firm that has performed well work at Conaway Ranch in the past. This unit cost was then applied to each well site and its corresponding raise height. The calculation of costs for well modifications can be found in Appendix B.

At the intersection of County Road 103 and County Road 27, there are two existing structures that would be impacted by the Project inundation area. These structures are owned by CPG, with one being used as staff housing and the other currently uninhabited. Because the flooding at these houses is expected to be shallow (less than one foot in depth), it was determined that the best course of action would be to demolish these structures and rebuild on a raised pad. In order to quantify the cost to do this, the square footage of the houses was estimated using the footprint area from ArcGIS (geographic information system (GIS) for working with maps and geographic information). A unit cost for demolishing residential structures was determined using *RS Means' Heavy Construction Data*. The unit cost for rebuilding was determined by using the cost per square



foot of comparable houses in the area. These unit costs were then applied to the estimated square footage. The unit cost for the volume of fill needed to raise the parcels that contain the structures was also determined by using recent contractor bid summaries for similar earthwork. The volume of fill needed was then calculated using the area of the parcels containing the structures and an average raise of one foot. The unit cost was then applied to the calculated volume to determine a price. The calculation of these costs can be found in Appendix B.

**Table 4 – Summary of Estimated Infrastructure Improvement Costs**

<b>Item</b>	<b>Cost of Improvements</b>	<b>Contingency</b>	<b>Total Cost of Improvements</b>
Pump Station Improvements <sup>1</sup>	\$1,425,000	\$712,500	\$2,137,500
Well Improvements	\$1,393,380	\$418,014	\$1,811,394
Structure Replacements	\$969,400	\$290,820	\$1,260,220
<b>TOTAL</b>	<b>\$3,787,780</b>	<b>\$1,421,334</b>	<b>\$5,209,114</b>

<sup>1</sup>. Cost does not include Herbie's Place pump station costs, as they are part of the levee construction cost estimate.

### **C. Agricultural Production Losses**

Potential agricultural losses are a major concern for Conaway Ranch and Yolo County. Inundation during the months when the land is being prepared for planting and during the growing season can result in significant losses to crop yield. The months of March, April, May, and June are critical months in the rice farming season. This is the time when preparation of the fields begins, as well as the actual planting of the crop. If the fields become inundated during these months, the crop yield would be negatively impacted. To estimate this impact, an estimated yield loss (percentage) for each month was developed in partnership with CPG staff. According to CPG staff, a 15-percent loss in crop yield would be expected for fields inundated in March. Fields inundated in April would have an estimated 30-percent crop loss, and fields inundated in May would have an estimated 50-percent loss. Fields still inundated in June would be a total loss. Therefore, the expected annual probability and extent of inundation for CPG fields in the Project area needed to be determined for March, April, May and June.

In order to estimate the annual probability that these weir elevations would be exceeded, historical flow data from the Yolo Bypass was obtained from the United States Geological Survey (USGS) gauge located in the Yolo Bypass, directly upstream of I-5. This gauge has daily flow data for the past 77 years. This daily flow data was converted to river stage elevations using the USACE model rating curves from the 1997 Common Features Calibration Analysis.

The historical river stage elevation data was then compared to the proposed weir elevation in order to determine the frequency that the weir elevation was surpassed for the months of March through

June. The number of years that the weir elevation was surpassed was then divided by the total number of years that records were available (77) to give the probability of exceedance. This process was repeated for one foot increments of elevation change until the probability of exceedance went to zero. The entire process was then repeated for each month in order to create a probability of exceedance curve for each month.

The relationship between river stage and exceedance probability was applied to existing ground elevations within Conaway Ranch using ArcGIS software. The extent and probability of inundation for the months of March, April and May are shown on **Figure 7**, **Figure 8** and **Figure 9**, respectively (attached). A map was not created for the month of June, since there is a zero-percent chance of the proposed weir elevations being exceeded for that month. The area of each probability range, for each month, was then calculated using ArcGIS software.

Once the affected areas were known, the value of the crops within the areas was calculated. Assumptions for average yield per acre, average price per sack of rice, and cost of growing one acre were made based on conversations with CPG staff. These assumptions allowed for the calculation of a net profit per acre. The calculated net profit per acre was then applied to the areas of each inundation probability range for each month to get a net profit of the acreage affected. This net profit was then adjusted by the probability of inundation, and then adjusted again for the percent loss for each month. These values, which represent the total estimated annual crop loss, were then added together for each month to get a total estimated annual crop loss value, which represents the amount of yearly profit that the CPG could lose due to agricultural yield losses resulting from the higher risk of flooding that comes along with the Project. This annual crop loss value was then projected to a future value over a 10-year period (using a rate of three percent) to calculate the total potential profit losses over the next 10 years. This future value was then discounted back into 2016 dollars. See **Appendix C** (attached) for agriculture crop loss estimates.

The estimated cost for potential agricultural losses is much lower than the actual value of the crops that the affected land would yield. This is due to the relatively small probability that the areas will flood in the critical months of March, April, May and June, and the fact that the month with the highest probability of inundation has the lowest yield loss percentage.

Due to the inverse relationship between probability of inundation and percent loss of yield, the probability of total crop loss remains low, which is reflected in the estimated potential agricultural losses.

A summary of the estimated costs for potential agricultural losses can be found in **Table 5** below.

**Table 5 – Summary of Estimated Potential Agricultural Losses**

<b>Month</b>	<b>Total Affected Acreage</b>	<b>Total Estimated Annual Crop Loss (Present Year)</b>	<b>Estimated Cumulative Crop Loss Over 10 Years (Future Value)</b>	<b>Present Lump Sum Value for Future Worth</b>
March	6,501	\$44,930	\$515,076	\$383,265
April	5,827	\$47,225	\$541,379	\$402,837
May	3,587	\$7,354	\$84,304	\$62,730
June	0	\$0	0	\$0
<b>TOTAL</b>		<b>\$99,509</b>	<b>\$1,140,760</b>	<b>\$848,832</b>

**D. Increased Operation and Maintenance Costs**

The proposed Conaway Setback Levee and Transitory Storage Project will cause inundation of CPG property that is not currently subject to inundation. This inundation will require increased Operation and Maintenance (O&M) to restore the functionality of roads and ditches after inundation. In order to estimate the increased O&M costs associated with this occurrence, the canal/ditch and road maintenance that will be necessary after inundation was estimated as described below.

During inundation the canals/ditches are typically littered with sediment and agriculture byproducts. During long periods of inundation, sediment can settle into the ditch, therefore decreasing its capacity and effectiveness. These canals/ditches would need to be cleaned to remove debris and sedimentation that might have occurred after inundation.

Similarly, roadways that become inundated will need maintenance including debris removal and minor road grading and resurfacing after the inundation period.

To quantify the cost of this added maintenance, the current practices on Conaway Ranch lands within the Yolo Bypass were used as a guide. In conversations with Conaway Ranch staff, it was determined that the length of canals and roads within the Yolo Bypass are similar to what would be in the proposed floodplain if the Project was put into effect. Since the lengths are similar, it was assumed that the amount of maintenance required would also be similar. Operating under that assumption, Conaway Ranch staff provided estimates of their yearly expenditures on O&M for the land within the Yolo Bypass. It was estimated that the increased cost for canal/ditch maintenance would be \$100,000 and for road repair it would be \$25,000. A 30-percent contingency was added to these estimates and applied as the expected increase in O&M costs.

Operation and Maintenance costs were assumed to be incurred on a yearly basis at full cost. These yearly costs were projected over a 10-year period and then discounted back into present value to obtain a total present day value. A summary of the estimated costs for O&M cost increases can be found in **Table 6** below.

**Table 6 – Summary of Estimated Annual O&M Costs**

<b>Item</b>	<b>Estimated Annual Cost</b>	<b>Contingency (30%)</b>	<b>Total O&amp;M Costs</b>	<b>Estimated Cumulative O&amp;M Costs Over 10 Years (Future Value)</b>	<b>Present Lump Sum Value for Future Worth</b>
Canal/Ditch Cleaning	\$100,000	\$30,000	\$130,000	\$1,490,304	\$1,108,926
Road Repair	\$25,000	\$7,500	\$32,500	\$372,576	\$277,232
<b>TOTAL</b>	<b>\$125,000</b>	<b>\$37,500</b>	<b>\$162,500</b>	<b>\$1,862,880</b>	<b>\$1,386,158</b>

*Note: Estimated O&M costs were based on discussions with CPG staff.*

## **VII. CONCLUSION**

The total cost to implement the proposed Project would be approximately \$54.7 million. This includes the cost of setback levee construction, Yolo Bypass modifications, Conaway Ranch infrastructure protection, agricultural production losses, and increased operation and maintenance. **Table 7** below shows a summary of all costs associated with the implementation of the Project.

**Table 7 – Summary of Estimated Potential Costs to the CPG**

<b>Type</b>	<b>Cost</b>	<b>Contingency</b>	<b>Total Cost</b>	<b>Present Value of 10-Year Period</b>
Setback Levee Construction and Yolo Bypass Modification	\$37,006,000	\$10,229,000	\$47,233,000	\$47,233,000
Conaway Ranch Infrastructure Protection	\$3,787,780	\$1,421,334	\$5,209,114	\$5,209,114
Agricultural Production Losses (10-Year Period)	\$76,545	\$22,964	\$99,509	\$848,832
Increased Operation and Maintenance Costs (10-Year Period)	\$125,000	\$37,500	\$162,500	\$1,386,158
<b>TOTAL</b>			<b>\$52,704,123</b>	<b>\$54,677,104</b>

## **VIII. COORDINATION AND NEXT STEPS**

In April 2016, Conaway Ranch provided comments on the Notice of Intent to develop the 2017 update of the Central Valley Flood Protection Plan and the draft Sacramento River Basin-Wide Feasibility Study. They recommended that the DWR should consider the Project in the 2017 update of the CVFPP. In response, the DWR instructed Conaway Ranch to first work with the Lower Sacramento River Delta North (LS/DN) Regional Flood Management Planning (RFMP) team to seek local support for the proposed Project. Accordingly, Conaway Ranch and its consulting team have been discussing the proposed Project with the City of Woodland, Yolo County, and LS/DN RFMP. As a result of these efforts, in August 2016 the LS/DN RFMP team endorsed the Project and included it in their project portfolio to the DWR for its consideration. Letters of support received to date from other agencies are presented in **Appendix D** (attached).

Continued coordination with the LS/DN RFMP team and other local stakeholders is needed to define the Project's benefits, including the groundwater recharge potential and habitat enhancement opportunities. Conaway Ranch and its consulting team will work with LS/DN RFMP and DWR for inclusion of the proposed Project as one of the options for the westside expansion of the Yolo Bypass in the 2017 Central Valley Flood Protection Plan.

## **IX. RECOMMENDATIONS**

Since the Conaway Setback Levee and Transitory Storage Project has gained the support of local agencies and the LS/DN RFMP team, coordination efforts should be continued with the local stakeholders, LS/DN RFMP team and state officials to include this Project as one of the alternatives for westside expansion of the Yolo Bypass. The Project details should be refined, as needed, to address questions and comments from local and state agency representatives.



## Figures

Figure 1 - Transitory Storage Project Layout

Figure 2 - Flood Benefits of the Transitory Storage Alternative

Figure 3 - Yolo Bypass Levee Breaches 1 & 2 Composite 200-Year Floodplain Extents Map

Figure 4 - Conaway Ranch Existing Habitat Easements Map

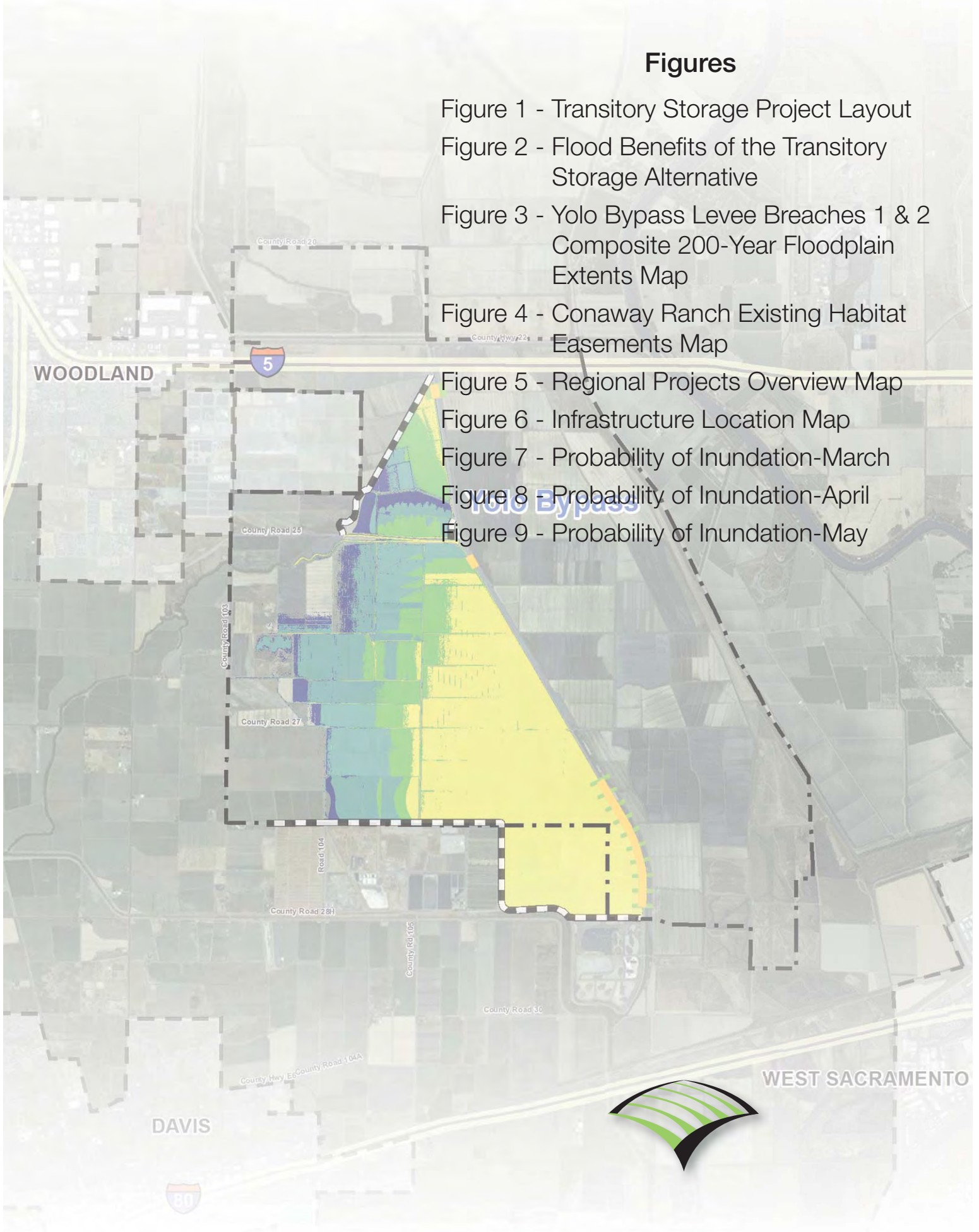
Figure 5 - Regional Projects Overview Map

Figure 6 - Infrastructure Location Map

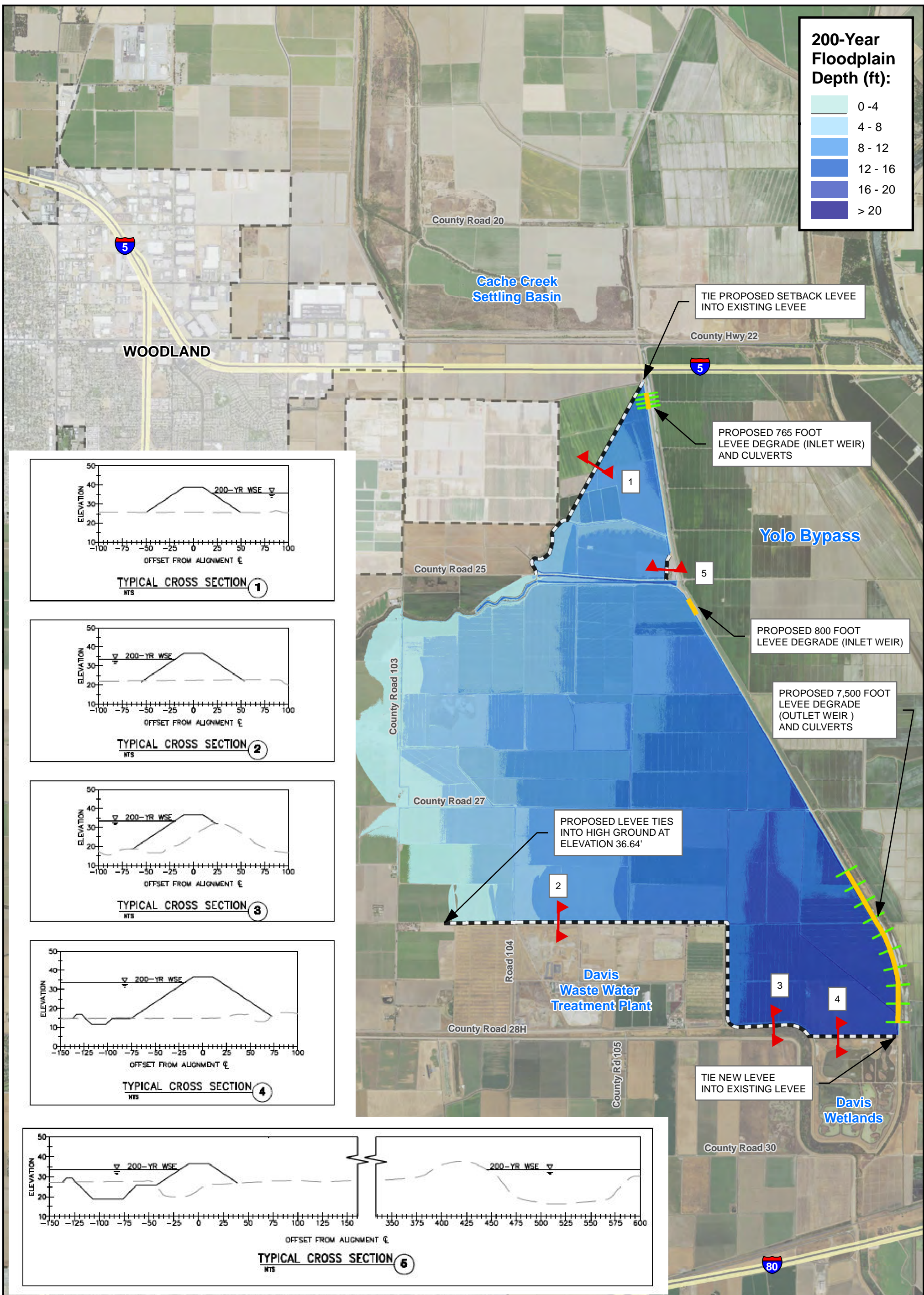
Figure 7 - Probability of Inundation-March

Figure 8 - Probability of Inundation-April

Figure 9 - Probability of Inundation-May

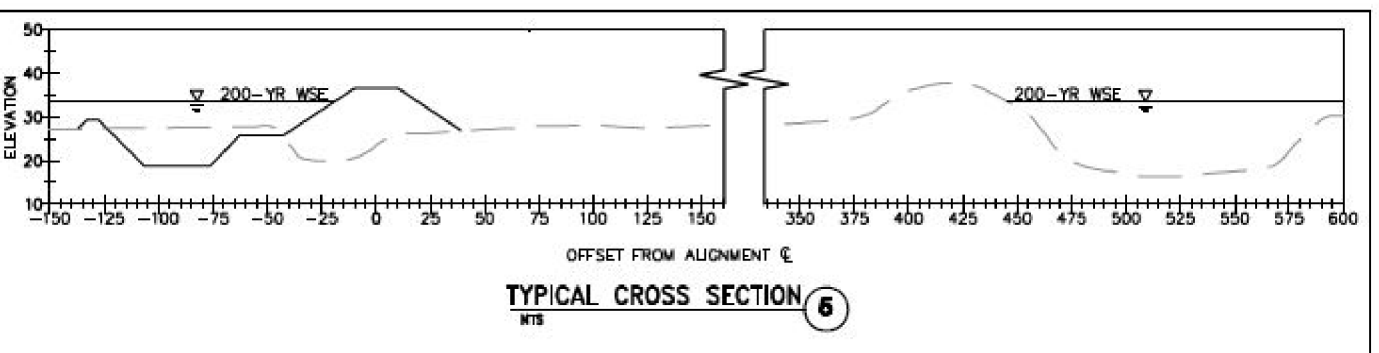
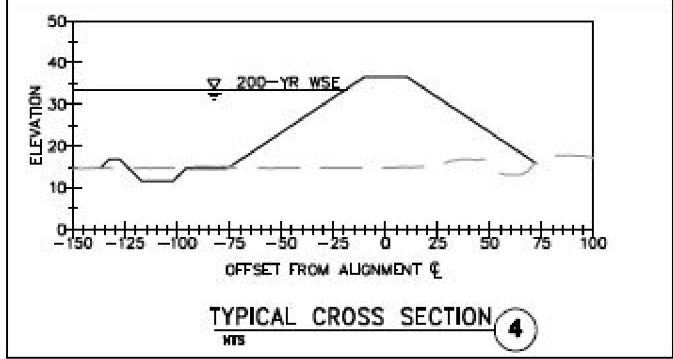
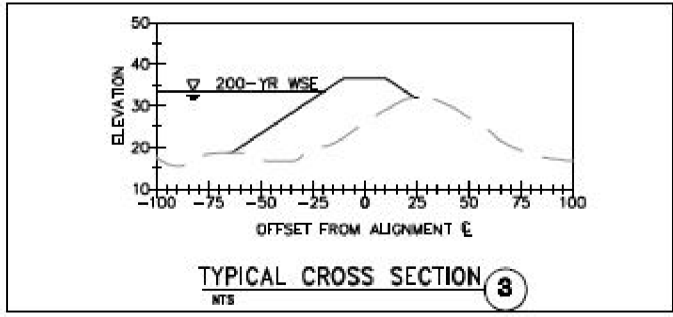
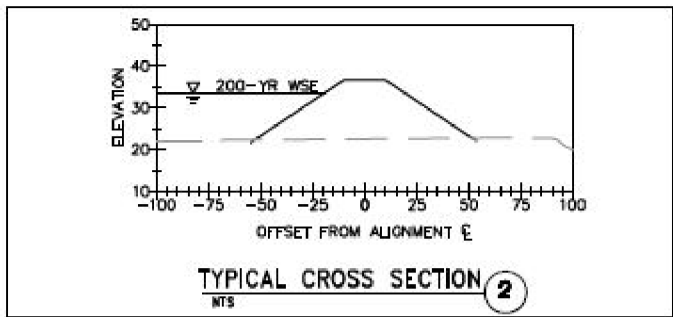
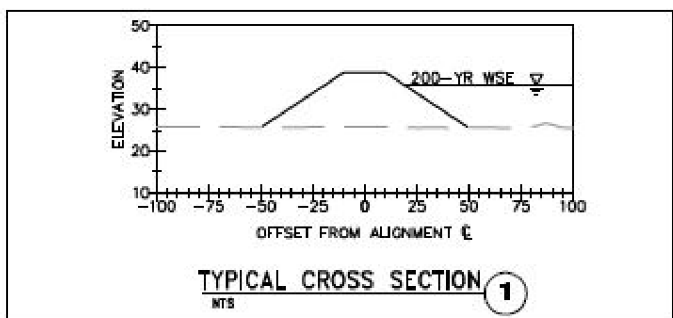






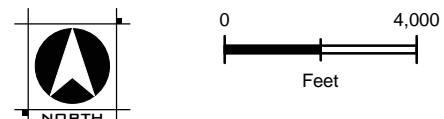
**200-Year Floodplain Depth (ft):**

0 - 4
4 - 8
8 - 12
12 - 16
16 - 20
> 20



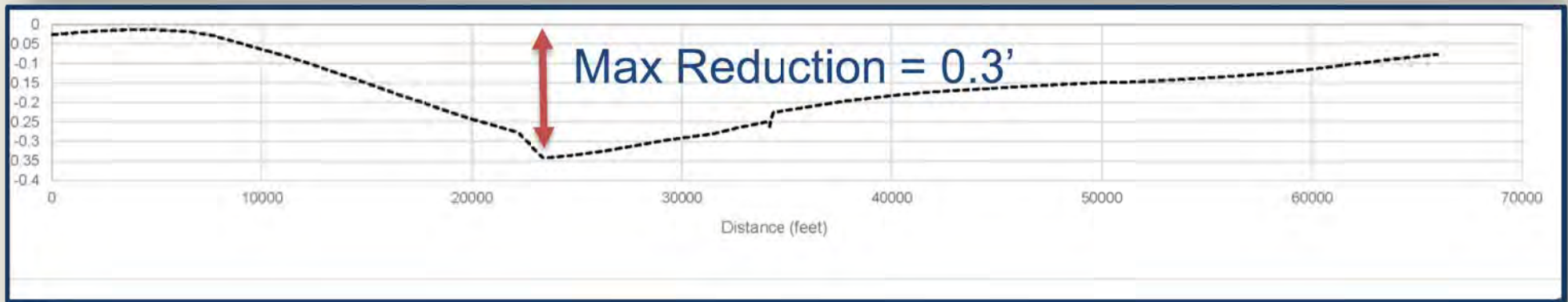
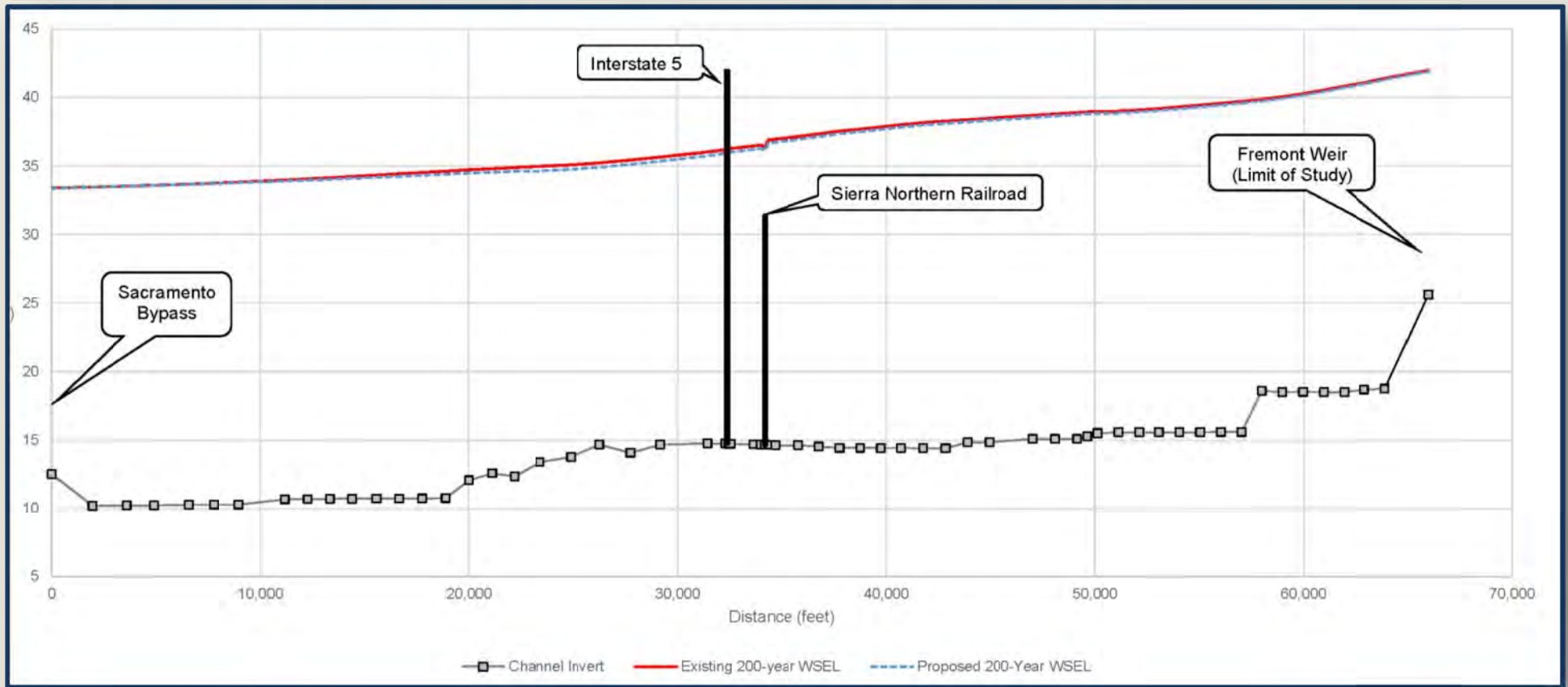
**TRANSITORY STORAGE PROJECT LAYOUT**  
**CONWAY LEVEE SETBACK AND**  
**TRANSITORY STORAGE PROJECT**  
**YOLO COUNTY**  
**NOVEMBER, 2016**

- Approximate Levee Alignment
- Levee Degrade (Weir)
- Proposed Culverts to Facilitate Interior Drainage When WSE in Yolo Bypass Recedes
- Cross Section



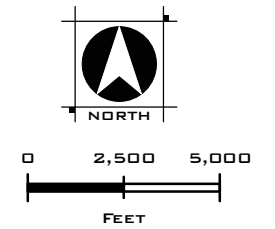


# Flood Benefits of Transitory Storage Alternative





YOLO BYPASS LEVEE BREACHES 1 AND 2  
 COMPOSITE 200-YEAR  
 FLOODPLAIN EXTENTS MAP  
 CONAWAY LEVEE SETBACK AND  
 TRANSITORY STORAGE PROJECT  
 YOLO COUNTY, CA  
 NOVEMBER, 2016



**Legend**

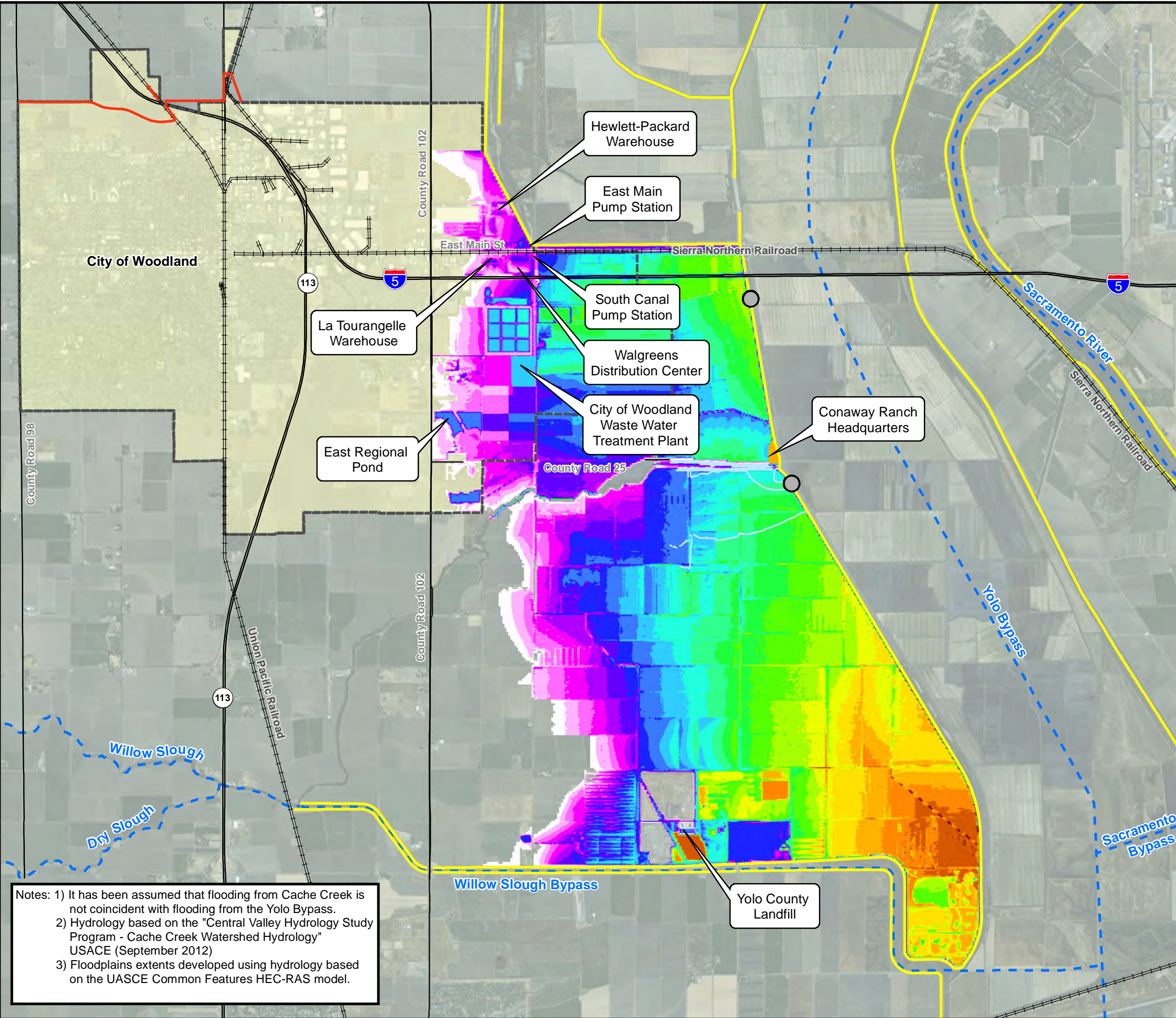
- Breach Location
- City of Woodland
- Conaway Ranch Headquarters
- Proposed Embankments
- State Plan of Flood Control Levees
- Stream Centerlines
- Preliminary 200-Year WSEL Contours (ft, NAVD 88)
- Existing Railways
- Highways

**200-Year Floodplain Depth (ft):**

	> 0.0 - 1.0		> 7.0 - 8.0		> 14.0 - 15.0
	> 1.0 - 2.0		> 8.0 - 9.0		> 15.0 - 16.0
	> 2.0 - 3.0		> 9.0 - 10.0		> 16.0 - 17.0
	> 3.0 - 4.0		> 10.0 - 11.0		> 17.0 - 18.0
	> 4.0 - 5.0		> 11.0 - 12.0		> 18.0 - 19.0
	> 5.0 - 6.0		> 12.0 - 13.0		> 19.0 - 20.0
	> 6.0 - 7.0		> 13.0 - 14.0		> 20.0

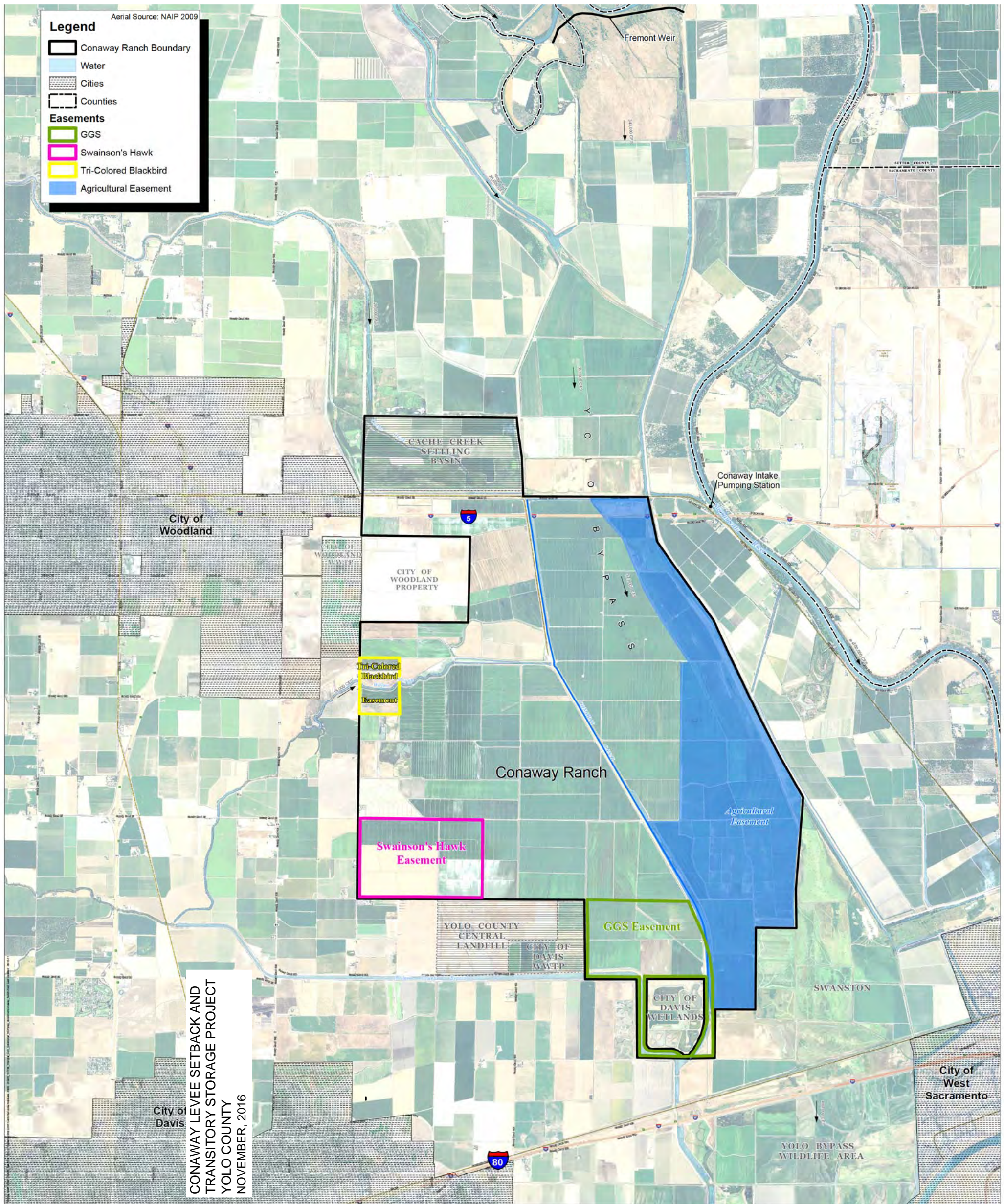
Basemap source: Esri Online Services

**PRELIMINARY**



Notes: 1) It has been assumed that flooding from Cache Creek is not coincident with flooding from the Yolo Bypass.  
 2) Hydrology based on the "Central Valley Hydrology Study Program - Cache Creek Watershed Hydrology" USACE (September 2012)  
 3) Floodplains extents developed using hydrology based on the UASCE Common Features HEC-RAS model.





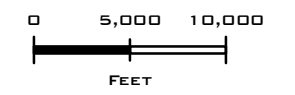
CONWAY LEVEE SETBACK AND  
TRANSITORY STORAGE PROJECT  
YOLO COUNTY  
NOVEMBER, 2016

CONWAY RANCH EXISTING HABITAT EASEMENTS MAP  
CONWAY LEVEE SETBACK AND  
TRANSITORY STORAGE PROJECT  
YOLO COUNTY  
NOVEMBER, 2016

FIGURE 4

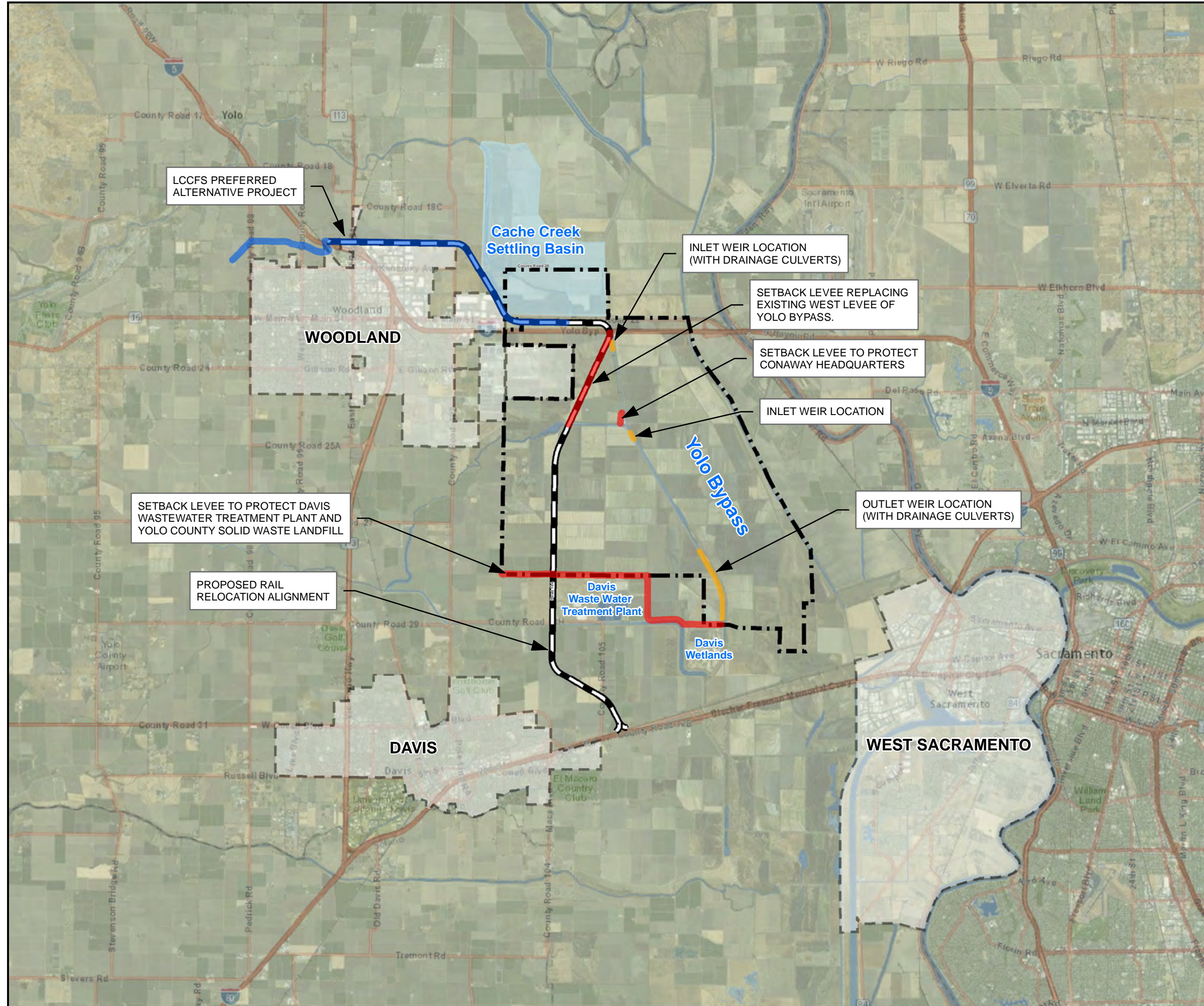


REGIONAL RAIL RELOCATION  
PROJECT OVERVIEW MAP  
CONAWAY LEVEE SETBACK AND  
TRANSITORY STORAGE PROJECT  
YOLO COUNTY, CA  
NOVEMBER, 2016



**Legend**

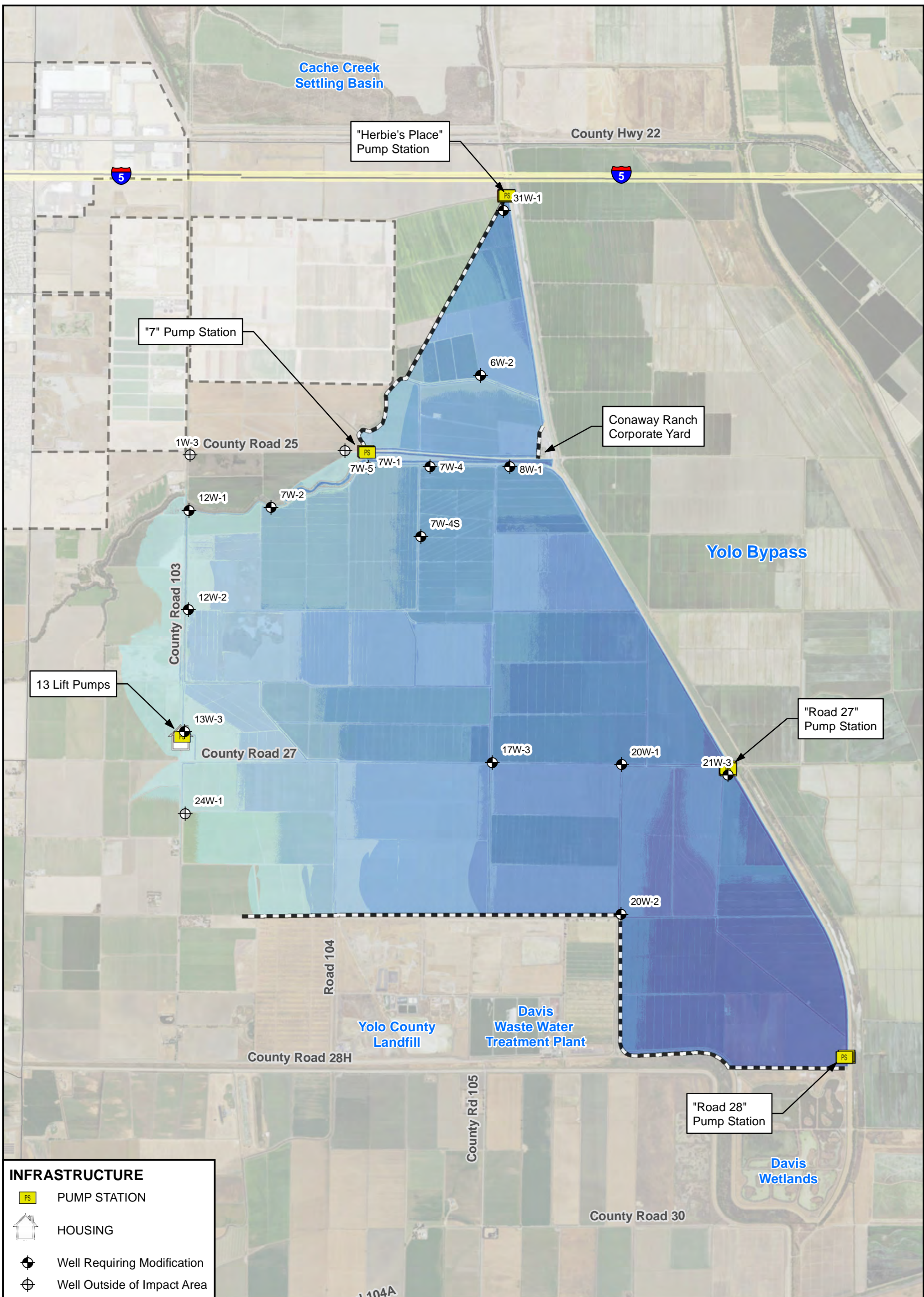
- Conaway Ranch Boundary
- City Boundary
- Cache Creek Settling Basin
- Proposed Rail Relocation**
  - Proposed Rail Alignment
- LCCFS Preferred Alternative Project**
  - Approximate Alignment
- Conaway Levee Setback and Transitory Storage Project**
  - Approximate Alignment
  - Weir



**PRELIMINARY**

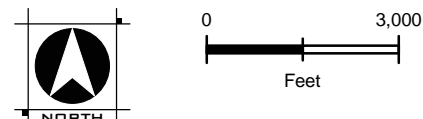




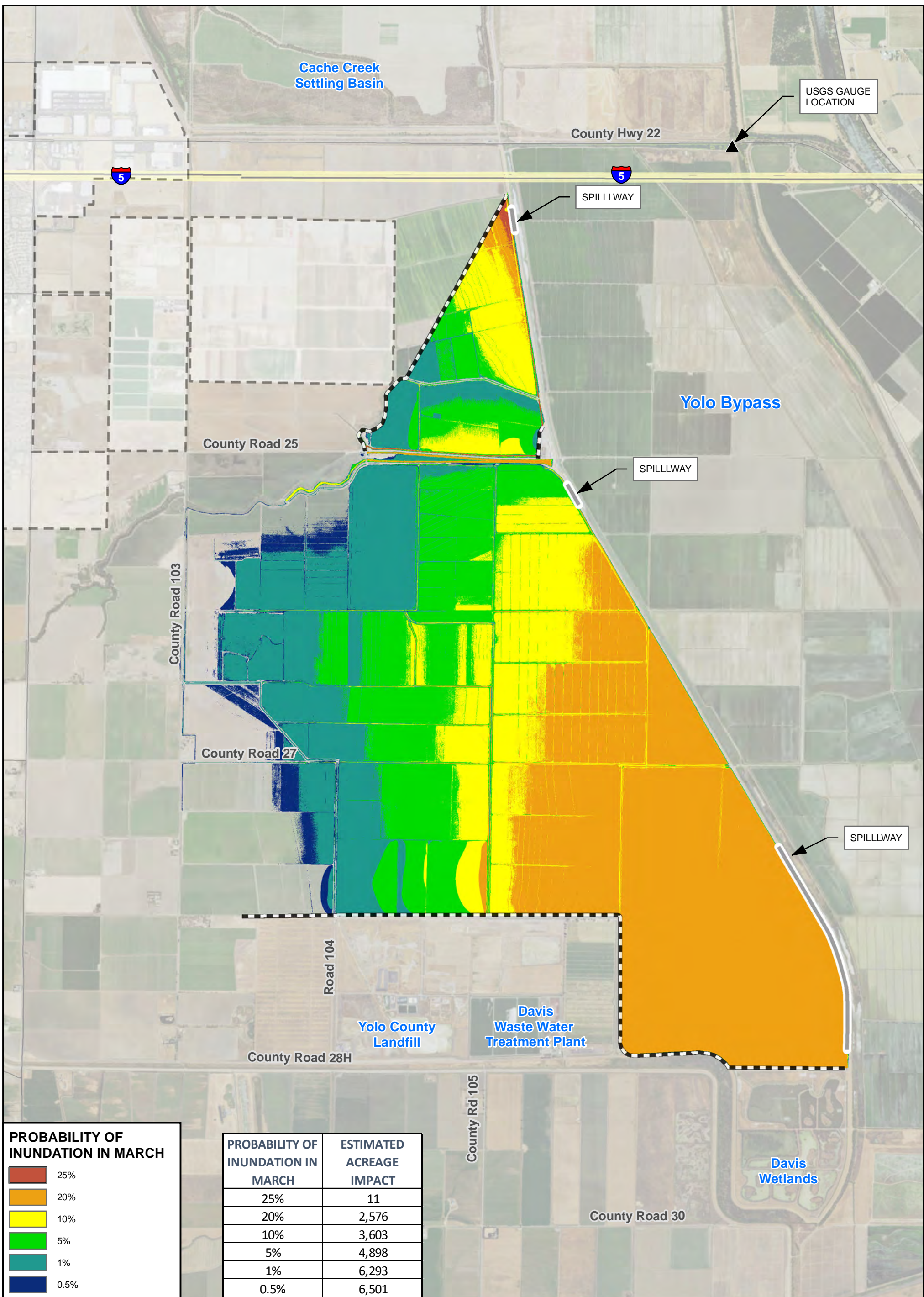


- INFRASTRUCTURE**
- PUMP STATION
  - HOUSING
  - Well Requiring Modification
  - Well Outside of Impact Area

**INFRASTRUCTURE LOCATION MAP**  
 CONAWAY LEVEE SETBACK AND  
 TRANSITORY STORAGE PROJECT  
 YOLO COUNTY  
 NOVEMBER, 2016

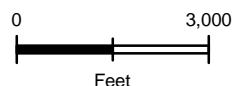




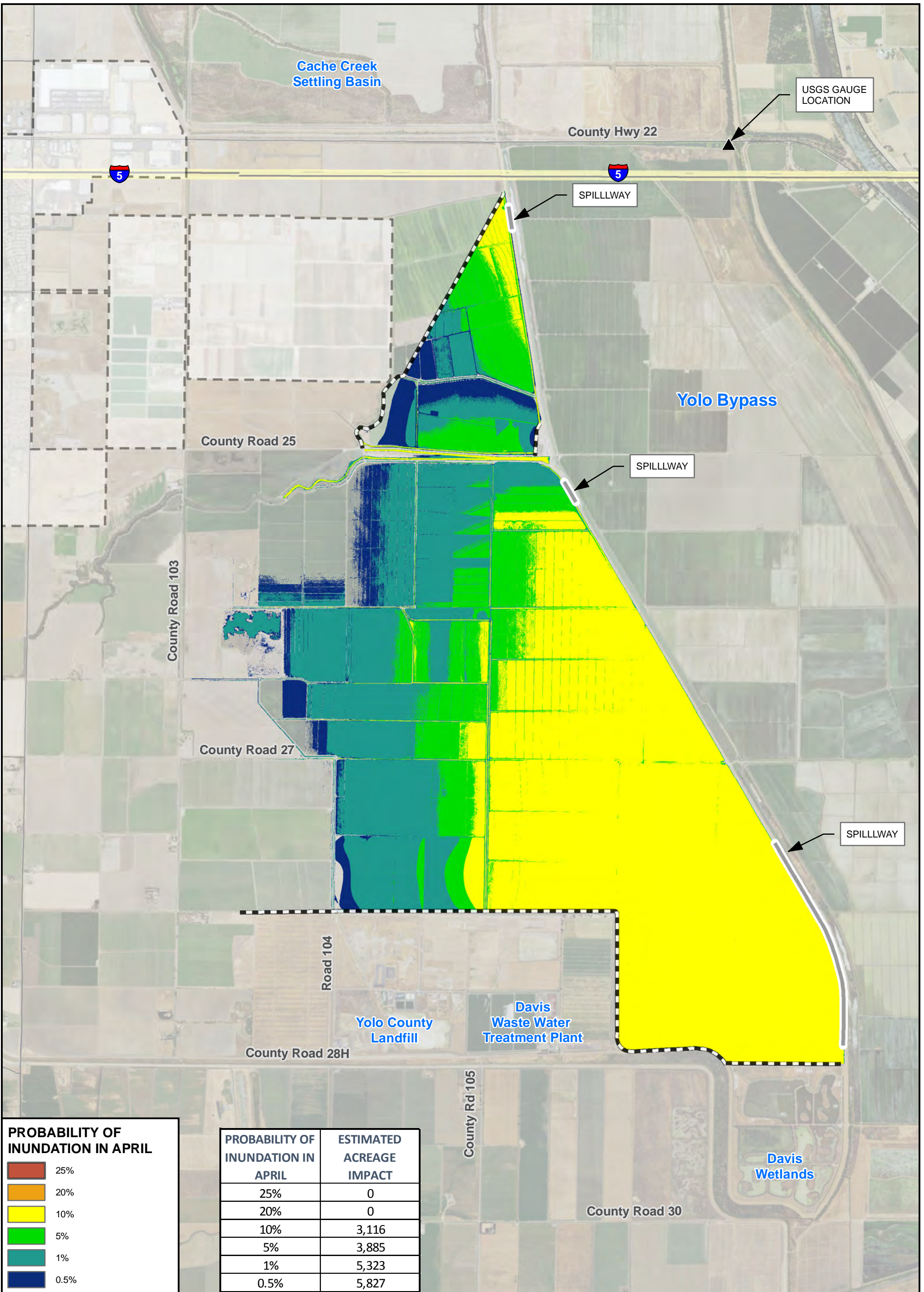


**PROBABILITY OF INUNDATION - MARCH**  
 CONWAY LEVEE SETBACK AND  
 TRANSITORY STORAGE PROJECT  
 YOLO COUNTY  
 NOVEMBER, 2016

NOTES  
 1. PROBABILITIES BASED ON HISTORICAL FLOW DATA FROM USGS GAUGE  
 "11453000 YOLO BYPASS NR WOODLAND CA".

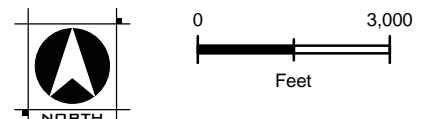




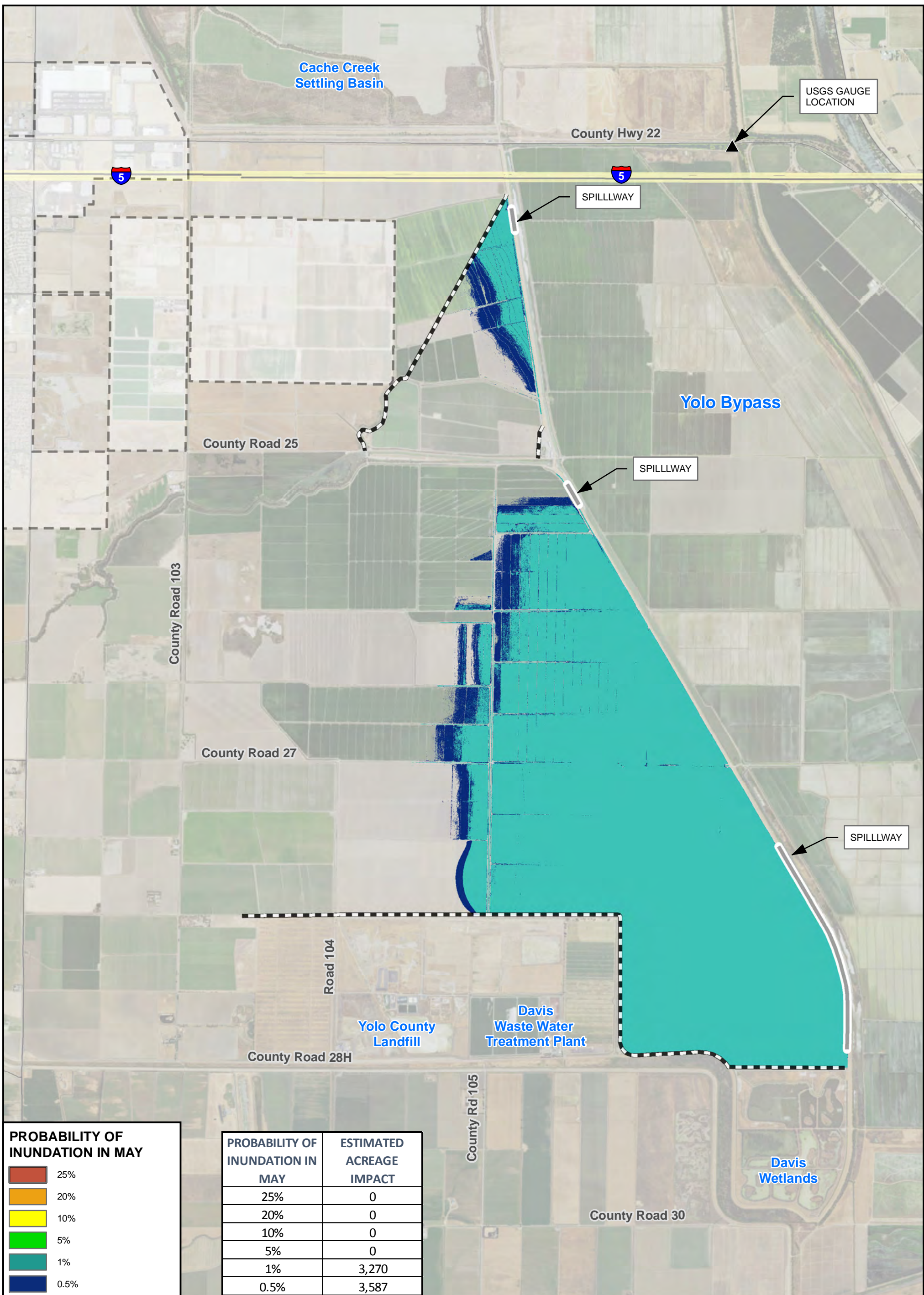


**PROBABILITY OF INUNDATION - APRIL**  
 CONWAY LEVEE SETBACK AND  
 TRANSITORY STORAGE PROJECT  
 YOLO COUNTY  
 NOVEMBER, 2016

NOTES  
 1. PROBABILITIES BASED ON HISTORICAL FLOW DATA FROM USGS GAUGE  
 "11453000 YOLO BYPASS NR WOODLAND CA".

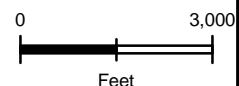






**PROBABILITY OF INUNDATION - MAY**  
 CONAWAY LEVEE SETBACK AND  
 TRANSITORY STORAGE PROJECT  
 YOLO COUNTY  
 NOVEMBER, 2016

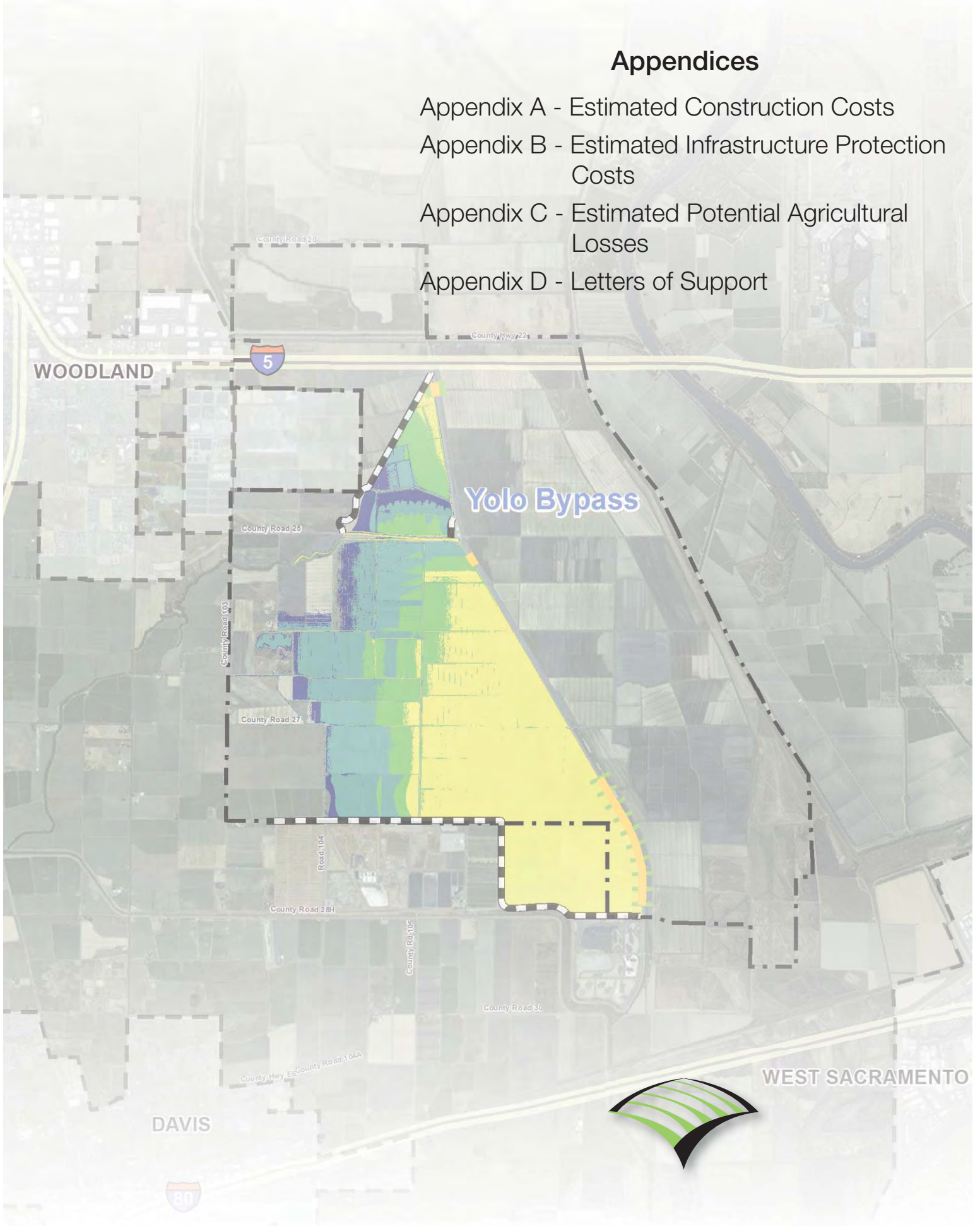
NOTES  
 1. PROBABILITIES BASED ON HISTORICAL FLOW DATA FROM USGS GAUGE  
 "11453000 YOLO BYPASS NR WOODLAND CA".





## Appendices

- Appendix A - Estimated Construction Costs
- Appendix B - Estimated Infrastructure Protection Costs
- Appendix C - Estimated Potential Agricultural Losses
- Appendix D - Letters of Support





# Appendix A

## Estimated Construction Costs

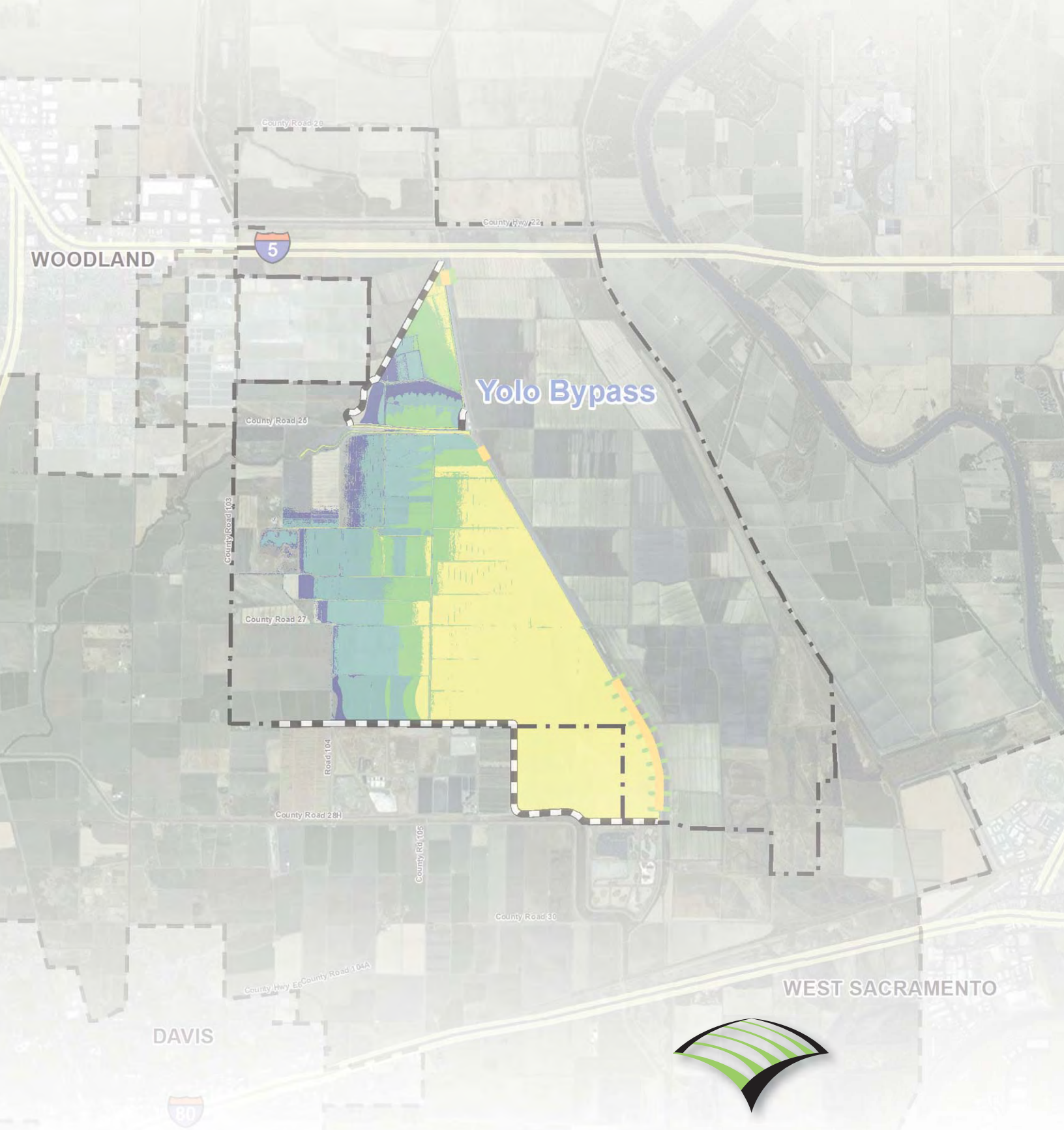


TABLE A.1  
ESTIMATED CONSTRUCTION COSTS  
CONAWAY LEVEE SETBACK AND TRANSITORY STORAGE PROJECT



Item	Quantity	Unit	Unit Price	Cost	Contingency (%)	Contingency (\$)	Cost w/Contingency
<b>Lands</b>							
<u>Parcel: APN 042 180 02</u>							
Land Acquisition - General	5.5	AC	\$30,000.00	\$165,000	0%	\$0	\$165,000
<u>Parcel: APN 042 140 14</u>							
Land Acquisition - General	13.0	AC	\$30,000.00	\$390,000	0%	\$0	\$390,000
<u>Parcel: APN 042 230 02</u>							
Land Acquisition - General	5.6	AC	\$30,000.00	\$168,000	0%	\$0	\$168,000
<u>Parcel: APN 042 230 13</u>							
Land Acquisition - Agricultural	13.5	AC	\$25,000.00	\$337,500	0%	\$0	\$337,500
<u>Parcel: APN 042 150 02</u>							
Land Acquisition - Agricultural	12.5	AC	\$25,000.00	\$312,500	0%	\$0	\$312,500
<u>Parcel: APN 042 150 01</u>							
Land Acquisition - Agricultural	14.5	AC	\$25,000.00	\$362,500	0%	\$0	\$362,500
<u>Parcel: APN 042 180 13</u>							
Land Acquisition - Agricultural	18.1	AC	\$25,000.00	\$452,500	0%	\$0	\$452,500
<u>Parcel: APN 057 190 11</u>							
Land Acquisition - Agricultural	14.7	AC	\$25,000.00	\$368,259	0%	\$0	\$368,259
<b>Subtotal - Lands</b>				<b>\$2,557,000</b>		<b>\$0</b>	<b>\$2,557,000</b>
<b>Mitigation - Fish and Wildlife</b>							
Environmental Mitigation	1	LS	\$3,440,300	\$3,440,300	30%	\$1,032,090	\$4,472,390
<b>Subtotal - Mitigation - Fish and Wildlife</b>				<b>\$3,440,000</b>		<b>\$1,033,000</b>	<b>\$4,472,000</b>
<b>Utilities and Relocations</b>							
Utility Pole Relocation	26	EA	\$30,000.00	\$780,000	30%	\$234,000	\$1,014,000
<u>Parcel: APN 042 180 02</u>							
Conaway Drainage/Irrigation Canal Relocation (Incl. Berm)	1,500	LF	\$85.00	\$127,500	30%	\$38,250	\$165,750
Access Gate Relocation	2	EA	\$3,000.00	\$6,000	30%	\$1,800	\$7,800
<u>Parcel: APN 042 230 02</u>							
Main Drainage/Irrigation Canal Relocation (Incl. Berm)	2,000	LF	\$30.00	\$60,000	30%	\$18,000	\$78,000
Access Gate Relocation	2	EA	\$3,000.00	\$6,000	30%	\$1,800	\$7,800
<u>Parcel: APN 042 230 13</u>							
Main Drainage/Irrigation Canal Relocation (Incl. Berm)	1,850	LF	\$30.00	\$55,500	30%	\$16,650	\$72,150
Farm Drainage/Irrigation Canal Relocation (Incl. Berm)	4,600	LF	\$20.00	\$92,000	30%	\$27,600	\$119,600
24" RCP Culvert (New)	480	LF	\$100.00	\$48,000	30%	\$14,400	\$62,400
24" Flap-Gate	4	EA	\$2,800.00	\$11,200	30%	\$3,360	\$14,560
Access Gate Relocation	2	EA	\$3,000.00	\$6,000	30%	\$1,800	\$7,800
<u>Parcel: APN 042 140 14</u>							
Main Drainage/Irrigation Canal Relocation (Incl. Berm)	5,000	LF	\$30.00	\$150,000	30%	\$45,000	\$195,000
Access Gate Relocation	2	EA	\$3,000.00	\$6,000	30%	\$1,800	\$7,800
<u>Parcel: APN 042 150 02</u>							
Farm Drainage/Irrigation Canal Relocation (Incl. Berm)	4,500	LF	\$20.00	\$90,000	30%	\$27,000	\$117,000
24" RCP Culvert (New)	240	LF	\$100.00	\$24,000	30%	\$7,200	\$31,200
24" Flap-Gate	2	EA	\$2,800.00	\$5,600	30%	\$1,680	\$7,280
Access Gate Relocation	2	EA	\$3,000.00	\$6,000	30%	\$1,800	\$7,800
<u>Parcel: APN 042 150 01</u>							
Farm Drainage/Irrigation Canal Relocation (Incl. Berm)	5,200	LF	\$20.00	\$104,000	30%	\$31,200	\$135,200
24" RCP Culvert	120	LF	\$100.00	\$12,000	30%	\$3,600	\$15,600
24" RCP Culvert (New)	160	LF	\$100.00	\$16,000	30%	\$4,800	\$20,800
24" Flap-Gate	1	EA	\$2,800.00	\$2,800	30%	\$840	\$3,640
Access Gate Relocation	1	EA	\$3,000.00	\$3,000	30%	\$900	\$3,900
18" RCP Culvert	40	LF	\$90.00	\$3,600	30%	\$1,080	\$4,680
24" RCP Culvert	30	LF	\$100.00	\$3,000	30%	\$900	\$3,900
<u>Parcel: APN 042 070 08</u>							
Farm Drainage/Irrigation Canal Relocation (Incl. Berm)	3,000	LF	\$20.00	\$60,000	30%	\$18,000	\$78,000
Access Gate Relocation	2	EA	\$3,000.00	\$6,000	30%	\$1,800	\$7,800

TABLE A.1  
ESTIMATED CONSTRUCTION COSTS  
CONAWAY LEVEE SETBACK AND TRANSITORY STORAGE PROJECT

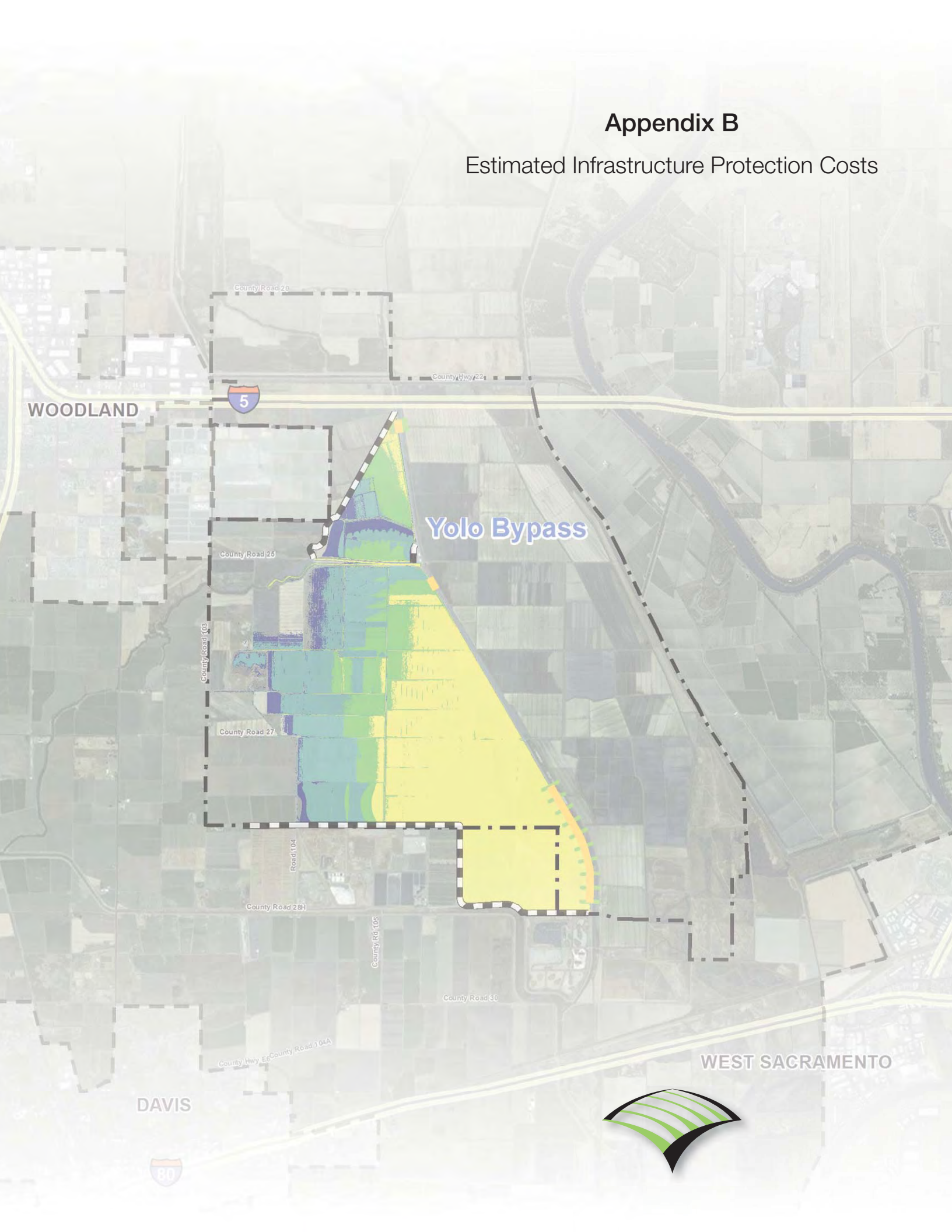


Item	Quantity	Unit	Unit Price	Cost	Contingency		Cost
					(%)	Contingency (\$)	w/Contingency
<b>Parcel: APN 042 180 13</b>							
Flap-Gated Box Culvert	18	EA	\$20,000.00	\$360,000	30%	\$108,000	\$468,000
24" RCP Culvert	100	LF	\$100.00	\$10,000	30%	\$3,000	\$13,000
Main Drainage/Irrigation Canal Relocation (Incl. Berm)	7,800	LF	\$30.00	\$234,000	30%	\$70,200	\$304,200
<b>Parcel: APN 057 190 11</b>							
Remove and Replace Herbie's Place Pump Station	1	LS	\$350,000.00	\$350,000	30%	\$105,000	\$455,000
Main Drainage/Irrigation Canal Relocation (Incl. Berm)	3,700	LF	\$30.00	\$111,000	30%	\$33,300	\$144,300
Remove and Preplace Debris Screen	2	EA	\$5,000.00	\$10,000	30%	\$3,000	\$13,000
24" RCP Culvert	40	LF	\$100.00	\$4,000	30%	\$1,200	\$5,200
48" RCP Culvert with Positive Closure Device	20	EA	\$50,000.00	\$1,000,000	30%	\$300,000	\$1,300,000
<b>Subtotal - Utilities and Relocations</b>				<b>\$3,764,000</b>		<b>\$1,129,000</b>	<b>\$4,893,000</b>
<b>Earthwork</b>							
Mobilization and Demobilization	1	LS	\$1,080,947.43	\$1,080,947	30%	\$324,284	\$1,405,232
Traffic Control (Rural)	1	LS	\$214,049.00	\$214,049	30%	\$64,215	\$278,264
Stabilized Construction Entrance	10	EA	\$3,500.00	\$35,000	30%	\$10,500	\$45,500
Erosion Control Seeding (Site)	88.0	AC	\$3,000.00	\$263,994	30%	\$79,198	\$343,193
Silt Fencing/Straw Wattles	92,000	LF	\$4.50	\$414,000	30%	\$124,200	\$538,200
Clearing and Grubbing	385.0	AC	\$2,800.00	\$1,077,868	30%	\$323,360	\$1,401,228
Weir/Spillway Excavation	56,000.0	CY	\$3.00	\$168,000	30%	\$50,400	\$218,400
Weir/Spillway Rock Slope Protection	63,000.0	Ton	\$52.00	\$3,276,000	30%	\$982,800	\$4,258,800
Closure Structure Across County Road 104	1.0	EA	\$300,000.00	\$300,000	30%	\$90,000	\$390,000
Borrow Site Excavation	1,391,609	CY	\$3.00	\$4,174,827	30%	\$1,252,448	\$5,427,275
Borrow Site Hauling Level 1	1,391,609	CY	\$2.35	\$3,270,281	30%	\$981,084	\$4,251,365
Borrow Site Stripping	288	AC	\$3,500.00	\$1,006,329	30%	\$301,899	\$1,308,227
Borrow Site Restoration	288	AC	\$4,000.00	\$1,150,090	30%	\$345,027	\$1,495,117
Levee Embankment Fill	1,253,702	CY	\$5.00	\$6,268,510	30%	\$1,880,553	\$8,149,063
<b>Subtotal - Earthwork</b>				<b>\$22,700,000</b>		<b>\$6,810,000</b>	<b>\$29,510,000</b>
				<b>Subtotal Local Levee Project Improvements</b>		<b>\$8,972,000</b>	<b>\$41,432,000</b>
				<b>Construction Cost Subtotal (10% Design Phase)</b>		<b>\$8,972,000</b>	<b>\$41,432,000</b>
				<b>Planning, Engineering, &amp; Design (8%)</b>		\$718,000	\$3,315,000
				<b>Construction Management (6%)</b>		\$539,000	\$2,486,000
				<b>ESTIMATED PROJECT TOTAL (10% Design Phase)</b>		<b>\$10,229,000</b>	<b>\$47,233,000</b>



# Appendix B

## Estimated Infrastructure Protection Costs



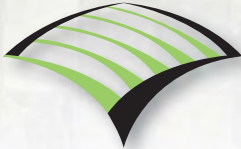
WOODLAND



Yolo Bypass

WEST SACRAMENTO

DAVIS



**TABLE B.1**  
**ESTIMATED COST FOR PUMP STATION MODIFICATIONS**  
**CONAWAY LEVEE SETBACK AND TRANSITORY STORAGE PROJECT**



Pump Station	Amount	Unit Cost	Cost	Contingency (50%)	Total Cost
<b>Herbie's Place PS</b>					
N/A	1		\$0	\$0	\$0
<b>Subtotal</b>			<b>\$0</b>		
<b>Road 27 PS</b>					
Demo of Existing Pump Station	1	\$35,000	\$35,000	\$17,500	\$52,500
<b>Subtotal</b>			<b>\$35,000</b>	<b>\$17,500</b>	<b>\$52,500</b>
<b>Road 28 PS</b>					
Demo of Existing Pump Station	1	\$35,000	\$35,000	\$17,500	\$52,500
<b>Subtotal</b>			<b>\$35,000</b>	<b>\$17,500</b>	<b>\$52,500</b>
<b>13 PS</b>					
Demo Existing Pump Station	1	\$15,000	\$15,000	\$7,500	\$22,500
Construction of New Pump Station	1	\$130,000	\$130,000	\$65,000	\$195,000
Pumps for New Pump Station	2	\$35,000	\$70,000	\$35,000	\$105,000
<b>Subtotal</b>			<b>\$215,000</b>	<b>\$107,500</b>	<b>\$322,500</b>
<b>7 PS</b>					
Demo Existing Pump Stations	1	\$25,000	\$25,000	\$12,500	\$37,500
Construction of New Pump Station (North of CR 25)	1	\$125,000	\$125,000	\$62,500	\$187,500
Construction of New Pump Station (South of CR 25)	1	\$300,000	\$300,000	\$150,000	\$450,000
Construction of New Electrical Building	1	\$150,000	\$150,000	\$75,000	\$225,000
Pumps for New Pump Station	6	\$90,000	\$540,000	\$270,000	\$810,000
<b>Subtotal</b>			<b>\$1,140,000</b>	<b>\$570,000</b>	<b>\$1,710,000</b>
<b>TOTAL PUMP STATION RAISING COST</b>			<b>\$1,425,000</b>	<b>\$712,500</b>	<b>\$2,137,500</b>

NOTES:

1. Costs for Herbie's Place pump station modifications were captured in Table A.1, therefore were not included in this table.
2. Assumed Road 27 and Road 28 pump stations will not need to be replaced due to the gravity drainage allowed by the proposed culverts at the south end of the property.
3. Assumed new pumps will be required for pump stations that are being raised.

**TABLE B.2**  
**ESTIMATED COST FOR WELL MODIFICATIONS**  
**CONAWAY LEVEE SETBACK AND TRANSITORY STORAGE PROJECT**



Well Name	200-YR WSE Depth	Ex. Height above EG	Elevation Raise	Base Cost for Each Well	Cost to Raise Well 1ft	Cost to Raise Well	Contingency (30%)	Total Cost
12W-1	2	2	2	\$90,295	\$1,100	\$92,495	\$27,749	\$120,244
12W-2	2	2	2	\$90,295	\$1,100	\$92,495	\$27,749	\$120,244
13W-3	2.5	2	2.5	\$90,295	\$1,100	\$93,045	\$27,914	\$120,959
17W-3	9.5	2	9.5	\$90,295	\$1,100	\$100,745	\$30,224	\$130,969
1W-3	0	2	0	\$0	\$1,100	\$0	\$0	\$0
20W-1	12	2	12	\$90,295	\$1,100	\$103,495	\$31,049	\$134,544
20W-2	14.5	2	14.5	\$90,295	\$1,100	\$106,245	\$31,874	\$138,119
21W-3	15	2	15	\$90,295	\$1,100	\$106,795	\$32,039	\$138,834
24W-1	0	2	0	\$0	\$1,100	\$0	\$0	\$0
31W-1	13.5	2	13.5	\$90,295	\$1,100	\$105,145	\$31,544	\$136,689
6W-2	9.5	2	9.5	\$90,295	\$1,100	\$100,745	\$30,224	\$130,969
7W-1	6.5	2	6.5	\$90,295	\$1,100	\$97,445	\$29,234	\$126,679
7W-2	4	2	4	\$90,295	\$1,100	\$94,695	\$28,409	\$123,104
7W-4	8	2	8	\$90,295	\$1,100	\$99,095	\$29,729	\$128,824
7W-4S	9.5	2	9.5	\$90,295	\$1,100	\$100,745	\$30,224	\$130,969
7W-5	0	2	0	\$0	\$1,100	\$0	\$0	\$0
8W-1	9	2	9	\$90,295	\$1,100	\$100,195	\$30,059	\$130,254
<b>TOTAL</b>						<b>\$1,393,380</b>	<b>\$418,014</b>	<b>\$1,811,394</b>

NOTES:

1. Assumed wells will need to be raised two feet above 200-year water surface elevation.
2. Cost data taken from bid documents for similar work done in the area.



**TABLE B.3**  
**ESTIMATED COST FOR STRUCTURE MODIFICATIONS**  
**CONAWAY LEVEE SETBACK AND TRANSITORY STORAGE PROJECT**



<b>Item</b>	<b>Unit</b>	<b>Quantity</b>	<b>Unit Cost</b>	<b>Cost</b>	<b>Contingency (30%)</b>	<b>Total Cost</b>
Demolish Structure 1	SF	2,200	\$6	\$13,200	\$3,960	\$17,160
Demolish Structure 2	SF	2,200	\$6	\$13,200	\$3,960	\$17,160
Fill Material for Raising Structures	CY	6,300	\$10	\$63,000	\$18,900	\$81,900
Construction of New Structure 1	SF	2,200	\$200	\$440,000	\$132,000	\$572,000
Construction of New Structure 2	SF	2,200	\$200	\$440,000	\$132,000	\$572,000
<b>Total</b>				<b>\$969,400</b>	<b>\$290,820</b>	<b>\$1,260,220</b>

NOTES:

1. Structure square footage estimated based on footprint area in ARC GIS.
2. Volume of Fill Material based on a conservative average one foot raise over the entire parcels that contain the structures.

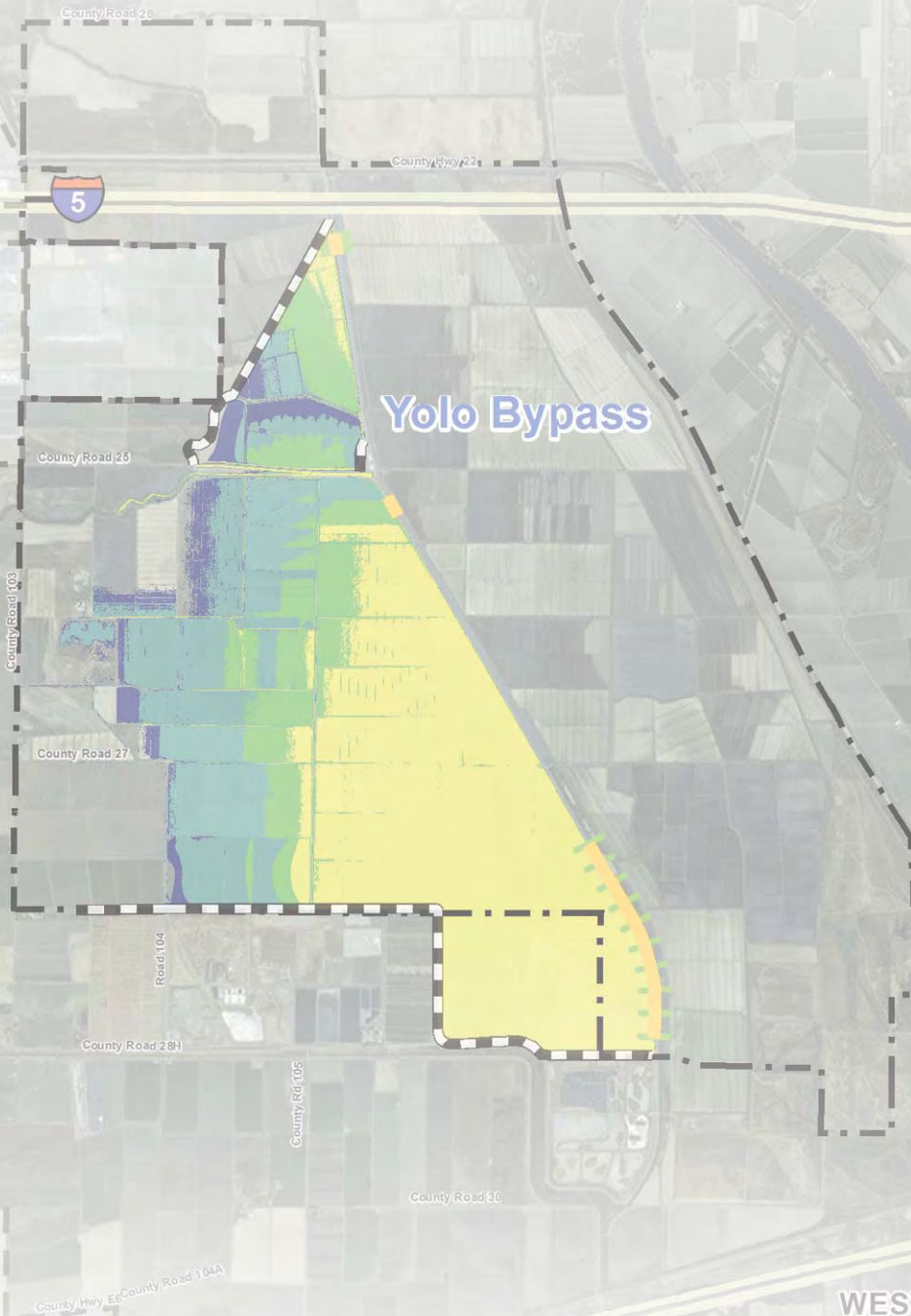
# Appendix C

## Estimated Potential Agricultural Losses

WOODLAND

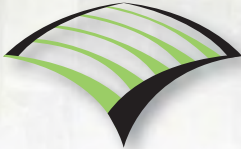


Yolo Bypass



WEST SACRAMENTO

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**TABLE C.1  
ESTIMATED FIELD INUNDATION BY MONTH  
BASED ON HISTORICAL YOLO BYPASS RIVER FLOWS  
CONAWAY LEVEE SETBACK AND TRANSITORY STORAGE PROJECT**



Elevation	Corresponding Flow (cfs) <sup>1</sup>	Number of Times Yolo Bypass Stage has Exceeded Given Elevation				Exceedance Probability <sup>2</sup>			
		March	April	May	June	March	April	May	June
<b>Northern Weir (Elevation 22.5)</b>									
22.5	35,330	20	8	1	0	26.0%	10.4%	1.3%	0.0%
23	41,939	16	8	1	0	20.8%	10.4%	1.3%	0.0%
24	55,156	12	7	1	0	15.6%	9.1%	1.3%	0.0%
25	78,792	9	6	0	0	11.7%	7.8%	0.0%	0.0%
26	109,560	6	3	0	0	7.8%	3.9%	0.0%	0.0%
27	144,703	4	1	0	0	5.2%	1.3%	0.0%	0.0%
28	183,660	3	1	0	0	3.9%	1.3%	0.0%	0.0%
29	222,617	2	0	0	0	2.6%	0.0%	0.0%	0.0%
30	258,636	0	0	0	0	0.0%	0.0%	0.0%	0.0%
31	293,204	0	0	0	0	0.0%	0.0%	0.0%	0.0%
<b>Southern Weir (Elevation 21.0)</b>									
21	43,024	15	7	1	0	20.0%	10.0%	1.3%	0.0%
22	62,938	10	7	1	0	13.0%	10.0%	1.3%	0.0%
23	87,852	7	5	0	0	9.1%	6.5%	0.0%	0.0%
24	116,327	5	2	0	0	6.5%	2.6%	0.0%	0.0%
25	148,100	4	1	0	0	5.2%	1.3%	0.0%	0.0%
26	180,719	3	1	0	0	3.9%	1.3%	0.0%	0.0%
27	213,338	3	0	0	0	3.9%	0.0%	0.0%	0.0%
28	244,808	1	0	0	0	1.3%	0.0%	0.0%	0.0%
29	275,015	0	0	0	0	0.0%	0.0%	0.0%	0.0%
30	305,223	0	0	0	0	0.0%	0.0%	0.0%	0.0%
31	335,431	0	0	0	0	0.0%	0.0%	0.0%	0.0%

Notes:

- Elevations were converted to corresponding flows within Yolo Bypass using USACE Model rating curves for comparison to historical flow data. The north weir location used the USACE Common Features 1997 Calibration Analysis (Yolo Bypass R.S. 20.084), while the south weir used the USACE Common Features 1997 Calibration Analysis (Yolo Bypass R.S. 48.327).
- Exceedance probabilities based on 77 years of historical data.

**TABLE C.2  
ESTIMATED POTENTIAL AGRICULTURAL LOSSES - MARCH  
CONAWAY LEVEE SETBACK AND TRANSITORY STORAGE PROJECT**



Probability of Inundation	Northern Acreage Affected	Southern Acreage Affected	Combined Acreage Affected <sup>1</sup>	Net Profit of Acreage Affected <sup>2</sup>	Net Value of Acreage Affected Adjusted for Probability of Inundation <sup>3</sup>	Net Value of Acreage Affected Adjusted for Probability of Inundation and Monthly Adjustment <sup>4</sup>	Contingency (30%)	Total Estimated Annual Crop Loss Value (Present Year)	Estimated Cumulative Crops Loss Values Over 10 Year (Future Value)	Present Lump Sum Value of Future Worth
25.00%	11.44349	0	11.44349	\$3,776.35	\$944.09	\$141.61	\$42.48	\$184.10	\$2,110	\$1,570
20.00%	33.00849	2531.685	2564.69349	\$846,349	\$169,270	\$25,390	\$7,617.14	\$33,007.61	\$378,395	\$281,562
10.00%	181.6678	844.8547	1026.5225	\$338,752	\$33,875	\$5,081	\$1,524.39	\$6,605.67	\$75,727	\$56,348
5.00%	86.81247	1208.67	1295.48247	\$427,509	\$21,375	\$3,206	\$961.90	\$4,168.21	\$47,784	\$35,556
1.00%	323.6917	1071.495	1395.1867	\$460,412	\$4,604	\$691	\$207.19	\$897.80	\$10,292	\$7,658
0.50%	0	208.1013	208.1013	\$68,673.43	\$343.37	\$52	\$15.45	\$66.96	\$768	\$571
<b>TOTAL</b>	<b>636.62395</b>	<b>5864.806</b>	<b>6501.42995</b>	<b>\$2,145,471.88</b>	<b>\$230,412.04</b>	<b>\$34,561.81</b>	<b>\$10,368.54</b>	<b>\$44,930.35</b>	<b>\$515,076</b>	<b>\$383,265</b>

**Ag Valuation Assumptions**

Average Yield (Sack/Acre)	85
Average Price of Rice (\$/Sack)	\$18.00
Average Value per Acre (\$/Acre)	\$1,530.00
Average Cost per Acre (\$/Acre)	\$1,200.00
Net Profit per Acre (\$/Acre)	\$330.00

**Percent Loss Adjustments (By Month) Assumptions**

March	15%
April	30%
May	50%

NOTES:

1. Values obtained from probability areas shown in Figure 2.
2. Based on assumed \$330. profit/acre shown in Ag Valuation assumptions above.
3. Net Value of Acreage Affected Adjusted for Probability of Inundation = Net Profit of Acreage Affected \* Probability of Inundation.
4. Net Value of Acreage Affected Adjusted for Probability of Inundation and Month Adjustment = Net Profit of Acreage Affected \* Probability of Inundation \* Monthly Percent Loss Adjustment.
5. Average Yield, Average Price of Rice, Average Cost per Acre, and Percent Loss Adjustments were all developed in conversations with Conaway Ranch Staff.
6. Assumed an annual interest rate of 3% for capitalization and discounting formulas.

**TABLE C.3  
ESTIMATED POTENTIAL AGRICULTURAL LOSSES - APRIL  
CONAWAY LEVEE SETBACK AND TRANSITORY STORAGE PROJECT**



Probability of Inundation	Northern Acreage Affected	Southern Acreage Affected	Combined Acreage Affected <sup>1</sup>	Net Profit of Acreage Affected <sup>2</sup>	Net Value of Acreage Affected Adjusted for Probability of Inundation <sup>3</sup>	Net Value of Acreage Affected Adjusted for Probability of Inundation and Monthly Adjustment <sup>4</sup>	Contingency (30%)	Total Estimated Annual Crop Loss Value (Present Year)	Estimated Cumulative Crops Loss Values Over 10 Year (Future Value)	Present Lump Sum Value of Future Worth
25.00%	0	0	0	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0	\$0
20.00%	0	0	0	\$0	\$0	\$0	\$0.00	\$0.00	\$0	\$0
10.00%	68.01194	3047.574	3115.58594	\$1,028,143	\$102,814	\$30,844	\$9,253.29	\$40,097.59	\$459,674	\$342,041
5.00%	166.8139	602.7462	769.5601	\$253,955	\$12,698	\$3,809	\$1,142.80	\$4,952.12	\$56,770	\$42,243
1.00%	71.58132	1366.478	1438.05932	\$474,560	\$4,746	\$1,424	\$427.10	\$1,850.78	\$21,217	\$15,788
0.50%	308.4135	195.5565	503.97	\$166,310.10	\$831.55	\$249	\$74.84	\$324.30	\$3,718	\$2,766
<b>TOTAL</b>	<b>614.82066</b>	<b>5212.3547</b>	<b>5827.17536</b>	<b>\$1,922,967.87</b>	<b>\$121,089.22</b>	<b>\$36,326.77</b>	<b>\$10,898.03</b>	<b>\$47,224.80</b>	<b>\$541,379</b>	<b>\$402,837</b>

**Ag Valuation Assumptions**

Average Yield (Sack/Acre)	85
Average Price of Rice (\$/Sack)	\$18.00
Average Value per Acre (\$/Acre)	\$1,530.00
Average Cost per Acre (\$/Acre)	\$1,200.00
Net Profit per Acre (\$/Acre)	\$330.00

**Percent Loss Adjustments (By Month) Assumptions**

March	15%
April	30%
May	50%

NOTES:

1. Values obtained from probability areas shown in Figure 3.
2. Based on assumed \$330. profit/acre shown in Ag Valuation assumptions above.
3. Net Value of Acreage Affected Adjusted for Probability of Inundation = Net Profit of Acreage Affected \* Probability of Inundation.
4. Net Value of Acreage Affected Adjusted for Probability of Inundation and Month Adjustment = Net Profit of Acreage Affected \* Probability of Inundation \* Monthly Percent Loss Adjustment.
5. Average Yield, Average Price of Rice, Average Cost per Acre, and Percent Loss Adjustments were all developed in conversations with Conaway Ranch Staff.
6. Assumed an annual interest rate of 3% for capitalization and discounting formulas.

**TABLE C.4  
ESTIMATED POTENTIAL AGRICULTURAL LOSSES - MAY  
CONAWAY LEVEE SETBACK AND TRANSITORY STORAGE PROJECT**



Probability of Inundation	Northern Acreage Affected	Southern Acreage Affected	Combined Acreage Affected <sup>1</sup>	Net Profit of Acreage Affected <sup>2</sup>	Net Value of Acreage Affected Adjusted for Probability of Inundation <sup>3</sup>	Net Value of Acreage Affected Adjusted for Probability of Inundation and Monthly Adjustment <sup>4</sup>	Contingency (30%)	Total Estimated Annual Crop Loss Value (Present Year)	Estimated Cumulative Crops Loss Values Over 10 Year (Future Value)	Present Lump Sum Value of Future Worth
25.00%	0	0	0	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0	\$0
20.00%	0	0	0	\$0	\$0	\$0	\$0.00	\$0.00	\$0	\$0
10.00%	0	0	0	\$0	\$0	\$0	\$0.00	\$0.00	\$0	\$0
5.00%	0	0	0	\$0	\$0	\$0	\$0.00	\$0.00	\$0	\$0
1.00%	106.6384	3163.143	3269.7814	\$1,079,028	\$10,790	\$5,395	\$1,618.54	\$7,013.68	\$80,404	\$59,828
0.50%	64.83624	252.3852	317.22144	\$104,683.08	\$523.42	\$262	\$78.51	\$340.22	\$3,900	\$2,902
<b>TOTAL</b>	<b>171.47464</b>	<b>3415.5282</b>	<b>3587.00284</b>	<b>\$1,183,710.94</b>	<b>\$11,313.69</b>	<b>\$5,656.85</b>	<b>\$1,697.05</b>	<b>\$7,353.90</b>	<b>\$84,304</b>	<b>\$62,730</b>

**Ag Valuation Assumptions**

Average Yield (Sack/Acre)	85
Average Price of Rice (\$/Sack)	\$18.00
Average Value per Acre (\$/Acre)	\$1,530.00
Average Cost per Acre (\$/Acre)	\$1,200.00
Net Profit per Acre (\$/Acre)	\$330.00

**Percent Loss Adjustments (By Month) Assumptions**

March	15%
April	30%
May	50%

NOTES:

1. Values obtained from probability areas shown in Figure 4.
2. Based on assumed \$330. profit/acre shown in Ag Valuation assumptions above.
3. Net Value of Acreage Affected Adjusted for Probability of Inundation = Net Profit of Acreage Affected \* Probability of Inundation.
4. Net Value of Acreage Affected Adjusted for Probability of Inundation and Month Adjustment = Net Profit of Acreage Affected \* Probability of Inundation \* Monthly Percent Loss Adjustment.
5. Average Yield, Average Price of Rice, Average Cost per Acre, and Percent Loss Adjustments were all developed in conversations with Conaway Ranch Staff.
6. Assumed an annual interest rate of 3% for capitalization and discounting formulas.



# Appendix D

## Letters of Support

WOODLAND

County Road 20



County Hwy 22

Yolo Bypass

County Road 26

County Road 103

County Road 27

Road 104

County Road 28H

County Rd 105

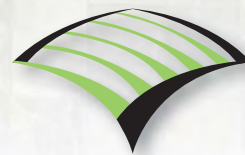
County Road 60

County Hwy E County Road 104A

DAVIS



WEST SACRAMENTO





November 1, 2016

Mr. William Edgar, President  
Central Valley Flood Protection Board  
3310 El Camino Avenue  
Sacramento, California 95821

Mr. Mark Cowin, Director  
Department of Water Resources  
1416 Ninth Street, Room 1115-1  
Sacramento, California 95814

**Subject: Request to Include Consideration of the Conaway Levee Setback and Transitory Storage Project in the Actions Approved as Part of the 2017 Update of the Central Valley Flood Protection Plan**

Dear Mr. Edgar and Mr. Cowin,

The Sacramento Area Flood Control Agency (SAFCA) has been a strong supporter and advocate of the system-wide investment approach to improving our regional flood control system which is embodied in the Central Valley Flood Protection Plan (CVFPP) recommended by the Department of Water Resources (DWR) and approved by the Central Valley Flood Protection Board (CVFPB) in June 2012. Consistent with this approach, we request that you include study of the Conaway Levee Setback and Transitory Storage Project (Levee Setback Project) in the actions approved as part of the 2017 update of the CVFPP.

The Levee Setback Project has the potential to augment the accomplishments of the system improvements identified in the CVFPP by providing up to 72,000 acre-feet of transitory flood storage along the west side of the Yolo Bypass in extreme flood events. The Project could also: reduce the risk of flooding along the Interstate 5 corridor connecting the City of Woodland to the Natomas Basin and Downtown Sacramento; provide potential groundwater recharge and wildlife habitat enhancements on the Conaway Ranch adjacent to the Yolo Bypass; protect the Yolo County Landfill from inundation; and facilitate relocation of the Sierra Northern Railway to the west side of the Yolo Bypass so as to eliminate the risks associated with continued use of the antiquated railway trestle across the Yolo Bypass and expedite the widening of the Sacramento Weir.

The Levee Setback Project would be consistent with the Lower Sacramento/ Delta North Region Corridor Management Framework (CMF) which has been endorsed by SAFCA, the

Office 916-874-7606  
Fax 916-874-8289

1007 - 7th Street, 7th Floor  
Sacramento, CA 95814-3407



West Sacramento Area Flood Control Agency (WSAFCA), Yolo County, Solano County, the Solano County Water Agency and Reclamation District 2068. The CMF sets forth the locally preferred approach to achieving the policy objectives of the CVFPP and other ongoing State and Federal water resource related initiatives in the Lower Sacramento/Delta North Region. These policy objectives include the ability to (1) provide essential conveyance capacity and improve the resilience, reliability and adaptability to climate change of the flood system, (2) preserve agricultural land and promote a strong, sustainable agricultural economy; and, (3) conserve and improve functionality of aquatic and terrestrial species habitat consistent with the paramount flood management purpose of the system. SAFCA and its regional partners have reviewed the Levee Setback Project and we believe it has the potential to address all of the above objectives in an integrated, cost effective manner. Accordingly, we request further study of the project be one of the actions recommended for approval as part of the 2017 update of the CVFPP.

If you have any questions with regard to this request, please contact me or my staff at (916) 874-7606 or [JohnsonR@SacCounty.net](mailto:JohnsonR@SacCounty.net).

Sincerely,



Richard M. Johnson

cc:

Ms. Elisa Sabatini, Manager of Natural Resources, County of Yolo  
Mr. Bill Emlen, Director of Resource Management, County of Solano  
Mr. Brent Meyer, City Engineer, City of Woodland





November 1, 2016

Mr. William Edgar, President  
Central Valley Flood Protection Board  
3310 El Camino Avenue, Suite 170  
Sacramento, California 95821

Mr. Mark Cowin, Director  
Department of Water Resources  
1416 - 9th Street, Room 1115-1  
Sacramento, California 95814

Dear Mr. Edgar and Mr. Cowin,

Subject: Request to include the Conaway Levee Setback and Transitory Storage Project as an option for the west side expansion of the Yolo Bypass in the 2017 Central Valley Flood Protection Plan

The south levee of Cache Creek and the west levee of the Yolo Bypass provide less than 100-year flood protection for the City of Woodland and surrounding areas. The Lower Cache Creek Feasibility Study (LCCFS) is being prepared by the U.S. Army Corps of Engineers (USACE) for addressing the flooding threat from Cache Creek. However, there is no major effort underway at this time to provide protection from the west levee of the Yolo Bypass. The purpose of this letter is to request that you include a Levee Setback and Transitory Storage Project (Transitory Storage Project) as an option for the west side expansion of the Yolo Bypass in the 2017 update of the Central Valley Flood Protection Plan (CVFPP). The proposed project (see attached **Figure 1**) would provide enhanced flood protection for the City of Woodland, City of Davis' infrastructure and other benefits as explained below.

## **BACKGROUND**

The U.S. Army Corps of Engineers, California Department of Water Resources (DWR), City of Woodland, and City of West Sacramento are contemplating several regional projects in the vicinity of the Yolo Bypass and Conaway Ranch within Yolo County to address existing flood problems. In addition, by way of recent initiatives and grant-funded programs, the DWR is interested in increasing transitory storage (areas where floodwaters can be stored in an extreme flooding event) within the Sacramento River Flood Control Project. The DWR is also seeking to advance new aquifer storage and recovery projects to enhance groundwater recharge in the region.

Lastly, restoring ecosystem functionality and enhancing environmental habitat remain high priorities for the Central Valley Flood Protection Board (CVFPB) and DWR. In light of these interests, the City of Woodland and Conaway Ranch have developed the proposed Levee Setback and Transitory Storage Project. The Transitory Storage Project seeks to set back the west levee of the Yolo Bypass to provide transitory storage and groundwater recharge within Conaway Ranch. The project would also enhance existing environmental restoration areas located within Conaway Ranch.

## PROJECT DESCRIPTION

The proposed project would construct new inlet weirs at the west bank of the Yolo Bypass. The northern weir would be constructed just south of Interstate 5 (I-5) (north of County Road 25) and the other weir would be constructed just south of County Road 25. These weirs would allow for transitory storage within Conaway Ranch. An outlet weir near the southern boundary of Conaway Ranch would also be constructed, which would be configured to allow flood water to spill over and back into the Yolo Bypass. During detailed design, the weirs would be configured to effectively reduce peak flows within the Yolo Bypass while maximizing transitory storage potential within Conaway Ranch.

## PROJECT BENEFITS

The Transitory Storage Project would create approximately 72,000 acre-feet of flood storage that would reduce flood stages within the Yolo Bypass. The Transitory Storage Project would provide additional benefits, including groundwater recharge and environmental restoration, which are currently being evaluated. The Lower Sacramento River/Delta North Regional Flood Management Planning Team has endorsed the Transitory Storage Project. It is one of the projects recommended by them to DWR for its consideration. Other key benefits of the proposed Levee Setback and Transitory Storage Project are that it would eliminate the need to address deficiencies of the Yolo Bypass west levee; it would provide protection to I-5 and the Sierra Northern Railway from flooding; and it would protect the industrial area east of County Road 102 and provide flood protection for the Yolo County Landfill. The proposed project is also compatible with the proposed regional rail relocation project and existing habitat easements within Conaway Ranch.

## RECOMMENDATION

On behalf of the Conaway Preservation Group, I request that the proposed Levee Setback and Transitory Storage Project should be included as one of the options for the west side expansion of the Yolo Bypass in the 2017 update of the CVFPP. A feasibility level study should be conducted in the future to compare all options and to assess their engineering and economic viability.

If you have any questions, please contact Mr. Jonathan Kors at (916) 919-3073/[jkors@woodrogers.com](mailto:jkors@woodrogers.com) or Mr. Jay Punia, at (916) 503-5093/[jpunia@woodrogers.com](mailto:jpunia@woodrogers.com), engineers for Conaway Ranch.

Sincerely,



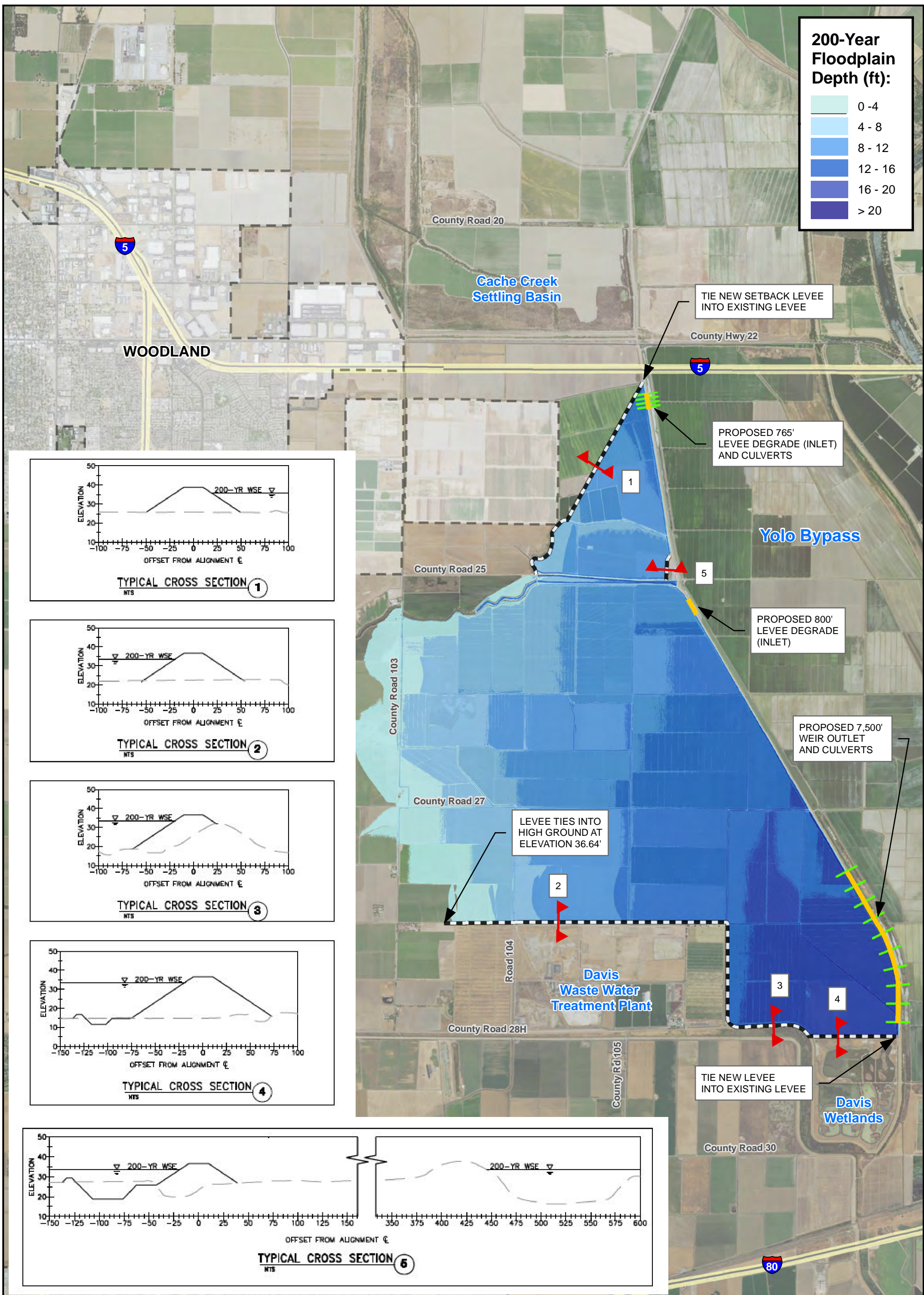
Kyriakos Tsakopoulos, President/CEO

Attachment:

Figure 1 – Transitory Storage Project Layout

cc: Mr. Paul Navazio, Manager, City of Woodland  
Mr. Brent Meyer, City Engineer, City of Woodland  
Mr. Phil Pogledich, Yolo County Counsel  
Mr. Robert Thomas, Conaway Preservation Group  
Mr. Mike Hall, General Manager, RD 2035  
Mr. Jonathan Kors, Wood Rodgers, Inc.  
Mr. Jay Punia, Wood Rodgers, Inc.

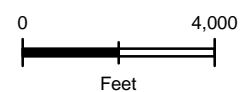




**CONAWAY SETBACK LEVEE AND TRANSITORY STORAGE PROJECT LAYOUT**

YOLO COUNTY  
OCTOBER, 2016

- Approximate Levee Alignment
- Weir/ Spillway
- Proposed Culverts to Facilitate Interior Drainage When WSE in Yolo Bypass Recedes
- Cross Section





**DEPARTMENT OF TRANSPORTATION****DISTRICT 3**

703 B STREET  
MARYSVILLE, CA 95901  
PHONE (530) 741-4233  
FAX (530) 741-4245  
TTY 711  
www.dot.ca.gov/dist3



*Serious Drought.  
Serious drought.  
Help save water!*

November 17, 2016

Mr. William Edgar, President  
Central Valley Flood Protection Board  
3310 El Camino Avenue, Suite 170  
Sacramento, California 95821

Mr. Mark Cowin, Director  
Department of Water Resources  
1416 Ninth Street, Room 1115-1  
Sacramento, California 95814

Dear Mr. Edgar and Mr. Corwin:

Caltrans supports the Conaway Levee Setback and Transitory Storage Project (Levee Setback Project) that would reduce the risk of flooding to the Interstate 5 (I-5) corridor. As you know, I-5 is the main interstate highway on the west coast of the United States and it extends from Mexico to Canada through the states of California, Oregon and Washington. Any project that would reduce the risk of flooding to the I-5 corridor is of great interest to us. We request that you include the study of the Levee Setback Project in the actions approved as part of the 2017 update of the Central Valley Flood Protection Plan (CVFPP).

The Levee Setback Project has the potential to augment the accomplishments of the system improvements identified in the 2012 Central Valley Flood Protection Plan by providing up to 72,000 acre-feet of transitory storage along the west side of the Yolo Bypass in extreme flood events. The Levee Setback Project could also do the following: reduce the risk of flooding along the I-5 corridor connecting the City of Woodland to the Natomas Basin and Downtown Sacramento; provide potential groundwater recharge and wildlife habitat enhancements on the Conaway Ranch located adjacent to the Yolo Bypass; protect the Yolo County Landfill from inundation and facilitate relocation of the Sierra Northern Railway to the west side of the Yolo Bypass in order to eliminate the risks associated with continued use of the antiquated railway trestle across the Yolo Bypass.

Caltrans also supports efforts to implement the Woodland Flood Risk Reduction Project that would reduce risk of flooding to I-5 as a result of an extreme flood event along Cache Creek. Caltrans' understanding is that if the Levee Setback Project preceded the Cache Creek flood risk improvement projects, it could further exacerbate the impacts to I-5 in an extreme Cache Creek flood event. While we support the Levee Setback Project and strongly support its inclusion in

Mr. Edgar and Mr. Corwin  
November 17, 2016  
Page 2

the CVFPP, it is imperative that both projects be implemented and that impacts to I-5 be strongly considered in prioritization of necessary improvements.

Considering all these benefits and that the proposed project would reduce the risk of flooding to I-5, we strongly request that further study of the Levee Setback Project be included in the 2017 update of the Central Valley Flood Protection Plan.

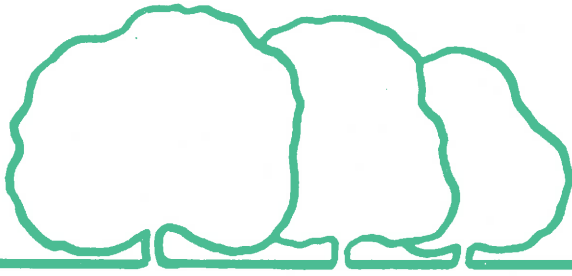
If you have any questions with regard to this request, please contact Eric Fredericks, Senior Transportation Planner, at 916-274-0635 or [eric.fredericks@dot.ca.gov](mailto:eric.fredericks@dot.ca.gov).

Sincerely,

  
for AMARJEET S. BENIPAL  
District Director

c: Mr. Paul Navazio, City Manager, City of Woodland  
Mr. Brent Meyer, City Engineer, City of Woodland  
Mr. Phil Pogledich, Counsel, Yolo County  
Mr. Robert Thomas, General Manager Conaway Preservation Group  
Mr. Mike Hall, General Manager, RD 2035  
Mr. Jonathan Kors, Vice President, Wood Rodgers, Inc.  
Mr. Jay Punia, Senior Project Manager, Wood Rodgers, Inc.





# City of Woodland

300 FIRST STREET

WOODLAND, CALIFORNIA 95695

(530) 661-5800  
FAX: (530) 661-5813

November 17, 2016

Mr. William Edgar, President  
Central Valley Flood Protection Board  
3310 El Camino Avenue  
Sacramento, California 95821

Mr. Mark Cowin, Director  
Department of Water Resources  
1416 - 9th Street, Room 1115-1  
Sacramento, California 95814

*Subject: Request to include a recommended action for a study of the Conaway Levee Setback and Transitory Storage Project in the 2017 update of the Central Valley Flood Protection Plan*

Dear Mr. Edgar and Mr. Cowin,

The purpose of this letter is to communicate the City of Woodland's support for including a recommended action to study the Conaway Ranch Levee Setback and Transitory Storage Project as part of the pending 2017 update of the Central Valley Flood Protection Plan.

As you are aware, the City of Woodland is actively working to provide our community with 200-year flood protection from both Lower Cache Creek (located north of the City) and the Yolo Bypass (located east of the City). Currently, both the south levee of Cache Creek and the west levee of the Yolo Bypass pose significant flood risks under a 100-year flood scenario.

While the City is making significant progress on developing plan to provide 200-year flood protection from the flood risk posed by Cache Creek via the Lower Cache Creek Feasibility Study (LCCFS) being finalized by the U.S. Army Corps of Engineers (USACE), there is no current effort underway to address the 200-year flood risk associated with the west levee of the Yolo Bypass.

Recently, the concept of a Levee Setback and Transitory Storage Project (see **Figure 1**) has been introduced which has the potential to provide needed 200-year flood protection to the eastern edge of the City of Woodland as well as additional benefits to the region.

The concept recommended for study would construct new inlet weirs at the west bank of the Yolo Bypass. The northern weir would be constructed just south of Interstate 5 (I-5) (north of County Road 25) and the other weir would be constructed just south of County Road 25. These weirs would allow for transitory storage within Conaway Ranch. An outlet weir near the southern boundary of Conaway Ranch would also be constructed, which would be configured to allow floodwater to spill over and back into the Yolo Bypass. The weirs would be configured to effectively reduce peak flows within the Yolo Bypass while maximizing transitory storage potential within Conaway Ranch.

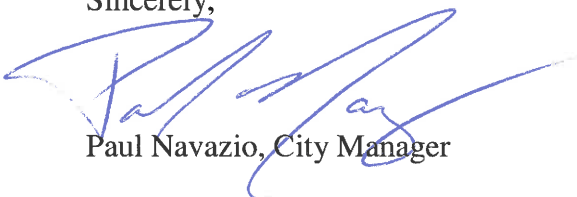
The City of Woodland and the Lower Sacramento River/Delta North Regional Flood Management Planning Team have endorsed the proposed study of the Transitory Storage Project. The Study is a recommended action by the Sacramento River/Delta North Regional Flood Management Planning Team's portfolio of projects to DWR for its consideration. The Transitory Storage Project would create approximately 72,000 acre-feet of flood storage that would reduce flood stages within the Yolo Bypass.

The Transitory Storage Project would also provide additional benefits, including the potential for groundwater recharge and environmental restoration. Other key benefits of the proposed Levee Setback and Transitory Storage Project are that it would eliminate the need to address deficiencies of the Yolo Bypass west levee; it would provide protection to I-5 and the Sierra Northern Railway from flooding; and it would protect the industrial area east of County Road 102 and provide flood protection for the Yolo County Landfill. The proposed project is also compatible with the proposed regional rail relocation project and existing habitats easements within the Conaway Ranch.

In light of these interests, the City of Woodland and Conaway Ranch propose that a Levee Setback and Transitory Storage Project be studied to better understand the benefits the project would have and how to ensure that the impacts to agricultural are avoided or appropriately mitigated to address Yolo County's concerns.

If you have any questions, please contact me at (530) 661-5800, or you may contact Mr. Brent Meyer, City Engineer at (530) 661-5947.

Sincerely,



Paul Navazio, City Manager

Attachment:

Figure 1 – Transitory Storage Project Layout

cc: City Council



November 4, 2016



Mr. William Edgar, President  
Central Valley Flood Protection Board  
3310 El Camino Avenue, Suite 170  
Sacramento, California 95821

Mr. Mark Cowin, Director  
Department of Water Resources  
1416 - 9th Street, Room 1115-1  
Sacramento, California 95814

Dear Mr. Edgar and Mr. Cowin,

**Subject: Request to include the Conaway Levee Setback and Transitory Storage Project as an option for the west side expansion of the Yolo Bypass in the 2017 Central Valley Flood Protection Plan**

The south levee of Cache Creek and the west levee of the Yolo Bypass provide less than 100-year flood protection for the City of Woodland and surrounding areas. The Lower Cache Creek Feasibility Study (LCCFS) is being prepared by the U.S. Army Corps of Engineers (USACE) for addressing the flooding threat from Cache Creek. However, there is no major effort underway at this time to provide protection from the west levee of the Yolo Bypass. The purpose of this letter is to request that you include a Levee Setback and Transitory Storage Project (Transitory Storage Project) as an option for the west side expansion of the Yolo Bypass in the 2017 update of the Central Valley Flood Protection Plan (CVFPP). The proposed project (see attached **Figure 1**) would provide enhanced flood protection for the City of Woodland, City of Davis' infrastructure and other benefits as explained below.

## **BACKGROUND**

The U.S. Army Corps of Engineers, California Department of Water Resources (DWR), City of Woodland, and City of West Sacramento are contemplating several regional projects in the vicinity of the Yolo Bypass and Conaway Ranch within Yolo County to address existing flood problems. In addition, by way of recent initiatives and grant-funded programs, the DWR is interested in increasing transitory storage (areas where floodwaters can be stored in an extreme flooding event) within the Sacramento River Flood Control Project. The DWR is also seeking to advance new aquifer storage and recovery projects to enhance groundwater recharge in the region.

Lastly, restoring ecosystem functionality and enhancing environmental habitat remain high priorities for the Central Valley Flood Protection Board (CVFPB) and DWR. In light of these interests, the City of Woodland and Conaway Ranch have developed the proposed Levee Setback and Transitory Storage Project. The Transitory Storage Project seeks to set back the west levee of the Yolo Bypass to provide transitory storage and groundwater recharge within Conaway Ranch. The project would also enhance existing environmental restoration areas located within Conaway Ranch.

## PROJECT DESCRIPTION

The proposed project would construct new inlet weirs at the west bank of the Yolo Bypass. The northern weir would be constructed just south of Interstate 5 (I-5) (north of County Road 25) and the other weir would be constructed just south of County Road 25. These weirs would allow for transitory storage within Conaway Ranch. An outlet weir near the southern boundary of Conaway Ranch would also be constructed, which would be configured to allow flood water to spill over and back into the Yolo Bypass. During detailed design, the weirs would be configured to effectively reduce peak flows within the Yolo Bypass while maximizing transitory storage potential within Conaway Ranch.

## PROJECT BENEFITS

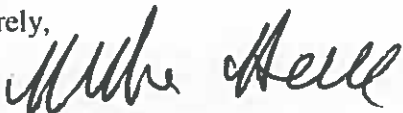
The Transitory Storage Project would create approximately 72,000 acre-feet of flood storage that would reduce flood stages within the Yolo Bypass. The Transitory Storage Project would provide additional benefits, including groundwater recharge and environmental restoration, which are currently being evaluated. The Lower Sacramento River/Delta North Regional Flood Management Planning Team has endorsed the Transitory Storage Project. It is one of the projects recommended by them to DWR for its consideration. Other key benefits of the proposed Levee Setback and Transitory Storage Project are that it would eliminate the need to address deficiencies of the Yolo Bypass west levee; it would provide protection to I-5 and the Sierra Northern Railway from flooding; and it would protect the industrial area east of County Road 102 and provide flood protection for the Yolo County Landfill. The proposed project is also compatible with the proposed regional rail relocation project and existing habitat easements within Conaway Ranch.

## RECOMMENDATION

On behalf of the Reclamation District 2035, I request that the proposed Levee Setback and Transitory Storage Project should be included as one of the options for the west side expansion of the Yolo Bypass in the 2017 update of the CVFPP. A feasibility level study should be conducted in the future to compare all options and to assess their engineering and economic viability.

If you have any questions, please call me at (530) 308-0681 or you may contact Mr. Jonathan Kors at (916) 919-3073/[jkors@woodrogers.com](mailto:jkors@woodrogers.com) or Mr. Jay Punia, at (916) 503-5093/[jpunia@woodrogers.com](mailto:jpunia@woodrogers.com), engineers for Conaway Ranch.

Sincerely,



Mike Hall, General Manager

Attachment:

Figure 1 – Transitory Storage Project Layout

cc: Mr. Paul Navazio, Manager, City of Woodland



Mr. Brent Meyer, City Engineer, City of Woodland  
Mr. Phil Pogledich, Yolo County Counsel  
Mr. Robert Thomas, Conaway Preservation Group  
Mr. Mike Hall, General Manager, RD 2035  
Mr. Jonathan Kors, Wood Rodgers, Inc.  
Mr. Jay Punia, Wood Rodgers, Inc.



# COUNTY OF YOLO

## Board of Supervisors

District 1, Oscar Villegas  
District 2, Don Saylor  
District 3, Matt Rexroad  
District 4, Jim Provenza  
District 5, Duane Chamberlain

625 Court Street, Room 204 • Woodland, CA 95695  
(530) 666-8195 • FAX (530) 666-8193  
[www.yolocounty.org](http://www.yolocounty.org)

County Administrator, Patrick S. Blacklock  
Deputy Clerk of the Board, Julie Dachtler

November 16, 2016

Mr. William Edgar, President  
Central Valley Flood Protection Board  
3310 El Camino Avenue  
Sacramento, California 95821

Mr. Mark Cowin, Director  
Department of Water Resources  
1416 - 9th Street, Room 1115-1  
Sacramento, California 95814

Dear Mr. Edgar and Mr. Cowin,

**Subject: Request to include a recommended action for a study of the Conaway Levee Setback and Transitory Storage Project in the 2017 update of the Central Valley Flood Protection Plan**

The City of Woodland (City), located in Yolo County, faces flood threats from both Cache Creek (located north of the City) and the Yolo Bypass (located east of the City). In their current condition, the south levee of Cache Creek and the west levee of the Yolo Bypass provide less than 100-year flood protection. The Lower Cache Creek Feasibility Study (LCCFS) is being prepared by the U.S. Army Corps of Engineers (USACE) for addressing the flooding threat from Cache Creek. However, there is no effort underway to reduce flood risk associated with the west levee of the Yolo Bypass. The purpose of this letter is to request that you include a recommendation to study a Levee Setback and Transitory Storage Project in the 2017 update of the Central Valley Flood Protection Plan (CVFPP) for providing flood protection to the eastern part of the City of Woodland.

The US Army Corps of Engineers (USACE), California Department of Water Resources (DWR), City of Woodland, and City of West Sacramento are contemplating several regional projects in the vicinity of the Yolo Bypass and Conaway Ranch within Yolo County to address existing flood problems. In addition, by way of recent initiatives and grant-funded programs, the DWR is interested in increasing transitory storage (areas where floodwaters can be stored in an extreme flooding event) within the Sacramento River Flood Control Project. DWR is also seeking to advance new aquifer storage and recovery projects to enhance groundwater recharge in the region.

The alternative recommended for study would construct new inlet weirs at the west bank of the Yolo Bypass. The northern weir would be constructed just south of Interstate 5 (I-5) (north of County Road 25) and the other weir would be constructed just south of County Road 25. These weirs would allow for



transitory storage within Conaway Ranch. An outlet weir near the southern boundary of Conaway Ranch would also be constructed, which would be configured to allow floodwater to spill over and back into the Yolo Bypass. During detailed design, the weirs would be configured to effectively reduce peak flows within the Yolo Bypass while maximizing transitory storage potential within Conaway Ranch.

The Levee Setback and Transitory Storage Project has the potential to augment the accomplishments of system improvements identified in the 2012 Central Valley Flood Protection Plan by providing up to 72,000 acre feet of transitory flood storage along the west side of the Yolo Bypass in extreme flood events. With further study, the project may also: reduce the risk of flooding to Interstate 5; potentially provide groundwater recharge and habitat improvements on Conaway Ranch; protect the Yolo County Landfill from inundation; and facilitate relocation of the Sierra Northern Railway.

In light of these interests, the County supports further study of the Levee Setback and Transitory Storage Project to better understand the potential benefits the project may have and to ensure that the impacts to agriculture are avoided or appropriately mitigated to address the County's longstanding concerns about projects that convert agricultural lands to other land uses or diminish the productivity of existing agricultural lands.

The City of Woodland and the Lower Sacramento River/Delta North Regional Flood Management Planning Team have supported additional study of the Setback Levee and Transitory Storage Project. The Study is a recommended action by the Sacramento River/Delta North Regional Flood Management Planning Team's portfolio of projects to DWR for its consideration. Other key benefits of the proposed Levee Setback and Transitory Storage Project are that it would eliminate the need to address deficiencies of the Yolo Bypass west levee; it would provide protection to I-5 and the Sierra Northern Railway from flooding; and it would protect the industrial area east of County Road 102 and provide flood protection for the Yolo County Landfill. The proposed project is also compatible with the proposed regional rail relocation project and existing habitats easements within the Conaway Ranch. Accordingly, we request that further study of the project be one of the actions recommended as part of the 2017 update to the CVFPP.

Sincerely

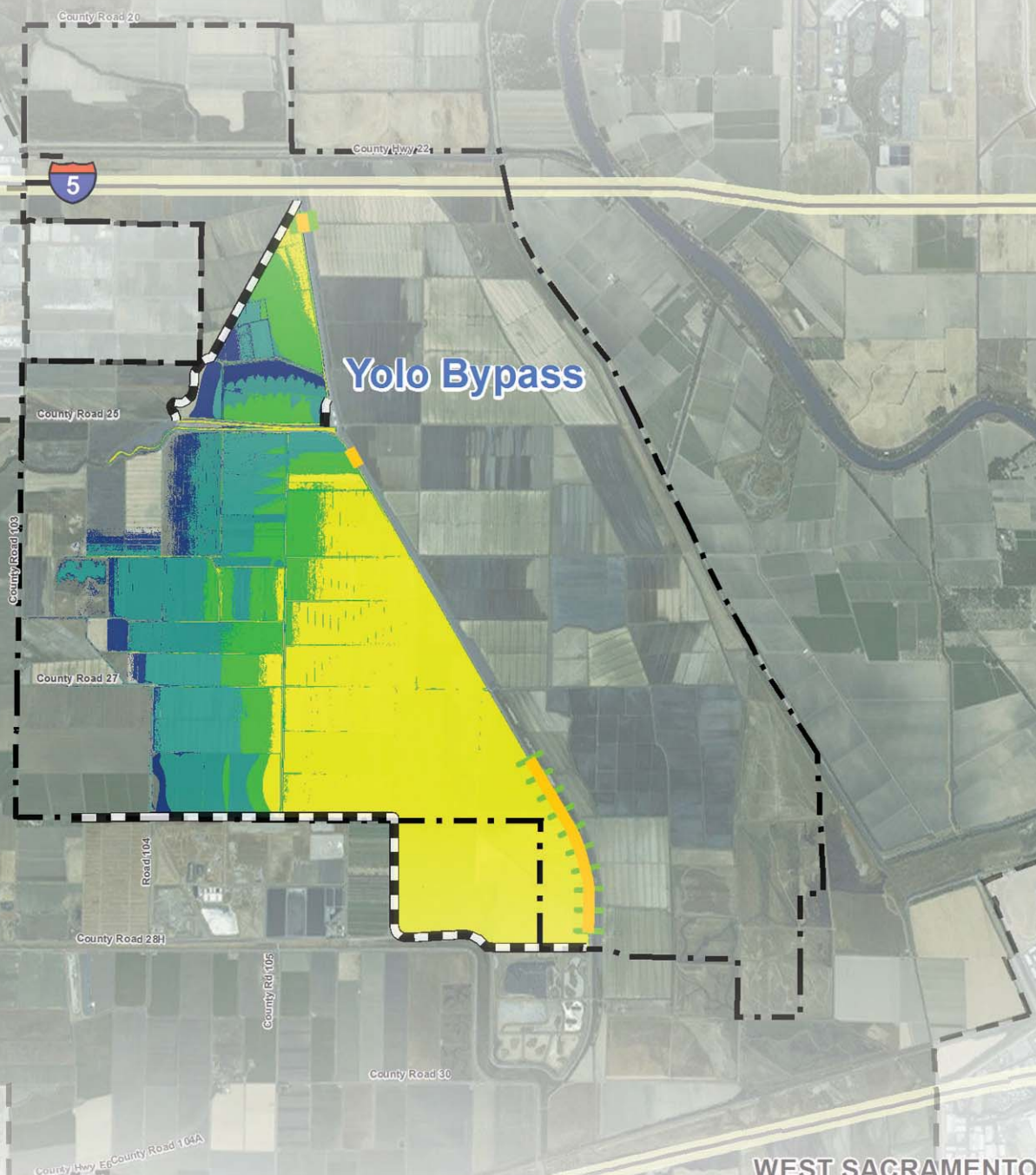
A handwritten signature in blue ink, appearing to read 'JP', followed by a horizontal line extending to the right.

Jim Provenza, Chair  
Yolo County Board of Supervisors

WOODLAND



Yolo Bypass



WEST SACRAMENTO



**WOOD RODGERS**  
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME  
3301 C Street, Bldg. 100-B Tel: 916.341.7760  
Sacramento, CA 95816 Fax: 916.341.7767