Appendix A:
ESA Coordination Documents

Previous ESA compliance documentation for this project is incorporated by reference and can be found in Appendix A of the Final Pajaro Reach 6 Project Supplemental EA #1 at https://www.spn.usace.army.mil/Missions/Projects-and-Programs/Current-Projects/Pajaro-River-Watsonville/

Appendix B:
Interior Drainage Report

PAJARO RIVER FLOOD RISK MANAGEMENT PROJECT

Reach 6 Interior Drainage Analysis

October 11, 2024

Prepared For:

PAJARO REGIONAL FLOOD MANAGEMENT AGENCY

US Army Corps of Engineers
San Francisco District

Prepared By:

R&F ENGINEERING
2270 Douglas Blvd., Suite 118
Roseville, CA 95661
(916) 416-6599

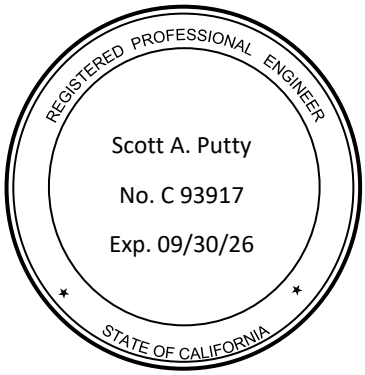
ENGINEER'S SIGNATURE PAGE

This report titled:

Pajaro River Flood Risk Management Project

Reach 6 Interior Drainage Analysis

has been prepared by or under the direct supervision of the following registered Civil Engineers:



Mike Rossiter, PE, CFM
2270 Douglas Blvd., Suite 118
Roseville, CA 95661
Email: mrossiter@rfengineeringinc.com

Table of Contents

1.0 Introduction

The Pajaro Regional Flood Management Agency (PRFMA) and the U.S. Army Corps of Engineers (USACE), San Francisco District have initiated the Pre-Construction, Engineering, and Design (PED) phase of the Pajaro River Flood Risk Management Project (Project). Figure 1-1 provides an overview of the Project area and the reaches included in the Project. "Reach 6" of the project was the first reach to move forward into design and is the focus of this report.

As part of the Reach 6 design effort, there was the need to conduct an interior drainage analysis to inform design of through-levee drainage features, including culverts and pump stations, that would alleviate ponding of rainfall-runoff along the landside toe of the newly constructed levee improvements. An interior drainage analysis was completed by R&F Engineering following criteria outlined in USACE Engineering Manual (EM) 1110-2-1413 and EM 1110-2-1417. This report provides a summary of the methods, assumptions, and results of the Reach 6 interior drainage analysis.

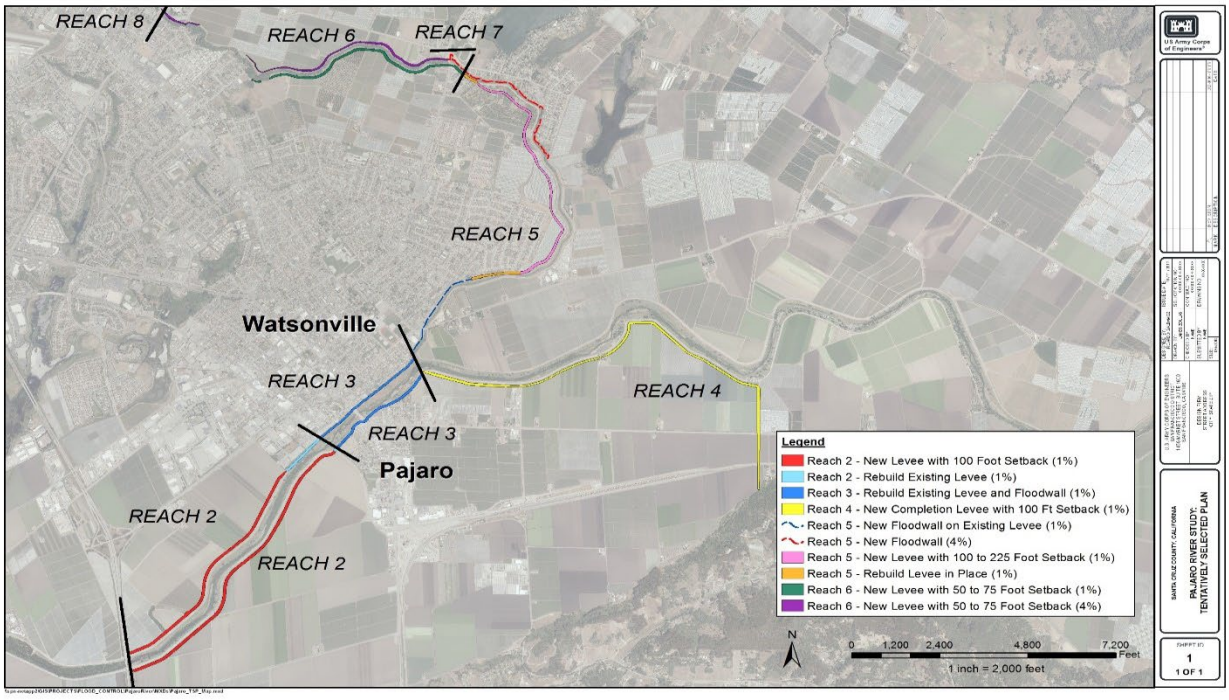


Figure 1-1. Overview of Pajaro River Flood Risk Management Project (USACE General Re-Evaluation Report, 2019)

2.0 General Approach

The Reach 6 project area includes a portion of Corralitos Creek that does not currently have levees and is an area primarily bordered by agricultural fields. This area was broken up into subbasins that defined distinct drainage areas where rainfall-runoff would end up draining towards the USACE Project levees.

The interior drainage analysis utilized a HEC-HMS model to evaluate rainfall-runoff that would be generated within the study area subbasins following a 1/100 annual chance exceedance (ACE) rainfall event. The HEC-HMS model estimated quantity and timing of the excess rainfall-runoff within in each subbasin.

The excess runoff hydrographs were then transferred into a 2-Dimensional (2-D) HEC-RAS model to evaluate the extents and location of ponding along the landside of the levees that are part of the USACE Project.

Preliminary recommendations for interior drainage facilities (culverts and/or pump stations) to relieve areas of ponding along the USACE Project were made based on results of the analysis.

The following sections of this report further described the development of the HEC-HMS and HEC-RAS models utilized in the interior drainage analysis, along with model results and recommendations.

3.0 HEC-HMS Model Development

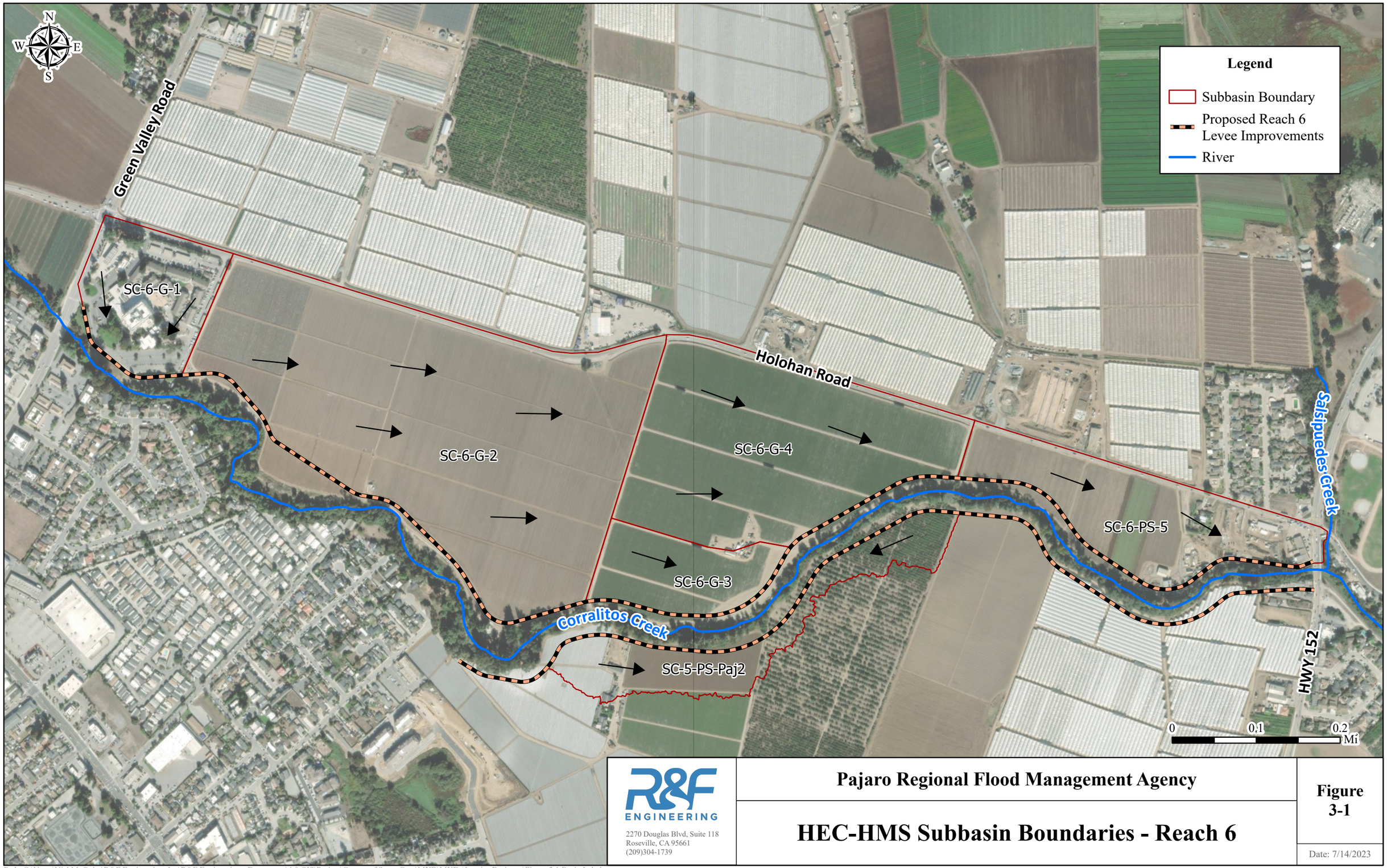
The HEC-HMS model used for the interior drainage analysis was developed by R&F Engineering using input from design manuals, information from similar studies conducted in and around the study area, available GIS datasets, and knowledge from the local operations and maintenance agencies.

3.1 Subbasin Delineation

Subbasin boundaries were primarily delineated using ground topography based on a U.S. Geological Survey (USGS) LiDAR dataset that was collected in 2018 and published in 2019[1]. Santa Cruz County Flood Control and Water Conservation District (Zone 7) also provided GIS data of the existing storm drain infrastructure and known subbasin boundaries that drain towards existing stormwater pump stations. Elevated roadways and existing drainage ditches within the study area also provided guidance for delineating subbasin boundaries. Following initial subbasin delineations, the LiDAR data was placed into a 2-D HEC-RAS model and a generic rainfall event was scattered across the 2-D model mesh to confirm subbasin boundaries through observations of general flow paths and runoff collection areas.

Six (6) subbasins were delineated as distinct areas that drain towards the proposed Reach 6 levees. Figure 3-1 provides an overview of these subbasins; Table 3-1 provides a summary of subbasin drainage areas.

[1] *CA AZ FEMA R9 2017 D18 Airborne LiDAR Report (USGS, July 2019).*



R&F ENGINEERING
2270 Douglas Blvd, Suite 118
Roseville, CA 95661
(209)304-1739

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HEC-HMS Subbasin Boundaries - Reach 6

Figure 3-1

Date: 7/14/2023

Path: C:\Users\NickMcGuire\R&F Engineering, Inc\R&F Engineering - Documents\4.0 GIS\Project\County of Santa Cruz\MXD\MXDs\Interior Drainage\Figure 2.1 Basin Labels.aprx

Table 3-1: Subbasin drainage areas.

Subbasin	Drainage Area (acre)
SC-6-G-1	16.1
SC-6-G-2	83.2
SC-6-G-3	11.5
SC-6-G-4	44.5
SC-6-PS-5	23.2
SC-5-PS-Paj2	15.5

3.2 Transform Method

The HEC-HMS model was set up to use the Standard Clark Unit Hydrograph as the transform method to convert excess precipitation to direct runoff and to estimate the timing of the subbasin runoff. This method creates a translation hydrograph based on a burst of precipitation derived from a time versus area curve unique to each basin. Storage attenuation effects are accounted for by routing the resulting hydrograph through a linear reservoir. Two parameters define the model's mechanics in transforming excess rainfall into runoff: (1) the time of concentration and (2) the storage coefficient.

Time of concentration (T_c) defines the maximum travel time of runoff through the subbasin, and the storage coefficient (R) is used to account for storage effects where runoff is collected in localized topographic depressions as it travels through the subbasin. There are various equations for T_c, and some are preferred over others within area-specific drainage/hydrology manuals. The County of Santa Cruz Design Criteria provides a nomograph for T_c calculations, but several basins failed to meet slope criteria to use the nomograph.

R&F reviewed several other design manuals and hydrology reports from Santa Cruz County, Monterey County, and the City of Watsonville for an accepted method to calculate T_c. After testing several industry standard methods, and to stay consistent with the nearby Watsonville Sloughs Hydrology Study[2], Equation 1 sourced from the HEC-HMS Tutorials and Guides[3] was used.

[2] Santa Cruz Resource Conservation District. *Watsonville Sloughs Hydrology Study*. Prepared by Balance Hydrologics Inc. 14 February 2014.
[3] United States Army Corps of Engineers. *HEC-HMS Tutorials and Guides – Estimating Time of Concentration & Storage Coefficient*. 6 October 2022.

$$T_c = 2.2 * \left(\frac{L*L_C}{\sqrt{Slope_{10-85}}}\right)^{0.3} \quad (1)$$

Where:

T_c = Time of concentration (hours)

L = Length of longest watercourse (miles)

L_c = Length along longest watercourse from a point perpendicular to the centroid of the watershed to the outlet (miles)

$Slope_{10-85}$ = Slope of the longest watercourse from 10% downstream of the starting point to 85% along the length of the watercourse (feet/mile)

L, L_c, and $Slope_{10-85}$ were calculated using ArcGIS software, USGS LiDAR and GNSS data.

The calculated T_c ranged from 0.39 hours to 1.02 hours for the study subbasins.

A dimensionless ratio can be defined as the storage coefficient divided by the sum of the time of concentration and storage coefficient[4]. This ratio is generally constant over a region and typically falls between 0.5 and 0.7. A simple relationship between T_c and R is a standard way to compute the Clark watershed storage coefficient where a dimensionless ratio is set equal to 2/3. The storage coefficients were defined based on Equation 2.

$$\frac{R}{T_c+R} = 0.\overline{6} \quad (2)$$

Where:

T_c = Time of concentration (hours)

R = Clark storage coefficient (hours) = 2* T_c

The calculated R ranged from 0.77 hours to 2.04 hours for the study subbasins.

The parameters used to develop the Clark Unit Hydrograph transform method for HEC-HMS subbasins can be found in Appendix A.2.

3.3 Loss Rates

The HEC-HMS model uses the initial and constant loss rate method to simulate runoff infiltration and depression storage losses. The National Resources Conservation Service (NRCS) classifies soils for most areas in the United States into four hydrologic soil groups (A, B, C, and D) based upon their infiltration rates. The NRCS soil types for the study area are shown in Figure 3-2.

[4] United States Army Corps of Engineers. *HEC-HMS Users Manual – Selecting a Transform Method.* 2023.

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Roseville, CA 95661
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Subbasin Soil Coverage

Figure 3-2

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Path: C:\Users\NickMcGuire\R&F Engineering, Inc\R&F Engineering - Documents\4.0 GIS\Project\County of Santa Cruz\MXD\MXDs\Interior Drainage\Figure 2.3 Soil Types.aprx

Table 3-2 summarizes the official rates published by the NRCS as well as the applied rates in the context of this study.

Table 3-2: NRCS soil hydrology groups

Hydrologic Soil Group	Loss Rate Range (in/hr)	R&F Applied Loss Rate (in/hr)
A	>0.3	0.35
B	0.15 – 0.30	0.2
C	0.05 – 0.15	0.1
D	0.00 – 0.05	0.025

Each subbasin was assigned a composite infiltration rate based upon the weighted average of the hydrologic soil types within their corresponding boundaries. Soil data was obtained from the Soil Survey Geographic Database (SSURGO) as collected by the National Cooperative Soil Survey. Appendix A.3 summarizes the distribution of soil types and the weighted average infiltration rate applied to each subbasin. Constant loss rates ranged from 0.17 inches/hour to 0.35 inches/hour for the Reach 6 subbasins.

EM 1110-2-1417 recommends that initial losses are set to 0.2 inches for urban subbasins and 1.5 inches for grass lands or open space. Most of the study area's subbasins are made up primarily of agricultural fields and were assigned an initial loss rate of 1.5 inches. Subbasin SC-6-G-1 is a fully urbanized subbasin and was assigned an initial loss rate of 0.2 inches.

3.4 Impervious Percentages

Impervious percentages were assigned in HEC-HMS based on a 2019 dataset obtained from the National Land Cover Database (NLCD), which is developed and maintained by the USGS and several other federal agencies. R&F compared the GIS data to current aerial photos of the study area to confirm its accuracy. Figure 3-3 shows the impervious areas that are present within each study subbasin.

No loss calculations are carried out in HEC-HMS on the impervious portions of the subbasin; all precipitation on that portion of the subbasin becomes excess precipitation and subject to surface storage and direct runoff.

Area-weighted impervious percentages ranged from 0.1% to 67% for the study subbasins and are presented in Appendix A.4.

An overview schematic of the HEC-HMS model can be found in Appendix C.

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Roseville, CA 95661
(209)304-1739

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Impervious Area

Figure 3-3

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Path: C:\Users\NickMcGuire\R&F Engineering, Inc\R&F Engineering - Documents\4.0 GIS\Project\County of Santa Cruz\MXD\MXDs\Interior Drainage\Figure 2.4 Impervious Area.aprx

3.5 Design Storm Development

Two different 100-year storm events were developed for the interior drainage analysis:

- 24-hour, 1/100-ACE Rainfall Event:
  - SCS Type 1 Storm Event
  - NOAA Atlas 14 Rainfall Depth[5]: 6.33 inches

- 48-hour, 1/100-ACE Rainfall Event:
  - Based on rainfall pattern of observed 1995 rainfall event
  - NOAA Atlas 14 Rainfall Depth14: 7.79 inches

The 24-hour rainfall event was the primary storm used in the analysis. This event produced the highest peak flows and was used as the basis of design for sizing recommended interior drainage facilities.

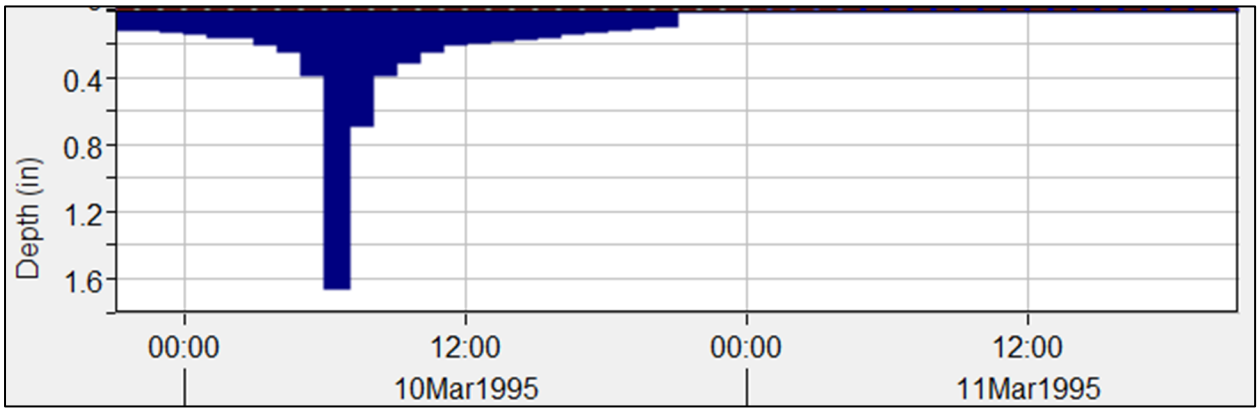


Figure 3-4: 100-year, 24-hour SCS Type 1 Storm Hyetograph (cumulative depth of 6.33").

The 48-hour rainfall event was constructed to be patterned based on the observed March 1995 storm event, which is the same event pattern used in the Project's hydraulic design. This provided the opportunity to evaluate the timing of a 1/100-ACE rainfall event in conjunction with 1/100-ACE river flows occurring during the same storm. This event was used to inform the tailwater conditions as part of the analysis of culvert recommendations.

The March 1995 event pattern was scaled to match the 100-year, 48-hour rainfall depth which was estimated at 7.79". The temporal distribution of rainfall was calculated by normalizing and averaging rainfall distributions from the two local California Irrigation Management Information System (CIMIS) stations that were active at the time of the 1995 event: #16 - San Juan and #111 - Green Valley Road. The 1995 rainfall pattern, scaled to a 100-year, 48-hour event, is shown in the figure below.

[5] NOAA Atlas 14 Rainfall Data Obtained from: https://hdsc.nws.noaa.gov/hdsc/pfds/pfds_map_cont.html?bkmrk=ca

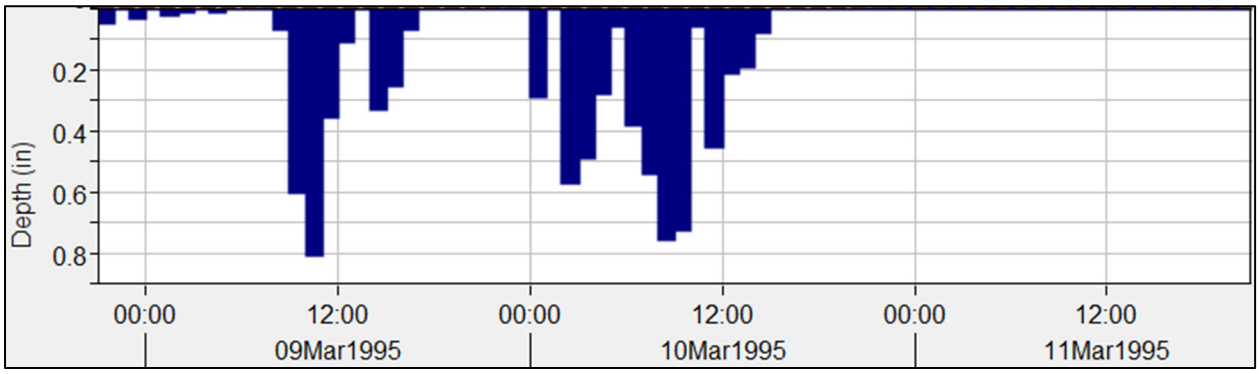


Figure 3-5: 100-year, 48-hour rainfall hyetograph based on March 1995 event pattern (cumulative depth of 7.79").

3.6 HEC-HMS Model Verification

Once the HEC-HMS model was set up, the two 100-year rainfall events were simulated and initial results were produced. Observed event data from flow gages or pump station records were not available for use as calibration data. Instead, unit runoff rates (cfs/acre) from HEC-HMS model results were compared to the unit runoff rates from the nearby Watsonville Sloughs Hydrology Study (WSHS) and to regional regression equations that are prescribed in the County of Santa Cruz Design Criteria[6].

Although this interior drainage report focuses on analysis of Reach 6, a full HEC-HMS model was developed as part of this effort that covers all the reaches in the Pajaro River Flood Risk Management Project. The full HEC-HMS model uses the same methods as described for Reach 6 and results from the full model were used as part of the model verification process described in this section.

Comparison to Watsonville Sloughs Hydrology Study

The WSHS was conducted adjacent to the Project area, so comparable urban and rural subbasins were selected for comparison of runoff results. The WSHS study area included a large portion of the City of Watsonville and included 23 subbasins. The similarity of topography and land cover translated to similar unit flow (cfs/acre). Urban subbasins from the WSHS generated on the order of 0.44-0.62 cfs/acre with an average of 0.49 cfs/acre for a 100-year event. In comparison, urban subbasins from the Pajaro interior drainage analysis generated on the order of 0.38-1.14 cfs/acre with an average of 0.56 cfs/acre for the 24-hour SCS Type 1 storm. The variability between the two studies is likely due to the variability seen in subbasin sizes and in the modeled rainfall events, however the urban subbasins were considered to generate relatively similar unit runoff considering the varying subbasin characteristics and methods used in the two studies.

A comparison of rural subbasins was also made between the two studies. Sample rural basins from the WSHS had unit runoff ranging between 0.07-0.25 cfs/acre. The Pajaro study generally had larger unit runoff rates between 0.32-0.79 cfs/acre. The discrepancies between the studies seen in rural basins can likely be attributed to the much higher infiltration rates used in the WSHS. The soil infiltration rates used

[6] County of Santa Cruz. *Design Criteria Containing Standards for the Construction of Streets, Storm Drains, Sanitary Sewers, Water Systems, and Driveways within the Unincorporated Portion of Santa Cruz County*. Dec 2021.

in the WSHS basins use values up to 1.5 in/hr whereas the Pajaro analysis has an upper limit of 0.35 in/hr for the most porous, Class A soils. The greater infiltration rates can largely explain why less runoff is observed in the WSHS. Additional factors such as varying topography/slopes of the subbasins and differing storm event parameters can also be contributing to the differences seen between the two studies.

Comparison to Regional Regression Equations

Santa Cruz County Design Criteria recommends using USGS Regional Regression Equations (RRE)[7] for subbasins larger than 200 acres. The 100-year runoff equation for the Central Coast Region is shown below in Equation 3. Of the 57 total subbasins included in the larger HEC-HMS model that covers all reaches in the Pajaro River Flood Risk Management Project area, 13 subbasins were greater than 200 acres and met the RRE criterion. The 100-year, 24-hour SCS peak flows from the HEC-HMS model vary from -27.8% to +25.5%, and on average +/-16.7%, as compared to the RRE calculations.

$$Q = 11.0(DRNAREA)^{0.840}(PRECIP)^{0.994} \quad (3)$$

Where:

Q = Peak flow estimate (cubic feet per second)

DRN AREA = Drainage area of basin (square miles)

PRECIP = Mean annual precipitation (inches)

Table 3-3: USGS Regional Regression Equations Compared to HEC-HMS Peak Flows

Basin	Area (acre)	Peak Flow (RRE, cfs)	Peak Flow (HEC-HMS, cfs)	Percent Difference
SC-5-PS-Atri	468.0	219.8	241.4	9.0%
SC-5-PS-Paj1	380.1	184.5	144.4	-27.8%
MC-TB-G-1A	241.8	126.2	132.6	4.8%
MC-TB-G-3D	380.8	184.8	243.5	24.1%
MC-TB-G-3E	378.1	183.7	246.6	25.5%
MC-TB-G-3F	249.3	129.5	147.0	11.9%
MC-TB-G-3G	808.4	347.8	412.9	15.8%
MC-TB-G-3I	447.8	211.8	167.1	-26.7%
MC-3-PS-1D	282.6	143.9	132.3	-8.8%
OOP-Elk-1	732.6	320.2	293.5	-9.1%
OOP-Elk-2	273.2	139.8	167.0	16.3%
OOP-H1-2	317.6	158.7	180.8	12.2%
OOP-H1-5	236.4	123.8	99.3	-24.7%

[7] United States Geological Survey. *Methods for Determining Magnitude and Frequency of Floods in California, Based on Data through Water Year 2006.* 2012.

3.7 Model Setup for Proposed Interior Drainage Facilities

Following initial model simulations, through-levee interior drainage facilities (culverts and pump stations) were added into the HEC-HMS model where significant ponding was seen on the landside of the Project levee improvements. Additional details on these recommended interior drainage facilities are discussed later in this report. The proposed through-levee culverts and pump stations were incorporated into the HEC-HMS model at recommended locations within the subbasins and were sized based on the 100-year, 24-hour SCS storm event.

For gravity culverts, inlet elevations were set approximately at the elevation of the Project's landside levee toe and outlet elevations were determined based on a 1.0% pipe slope towards the river. The gravity culverts were set to have their discharge controlled by the tailwater stage of the river when river stages are high. Subbasins drained by pump stations, on the other hand, are not controlled by the river tailwater condition.

River stage hydrographs from the 100-year, 48-hour scaled 1995 storm pattern were sourced from the HEC-RAS model that was used for Project design[8]. To remain conservative, a 100-year rainfall event over the interior drainage subbasins was assumed to occur at the same time that a 100-year flow event was coming down the river. The lag time between the peak rainfall intensity of the 1995 event and peak river stage was identified from the 1995 event and this same lag time was used to generate a tailwater condition for the 100-year, 24-hour SCS event scenario.

The HEC-HMS model was re-run for both the 100-year, 24-hour SCS event and for the 100-year, 48-hour scaled 1995 event with the through-levee interior drainage facilities added. Ultimately, the interior drainage facilities were sized based on peak flows generated from the 100-year, 24-hour SCS event as these peak flows were greater than those generated by the 48-hour storm. Once the facility sizing was determined, the 100-year, 48-hour scaled 1995 event was run through the model to further evaluate the functionality of the proposed through-levee interior drainage facilities.

Additional details on the development of the proposed interior drainage facilities are discussed in *Section 6.0 Proposed Interior Drainage Facilities*.

[8] Santa Cruz County Zone 7 Flood Control and Water Conservation District. *Pajaro River Flood Risk Management Project: Hydraulic Model Update.* Prepared by R&F Engineering and PBI. 18March2022.

4.0 HEC-RAS Model Development

The runoff hydrographs estimated in the HEC-HMS analysis were transferred into a 2-D HEC-RAS model to further evaluate the extents, depths, and location of residual flooding. The HEC-RAS inundation mapping results were primarily used to identify locations of expected interior drainage ponding along the landside of the Project levee improvements and to inform the recommended locations of proposed through-levee interior drainage facilities.

The HEC-RAS model developed as part of the USACE Project was used for this portion of the analysis[7]. Details relevant to the setup of the 2-D portion of this model used in the interior drainage analysis are provided in the sections below. A more comprehensive summary of the HEC-RAS model development is provided in the referenced model documentation report.

4.1 Ground Topography

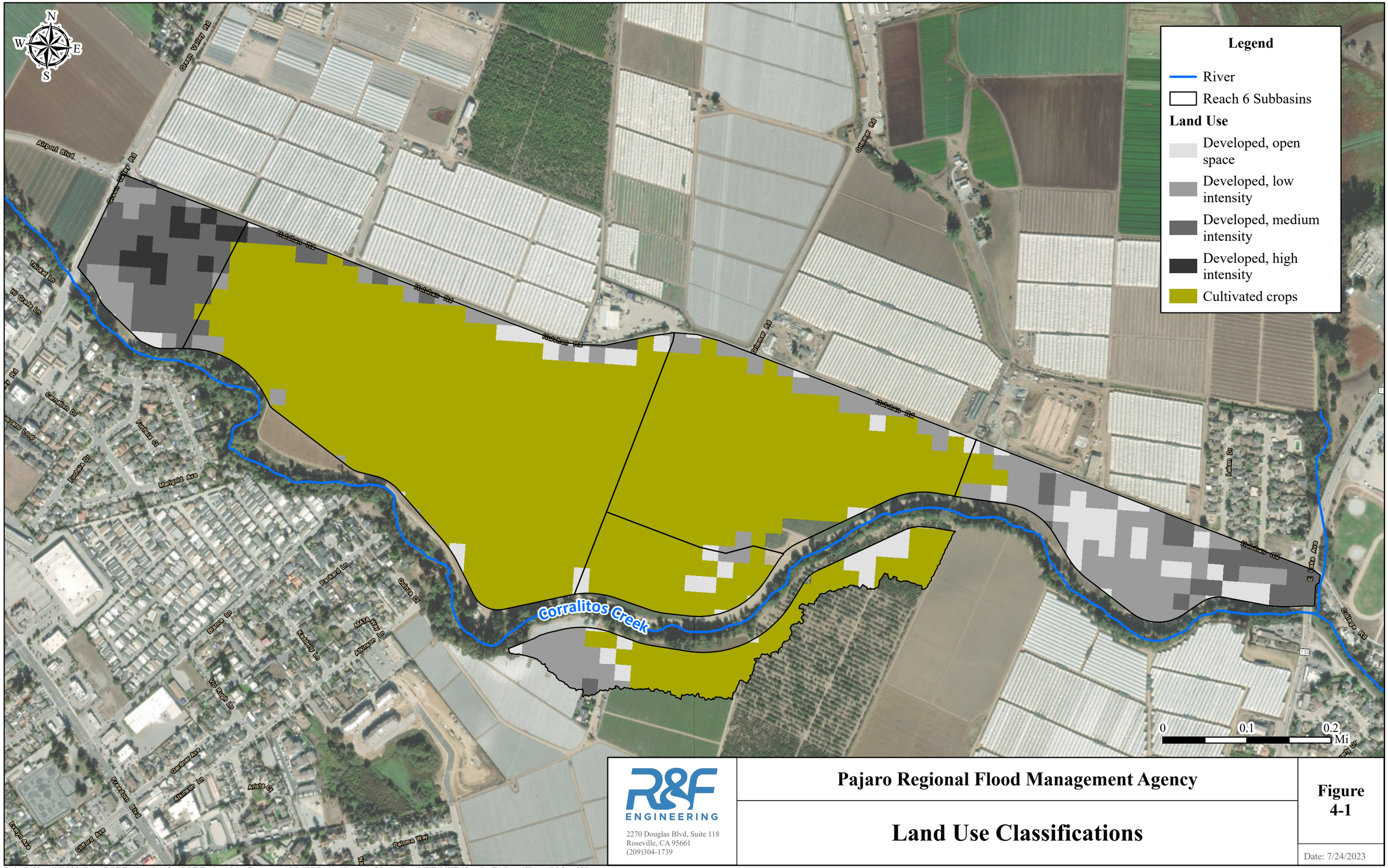
Terrain data was sourced from a 2019 LiDAR dataset collected and published by the USGS[1]. This dataset provided recent and detailed topography of the subbasin areas. The non-vegetated vertical accuracy of the dataset is estimated at 0.099m (0.32ft).

4.2 Land Use

Manning's n-values were assigned to the 2-D grid cells based on County land use datasets and verified with recent aerial imagery. Figure 4-1 shows the land use classifications throughout the study area and Table 4-1 summarizes the applied n-value assignments for each land use type. All of the applied n-values are within appropriate ranges prescribed by the USACE HEC-RAS users manual.

Table 4-1: Manning's n-values classifications for the 2-D model grid based on land use classifications.

Classification	Manning's n
Open water	0.04
Developed, Open Space	0.04
Developed, Low Intensity	0.1
Developed, Medium Density	0.12
Developed, High Intensity	0.15
Barren Land Rock/Sand/Clay	0.025
Deciduous Forest	0.16
Evergreen Forest	0.16
Mixed Forest	0.16
Shrub/Scrub	0.1
Grassland/Herbaceous	0.035
Pasture/Hay	0.03
Cultivated Crops	0.035
Woody Wetlands	0.12
Emergent Herbaceous Wetlands	0.07



R&F ENGINEERING 2270 Douglas Blvd, Suite 118 Roseville, CA 95661 (209)304-1739	**Pajaro Regional Flood Management Agency** **Land Use Classifications**	**Figure 4-1** Date: 7/24/2023

Path: C:\Users\NickMcGuire\R&F Engineering, Inc\R&F Engineering - Documents\4.0 GIS\Project\County of Santa Cruz\MXD\MXDs\Interior Drainage\Figure 4.1 Land Use.aprx

4.3 2-D Grid Cell Mesh

The HEC-RAS model developed for the Project includes a 2-D grid cell mesh that covers the overbank floodplain areas and the extents of the interior drainage study area. The grid cells for the Reach 6 subbasin area have 250'x250' cell sizes and were not altered from the original model.

4.4 Model Simulation Settings

The HEC-RAS model simulation was set to run for an 84-hour time window with a computation interval of 5 seconds. The 84-hour simulation time window allows enough time for the 24-hour and 48-hour rainfall events to run their course along with sufficient travel time for overland runoff to collect at the bottom of the subbasins. The computation interval of 5 seconds was tested and considered to provide an appropriate balance that minimized model calculation errors while having reasonable computation times.

4.5 Hydrologic-Hydraulic Handoff

To analyze the overland flow paths and collection points, excess rainfall-runoff hydrographs from HEC-HMS were input to the 2-D HEC-RAS grid. The excess hydrographs from each subbasin were individually calculated based on the difference between the inflow and outflow hydrographs and coded into the HEC-RAS 2-D mesh at the downstream location of the subbasins (ie- at the subbasin outlet point). From there the excess runoff ponded and/or traveled within the 2-D mesh.

In running the 2-D HEC-RAS simulations, it was recognized that there was an irrigation ditch located in one of the subbasins that ended up overflowing during the runoff event and spilling into another subbasin. Two basins (SC-6-G-2 and SC-6-G-4) drain into an irrigation ditch that quickly overflows and spills into the next downstream basin (SC-6-G-3 and SC-6-PS-5). Profiles lines in HEC-RAS were placed on the downstream side of the irrigation ditch and were used to measure the rate of overflow. This overflow was translated back into the HEC-HMS model where a diversion element was incorporated to more accurately estimate the amount of water arriving at the downstream outlet point of each subbasin.

The process of transferring flow results from HEC-HMS to HEC-RAS required manual iteration. The peak rates of the excess flow from the HEC-HMS model that were applied to the 2D RAS grid are presented in Appendix B.

5.0 Results for Baseline Scenario

A baseline model scenario was first run where it was assumed that the levee improvement project was in place, however no through-levee interior drainage facilities are installed. This scenario allowed for an initial evaluation of where, and to what extent, interior rainfall-runoff would pond against the levee system.

The Reach 6 subbasins in the baseline scenario route excess rainfall-runoff overland and through existing ditches that drain towards Corralitos Creek. The Project proposes to install levees and floodwalls along Corralitos Creek which would block the drainage pathways that would otherwise send runoff into the channel. Tables 5-1 and 5-2 show the HEC-HMS rainfall-runoff results from the 100yr, 24hr and 48hr storms for the baseline scenario.

Table 5-1: HEC-HMS results for 100yr, 24hr SCS event - Reach 6 Baseline Scenario.

Subbasin	Area	Rainfall	Loss	Peak Flow Generated within Subbasin	Peak Flow Received at Subbasin Outlet	Runoff Volume Generated within Subbasin	Runoff Volume Received at Subbasin Outlet
	(acre)	(acre-ft)	(acre-ft)	(cfs)	(cfs)	(acre-ft)	(acre-ft)
SC-6-G-1	16.1	8.5	1.7	15.9	15.9	6.8	6.8
SC-6-G-2	83.2	43.9	27.1	47.8	36.1	16.8	12.8
SC-6-G-3	11.5	6.0	4.4	8.6	18.3	1.6	5.6
SC-6-G-4	44.5	23.5	13.7	35.0	32.4	9.8	0.7
SC-6-PS-5	23.2	12.3	6.5	16.9	28.1	5.8	11.4
SC-5-PS-Paj2	15.5	8.2	6.0	11.9	11.9	2.2	0.8

Table 5-2: HEC-HMS results for the 100yr, 48hr scaled 1995 event - Reach 6 Baseline Scenario.

Subbasin	Area	Rainfall	Loss	Peak Flow Generated within Subbasin	Peak Flow Received at Subbasin Outlet	Runoff Volume Generated within Subbasin	Runoff Volume Received at Subbasin Outlet
	(acre)	(acre-ft)	(acre-ft)	(cfs)	(cfs)	(acre-ft)	(acre-ft)
SC-6-G-1	16.1	10.5	1.7	10.0	10.0	8.8	8.8
SC-6-G-2	83.2	54.0	31.9	32.2	23.4	22.1	14.7
SC-6-G-3	11.5	7.4	5.9	4.1	12.4	1.5	8.8
SC-6-G-4	44.5	28.9	15.4	22.0	5.9	13.5	0.9
SC-6-PS-5	23.2	15.1	8.4	9.9	28.4	6.7	19.5
SC-5-PS-Paj2	15.5	10.3	8.3	5.8	5.8	2.0	0.7

The subbasins all generate their own runoff volume and, in some cases, the existing drainage ditches accumulate runoff and eventually overtop. The Reach 6 subbasins are generally sloped towards the east, so overtopped ditches spill into adjacent basins. For example, subbasin SC-6-PS-5 generates a small

amount of runoff within its own boundaries, however it receives runoff from other subbasins where drainage ditches overtop which accounts for the differences seen between the peak flows and volumes generated within the subbasins versus what is seen at the subbasin outlet locations.

Figure 5-1 presents the inundation mapping results from the HEC-RAS modeling for the 100-year, 24-hour baseline scenario. Figure 5-2 presents the same results for the 100-year, 48-hour event. These maps identify areas where rainfall-runoff ponding is expected to occur along the landside of the levees if no through-levee interior drainage facilities were to be installed.

*Ponding shown on this map only considers localized runoff from a 1/100-AEP rainfall event and does not consider ponding caused by College Lake flows or other sources.

R&F ENGINEERING
2270 Douglas Blvd, Suite 118
Roseville, CA 95661
(209)304-1739

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Reach 6 - 1/100-ACE Residual Flooding without Through-Levee Interior Drainage Facilities

Figure 5-1

Date: 7/25/2023

Path: C:\Users\NickMcGuire\R&F Engineering, Inc\R&F Engineering - Documents\4.0 GIS\Project\County of Santa Cruz\MXD\MXDs\Interior Drainage\Reach 6.aprx

*Ponding shown on this map only considers localized runoff from a 1/100-AEP rainfall event and does not consider ponding caused by College Lake flows or other sources.

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2270 Douglas Blvd, Suite 118
Roseville, CA 95661
(209)304-1739

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Reach 6 - 1/100-ACE Residual Flooding without Through-Levee Interior Drainage Facilities

Figure 5-2

Date: 7/25/2023

Path: C:\Users\NickMcGuire\R&F Engineering, Inc\R&F Engineering - Documents\4.0 GIS\Project\County of Santa Cruz\MXD\MXDs\Interior Drainage\Reach 6.aprx

6.0 Proposed Interior Drainage Facilities

The analysis of the baseline scenario helped to inform preliminary recommendations for the location and sizing of interior drainage facilities.

To alleviate interior rainfall-runoff ponding along the landside of the USACE Project levees, it is recommended to incorporate the following gravity culverts and pump station into the Reach 6 levee design. Final locations and sizing of facilities are to be determined by the USACE design team.

Table 6-1: Recommended interior drainage facilities.

Approx. Levee STA	HEC-HMS Model Element	Design 1/100-ACE Peak Flow at Subbasin Outlet (cfs)	Recommended Interior Drainage Facility*
LB 1+50	SC-6-PS-5-Diversion	23.9	24 CFS Pump Station 1x Pump Discharge Pipe 1x24" Gravity Culvert
LB 25+50	SC-6-G-4-Reservoir	26.6	30" Gravity Culvert
LB 38+00	SC-6-G-3-Reservoir	12.3	24" Gravity Culvert
LB 52+00	SC-6-G-2-Reservoir	43.0	36" Gravity Culvert
LB 89+50	SC-6-G-1-Reservoir	15.9	24" Gravity Culvert
RB 40+00	SC-5-PS-Paj2-Reservoir	11.9	24” Gravity Culvert

*Final sizes of drainage facilities will be determined by the USACE design team

The design peak flows listed represent the 100-year, 24-hour scenario for post-project conditions where all recommended interior drainage facilities are installed. Tables B.3 and B.4 are included in Appendix B and provide peak flows at all HEC-HMS elements for post-project conditions. The following provides the methods and assumptions used to inform these recommendations.

6.1 Location of Proposed Facilities

The proposed facility locations are based upon drainage patterns seen in existing topography (2018 LiDAR dataset) used for this analysis. The 2-D HEC-RAS model was used to identify general flow paths and areas where runoff is expected to collect. Final grading plans associated with the Reach 6 levee design should confirm the drainage collection points for post-project topography and adjust facility locations as needed.

6.2 Assumptions for Recommended Culverts

Culvert sizing was based on peak runoff flows for the 1/100-ACE, 24-hour SCS rainfall event analyzed in HEC-HMS. Assumptions for the preliminary culvert sizing include:

- Culvert capacity calculations were based on a spreadsheet developed by the National Resource Conservation Service (NRCS) and adheres to methods prescribed in the Federal Highway Administration's "Hydraulic Design of Highway Culverts"[8].
    - Culvert capacity calculations are provided in Appendix D
- Reinforced Concrete Pipe (RCP) material for all proposed facilities (n = 0.012)
- Pipe slope at 1%
- Submerged inlet control; allowance of up to 1-foot headwater depth above the inlet crown of the culvert
- The USACE design team indicated a design preference to keep minimum pipe diameters to 18" or greater and to target pipe velocities generally in the range of 2 ft/s to 10 ft/s to provide self-cleaning capabilities
    - The resulting velocities of the recommended gravity culverts range from 4.7 ft/s to 7.6 ft/s during the analyzed 1/100-AEP rainfall-runoff event which provides self-cleaning velocities and remains well within the limits of recommended max velocities for RCP.
- Appropriate erosion control measures, flapgates, and positive closure devices are recommended to be included with each culvert design
- Facilities were sized based only on the localized rainfall-runoff expected to drain towards the levee. Facilities were not sized to handle additional runoff coming from College Lake, from a levee breach scenario, or from other sources of flood waters.

6.3 Recommended Pump Station at STA 1+50

A 24 CFS pump station with a discharge pipe is recommended near STA 1+50 to prevent localized rainfall-runoff accumulation near Highway 152 and the adjacent commercial buildings. The exact sizing of the discharge pipe is to be confirmed by the pump station design team. An additional 24" gravity culvert is recommended at the same location as this setup of a gravity pipe alongside a pumping facility is typical of other Santa Cruz County and City of Watsonville pump facilities and allows for more flexibility with pump station operations.

The sizing of the pump station at STA 1+50 considers localized runoff from a 1/100-AEP rainfall event and does not consider flood flows coming from College Lake or other sources. A 1/100-ACE flow event that causes College Lake to spill would be expected to overwhelm the 24 CFS pump. It is recommended to flood proof the pumping facility and install all critical components of the pump station above the 1/100-AEP floodplain elevation.

Based on current topography, runoff collects at the southwest corner of the parking lot found at the intersection of Holohan Road and Highway 152 which is the recommended location for the pumping

[8] U.S. Department of Transportation Federal Highway Administration. *Hydraulic Design of Highway Culverts - Third Edition.* April 2012.

facility. The final sizing and locations of the pumping facility and associated pipes should be evaluated by the design team.

6.4 Residual Flooding

During a 1/100-AEP storm event, Corralitos Creek water surface elevations (WSELs) are expected to rise to a point where proposed gravity culverts would have reduced capacity or would be shut off completely during the peak of the event. Corralitos Creek has a short lag time where the river would likely see peak flows within hours of the peak of the rainfall event. This type of response has been observed on Corralitos Creek in past large rainfall events.

The reduced culvert capacities during this time would result in temporary ponding on the landside of the levee, which is shown on Figure 6-1 for the 100-year, 24-hour event, and in Figure 6-2 for the 100-year, 48-hour event. Once the WSELs in Corralitos Creek recede, the culverts would be able to drain these ponded waters.

An option for eliminating this temporary ponding would be to recommend pump stations instead of culverts. However, the ponding seen behind the proposed culvert locations is primarily contained within open space and does not cause major impacts to structures, so the recommendation of gravity culverts was maintained as a more cost-efficient and O&M-efficient option. There is an existing structure located within the residual ponding near STA 89+50, however this structure is currently expected to be acquired as part of the levee improvement project.

6.5 Limits of Analysis

The primary purpose of R&F's interior drainage analysis was to inform the recommendations of through-levee drainage facilities by estimating the magnitude of runoff from a 1/100-AEP rainfall event within the localized project area and to identify the areas along the proposed levee system where rainfall-runoff is expected to accumulate. Pipe sizes, materials, riprap sizing, and other design-level details should be confirmed by the design team.

Proposed culvert locations are based upon drainage patterns seen in existing topography from a 2018 LiDAR dataset. Final grading plans should confirm these drainage collection points based on post-project topography.

The analysis considered a localized rainfall-runoff scenario using industry standard practices and the best available information at the time of this study. The analysis did not consider other possible flooding scenarios entering the project area such as a levee breach scenario or a spilling event coming from College Lake.

STA 89+50*
24" culvert

STA 52+00*
36" culvert in pre-existing drainage ditch

STA 38+00*
24" culvert

STA 25+50*
30" culvert in pre-existing drainage ditch

Holohan Road

Corralitos Creek

HWY 152

STA 40+00*
24" Culvert

STA 1+50*
24 CFS Pump Station with Pressure Pipe and 24" Culvert

Legend

- Subbasin Boundaries
- Reach 6 - 60% Design Alignment
- Reach 5 - 30% Design Alignment
- Proposed Discharge Pipes

1/100-ACE 24hr Flood Depths (ft)

- 0 - 0.1
- 0.1 - 0.5
- 0.5 - 1
- 1 - 2
- 2 - 3
- > 3

0 500 1,000 Feet

*Proposed culvert locations are based upon drainage patterns resulting from existing topography shown in 2018 LiDAR dataset. Grading plans should confirm the exact location of culvert collection point.

*Ponding shown on this map only considers localized runoff from a 1/100-AEP rainfall event and does not consider ponding caused by College Lake flows or other sources.

R&F ENGINEERING
2270 Douglas Blvd, Suite 118
Roseville, CA 95661
(209)304-1739

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Reach 6 - 1/100-ACE Residual Flooding with Proposed Through-Levee Interior Drainage Facilities

Figure 6-1

Date: 7/25/2023

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STA 89+50*
24" culvert

STA 52+00*
36" culvert in pre-existing drainage ditch

STA 38+00*
24" culvert

STA 25+50*
30" culvert in pre-existing drainage ditch

STA 40+00*
24" Culvert

STA 1+50*
24 CFS Pump Station with Pressure Pipe and 24" Culvert

Holohan Road

Corralitos Creek

HWY 152

Legend

- Subbasin Boundaries
- Reach 6 - 60% Design Alignment
- Reach 5 - 30% Design Alignment
- Proposed Discharge Pipes

1/100-ACE 48hr Flood Depths (ft)

- 0 - 0.1
- 0.1 - 0.5
- 0.5 - 1
- 1 - 2
- 2 - 3
- > 3

0 500 1,000 Feet

*Proposed culvert locations are based upon drainage patterns resulting from existing topography shown in 2018 LiDAR dataset. Grading plans should confirm the exact location of culvert collection point.

*Ponding shown on this map only considers localized runoff from a 1/100-AEP rainfall event and does not consider ponding caused by College Lake flows or other sources.

R&F ENGINEERING
2270 Douglas Blvd, Suite 118
Roseville, CA 95661
(209)304-1739

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Reach 6 - 1/100-ACE Residual Flooding with Proposed Through-Levee Interior Drainage Facilities

Figure 6-2

Date: 7/25/2023

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Appendix A

HEC-HMS Subbasin Parameters

A.1 SUBBASIN AREAS

Subbasin	Area
	(acre)
SC-6-G-1	16.1
SC-6-G-2	83.2
SC-6-G-3	11.5
SC-6-G-4	44.5
SC-6-PS-5	23.2
SC-5-PS-Paj2	15.5

A.2 CLARK UNIT HYDROGRAPH PARAMETERS

Subbasin	Length of Longest Flowpath (L)	Length of Centroidal Flowpath (L_{CA})	Average Slope of 10-85% Flowpath (S)	Time of Concentration (T_c)	Runoff Coefficient (R)
	(miles)	(miles)	(feet/mile)	(hours)	(hours)
SC-6-G-1	0.25	0.15	31.63	0.49	0.98
SC-6-G-2	0.78	0.49	24.70	1.02	2.04
SC-6-G-3	0.22	0.10	36.30	0.41	0.82
SC-6-G-4	0.43	0.17	27.62	0.61	1.22
SC-6-PS-5	0.41	0.20	18.59	0.67	1.34
SC-5-PS-Paj2	0.34	0.04	21.12	0.39	0.77

A.3 SUBBASIN LOSS PARAMETERS

NRCS Hydrologic Soil Group	A	B	C	D	Composite Loss Rate	Initial Abstractions
Infiltration Rate (in/hr)	0.35	0.2	0.1	0.025		
Subbasin	(acres)	(acres)	(acres)	(acres)	(in/hr)	(in)
SC-6-G-1	6.3	0.0	9.8	0.0	0.198	0.2
SC-6-G-2	34.7	0.0	48.3	0.0	0.204	1.5
SC-6-G-3	11.5	0.0	0.0	0.0	0.350	1.5
SC-6-G-4	12.4	0.0	32.2	0.0	0.170	1.5
SC-6-PS-5	18.2	0.0	4.9	0.0	0.297	1.5
SC-5-PS-Paj2	15.3	0.0	0.2	0.0	0.347	1.5

A.4 SUBBASIN LAND USE

Subbasin	Impervious Percentage (%)
SC-6-G-1	67.0
SC-6-G-2	3.1
SC-6-G-3	0.9
SC-6-G-4	2.8
SC-6-PS-5	25.3
SC-5-PS-Paj2	0.1

Appendix B

HEC-HMS Model Results

B.1 100YR, 24HR EVENT WITH BASELINE GEOMETRY

Hydrologic Element	Drainage Area	Peak Inflow	Peak Discharge	Peak Excess	Time of Peak Discharge	Volume Discharged
	(sq miles)	(cfs)	(cfs)	(cfs)		(acre-feet)
SC-6-G-1	0.03	0.00	15.92	0.00	3/10/1995 8:00	6.81
SC-6-G-1-Reservoir	0.03	15.92	0.00	15.92	-	0.00
SC-6-G-2	0.13	0.00	47.82	0.00	3/10/1995 8:00	16.79
SC-6-G-2-Reservoir	0.13	36.10	0.00	36.10	-	0.00
SC-6-G-3	0.02	0.00	8.60	0.00	3/10/1995 8:00	1.64
SC-6-G-3-Reservoir	0.02	18.30	0.00	18.30	-	0.00
SC-6-G-4	0.07	0.00	34.97	0.00	3/10/1995 8:00	9.81
SC-6-G-4-Reservoir	0.07	32.40	0.00	32.40	-	0.00
SC-6-PS-5	0.04	0.00	16.92	0.00	3/10/1995 8:00	5.79
SC-6-PS-5-Reservoir	0.04	28.13	0.00	28.13	-	0.00
SC-5-PS-Paj2	0.02	0.00	11.88	0.00	3/10/1995 8:00	2.20
SC-5-PS-Paj2-Reservoir	0.02	11.88	0.00	11.88	-	0.00

B.2 100YR, 48HR EVENT WITH BASELINE GEOMETRY

Hydrologic Element	Drainage Area	Peak Inflow	Peak Discharge	Peak Excess	Time of Peak Discharge	Volume Discharged
	(sq miles)	(cfs)	(cfs)	(cfs)		(acre-feet)
SC-6-G-1	0.03	0.00	10.03	0.00	3/10/1995 10:00	8.81
SC-6-G-1-Reservoir	0.03	10.03	0.00	10.03	-	0.00
SC-6-G-2	0.13	0.00	32.23	0.00	3/10/1995 10:00	22.11
SC-6-G-2-Reservoir	0.13	23.36	0.00	23.36	-	0.00
SC-6-G-3	0.02	0.00	4.12	0.00	3/10/1995 10:00	1.50
SC-6-G-3-Reservoir	0.02	12.36	0.00	12.36	-	0.00
SC-6-G-4	0.07	0.00	21.98	0.00	3/10/1995 10:00	13.47
SC-6-G-4-Reservoir	0.07	5.89	0.00	5.89	-	0.00
SC-6-PS-5	0.04	0.00	9.92	0.00	3/10/1995 10:00	6.68
SC-6-PS-5-Reservoir	0.04	28.43	0.00	28.43	-	0.00
SC-5-PS-Paj2	0.02	0.00	5.80	0.00	3/10/1995 10:00	2.04
SC-5-PS-Paj2-Reservoir	0.02	5.80	0.00	5.80	-	0.00

B.3 100YR, 24HR EVENT WITH POST-PROJECT GEOMETRY

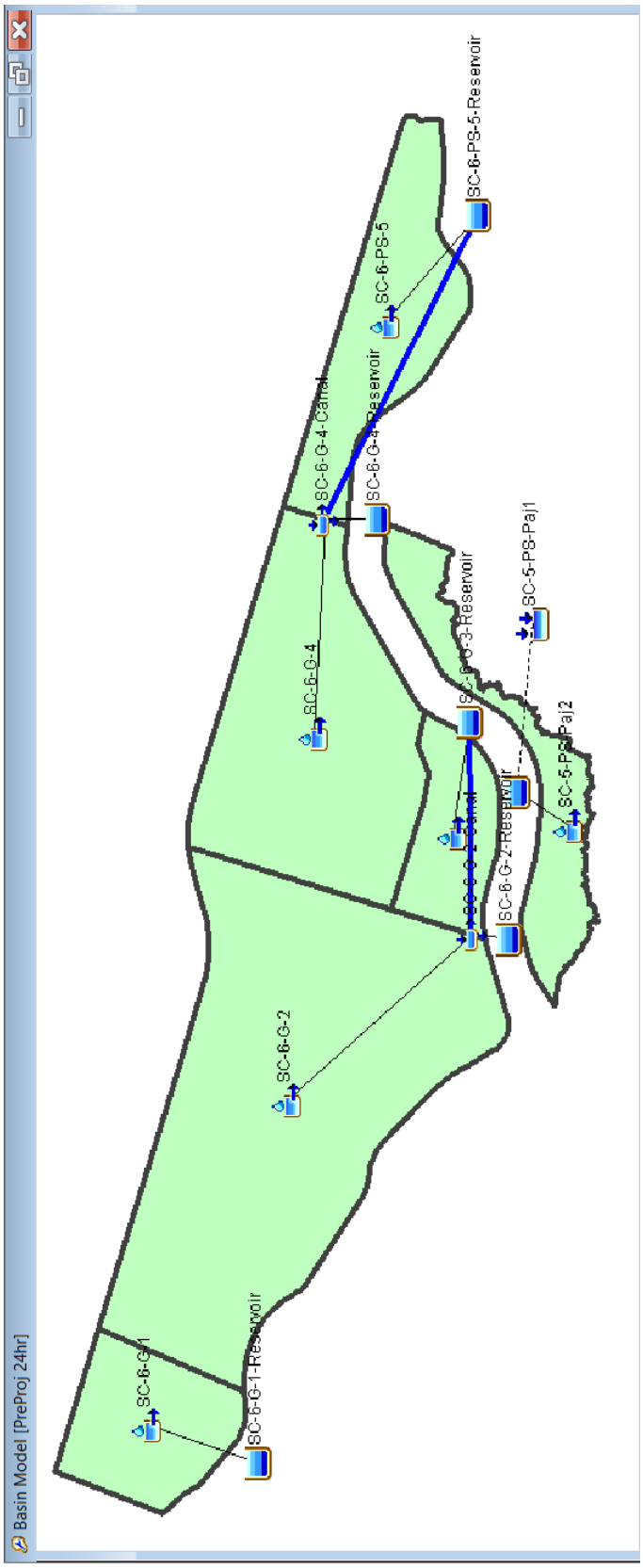
Hydrologic Element	Drainage Area (sq miles)	Peak Inflow (cfs)	Peak Discharge (cfs)	Peak Excess (cfs)	Time of Peak Discharge	Volume Discharged (acre-feet)
SC-6-G-1	0.03	0.00	15.92	0.00	3/10/1995 8:00	6.81
SC-6-G-1-Reservoir	0.03	15.92	10.87	15.92	3/11/1995 2:00	6.81
SC-6-G-2	0.13	0.00	47.82	0.00	3/10/1995 8:00	16.79
SC-6-G-2-Reservoir	0.13	43.02	37.87	12.24	3/10/1995 9:00	16.50
SC-6-G-3	0.02	0.00	8.60	0.00	3/10/1995 8:00	1.64
SC-6-G-3-Reservoir	0.02	12.25	5.48	17.05	3/10/1995 23:00	2.27
SC-6-G-4	0.07	0.00	34.97	0.00	3/10/1995 8:00	9.81
SC-6-G-4-Reservoir	0.07	26.60	20.39	7.05	3/10/1995 9:00	5.63
SC-6-PS-5	0.04	0.00	16.92	0.00	3/10/1995 8:00	5.79
SC-6-PS-5-Diversion	0.04	23.82	23.82	0.00	3/10/1995 8:00	10.25
SC-5-PS-Paj2	0.02	0.00	11.88	0.00	3/10/1995 8:00	2.19
SC-5-PS-Paj2-Reservoir	0.02	11.88	2.95	11.88	3/10/1995 22:00	0.48

B.4 100YR, 48HR EVENT WITH POST-PROJECT GEOMETRY

Hydrologic Element	Drainage Area (sq miles)	Peak Inflow (cfs)	Peak Discharge (cfs)	Peak Excess (cfs)	Time of Peak Discharge	Volume Discharged (acre-feet)
SC-6-G-1	0.03	0.00	10.03	0.00	3/10/1995 10:00	8.81
SC-6-G-1-Reservoir	0.03	10.03	10.60	8.28	3/9/1995 18:00	9.03
SC-6-G-2	0.13	0.00	32.23	0.00	3/10/1995 10:00	22.11
SC-6-G-2-Reservoir	0.13	30.26	29.06	2.14	3/10/1995 11:00	21.96
SC-6-G-3	0.02	0.00	4.12	0.00	3/10/1995 10:00	1.50
SC-6-G-3-Reservoir	0.02	5.96	3.58	4.85	3/10/1995 23:00	1.93
SC-6-G-4	0.07	0.00	21.98	0.00	3/10/1995 10:00	13.47
SC-6-G-4-Reservoir	0.07	21.81	19.22	3.54	3/10/1995 10:00	12.54
SC-6-PS-5	0.04	0.00	9.92	0.00	3/10/1995 10:00	6.68
SC-6-PS-5-Diversion	0.04	7.79	7.79	0.00	3/10/1995 10:00	7.68
SC-5-PS-Paj2	0.02	0.00	5.69	0.00	3/10/1995 10:00	2.00
SC-5-PS-Paj2-Reservoir	0.02	5.69	4.38	0.47	3/10/1995 22:00	2.04

Appendix C

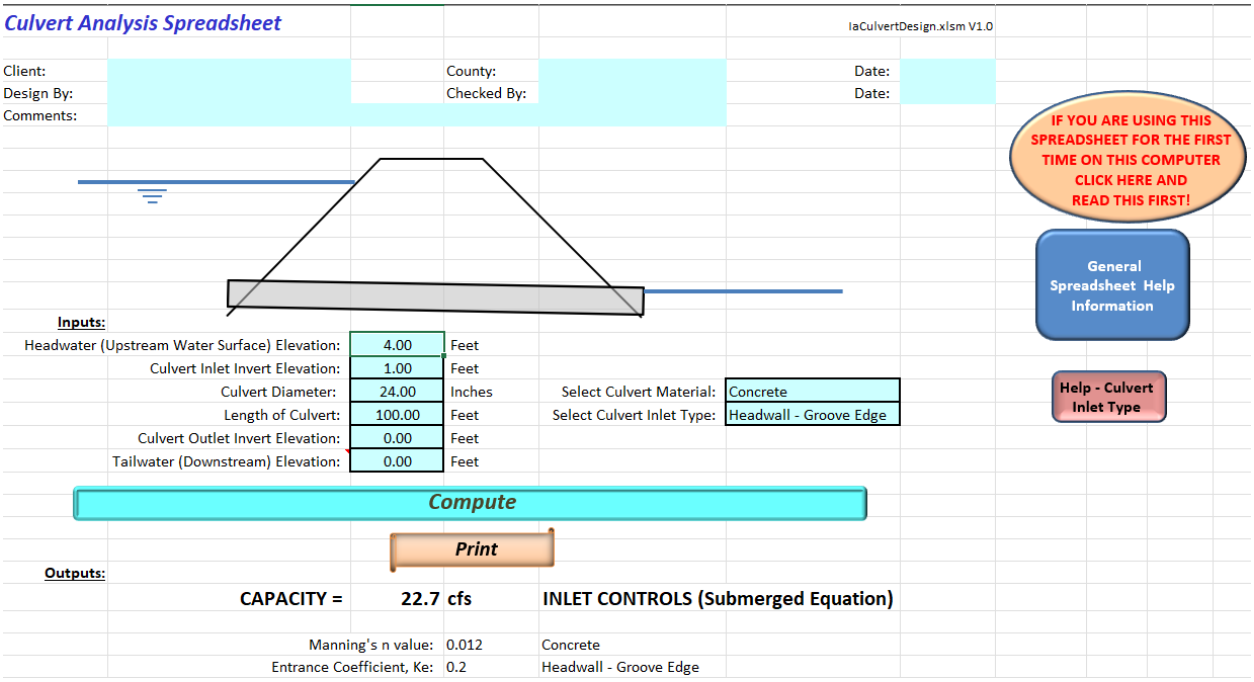
HEC-HMS Model Schematic



HMS model schematic

Appendix D

Culvert Capacity Calculations



Culvert Analysis Spreadsheet — laCulvertDesign.xlsm V1.0

Client:		County:		Date:	
Design By:		Checked By:		Date:	
Comments:					

IF YOU ARE USING THIS SPREADSHEET FOR THE FIRST TIME ON THIS COMPUTER CLICK HERE AND READ THIS FIRST!

General Spreadsheet Help Information

Help - Culvert Inlet Type

Inputs:

Headwater (Upstream Water Surface) Elevation:	4.00	Feet		
Culvert Inlet Invert Elevation:	1.00	Feet		
Culvert Diameter:	24.00	Inches	Select Culvert Material:	Concrete
Length of Culvert:	100.00	Feet	Select Culvert Inlet Type:	Headwall - Groove Edge
Culvert Outlet Invert Elevation:	0.00	Feet		
Tailwater (Downstream) Elevation:	0.00	Feet		

Compute

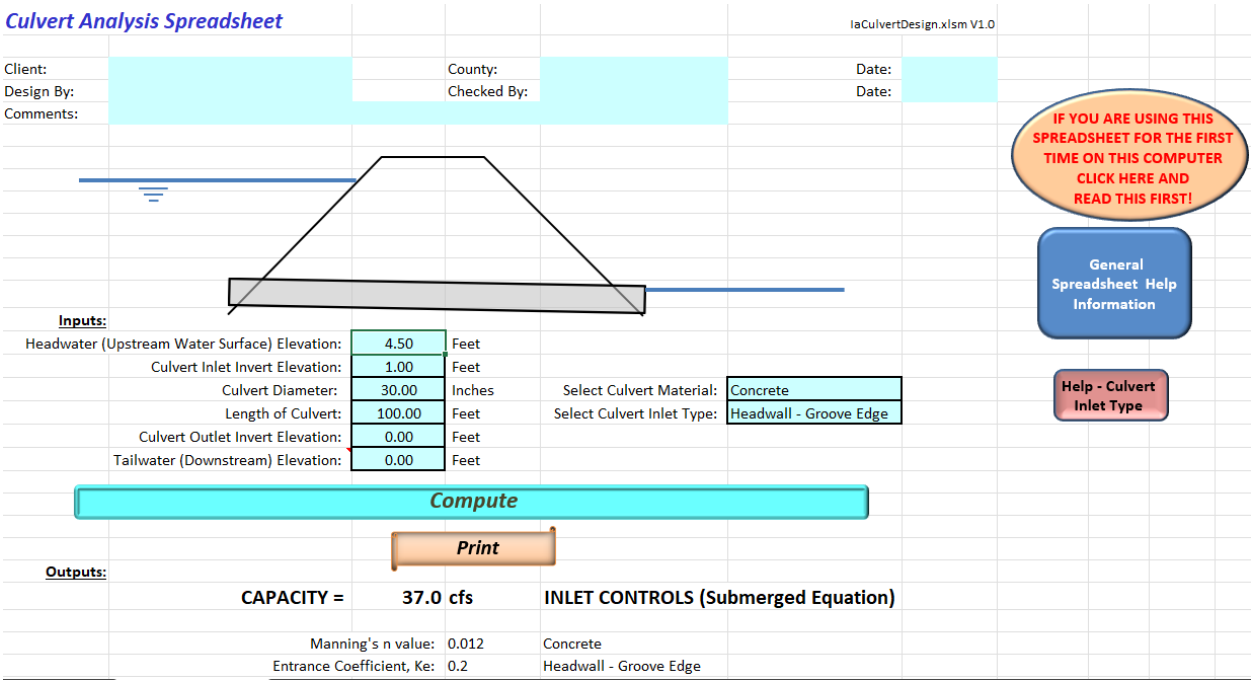
Print

Outputs:

CAPACITY = 22.7 cfs **INLET CONTROLS (Submerged Equation)**

Manning's n value:	0.012	Concrete
Entrance Coefficient, Ke:	0.2	Headwall - Groove Edge

Culvert capacity calculation for 24" diameter pipe



Culvert Analysis Spreadsheet — laCulvertDesign.xlsm V1.0

Client:		County:		Date:	
Design By:		Checked By:		Date:	
Comments:					

IF YOU ARE USING THIS SPREADSHEET FOR THE FIRST TIME ON THIS COMPUTER CLICK HERE AND READ THIS FIRST!

General Spreadsheet Help Information

Help - Culvert Inlet Type

Inputs:

Headwater (Upstream Water Surface) Elevation:	4.50	Feet		
Culvert Inlet Invert Elevation:	1.00	Feet		
Culvert Diameter:	30.00	Inches	Select Culvert Material:	Concrete
Length of Culvert:	100.00	Feet	Select Culvert Inlet Type:	Headwall - Groove Edge
Culvert Outlet Invert Elevation:	0.00	Feet		
Tailwater (Downstream) Elevation:	0.00	Feet		

Compute

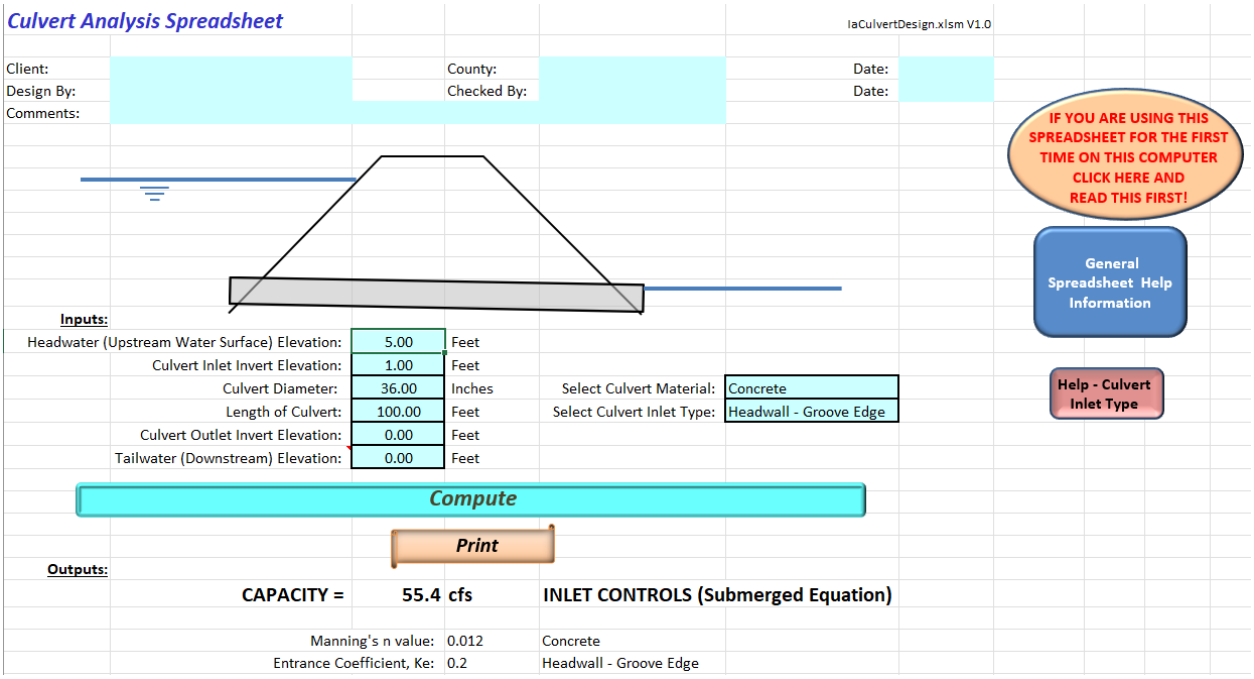
Print

Outputs:

CAPACITY = 37.0 cfs **INLET CONTROLS (Submerged Equation)**

Manning's n value:	0.012	Concrete
Entrance Coefficient, Ke:	0.2	Headwall - Groove Edge

Culvert capacity calculation for 30" diameter pipe



Culvert Analysis Spreadsheet — IaCulvertDesign.xlsm V1.0

Client:		County:		Date:	
Design By:		Checked By:		Date:	
Comments:					

IF YOU ARE USING THIS SPREADSHEET FOR THE FIRST TIME ON THIS COMPUTER CLICK HERE AND READ THIS FIRST!

General Spreadsheet Help Information

Inputs:

Headwater (Upstream Water Surface) Elevation:	5.00	Feet		
Culvert Inlet Invert Elevation:	1.00	Feet		
Culvert Diameter:	36.00	Inches	Select Culvert Material:	Concrete
Length of Culvert:	100.00	Feet	Select Culvert Inlet Type:	Headwall - Groove Edge
Culvert Outlet Invert Elevation:	0.00	Feet		
Tailwater (Downstream) Elevation:	0.00	Feet		

Help - Culvert Inlet Type

Compute

Print

Outputs:

CAPACITY = 55.4 cfs **INLET CONTROLS (Submerged Equation)**

Manning's n value:	0.012	Concrete
Entrance Coefficient, Ke:	0.2	Headwall - Groove Edge

Culvert capacity calculation for 36” diameter pipe

Appendix C:
404(b)(1) Evaluation

SECTION 404(b)(1) WATER QUALITY EVALUATION

Pajaro Flood Risk Management Reach 6 Interior Drainage Project, Watsonville, California

This document constitutes the Statement of Findings, and review and compliance determination according to the Section 404(b)(1) Guidelines for the proposed project.
This analysis has been prepared in accordance with the Section 404(b)(1) Guidelines, 40 CFR Part 230 and the U.S. Army Corps of Engineers Planning Guidance Notebook, Engineer Regulation (ER) 1105-2-100.

I. Project Description

1. Background

The Pajaro Flood Risk Management Reach 6 Interior Drainage Project is part of the greater Pajaro River Flood Risk Management Project. The Pajaro River Flood Risk Management Project, is a single-purpose flood risk management project along the Pajaro River and its tributaries in Santa Cruz and Monterey Counties, California and its purpose is to reduce flood risk to the City of Watsonville, the Town of Pajaro, and surrounding agricultural lands.
The proposed overarching project includes construction of levee improvements along the Pajaro River and Salsipuedes and Corralitos Creeks. These levee improvements include a series of measures including new levees, setback levees, floodwalls, pump stations, and other associated features, including nature-based features such as terraces and side channels within the levee setbacks to provide in-situ borrow material. The lead agency is the USACE. The Pajaro Regional Flood Management Agency (PRFMA) has assumed the role as the non-federal sponsor (NFS).

The most up-to-date descriptions of the Pajaro River Flood Risk Management Project and the Reach 6 Design can be found in the *Pajaro River at Watsonville Integrated General Reevaluation Report and Environmental Assessment (GRR/EA)* (February 2019, revised December 2020) and the *Pajaro River at Watsonville, California, Reach 6 Flood Risk Management Project Supplemental Environmental Assessment* (June 2024), respectively. The broader project construction will begin with Reach 6 along Corralitos Creek.
The proposed project being addressed in this document is referred to as the Pajaro Flood Risk Management Reach 6 Interior Drainage Project. A supplement to the most recent NEPA document is currently being prepared for the drainage features described for this project. This 404(b)(1) evaluation addresses the construction of a pumping plant and several storm drain features planned along the planned Reach 6 levee adjacent to Corralitos Creek.

2. Location

The project area is located within the lower Pajaro River watershed in an area known as the Pajaro River Valley. The watershed within the project area encompasses an area of approximately 10,000 acres, which includes the stream channels, active floodplains, and terraces along the Pajaro River and Salsipuedes and Corralitos Creeks. The Pajaro River

serves as a border for the counties of Santa Cruz (north) and Monterey County (south). Two urban areas are within the project site, the economically disadvantaged and historically marginalized communities of the city of Watsonville (Santa Cruz County) and the unincorporated town of Pajaro (Monterey County).

The first phase of the greater Pajaro River Flood Risk Management Project, where the interior drainage project features described in this application are located, will be the Reach 6 Project. Reach 6 is located along Corralitos Creek, with the downstream limit at the intersection of Corralitos Creek and Highway 152 and the upstream limit at the intersection of Corralitos Creek and Green Valley Road. Reach 6 is located within Santa Cruz County, near the City of Watsonville and the Town of Pajaro. The exact locations for the proposed features (including 7 storm drain features and a pump station) are found below in Table 1 and Figure 1.

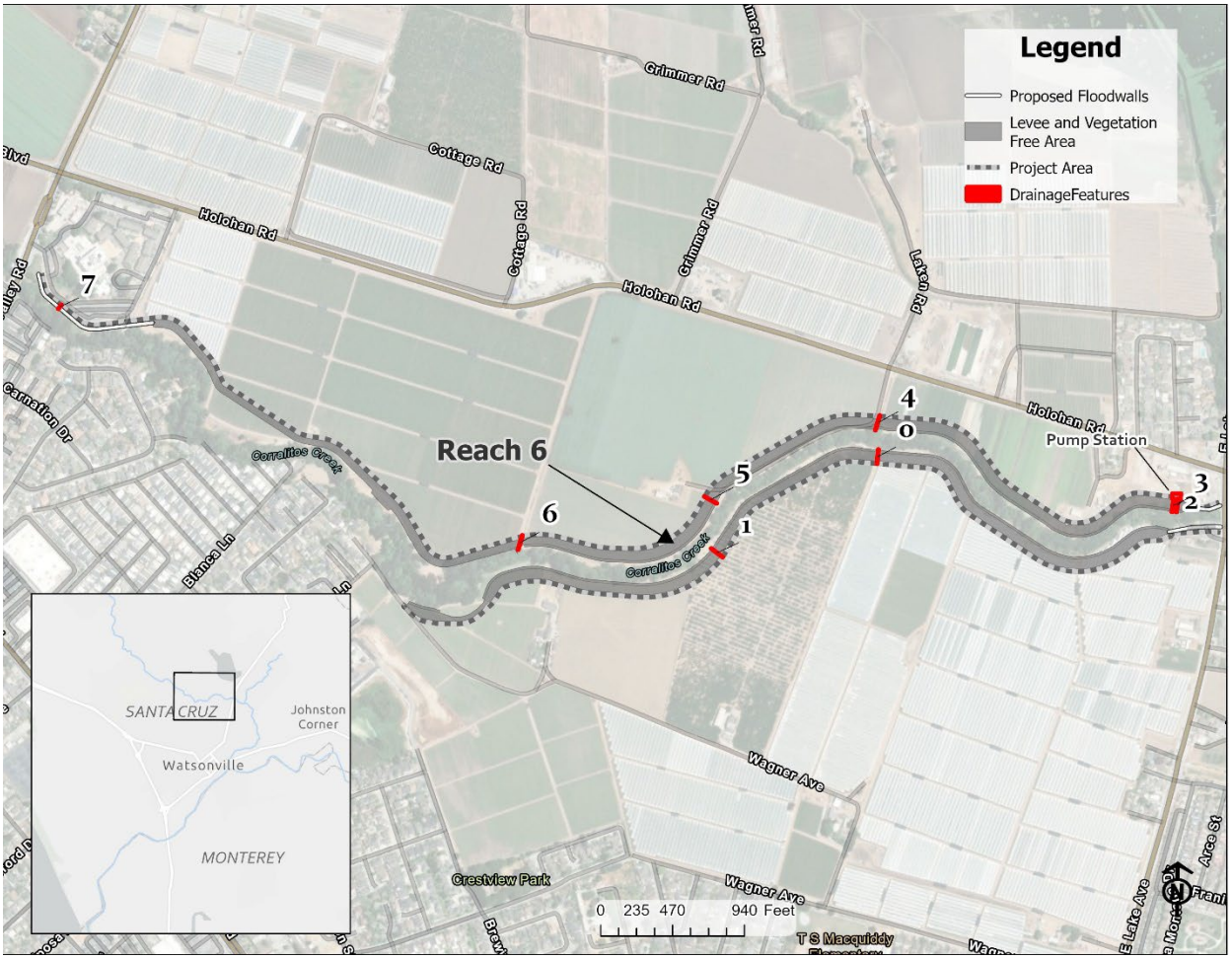


Figure 1. Map of Reach 6 and proposed drainage feature locations.

Table 1. Description and locations of project features

Name	Description	Latitude	Longitude	Township/Range
SD 0	24” Gravity Culvert	36° 56' 10.11"N	121° 45' 1.62"W	*T11S-R2E*
SD 1	24” Gravity Culvert	36° 56' 03.72" N	121° 45' 16.61" W	*T11S-R2E*
Pump Station	24 CFS Pump Station	36° 56' 07.32" N	121° 44' 39.93" W	*T11S-R2E*
SD 2	Pump Discharge Pipe	36° 56' 07.32" N	121° 44' 39.93" W	*T11S-R2E*
SD 3	24" Gravity Culvert	36° 56' 07.32" N	121° 44' 39.93" W	*T11S-R2E*
SD4	30" Gravity Culvert	36° 56' 12.25" N	121° 45' 03.83" W	*T11S-R2E*
SD5	24" Gravity Culvert	36° 56' 07.13" N	121° 45' 17.19" W	*T11S-R2E*
SD6	36" Gravity Culvert	36° 56' 04.21" N	121° 45' 32.46" W	*T11S-R2E*
SD7	24" Gravity Culvert	36° 56' 18.94" N	121° 46' 09.62" W	*T11S-R2E*

3. Proposed Action and Alternatives-General Descriptions

An evaluation of alternatives is required under NEPA for all jurisdictional activities. NEPA requires discussion of a reasonable range of alternatives, including the no action alternative, and the effects of those alternatives. An evaluation of alternatives is required under the Section 404(b)(1) Guidelines for projects that include the discharge of dredged or fill material to waters of the United States. Under the Section 404(b)(1) Guidelines, practicability of alternatives is taken into consideration and no alternative may be permitted if there is a less environmentally damaging practicable alternative.

a) No Action Alternative

Under the No Action Alternative, the proposed Reach 6 Pump Station and storm drain features would not be constructed. As a result, the improved drainage provided by the pump station and culverts would not occur. Significant ponding in adjacent areas is expected to occur, and water would back up onto the agricultural fields, prolonging interior flooding following major storm events. This would significantly impact the efficacy of the overall levee in preventing flooding to the area. The No Action Alternative, under the Clean Water Act (CWA), assumes that there is no discharge of fill material into WOTUS as a result of the project. The no action is the same as the no project alternative.

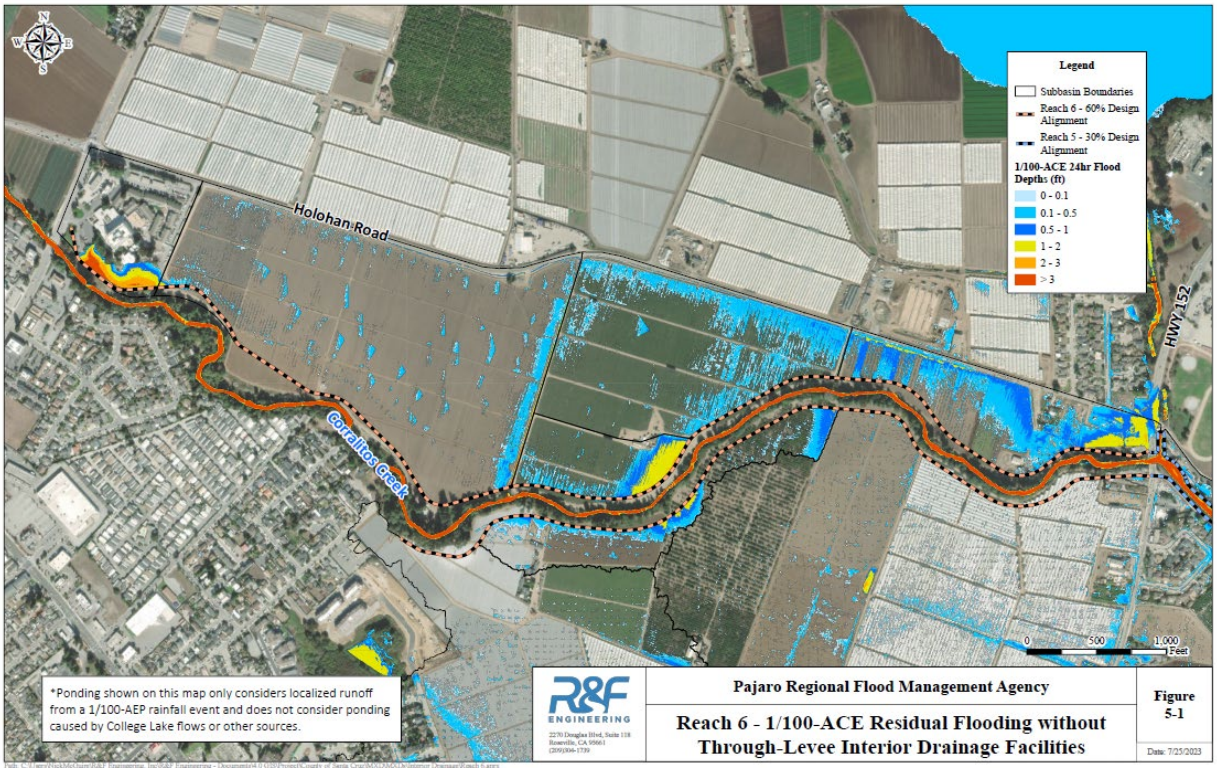


Figure 1. Map showing residual flooding without through-levee interior drainage facilities after levee construction

b) Alternative 1 – Proposed Action

The proposed action includes the construction of the Reach 6 Pump Station, and seven gravity culverts along the length of the Reach 6 levee. The pump station would consist of a 24 cubic feet per second (cfs) pump station with a discharge pipe to prevent localized rainfall-runoff accumulation near Highway 152 and the adjacent commercial buildings. An additional 24" gravity culvert is recommended at the same location as this setup of a gravity pipe alongside a pumping facility is typical of other Santa Cruz County and City of Watsonville pump facilities and allows for more flexibility with pump station operations. The culverts consist of a 24 or 36" reinforced concrete pipe, with drainage structures at the inlet and outlet. For each pipe feature, the culvert begins near the landside levee toe with a graded inlet basin and ends adjacent to the stream channel with most the pipe under the levee. Where the pipe daylights there will be measures to reduce the risk of erosion, including the placement of rip rap or a small concrete pad with gently graded slope down to the channel. Excavation at the outfalls and placement of suitable gravel and rock material will take place to provide a 2% slope down to the channel to minimize erosion and move water into the channel effectively. The combination of pipe and erosion reduction measures is relatively small when compared to the channel section and similar to existing pipe and erosion reduction measures in the channel. Seven of the pipe features are gravity culverts. Storm Drain 2, which is associated with the pump station feature is a forced discharge pipe.

The pump station will be constructed under a separate construction contract and will consist of the completion of a wet well pump station with submersible pumps, an operator room, fuel storage platform, access roads, and re-grading drainage ditches. Access to the area is via a permanent access road.

A bioswale feature at the inlet of SDs 2 and 3 (which are the culverts associated with the pump station) is also proposed to reduce surface water velocity and provide some filtration to the water draining into that feature. No proposed construction activities for the pump station construction itself are within jurisdictional WOTUS.
The entire footprint of the proposed project features, including the pipes, inlets, outlets and pump station is just under 0.4 acres. The footprint of the project that falls within Waters of the U.S. is .03 acres and consists of erosion control rip-rap and a small amount of concrete at the outlet from the pipes to allow for structurally sound drainage of the water. The extent of permanent fill impacts for the project consists of approximately 189 CY of fill and covers this .03 acre area. Fill will primarily consist of compacted soil, gravel and RSP, with a very small portion (~3 cy) of concrete for the pad at one of the outfalls). Notably, post construction, the excavation necessary to complete this project will increase WOTUS in certain areas by .02 acres.

4. Authority and Purpose

The purpose of this project is to construct several drainage features, including a pump station and a series of storm drain features along Corralitos Creek. The need of this project is to improve interior drainage along the planned Reach 6 Levee. The proposed levee system improvements are intended to reduce flood risk within the project area.

The existing USACE Pajaro River project was completed in 1949 and authorized by the Flood Control Act (FCA) of 1944 (Public Law No. 534, 78th Congress, Ch. 665, 2nd Session). A new project authorization to modify the project was provided by the 1966 FCA (Public Law 89–789, 80 Stat. 1421). Section 1001 of the Water Resources Development Act (WRDA) of 1986 states that every two years, the Secretary of the Army shall submit a list of projects to Congress for deauthorization. The list would include authorized projects that have not been constructed and have received no funding for the previous 10 fiscal years. To avoid de-authorization, the Pajaro River flood risk management feasibility study was re-authorized by WRDA 1990, Continuation of Authorization of Certain Projects (Public Law 101–640). With the GRR's approval through the December 2019 Director's Report, the 1966 project remains authorized for construction. On 30 March 2022, the project was granted initial construction funding under the Infrastructure Investment and Jobs Act of 2021.

5. Alternatives

a) No action:

The No-Action Alternative is also the no fill alternative. The No Action Alternative assumes that the pumping plant and interior drainages would not be constructed. As a result, drainage issues identified within the area would not be addressed, and the adjacent areas would continue to be at risk for flooding during high water events. Although the No Action Alternative would have no impacts on waters of the U.S., it does not meet the project purpose since it does not address the flood risk in the study area, and is, therefore, not considered to be the least environmentally damaging practicable alternatives (LEDPA).

b) Other project alternatives:

Alternative 1 involves the construction of a new Pumping Plant and several storm drain features along the newly constructed Reach 6 Levee. The project area for this alternative is shown above in Figures 1 and 2. This action is considered a practicable alternative and will be retained and evaluated in determining the LEDPA.

6. General Description of Dredged or Fill Material

a) General Characteristics of Material

Fill of the outfalls for the newly constructed drainage pipes could consist primarily of rip rap for erosion protection, and a small concrete pad at the outfall of the pipe. In cases where some fill is needed to bring an eroded/incised area up to grade, aggregate base may be used as well, which would come from clean, imported fill material.

b) Quantity of Material

The materials for completion of these drainage features include approximately 186 cubic yards (cy) of rip rap and 3 cy of concrete to be placed around the outfall structures of the new pump station and the additional culverts throughout the reach. While the overall project footprint, including the inlet, pipes and a concrete pad and rip rap to disperse energy of the pipe discharge is .3 acres, only .03 acres (189 cy of fill) will be within jurisdiction of Waters of the United States.

c) *Source of Material*

Material that is required to meet specific soil and rock types would be imported from a licensed, permitted facility that meets all Federal and State standards and requirements. The material would be transported to the site with haul trucks.

7. Description of the Proposed Discharge Site

a) Location

To complete the construction of the proposed drainage features, a series of pipes, seven gravity -fed and one pressurized will need to be constructed through the levee, in addition to the construction of a pump station at the downstream end of the reach. Six storm drain culvert features, and the pump station will be constructed along the left bank of Corralitos Creek, while the other two will be constructed along the right bank. Two of the culverts will be constructed in pre-existing agricultural drainage ditches.
Outfall erosion control on the waterside end of the features will consist of the installation of a small concrete pad and rock/rip rap to prevent outfall from eroding. Only a fraction of the planned construction fill will be placed along the bank within the jurisdiction of Water of the United States. Specifically, this will occur at SD 2/3 adjacent to the pump station, and SD 6.

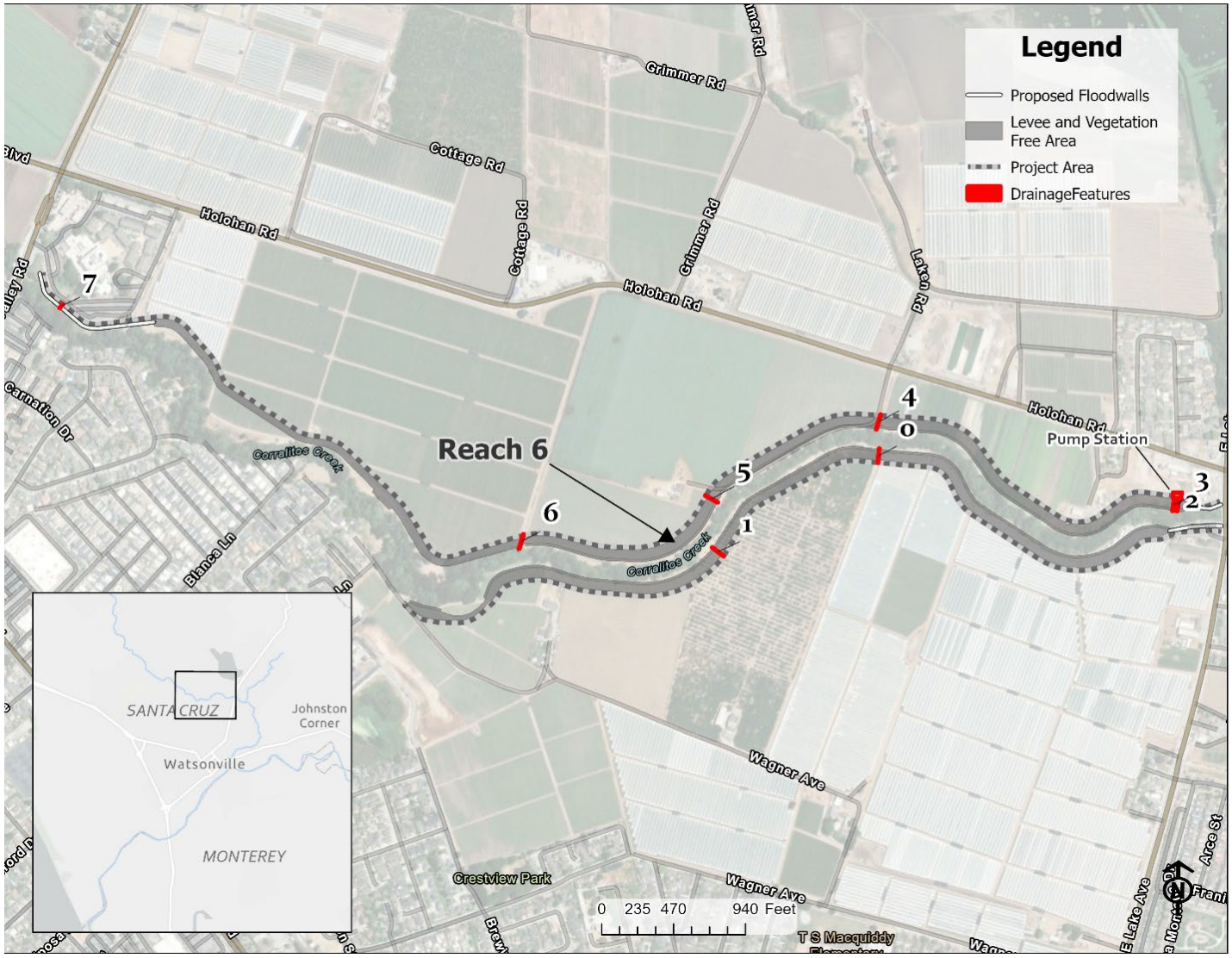


Figure 2. Project Area Map.

b) Size

Approximately 0.27 acres of rip rap, rock, or concrete would be placed at the outfall of the series of drainage pipes built through the proposed levee project to dissipate flow and minimize erosion, two of which will be constructed as part of the pump station. Only 189 cubic yards and .03 acres would be within jurisdictional waters of the U.S, i.e. below the Ordinary High Water Mark (OHWM), and following placement most the area would remain WOTUS.

c) Type of Site

The sites proposed for construction of the drainage features are primarily adjacent to agricultural fields or developed areas along the banks of Corralitos Creek, with the footprint expanding from bare or agricultural land down into the riparian corridor. Two of the features (SD 6 and 4) are planned within existing drainage ditches.

d) Type of Habitat

The Corralitos Creek watershed and Pajaro River Basin within the project area primarily consist of agricultural land, with some developed urbanized areas. Along both sides of the creek, a riparian corridor is present, predominantly bordered by agricultural fields. However, towards the most downstream and upstream portions of the reach, residential and commercial properties become more common. Despite being a moderately altered and developed environment, Corralitos Creek provides habitat for many species; The habitat types along the footprint of the proposed drainage features measures include riparian woodland habitat, described in more detail below.

Riparian Woodland Habitat

Riparian Woodland habitat occurs near the proposed project site. The overstory of this woodland habitat consists of mature, well-established trees: Fremont cottonwood (*Populus fremontii ssp. fremontii*), willow (*Salix sp*.), and occasionally sycamore (*Plantanus Occidentalis*). The shrub layer consists of smaller trees and shrubs; representative species include poison oak (*Toxicodendron diversilobum*), English Ivy (*Hedera Helix*) and Himalayan blackberry (*Rubus discolor*). However, the actual footprint for the proposed project is primarily in adjacent developed/pre-disturbed agricultural lands, with minimal vegetation disturbance necessary.

The Pajaro River is located within the study area and is a navigable waterway that are jurisdictional under Section 404 of the Clean Water Act. The Pajaro River would not be impacted by fill.

e) Timing and Duration of Discharge

The construction of the Reach 6 Levee and Pumps Station is currently anticipated to begin in Fall of 2025 and is anticipated to take two years to complete. It is anticipated that the levee and drainage features would be constructed first, and the pump station would be completed after the completion of the levee, potentially starting in late 2027 or 2028 and take one year to complete.

8. Description of Disposal Method

Excavation, and placement of rip rap and erosion control material would be conducted from the landside of the project area. The Contractor would be required to maintain erosion control and ensure that the construction activities do not degrade any areas outside the construction site.

II. Factual Determinations

1. Physical Substrate Determinations

a) Substrate, Sediment Type, Elevation, Contours and Slope

The proposed placement of 189 CY of fill, primarily in the form of rip rap would have a minor effect on the existing substrate, elevation, contours and slope. The slope in these locations would be gentler (2% planned) to allow for energy dissipation of discharge through the pipes. The physical substrate would be affected by the placement of the fill and would be a long-term effect. However, this impact would be extremely small in scale (.03 acres) over several miles of streambank, and have minimal impacts to the surrounding environs.

b) Dredged/Fill Material Movement

Although there is some anticipated settling of fill materials, in general the fill materials would settle in place and are not anticipated to migrate.

c) Physical Effects on Benthos (burial, changes in sediment type, etc.)

No impacts anticipated

d) Other Effects

No impacts anticipated

e) Actions Taken to Minimize Impacts

The following mitigation measures would be used during construction of Alternative 1 to reduce impacts to environmental quality:

- Prior to construction, the Corps or its contractor would be required to acquire all applicable permits for construction.
- Prior to construction, a Stormwater Pollution Protection Plan (SWPPP) and a Spill Prevention Control and Countermeasures Plan would be prepared. Best management practices (BMPs) would be proposed to reduce potential erosion and runoff during rain events.
- Minimize ground and vegetation disturbance during project construction by establishing designated equipment staging areas, ingress and egress corridors, spoils disposal and soil stockpile areas, and equipment exclusion zones prior to the commencement of any grading operations.

2. Water Circulation, Fluctuation, and Salinity Determinations

a) Water

i. Salinity
No impacts anticipated

ii. Water Chemistry (pH, etc.)
Construction materials and construction activities have the potential to affect water chemistry if a discharge were to occur. Construction contractors would be required to prepare and implement a SWPPP and comply with the conditions of the NPDES general stormwater permit for construction activity. The contractor would be required to obtain a permit from the Central Coast Regional Water Control Board (CCRWQCB) detailing a plan to control any spills that could occur during construction. The plan would describe the construction activities to be conducted, BMPs that would be implemented to prevent discharges of contaminated stormwater into waterways, and inspection and monitoring activities that would be conducted.

iii. Clarity
No impacts anticipated

iv. Color
No impacts anticipated

v. Odor
The proposed project would not result in any major sources of odor, and the project would not involve operation of any of the common types of facilities that are known to produce odors (e.g., landfill, wastewater treatment facility). Odors associated with diesel exhaust emissions from the use of onsite construction equipment may be noticeable from time to time by adjacent receptors. However, the odors would be intermittent and temporary and would dissipate rapidly from the source with an increase in distance. Furthermore, as required by CARB regulation 13 CCR 2449(d)(3), no in-use off-road diesel vehicles may idle for more than 5 consecutive minutes. Therefore, this direct effect would be less than significant. In addition, implementation of mitigation measures, which are required under other air quality effects, would further reduce exhaust emissions, and provide advanced notification of construction activity.

vi. Taste
No impacts anticipated

vii. Dissolved Gas Levels
No impacts anticipated

viii. Nutrients
No impacts anticipated

ix. Eutrophication
No impacts anticipated

x. Temperature

No impacts anticipated

b) Current Patterns and Circulation

i. Current Patterns and Flow (including diversions and obstructions)

For low flow conditions in the channel, which occur most of the year, there will be no change in flow rates or flow patterns. For higher flow rates in the channel, the presence of the erosion reduction measures there will be no change on flow rates; however, the features may have a minimal and localized impact on flow patterns, as the pipe and erosion reduction measures present an obstruction for flow coming out of the pipes. The localized flow pattern change due to the obstruction is limited to the immediate vicinity of the obstruction, meaning the length, width, and height of the flow pattern change only occurs at the obstruction.

ii. Water Circulation and Velocity

It is not anticipated that the fill will substantially impact water circulation and velocity within Corralitos Creek, and any potential impacts would be highly localized.

iii. Alteration of Bottom Contours

No impacts anticipated

iv. Stratification

No impacts anticipated

v. Other Hydrologic Regime Changes

No impacts anticipated

c) Normal Water Level Fluctuations

No impacts anticipated

d) Salinity Gradients

No impacts anticipated

e) Actions That Will Be Taken to Minimize Impacts

Construction contractors would be required to prepare and implement a SWPPP and comply with the conditions of the NPDES general stormwater permit for construction activity. The contractor would be required to obtain a permit from the Central Coast Regional Water Quality Control Board detailing a plan to control any spills that would occur during construction. The plan would describe the construction activities to be conducted, BMPs that would be implemented to prevent discharges of contaminated

stormwater into waterways, and inspection and monitoring activities that would be conducted.

3. Suspended Particulate/Turbidity Determinations

a) Expected Changes in Suspended Particulates and Turbidity Levels in Vicinity of Disposal Site

It is not expected that the proposed project actions will impact suspended particulates and turbidity levels in the vicinity of the disposal site as discharge will not impact wetted areas during construction. It is not anticipated that the fill will substantially impact turbidity or suspended particulates negatively after installation. Potential changes that may cause violations of applicable water quality standards are not anticipated.

b) Effects (degree and duration)

i. Light Penetration

No impacts anticipated

ii. Dissolved Oxygen

No impacts anticipated

iii. Toxic Metals and Organics

No impacts anticipated

iv. Pathogens and Viruses

No impacts anticipated

c) Effects on Aquatic Biota

No impacts anticipated

d) Actions taken to Minimize Impacts

4. Contaminant Determinations (*Consider requirements in section 230.11(d)*)

The material proposed for discharge is not likely to introduce, relocate or increase contaminants in the impacted water body. Almost all proposed fill material within WOTUS would consist of clean natural materials such as rock and soil, with a small portion of fill being clean concrete.

5. Aquatic Ecosystem and Organism Determinations

a) Effects on the aquatic food web

No impacts anticipated

b) Effects on Special Aquatic Sites (Discuss only those found in project area or disposal site)

No impacts anticipated

c) Threatened and Endangered Species

Federally threatened and endangered species in the vicinity of the project area include the federally threatened California red-legged frog (Rana draytonii) and yellow-billed cuckoo (Coccyzus americanus), and the federally endangered least Bell's vireo (Vireo bellii pusillus).
USACE consulted with USFWS and received a Biological Opinion, dated February 24, 2023, on the effects of the overall Pajaro project on the federally threatened California red-legged frog (Rana draytonii), yellow-billed cuckoo (Coccyzus americanus), and the federally endangered least Bell's vireo (Vireo belliipusillus). USACE also consulted with NMFS, and received a Concurrence Letter, dated February 17, 2023, specific to the determination that the project is not likely to adversely affect the federally threatened South-Central California Coast steelhead (Oncorhynchus mykiss), as designated under the Endangered Species Act. Consultation documentation and more detailed description of impacts and minimization measures can be found in the Pajaro River at Watsonville, California Reach 6 Flood Risk Management Project Final Supplemental Environmental Assessment Document dated June 2024.
The proposed action for this project represents a very small addition to the construction footprint for the levee project in this area and is not expected to have any additional impacts to threatened and endangered species with the incorporation of the proposed BMPs.

d) Effects on Other Wildlife

Wildlife effects associated with the construction are expected to be temporary and no additional measures to minimize effects are needed for fill occurring in the area. Surveys would be conducted to determine if any nesting birds are present prior to construction. If nesting birds are located adjacent to the project area, coordination with the resource agencies would occur. Vegetation removal is expected to be over a relatively small area and is not likely to significantly impact habitat availability. Once construction is complete, the wildlife is expected to return to the area.

e) Actions to Minimize Impacts

Mitigation measures for the protection of CRLF would be conducted in accordance with the requirements from USFWS. Actions proposed to minimize and mitigate for project impacts to listed species are discussed in the Pajaro River at Watsonville, California Reach 6 Flood Risk Management Project Final Supplemental Environmental Assessment Document dated June 2024.

6. Proposed Disposal Site Determinations

a) Mixing Zone Determination (*Consider factors in section* 230.11(f))

Not Applicable.

b) Determination of Compliance with Applicable Water Quality Standards

Water quality is not likely to be affected during the construction of the described features. No water quality or effluent standards would be violated during or after construction of the new pumping plant, and the fill material being used to provide erosion control would not result in violation of the Environmental Protection Agency or State water quality standards. There would be no impacts to drinking water.

c) Potential Effects on Human Use Characteristics

i. Municipal and Private Water Supply

No impacts anticipated

ii. Recreational and Commercial Fisheries

No impacts anticipated

iii. Water Related Recreation

No impacts anticipated

iv. Aesthetics

Aesthetics may be minimally impacted through the construction of the proposed features. Specifically, the pump station has the largest potential to impact aesthetics and impact the viewshed with the additional construction of a new building. The footprint of the pump station and the drainage features is very small, especially compared with the scale of the levee project. The aesthetic impact of the construction features within WOTUS is negligible.

v. Parks, National and Historical Monuments, National Seashores, Wilderness Areas, Research Sites, and Similar Preserves

There are no parks, national and historic monuments, national seashores, national scenic rivers, wilderness areas, research sites or similar preserves in the area in and around the Project, therefore, no impacts anticipated

7. Determination of Cumulative Effects on the Aquatic Ecosystem

The proposed project would result in minor long-term effects on the aquatic ecosystem. Effects of the proposed action include the permanent addition of a small amount of fill (.03 acres) to WOTUS at the outfall of the drainage pipe features. Excavation activities at Sites 2 and 3 would lead to the expansion of WOTUS by .02 acres, though notably this not high quality habitat given the rock and/or concrete substrate. Some minimal grubbing and vegetation may be required to complete construction, but impacts would be minor and temporary.

Actions that could contribute to cumulative effects on waters of the U.S. in the Pajaro River Watershed include other components of the broader Pajaro River Flood Risk Management Project, such as the construction of levees in Reach 6 and the adjacent downstream Reach 5. However, Reach 5 construction is not expected to begin until after the completion of this project and will comply with all applicable permits and regulations to minimize impacts. No long-term impacts to water quality are anticipated, and no significant cumulative effects on water quality or the aquatic ecosystem are expected from this project or others in the area in the near-term.

8. Determination of Secondary Effects on the Aquatic Ecosystem

Any impacts to the aquatic ecosystem from the Proposed Action would be minor in comparison to the larger system, and secondary impacts to the aquatic ecosystem in Corralitos Creek are not anticipated to be affected.

III. Findings of Compliance or Non-Compliance with the Restrictions on Discharge

No significant adaptations of the guidelines were made relative to this evaluation.

1. Evaluation of Availability of Practicable Alternatives to the Proposed Discharge Site

The construction of the Reach 6 Pump Station, along with the incorporation of storm drain features into the levee designs along Corralitos Creek, is a critical component of enhancing the flood prevention capacity of the planned levee infrastructure within this portion of the Pajaro River watershed. These features are essential and there are no other practicable alternatives to improving interior drainage for the levee system, and effectively preventing ponding or flooding on the landside of the levee and ensuring the levee system functions as intended during high-water events.

The proposed project would implement BMPs to ensure that it does not violate State water quality standards for this region and the State of California. The Corps is currently applying for a 401 Water Quality Certification Permit.

The discharges of fill materials will not cause or contribute to, after consideration of disposal site dilution and dispersion, violation of any applicable State water quality standards for waters. The discharge operations will not violate the Toxic Effluent Standards of Section 307 of the Clean Water Act.

The placement of fill materials in the project area(s) will not jeopardize the continued existence of any species listed as threatened or endangered or result in the likelihood of destruction or adverse modification of any critical habitat as specified by the Endangered Species Act of 1973. Formal consultation was completed for the overall project with the regulatory agencies U.S. Fish and Wildlife Service and National Marine Fisheries Service.

Based on the guidelines and the inclusion of appropriate and practical conditions to minimize pollution or adverse effects on the aquatic ecosystem, the proposed project complies with the requirements of the Clean Water Act.

IV.Summary and Conclusion

In summary:
1. The selected plan represents the least environmentally damaging, practicable alternative (LEDPA).
2. The discharge does not cause or contribute to violation of any applicable state water quality standard, does not violate any applicable toxic effluent standard.
3. The discharge does not cause or contribute to significant degradation of the waters of the US.
4. All appropriate and practicable steps have been taken to minimize potential adverse impacts of the discharge on the aquatic ecosystem.

Appendix D:
Cultural Compliance Documents

State of California • Natural Resources Agency
Gavin Newsom, *Governor*

DEPARTMENT OF PARKS AND RECREATION
OFFICE OF HISTORIC PRESERVATION
Armando Quintero, *Director*

Julianne Polanco, State Historic Preservation Officer
1725 23rd Street, Suite 100, Sacramento, CA 95816-7100
Telephone: (916) 445-7000 FAX: (916) 445-7053
calshpo.ohp@parks.ca.gov www.ohp.parks.ca.gov

August 13, 2024

VIA EMAIL

In reply refer to: COE_2017_1020_002

Julie Beagle, Chief
U.S. Army Corps of Engineers
San Francisco District
450 Golden State Avenue, 4th Floor, Suite 0134
San Francisco, CA 94102-3406

Subject: Section 106 Consultation for the Pajaro River Flood Risk Management Project, Reach 6 Phase, Monterey and Santa Cruz Counties, California

Dear Ms. Beagle:

The State Historic Preservation Officer (SHPO) is in receipt of a consultation letter dated June 7, 2024, from the U.S. Army Corps of Engineers, San Francisco District (USACE) for the above referenced undertaking. USACE is continuing consultation with the SHPO to comply with Stipulations III and IV of the *Programmatic Agreement Among the U.S. Army Corps of Engineers and the California State Historic Preservation Officer Regarding the Pajaro River Flood Risk Management Project, Monterey and Santa Cruz Counties, California* (PA) and with Section 106 of the National Historic Preservation Act of 1966 (as amended) and its implementing regulation at 36 CFR 800. USACE is seeking SHPO review and comment on their efforts to identify historic properties and on their finding of *no historic properties affected.*

The purpose of the undertaking is to provide protection to the nearby communities of Watsonville and Pajaro, and the agricultural and residential lands around them from future flooding events. The major objectives are to address the long history of flooding in the Watsonville area which has led to substantial damages, and to reduce the risks of future flooding events. Flood risk reduction measures in Reach 6 are anticipated to include setback levees, terracing and erosion-protection riprap along Corralitos Creek. The undertaking will include new setback levees between 50 and 100 feet on each bank of Corralitos Creek for approximately two miles.

The Area of Potential Effects (APE) consists of the extent for all construction activities and the stream channel, active floodplains and terraces of Corralitos Creek. The APE also includes a new pump station, three borrow areas, and staging areas. All access routes to the project are on pre-existing roads and trails. The Reach 6 APE begins at the confluence of Highway 152 and extends to Green Valley road for approximately two miles. The APE surrounds Corralitos Creek for a maximum of 400 feet and 200 feet east and west from the

center of the creek. The subsurface APE for construction of the levees includes a depth of 10 to 15 feet below ground surface (bgs), which will extend in some locations to a maximum depth of 35 feet bgs for sheet piling. There are three locations within the existing APE where borrow material will be sourced from the existing floodplain, reducing the cost of importing material while reconnecting the main channel with its historic floodplain and providing geomorphic and ecological habitat benefits. The maximum depth for the borrow areas is 10 feet bgs, for an excavation total of 40,425 cubic yards of usable material produced for levee fill.

Efforts to identify historic properties within the APE included a records search conducted at the Northwest Information Center (NWIC) of the California Historical Resources Information System (CHRIS), archival research, review of previous Native American consultation and on-going Native American consultation by USACE, correspondence with historical societies, archaeological and built environment surveys, geoarchaeological investigations, and evaluations of archaeological and historic-era built environment resources.

USACE contacted the following ten tribes in December 2023 and provided a description of the undertaking, a description and maps of the preliminary APE, the records search results from the CHRIS, and an invitation to participate in the cultural resource surveys: the Esselen Tribe of Monterey County, the Amah Mutsun Tribal Band of Mission San Juan Bautista, the Coastanoan Rumsen Carmel Tribe, the Costanoan Ohlone Rumsen-Mutsen Tribe, the Salinan Tribe of Monterey and San Luis Obispo Counties, the Xolon-Salinan Tribe, Ohlone/Coastanoan-Esselen Nation, Muwekma Oh lone Indian Tribe of the San Francisco Bay Area, the Amah Mutsun Tribal Band, and the Indian Canyon Mutsun Band of Costanoan. To date, the Amah Mutsun Tribal Band is the only Tribe that has responded. USACE held a meeting with the Amah Mutsun Tribal Band in April 2024 and USACE provided their finding of effect determination to the Tribe on May 10, 2024. USACE is continuing consultation with the Amah Mutsun Tribal Band to ensure Tribal Ecological Knowledge is incorporated into planning studies for all subsequent phases of the project.

Pedestrian surveys were completed in conjunction with geoarchaeological auger-testing, neither of which identified archaeological resources within the APE. The geological data obtained from geotechnical boring in Reach 6 suggests that the APE is primarily characterized by an active, meandering creek with substantial deposits of alluvial sediments, which are continually redistributed due to natural fluvial processes. A review of historical maps and aerial photographs spanning over a century indicate that Corralitos Creek has maintained a stable course during this period. Analysis of topographic mapping data indicates that surrounding sites are predominantly situated at elevations of 50 feet or higher, often positioned on elevated terrain adjacent to the creek system. As a result of the identification efforts, no archaeological resources were identified within the APE for Reach 6. A total of five built environment resources were identified within the Reach 6 APE:

- Orchard Park commercial building (P-44-000984) at 2233 E. Lake Avenue
- Corralitos Creek Bridge (no. 36-0001)
- a multi-family residential property at 2215 E Lake Avenue
- Farm Fresh Produce market at 37 Holohan Road

- a segment of Highway 152 (P-44-000408)

The Orchard Park property was previously evaluated for inclusion in the National Register of Historic Places (NRHP) and was recommended as ineligible because of a lack of historical significance and integrity. This resource was re-evaluated for the purposes of this undertaking and USACE has determined it is not eligible for inclusion in the NRHP. The Corralitos Creek Bridge (no. 36-0001) was also previously evaluated and was determined to be not eligible for inclusion in the NRHP in 2018. USACE evaluated the multi-family residential property at 2215 E Lake Avenue, the Farm Fresh Produce market at 37 Holohan Road, and the segment of Highway 152 (P-44-000408) for inclusion in the NRHP and has determined that all three built-environment resources are not eligible under any Criteria and are not considered historic properties for the purposes of Section 106.

As a result of the identification efforts, no historic properties have been identified within the APE for Reach 6. Therefore, USACE has determined a finding of *no historic properties affected* pursuant to 36 CFR § 800.4(d)(1) is appropriate for Reach 6.

USACE has requested SHPO review and comment on their efforts to identify historic properties and on their finding of effect. The SHPO previously provided comment on the delineation of the APE. Following review of the submittal, I offer the following comments:

- Pursuant to 36 CFR § 800.4(b)(1), I find the efforts to identify historic properties to be reasonable and in good faith;

- Pursuant to 36 CFR § 800.4(c)(2), **I concur** that the Orchard Park commercial building (P-44-000984) at 2233 E. Lake Avenue, the multi-family residential property at 2215 E Lake Avenue, the Farm Fresh Produce market at 37 Holohan Road, and the segment of Highway 152 (P-44-000408) are not eligible for inclusion in the NRHP under any Criteria;

- Pursuant to 36 CFR § 800.4(d)(1), **I do not object** to a finding of *no historic properties affected*, and I have no further comments.

If you require further information, please contact Robert Fitzgerald, Associate State Archaeologist or Robert.Fitzgerald@parks.ca.gov.

Sincerely,

Julianne Polanco
State Historic Preservation Officer

AMENDMENT
TO THE
PROGRAMMATIC AGREEMENT
AMONG
THE U.S. ARMY CORPS OF ENGINEERS AND
THE CALIFORNIA STATE HISTORIC PRESERVATION OFFICER
REGARDING
THE PAJARO RIVER AT WATSONVILLE
PROJECT,
MONTEREY AND SANTA CRUZ
COUNTIES, CALIFORNIA

WHEREAS, the U.S. Army Corps of Engineers (Corps) and the California State Historic Preservation Officer (SHPO) entered into a Programmatic Agreement (PA) on July 16, 2019, to guide the Section 106 Process for the Pajaro River Flood Risk Management Project (Project or Undertaking); and

WHEREAS, PA Stipulation XV.D (Duration of the PA) states that "This Agreement shall remain in effect for a period of five (5) years after the date it takes effect and shall automatically expire and have no further force or effect at the end of this five-year period unless it is amended or terminated prior to that time. No later than ninety (90) calendar days prior to the expiration date of the Agreement, the Corps shall initiate consultation to determine if the Agreement should be allowed to expire automatically or whether it should be extended, with or without amendments, as the Signatories may determine"; and

WHEREAS, Project construction has not begun, and Identification of Potential Historic Properties is in process for the Project, pursuant to Stipulation III.A (Identification and Evaluation); and

WHEREAS, the Corps has consulted with the SHPO, Concurring Parties, and Consulting Parties to amend the duration of the PA for that purpose; and

WHEREAS, the SHPO accepted to extend the duration of the PA and requested an amendment to ensure language is changed throughout to ensure any interested party is able to consult regardless of their decision to participate as a Concurring Party to the agreement; and

WHEREAS, a Project Partnership Agreement was recently executed that changed the Project name and agency which is the Non-Federal Sponsor for the Project.

NOW, THEREFORE, in accordance with PA Stipulation XIV (Amendments, Noncompliance, and Termination) the Corps and SHPO agree to extend the duration of the PA and change language throughout to ensure interested parties are consulted by amending it as follows:

Replace Stipulation XV (Duration of the PA) in its entirety with the following:

"This PA will remain in effect until July 16, 2029, unless otherwise amended in accordance with Stipulation XIV (Amendments, Noncompliance, and Termination). If the terms of the PA are still not met prior to that date, the Corps may extend the PA for an additional five years following consultation with Signatories, Concurring Parties, and Consulting Parties."

Replace “SHPO and Concurring Parties” with “SHPO, Concurring Parties, and Consulting Parties” in the WHEREAS clause that states, “this Agreement shall establish the process the Corps shall follow for compliance with Section 106, taking into consideration the views of the Signatory, Concurring Parties, and Consulting Parties”.

Replace all references to “Concurring Parties” in the Stipulations section of the Agreement with “Concurring Parties, and Consulting Parties”.

Replace the title and name of the Project from the “Pajaro River Flood Risk Management” to the “Pajaro River at Watsonville, CA” Project.

Replace the Non-Federal Sponsor, as a Concurring Party, from “Monterey County” and “Santa Cruz County” to the “Pajaro Regional Flood Management Agency”.

All other PA Stipulations are unchanged and shall remain in full force and effect.

SIGNATORIES:

U.S. ARMY CORPS OF ENGINEERS, SAN FRANCISCO DISTRICT

By: SHEBESTA.TIMOTHY.WILLIAM.1260730980 Digitally signed by SHEBESTA.TIMOTHY.WILLIAM.1260730980 Date: 2024.04.25 13:51:05 -07'00'

Date: 4/25/24

Timothy W. Shebesta
Lieutenant Colonel, U.S. Army
Commanding

CALIFORNIA STATE HISTORIC PRESERVATION OFFICER

By: _____ Date: April 25, 2024

Julianne Polanco, California State Historic Preservation Officer

CONCURRING PARTIES:

By: DocuSigned by: Mark Strudley 9A58C342FF79465... Date: 5/19/2024

Mark Strudley, Pajaro Regional Flood Management Agency

By: _____ Date: 5/14/24

Valentin Lopez, Amah Mutsun Tribal Band

By: _____ Date: _____

Tom Little Bear Nason, Esselen Tribe of Monterey County

PROGRAMMATIC AGREEMENT
AMONG
THE U.S. ARMY CORPS OF ENGINEERS AND
THE CALIFORNIA STATE HISTORIC PRESERVATION OFFICER REGARDING
THE PAJARO RIVER FLOOD RISK MANAGEMENT PROJECT, MONTEREY AND SANTA CRUZ COUNTIES, CALIFORNIA

WHEREAS, The Pajaro River Flood Risk Management Project is being conducted by the U.S. Army Corps of Engineers San Francisco District (Corps). The existing Pajaro Project was authorized by the Flood Control Act of 1966, Pub. L. No. 89–789, § 203, 80 Stat. 1405, 1421, and re-authorized by the Water Resources Development Act of 1990, Pub. L. No. 101–640, 104 Stat. 4604, 4620; and

WHEREAS, The purpose of the study was to determine if there is Federal interest in providing additional flood risk management improvements along the Pajaro River and its tributaries; and

WHEREAS, Santa Cruz and Monterey Counties are the non-Federal Sponsor for the study and have been invited to be Concurring Parties to this Programmatic Agreement (Agreement); and

WHEREAS, the Corps has determined that the Study, and any subsequent associated project activities (Project), constitute an Undertaking, as defined in 36 C.F.R. § 800.16(y), and therefore is subject to Section 106 of the National Historic Preservation Act of 1966, 54 U.S.C. § 306108 (formerly 16 U.S.C. § 470f, referred to hereinafter as "Section 106" or "NHPA"); and

WHEREAS, the Corps has determined that the Project may have an effect on properties that are either listed or eligible for listing in the National Register of Historic Places (NRHP) and has consulted with the California State Historic Preservation Officer (SHPO) pursuant to the NHPA; and

WHEREAS, this Agreement shall establish the process the Corps shall follow for compliance with Section 106, taking into consideration the views of the Signatory and Concurring Parties; and

WHEREAS, large portions of the APE have not been inventoried, however, at least five (5) cultural resources are known to be present within the Area of Potential Effects (APE), two of which are listed on the National Register of Historic Places (NRHP), and

WHEREAS, the Corps has decided to comply with Section 106 of the NHPA for the Project through the execution and implementation of this Agreement because the Corps cannot fully determine the effects of the Undertaking on Historic Properties, 36 C.F.R. § 800.14(b)(1)(ii), for all phases and segments of the Project at this time and

the SHPO has agreed; and

WHEREAS, in accordance with 36 C.F.R. §§ 800.2(c)(2)(ii)(A), 800.3(f)(2), and 800.14(b)(2)(i), the Corps has contacted federal and state recognized Native American Tribes, via letter(s), phone call(s), email(s), and meetings, to invite them to consult on the Project and this Agreement, including the Esselen Tribe of Monterey County, the Amah Mutsun Tribal Band of Mission San Juan Bautista, the Coastanoan Rumsen Carmel Tribe, the Costanoan Ohlone Rumsen-Mutsen Tribe, the Salinan Tribe of Monterey and San Luis Obispo Counties, the Xolon-Salinan Tribe, Ohlone/Coastanoan-Esselen Nation, Muwekma Ohlone Indian Tribe of the San Francisco Bay Area, the Amah Mutsun Tribal Band, and the Indian Canyon Mutsun Band of Costanoan; the Corps has invited them (and others who may be identified in the future as appropriate Concurring Parties) to participate as Consulting Parties to this Agreement; and the Corps will continue consultation throughout the duration of this agreement; and

WHEREAS, as of October 12, 2018, the Esselen Tribe of Montery County, the Ohlone/Costanoan-Esselen Nation, and the Amah Mutsun Tribal Band have responded to the Corps' invitation to consult,have participated in consultation on the Project and Agreement, and may choose to sign the Agreement as Concurring Parties; and

WHEREAS, the definitions set forth in 36 C.F.R. § 800.16 are incorporated herein by reference and apply throughout this Agreement; and

WHEREAS, the definitions for Signatory Parties set forth in 36 C.F.R. § 800.6(c)(1), and the definitions for Concurring Parties set forth in 36 C.F.R. § 800.6(c)(3), are incorporated herein by reference and apply throughout this Agreement; and

WHEREAS, in accordance with 36 C.F.R. § 800.14(b)(3), the Corps notified and invited the Advisory Council on Historic Preservation (ACHP) per 36 C.F.R. § 800.6(a)(1)(C) to participate in consultation to resolve potential adverse effects of the Project, including development of this Agreement, pursuant to 36 C.F.R. § 800.6(a)(1)(iii), in a letter dated 18 October 2017, and in a letter dated 8 November 2018 the AHCP declined to participate in consultation on the resolution of adverse effects; and

WHEREAS, in accordance with 36 C.F.R. § 800.6(a)(4) and 36 C.F.R. § 800.14(b)(2)(ii), the Corps conducted a public meeting on the integrated Draft General Reevaluation Report and Environmental Assessment on November 8, 2017, at the Watsonville Civic Plaza Community Room, 275 Main Street, 4th Floor, Watsonville, California 95076-5133 and has notified the public of the Project and provided an opportunity for members of the public to comment on the Project and the Section 106 process as outlined in this Agreement; and

NOW, THEREFORE, the Signatories agree that the Undertaking shall be implemented in accordance with the following stipulations in order to take into account the effects of the undertaking on Historic Properties and to satisfy the Corps' Section 106 responsibilities for all individual aspects of the undertaking.

The Corps shall ensure that the following measures are carried out:

STIPULATIONS

I. TIME FRAMES AND REVIEW PROCEDURES

A. **Document and Deliverable Review:** For all documents and deliverables produced in accordance with the stipulations of this Agreement, the Corps shall provide a draft document to the SHPO and Concurring Parties for review. Any written comments provided by the SHPO and Concurring Parties within thirty (30) calendar days from the date of receipt, shall be considered in the revision of the document or deliverable. The Corps shall document and report the written comments received for the document or deliverable and how comments were addressed. The Corps shall provide a revised final document or deliverable to the SHPO and concurring parties for review and comment. The SHPO shall have thirty (30) calendar days from the date of receipt to respond. Failure of the SHPO or Concurring Parties to respond within thirty (30) calendar days of receipt of any submittal shall not preclude the Corps from moving to the next step in this Agreement. The timeframe to consult on deliverables may be extended by mutual consent of the Corps and SHPO.

B. Should the SHPO or Concurring Parties object to the Corps' findings of NRHP eligibility and/or findings of effect within the final document or deliverable submitted for review, the Corps, SHPO, and Concurring Parties shall consult for a period not to exceed fifteen (15) Calendar days following the receipt of the SHPO's and Concurring Parties' written objection in an effort to come to agreement on the issues to which the SHPO, other interested party, or Tribe has objected. Should the SHPO and the Corps be unable to agree on the issues to which the SHPO has objected, the SHPO and the Corps shall proceed in accordance with **Stipulation XIII (Dispute Resolution)**, below. The timeframe to consult to resolve a disagreement or objection may be extended by mutual consent of the Corps and the SHPO.

II. AREA OF POTENTIAL EFFECTS

Attachment 1 includes an overall APE map for the Project. It will be necessary to further refine the APE as design and construction proceed. Prior to activities under **Stipulation III (Identification and Evaluation)**, the Corps shall submit to the Signatories and Concurring Parties a map of the APE, and a description of the Project activities that would occur within it, in accordance with **Stipulation I (Timeframes and Review Procedures)**.

A. The refined APE shall include:

(1) The extent of all Project construction and excavation activity required to improve existing or build new levees and flood walls; and

(2) The additional right-of-way/easements obtained by the Corps as part of the

Project's features; and

(3) All areas used for excavation of borrow material and habitat creation; and

(4) All construction staging areas, access routes, spoil areas, and stockpiling areas, and

(5) Boundaries of all identified historic properties that have a potential to be affected by the Project.

(6) Any areas where indirect effects to historic properties may be reasonably anticipated.

B. After the APE has been refined and consulted on in accordance with **Stipulation II (Area of Potential Effects)** above, construction or other Project activities may require revisions to the APE. If the APE is revised, the Corps shall consult on that revision in accordance with **Stipulation I (Timeframes and Review Procedures)**, and the Corps shall determine the potential for Project activities in a revised APE to affect potential Historic Properties, in accordance with **Stipulation IV (Determination of Effects)**. Revisions to the APE shall not necessitate modifications to this Agreement.

III. IDENTIFICATION AND EVALUATION

The Corps shall complete any identification and evaluation, and as necessary, any resolution of effects to Historic Properties prior to proceeding with construction. If the Signatory Parties object to the Corps' identification and evaluation efforts and do not agree to proceed with the phase of the Project, the Corps shall follow **Stipulation XIII (Dispute Resolution)**.

A. Identification of Potential Historic Properties: An inventory of Historic Properties within the APE, consistent with the *Secretary of Interior's Standards and Guidelines for Archeology and Historic Preservation* (48 Fed. Reg. 44,716–44,740) will be initiated for the Project, or for individual phases of the Project, as construction details become available.

The Corps shall conduct a current records and literature search at the Northwest Information Center, Sonoma State University, Rohnert Park for Monterey County and Santa Cruz County prior to conducting archaeological surveys of the APE. Records and literature searches shall be considered complete and current for a period of three years after they are conducted unless, in the professional opinion of the Corps archaeologist, more frequent updates are required.

Survey recordation shall include features, isolates, and re-recordation of previously recorded sites, as necessary. The survey shall ensure that potential Historic Properties such as historical structures and buildings, historical

engineering features, landscapes, and viewsheds are recorded in addition to archeological sites. Recordation of historic structures, buildings, objects, and sites shall be prepared using the California Department of Parks and Recreation (DPR) 523 Site Record forms.

In consultation with Concurring Parties, the Corps will make a reasonable effort to identify historic properties with religious and cultural significance to Native American communities following **Stipulation X.A (Tribal Involvement)**. The Corps will also seek comments from Concurring Parties in making determination of NRHP eligibility following **Stipulation X.B (Tribal Involvement)**.

A geoarchaeological assessment will be included with the inventory report of the potential that subsurface archaeological resources may exist in the APE, and an appropriate effort to find and identify such resources.

B. **Property Types Exempt from Evaluation:** By agreement of the Signatories and through consultation between the Signatories, various property or feature types shall be exempt from evaluation.**Attachment 2** to this Agreement lists the properities that will be exempt from evaluation.

C. **Evaluation of Potential Historic Properties**: After recordation on DPR 523 Site Record forms, all potential Historic Properties shall be evaluated by a qualified professional for their eligibility for listing in the NRHP consistent with the *Secretary of Interior's Standards for Evaluation*, 36 C.F.R. § 60.4. In accordance with **Stipulation I (Timeframes and Review Procedures)**, the Corps shall submit a completed inventory and evaluation for each phase of Project work.

IV. DETERMINATION OF EFFECTS

Avoidance of adverse effects to Historic Properties is the preferred treatment approach. The Corps will consider redesign of Project elements in order to avoid Historic Properties and Project effects that may be adverse. However, in some cases, it may not be possible to redesign the Project in order to avoid adverse effects to Historic Properties.

The Corps will apply the criteria of adverse effect, pursuant to 36 C.F.R. § 800.5(a)(1), to all Historic Properties within the APE that will be affected by the Project. The Corps shall submit determinations of effects in accordance with **Stipulation I (Timeframes and Review Procedures)**.

V. HISTORIC PROPERTIES TREATMENT PLAN

If adverse effects are found, the Corps, in consultation with the SHPO and Concurring Parties shall develop a Historic Property Treatment Plan (HPTP), which would be appended to this agreement. The HPTP would outline the measures necessary to resolve adverse effects to Historic Properties. Development of appropriate measures

shall include consideration of Historic Property types and provisions for avoidance or protection of Historic Properties where possible.

The HPTP may be amended and appended to this Agreement without amending the Agreement. If adverse effects are found, the HPTP would be developed and implemented before construction commences.

A. **Review:** The Corps shall submit the Draft HPTP to the SHPO and Concurring Parties for review and comment pursuant to **Stipulation I (Timeframes and Review Procedures)**.

B. **Reporting:** Reports and other data pertaining to the adversely affected Historic Properties and the treatment of effects to Historic Properties may be provided to Concurring Parties to this Agreement and other members of the public, consistent with **Stipulation XII (Confidentiality)** of this Agreement.

C. **Amendments/Addendums/Revisions:** If an Historic Property type that is not covered by the existing HPTP is discovered within the APE subsequent to an initial inventory effort for a phase, or if the Corps and SHPO agree that another modification to the HPTP is necessary, the Corps shall submit an addendum to the HPTP to the SHPO and Concurring Parties for review and comment, and if necessary, shall follow the provisions of **Stipulation VIII (Discovery of Unknown Historic Properties)**. A single HPTP may cover multiple discoveries for the same property type as agreed upon by the Signatories.

D. **Data Recovery:** Data recovery is not always the appropriate method of resolving adverse effects for archaeological sites. Appropriate treatment wil be decided in consultation with the consulting parties and signatories to this Agreement. When data recovery is proposed, the Corps, in consultation with the SHPO, shall ensure that specific Research Designs are developed consistent with the *Secretary of the Interior's Standards and Guidelines for Archaeology and Historic Preservation* and the ACHP's "Recommended Approach for Consultation on Recovery of Significant Information from Archaeological Sites" (ACHP, May 18, 1999).

E. **Final Phase Report Documenting Implementation of the Historic Properties Treatment Plan:** Within one year after the completion of all work conducted to resolve adverse effects for that phase under the HPTP, the Corps shall submit to the SHPO and Concurring Partiesa Final Phase Report documenting the results of all work prepared for that phase under the HPTP, and the information learned from each of the Historic Properties. The submittal of the Final Phase Report shall be in accordance with **Stipulation I (Timeframes and Review Procedures)**.

VI. QUALIFICATIONS

A. **Professional Qualifications:** All technical work required for historic preservation activities implemented pursuant to this Agreement shall be carried out by or under

the direct supervision of a person or persons meeting, at a minimum, the *Secretary of Interior's Professional Qualifications Standards* for archeology or history, as appropriate (48 Fed. Reg. 44,739). "Technical work" here means all efforts to inventory, evaluate, and perform subsequent treatment such as data recovery excavation or recordation of potential Historic Properties that is required under this Agreement. This stipulation shall not be construed to limit peer review, guidance, or editing of documents by SHPO or associated Project consultants.

B. **Historic Preservation Standards:** Historic preservation activities carried out pursuant to this Agreement shall meet the *Secretary of Interior's Standards and Guidelines for Archaeology and Historic Preservation* (48 Fed. Reg. 44,716-44,740), as well as standards and guidelines for historic preservation activities established by the SHPO. The Corps shall ensure that all reports prepared pursuant to this Agreement will be provided to the Signatories and Concurring Parties and are distributed in accordance with **Stipulation XII (Confidentiality),** and meet published standards of the California Office of Historic Preservation, specifically, *Preservation Planning Bulletin* Number 4(a), "Archaeological Resources Management Reports: Recommended Contents and Format" (December 1989).

C. **Archeological Monitor Standards:** Archeological monitoring activities required for exploratory, construction, or construction related ground disturbing activities implemented pursuant to this Agreement shall be carried out by a person meeting, at a minimum, the *Secretary of Interior's Professional Qualifications Standards* for prehistoric or historic archaeology, as appropriate (48 Fed. Reg. 44,739). "Archeological monitoring" here includes monitoring ground disturbing activities that have been determined by the Corps to be occurring in areas potentially sensitive for Historic Properties or buried resources.

VII. NOTICES TO PROCEED WITH CONSTRUCTION

Notices to Proceed may be issued by the Corps for individual construction segments, defined by the Corps in its construction specifications, after a Historic Properties inventory has been completed per **Stipulation V (Historic Properties Management Plan)** or **Stipulation III (Identification and Evaluation)**, and prior to treatment of adverse effects on Historic Properties within the APE provided that:

A. A plan to respond to inadvertent archeological discoveries is prepared by the Corps, and approved by SHPO, prior to the commencement of Project activities anywhere in the APE for that phase of the Project; and

B. Project development activities do not encroach within 30 meters (100 feet) of the known boundaries of any Historic Property as determined from archeological site record forms, other documentation, or as otherwise defined in consultation with the SHPO and other parties, unless provided for in the HPTP; and

C. An archeological monitor meeting the professional qualifications as described in **Stipulation VI (Qualifications)**, is present during any Project activities that are anticipated to extend either vertically or horizontally into any areas designated to be archeologically sensitive by the Corps, in consultation with SHPO, except in phases of construction where visual inspection of the construction area cannot be safely or feasibly accomplished.

VIII. DISCOVERY OF UNKNOWN HISTORIC PROPERTIES

The Corps is responsible for complying with 36 C.F.R. § 800.13(a) in the event of inadvertent discoveries of Historic Properties during implementation of the Project. If an HPTP has been prepared, the HPTP will provide specific procedures for complying with post review and inadvertent discoveries of Historic Properties. If an HPTP has not been prepared and there is a discovery of an unknown historic property, the Corps shall follow 36 C.F.R. § 800.13(b). Additionally, the following procedures shall be followed:

A. **Workforce Training:** During implementation of Project activities, the Corps, or archeologists meeting the professional qualifications as described in **Stipulation VI (Qualifications)**, will provide training to all construction personnel before they begin work, regarding proper procedures and conduct in the event that archeological materials are encountered during construction.

B. **Human Remains:** In cases when human remains are discovered on non-federally owned property within the designated APE, NAGPRA would not apply. The landowner shall ensure that Native American human remains and grave goods encountered during the Undertaking that are located on state or private land are treated in accordance with the requirements in California State Health and Safety Code, Section 7050.5 and Public Resources Code 5097.98. If Native American human remains are encountered within the context of a National Register eligible archaeological site, a clear means of identifying those remains and grave goods will be described in the HPTP. Any procedures described in the HPTP regarding the handling or treatment of human remains will be coordinated with the landowner to ensure that they are consistent with Public Resources Code 5097.98.

IX. CURATION

If curation is determined to be appropriate mitigation to resolve adverse effects to Historic Properties, curation shall be conducted in accordance with 36 C.F.R. pt. 79, except those materials identified as Native American human remains and items associated with Native American burials. Archeological items and materials from State or privately owned lands shall be maintained in accordance with 36 C.F.R. pt. 79 until any specified analyses are complete. This agreement incorporates by reference the definitions for "human remains" and "funerary objects" set forth in 43 C.F.R. § 10.2(d) and those definitions shall apply to actions under this Agreement. Further treatment

of human remains is addressed in **Stipulation VIII (Discovery of Unknown Historic Properties)**.

X. TRIBAL INVOLVEMENT

A. In consultation with Native American interested parties and Tribes, the Corps will make a reasonable and good-faith effort to identify Historic Properties of traditional religious and cultural importance. The Corps shall ensure that consultation with Native American Tribes is initiated early with respect to the Project and continues throughout the Section 106 process.

B. In accordance with the guidance provided in National Register Bulletin 38 and Preservation Brief 36, the Corps will seek comments from all potentially interested Native American interested parties and Tribes in making determinations of NRHP eligibility for any Traditional Cultural Properties (TCPs) and Cultural Landscapes (as defined in Bulletin 38 and Preservation Brief 36). Review of documentation shall be consistent with **Stipulation I (Timeframes and Review Procedures)**.

C. In consultation with Native American interested parties and Tribes, the Corps will consider Tribal Monitoring as a mitigation measure when preparing HPTPs pursuant to **Stipulation V (Historic Properties Treatment Plan)**, or as a requirement during construction activities when issuing Notices to Proceed pursuant to **Stipulation VII (Notices to Proceed with Construction)** in areas with potential for Historic Properties of traditional religious and cultural importance. Areas with potential for Historic Properties of traditional religious and cultural importance will be determined in consultation with Native American interested parties and Tribes.

D. Pursuant to 36 C.F.R. § 800.6(c)(2)-(3), the Corps shall consider requests by Native American Tribes to become Concurring Parties to this Agreement. In accordance with **Stipulation XII (Confidentiality)**, Concurring Parties to this Agreement will receive documents produced under this Agreement, as appropriate.

E. Native American Tribes may choose not to sign this Agreement as a Concurring Party. Native American Tribes and individuals not acting as Concurring Parties to the Agreement will be contacted when the Corps is made aware of their potential interest in a specific phase or action of the project. The Corps will make a good faith effort to identify any Native American organizations and individuals with interest in the proposed treatment of Historic Properties. The identification effort may include contacting the Native American Heritage Commission (NAHC), using online databases, and using personal and professional knowledge. The Corps will then contact each identified organization and individual by mail or email inviting them to consult about the specific Historic Properties. If interest from the contacted parties is received by the Corps, the Corps will proceed to consult in accordance with **Stipulation X.A. (Tribal Involvement)**. Further consultation may

also be carried out through either letters of notification, emails, public meetings, environmental assessments/environmental impact statements, site visits, and/or another method requested by a Native American interested party and Tribe. Failure of any contacted group to comment within thirty (30) calendar days from the date of notification shall not preclude the Corps from proceeding with the Project.

F. The Corps shall make a reasonable and good-faith effort to ensure that Native American Tribes, acting as either Concurring Parties or those expressing interest in the project, will be invited to participate in the development and implementation of the terms of this Agreement, including, but not limited to, the identification of the APE, identification of potential Historic Properties, determinations of eligibility, findings of effect, and the resolution of adverse effect for those Historic Properties. Review periods shall be consistent with **Stipulation I (Timeframes and Review Procedures)** except in situations involving unanticipated discoveries and treatment, which shall follow the review schedules of **Stipulation VIII (Discovery of Unknown Historic Properties)**. The Corps shall ensure that all interested Native American reviewers receive copies of all final survey and evaluation reports.

XI. PUBLIC CONSULTATION AND PUBLIC NOTICE

A. Pursuant to 36 C.F.R. § 800.6(c)(2)-(3), the Corps will consider requests by interested parties to become Concurring Parties to this Agreement. Within thirty (30) calendar days of the effective date of this Agreement, the Corps shall consult with the SHPO to compile a list of members of the interested public who shall be provided notice of this Agreement.

B. The interested public will be invited to provide input on the identification, evaluation, and proposed treatment of Historic Properties. This may be carried out through either letters of notification, public meetings, environmental assessment/environmental impact statements, and/or site visits. The Corps shall ensure that any comments received from members of the public are taken under consideration and incorporated where appropriate. Review periods shall be consistent with **Stipulation I (Timeframes and Review Procedures)**. In seeking input from the interested public, locations of Historic Properties will be handled in accordance with **Stipulation XII (Confidentiality)**. In cases where the release of location information may cause harm to the Historic Property, this information will be withheld from the public in accordance with Section 304 of the NHPA, 54 U.S.C. § 307103.

XII. CONFIDENTIALITY

Confidentiality regarding the nature and location of the archaeological sites and any other cultural resources discussed in this Agreement shall be limited to appropriate Corps personnel, Corps contractors, Native American tribes, the SHPO, and those

parties involved in planning, reviewing and implementing this Agreement in accordance with Section 304 of the NHPA, 54 U.S.C. § 307103.

XIII. DISPUTE RESOLUTION

A. Should any Signatory Party to this Agreement object in writing to any action proposed or carried out pursuant to this Agreement, the Corps will immediately notify the SHPO and the Concurring Parties of the objection and proceed to consult with the objecting party for a period of time, not to exceed thirty (30) calendar days, to resolve the objection. If the objection is resolved through consultation, the Corps may authorize the disputed action to proceed in accordance with the terms of such resolution. If the Corps determines that the objection cannot be resolved, the Corps shall forward all documentation relevant to the dispute to the ACHP and notify Signatories and concurring parties of this decision. Within forty-five (45) calendar days after receipt of all pertinent documentation, the ACHP shall either:

(1) Advise the Corps that the ACHP concurs in the Corps' proposed response to the objection, whereupon the Corps will respond to the objection accordingly; or

(2) Provide the Corps with recommendations, which the Corps shall consider in reaching a final decision regarding the objection; or

(3) Notify the Corps that the ACHP will comment in accordance with the requirements of Section 106 of the NHPA, and proceed to comment. Any ACHP comment provided in response shall be considered by the Corps, pursuant to the requirements of Section 106 of the NHPA.

Should the ACHP not exercise one of the options under **Stipulation XIII.A. (Dispute Resolution)** within forty-five (45) calendar days after receipt of all submitted pertinent documentation, the Corps may move forward with implementation of the proposed response to the objection.

B. The Corps shall consider any ACHP recommendation or comment and any comments from the SHPO to this Agreement provided in accordance with this stipulation with reference only to the subject of the objection; the Corps' responsibility to carry out all actions under this Agreement that are not the subjects of the objection shall remain unchanged.

C. The Corps shall provide the SHPO and concurring parties with a written copy of its final decision regarding any objection addressed pursuant to **Stipulation XIII.A. (Dispute Resolution)**.

D. At any time during implementation of the measures stipulated in this Agreement should an objection pertaining to the Agreement be raised by a Concurring Party,

Native American Tribe, or a member of the public, the Corps shall notify the Signatory and Concurring Parties and take the objection under consideration, consulting with the objecting party and, should the objecting party request, any of the Signatory and Concurring Parties to thisAgreement, for no longer than fifteen (15) calendar days. The Corps shall consider the objection, and in reaching its decision, will consider all comments provided by the other parties. Within fifteen (15) calendar days following closure of the comment period, the Corps will render a decision regarding the objection and respond to the objecting party. The Corps will promptly notify the other parties of its decision in writing, including a copy of the response to the objecting party. The Corps' decision regarding resolution of the objection will be final. Following issuance of its final decision, the Corps may authorize the action that was the subject of the dispute to proceed in accordance with the terms of that decision. The Corps' responsibility to carry out all other actions under this Agreement shall remain unchanged.

XIV. NOTICES

A. All notices, demands, requests, consents, approvals or communications from all parties to this Agreement to other parties to this Agreement shall be personally delivered, sent by United States Mail, or emailed, and all parties shall be considered in receipt of the materials five (5) calendar days after deposit in the United States mail, certified and postage prepaid, return receipt requested.

B. Signatory and Concurring Parties agree to accept facsimiles or copies of signed documents and agree to rely upon such facsimiles or copies as if they bore original signatures.

XV. AMENDMENTS, NONCOMPLIANCE, AND TERMINATION

A. Amendment: Any Signatory Party to this Agreement may propose that the Agreement be amended, whereupon the Corps shall consult with the SHPO to consider such amendment. The Agreement may be amended only upon written concurrence of all Signatories.

All attachments to this Agreement, and other instruments prepared pursuant to this agreement including, but not limited to, the Project's description, initial cultural resource inventory report and maps of the APE, the HPTP, and monitoring and discovery plans, may be individually revised or updated through consultation consistent with **Stipulation I (Timeframes and Review Procedures)** and agreement in writing of the Signatories without requiring amendment of this Agreement, unless the Signatories through such consultation decide otherwise. In accordance with **Stipulation X (Tribal Involvement)** and **Stipulation XI (Public Consultation and Public Notice)**, the Concurring Parties, interested Native American Tribes, and interested members of the public, will receive a copy of amendments to the Project's description, initial cultural resource inventory reports and maps of the APE, the HPTP, and monitoring and discovery plans, as

appropriate, and copies of any amendment(s) to the Agreement.

B. **Termination:** Only the Signatories may terminate this Agreement. If this Agreement is not amended as provided for in **Stipulation XV.A. (Amendment)**, or if any Signatory proposes termination of this Agreement for other reasons, the Signatory proposing termination shall notify the other Signatory in writing, explain the reasons for proposing termination, and consult with the other Signatory to seek alternatives to termination, within thirty (30) calendar days of receipt of the notification.

Should such consultation result in an agreement on an alternative to termination, the Signatories shall proceed in accordance with that agreement.

Should such consultation fail, the Signatory proposing termination may terminate this Agreement by promptly notifying the other Signatory and Concurring Parties in writing.

Beginning with the date of termination, the Corps shall ensure that until and unless a new agreement is executed for the actions covered by this Agreement, such undertakings shall be reviewed individually in accordance with 36 C.F.R. § 800.4-800.6.

C. **Duration:** This Agreement shall remain in effect for a period of five (5) years after the date it takes effect and shall automatically expire and have no further force or effect at the end of this fivefive-year period unless it is amended or terminated prior to that time. No later than ninety (90) calendar days prior to the expiration date of the Agreement, the Corps shall initiate consultation to determine if the Agreement should be allowed to expire automatically or whether it should be extended, with or without amendments, as the Signatories may determine. Unless the Signatories unanimously agree through such consultation on an alternative to automatic expiration of this Agreement, this Agreement shall automatically expire and have no further force or effect in accordance with the timetable stipulated herein.

XVI. ANNUAL REPORTING

At the end of every calendar year following the execution of this Agreement, the Corps shall provide all parties to this Agreement a summary report detailing work carried out pursuant to its terms, if any. Such report shall describe progress made implementing the terms of the Agreement as well as include any scheduling changes proposed, any problems encountered, and any disputes and objections received in the Corps' efforts to carry out the terms of this Agreement. Any Signatory party may request to meet with the other Signatories to discuss implementation of this Agreement.

XVII. EFFECTIVE DATE

This Agreement shall take effect on the date that it has been fully executed by the Corps and the SHPO, and transmitted to the ACHP.

EXECUTION of this Agreement by the Corps and the SHPO, its transmittal to the ACHP, and subsequent implementation of its terms evidence that the Corps has afforded the ACHP an opportunity to comment on the undertaking and its effects on Historic Properties, that the Corps has taken into account the effects of the undertaking on Historic Properties, and that the Corps has satisfied its responsibilities under Section 106 of the NHPA and applicable implementing regulations for all aspects of the undertaking.

PROGRAMMATIC AGREEMENT
AMONG
THE U.S.ARMY CORPS OF ENGINEERS AND
THE CALIFORNIA STATE HISTORIC PRESERVATION OFFICER REGARDING
THE PAJARO RIVER FLOOD RISK MANAGEMENT PROJECT, MONTEREY
AND SANTA CRUZ COUNTIES, CALIFORNIA

SIGNATORIES TO THIS AGREEMENT:

U.S. ARMY CORPS OF ENGINEERS, SAN FRANCISCO DISTRICT

BY:_____ DATE : 8 JUL 2019
John D. Cunningham, Lieutenant Colonel, U. S. Army, District
Commander and Engineer

CALIFORNIA STATE HISTORIC PRESERVATION OFFICER

BY:_____ DATE: 7/16/19
Julianne Polanco, State Historic Preservation Officer

CONCURRING PARTIES TO THIS AGREEMENT :

MONTEREY COUNTY, CALIFORNIA

BY :_____DATE :_____

CONCURRING PARTIES TO THIS AGREEMENT :

SANTA CRUZ COUNTY, CALIFORNIA

BY :_____DATE :_____

CONCURRING PARTIES TO THIS AGREEMENT :

AMAH MUTSUN TRIBAL BAND

BY :_____DATE :_____

CONCURRING PARTIES TO THIS AGREEMENT :

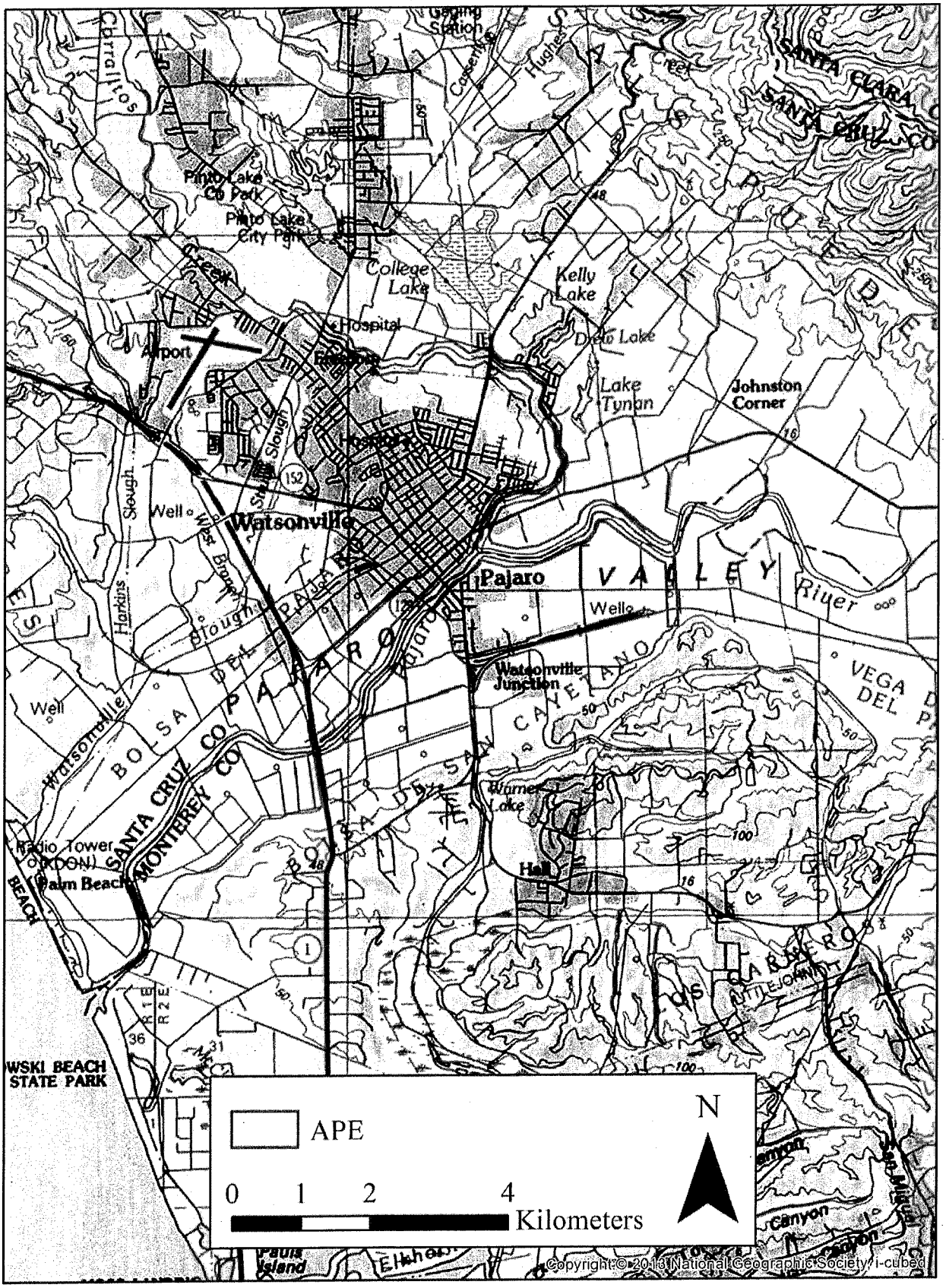
ESSELEN TRIBE OF MONTEREY COUNTY

BY :_____DATE :_____

CONCURRING PARTIES TO THIS AGREEMENT :

OHLONE/COSTANOAN-ESSELEN NATION

BY : _____ DATE : _____



Attachment 1. Map of APE.

Attachment 2

Property Types Exempt from Evaluation

This attachment defines categories of properties that do not warrant evaluation pursuant to Stipulation III.B of this Agreement. Only individuals meeting the Secretary of the Interior's Professional Qualification Standards pursuant to Stipulation VI.A of this agreement are authorized to determine whether properties meet the requirements of this attachment and are therefore exempt from evaluation and consultation with SHPO. Exempted properties may be documented, if documentation is warranted, at a level commensurate with the nature of the property (e.g., DPR 523 Primary Form, Location Map, memo). The Corps Cultural Resources staff shall make any final determinations on level of documentation required under this agreement.

Exempt Property Type 1: Archaeological Property Types and Features

1. Isolated prehistoric finds consisting of fewer than three items per 100 m^2
2. Isolated historic finds consisting of fewer than three artifacts per 100 m^2 (several fragments from a single glass bottle, and similar vessels are to be counted as one artifact)
3. Refuse scatters less than 50 years old (scatters containing no material that can be dated with certainty as older than 50 years old)
4. Features less than 50 years old (those known to be less than 50 years old through map research, inscribed dates, etc.)
5. Isolated refuse dumps and scatters over 50 years old that lack specific associations
6. Isolated mining prospect pits
7. Placer mining features with no associated structural remains or archaeological deposits
8. Foundations and mapped locations of buildings or structures more than 50 years old with few or no associated artifacts or ecofacts, and with no potential for subsurface archaeological deposits

Exempt Property Type 2: Minor, Ubiquitous, or Fragmentary Infrastructure Elements

The following list does not apply to properties 50 years old or older that could be potentially important, nor does it apply to properties that may contribute to the significance of larger historic properties such as districts or cultural landscapes.

Water Conveyance and Control Features

- Natural bodies of water providing a water source, conveyance, or drainage
- Modified natural waterways

- Concrete-lined canals less than 50 years old and fragments of abandoned canals
- Roadside drainage ditches and secondary agricultural ditches
- Small drainage tunnels
- Flood storage basins
- Reservoirs and artificial ponds
- Levees and weirs
- Gates, valves, pumps, and other flow control devices
- Pipelines and associated control devices
- Water supply and waste disposal systems
- Rip-rap

Recent Transportation or Pedestrian Facilities

- Railroad grades converted to other uses, such as roads, levees, or bike paths
- Bus shelters and benches
- Vista points and rest stops
- Bike paths, off-road vehicle trails, equestrian trails, and hiking trails
- Parking lots and driveways

Highway and Roadside Features

- Isolated segments of bypassed or abandoned roads
- Retaining walls
- Highway fencing, soundwalls, guard rails, and barriers
- Drains and culverts, excluding culverts assigned a Caltrans bridge number
- Cattle crossing guards
- Roadside landscaping and associated irrigation systems
- Signs and reflectors
- Telecommunications services, including towers, poles, dishes, antennas, boxes, lines, cables, transformers, and transmission facilities
- Utility services, including towers, poles, boxes, pipes, lines, cables, and transformers
- Oil and gas pipelines and associated control devices

Adjacent Features

- Fences, walls, gates, and gateposts

- Isolated rock walls and stone fences
- Telephone booths, call boxes, mailboxes, and newspaper receptacles
- Fire hydrants and alarms
- Markers, monuments, signs, and billboards
- Fragments of bypassed or demolished bridges
- Temporary roadside structures, such as seasonal vendors' stands
- Pastures, fields, crops, and orchards
- Corrals, animal pens, and dog runs
- Open space, including parks and recreational facilities
- Building and structure ruins and foundations less than 50 years old

Movable or Minor Objects

- Movable vehicles
- Stationary vehicles less than 50 years old or moved within the last 50 years
- Agricultural, industrial and commercial equipment and machinery
- Sculpture, statuary, and decorative elements less than 50 years old or moved within the last 50 years