Attachment 20 – Devereux Creek Flood Analysis
(Stantec, 2016)

Devereux Creek Flood Analysis

An evaluation of the reduction in flood impacts due to the implementation of the UCSB North Campus Open Space Restoration Project

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June 3, 2016

Revision	Description	Author		Quality Check		Independent Review	
1	Initial Draft	C.Steward	6/3/16	S.Wang	5/31/16		

Sign-off Sheet

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Executive Summary

The Devereux Creek Flood Analysis identifies the hydraulic impacts expected to occur due to water surface elevations due to the proposed grading and structural changes proposed as the UCSB North Campus Open Space Restoration Project. These changes include:

- Excavation of approximately 350,000 cubic yards of soil
- Lowering of the Devereux Creek Main Reach sufficiently to allow saline water to enter from the Venoco Crossing to near the confluence Tributary 2 (Phelps Ditch).
- Construction of four new bridges or crossings – three in Tributary 3 and one over Tributary 2 (Phelps Ditch).
- Removal of one existing pedestrian bridge over Tributary 2 (Phelps Ditch).

As a result of the grading changes which generally involve mass grading and the removal of sediment from the channel, between the Venoco Crossing and Phelps Road, there will be a reduction in the 100-year water surface elevation generally ranging between 1.5 and 2 feet. This reduction in the flood elevation will remove eight (8) single family dwelling units and approximately sixteen (16) condominium units in two locations.

Within the affected area there will be no rise in the 100-year water surface elevation that will negatively impact property owners other than UCSB.

Abbreviations

cfs	Cubic feet per second
CLOMR	Conditional Letter of Map Revision
DFIRM	Digital Flood Insurance Rate Map (published by FEMA)
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map ((published by FEMA)
FIS	Flood Insurance Study (published by FEMA)
HEC-RAS	Hydrologic Engineering Center – River Analysis System[1]
LOMR	Letter of Map Revision
UCSB	University of California at Santa Barbara

[1] Software program supplied by the U.S. Army Corp of Engineers Hydrologic Engineering Center.

1.0 PURPOSE OF THE REPORT

The purpose of this report is to document the methods and assumptions used in this Devereux Creek flood analysis to support funding request from Santa Barbara County Flood Control District and for submittal of a Conditional Letter of Map Revisions (CLOMR) to the Federal Emergency Management Agency (FEMA).

2.0 LOCATION

Devereux Creek is located west of Storke Avenue, adjacent to the University of California at Santa Barbara (UCSB) Married Student Housing, and about 10 miles west of the City of Santa Barbara, California. See Figure 1. The evaluation encompasses the following Santa Barbara County Assessor Parcel Numbers:

- 073-063 - various
- 073-090-056
- 073-090-071
- 073-090-074

This study evaluates the portion of Devereux between the Pacific Ocean and Phelps Road. It includes the main reach as well as Devereux Slough, Tributary 2 (Phelps Ditch) and Tributary 3 (unnamed extension south of Whittier Drive. See Figure 2.

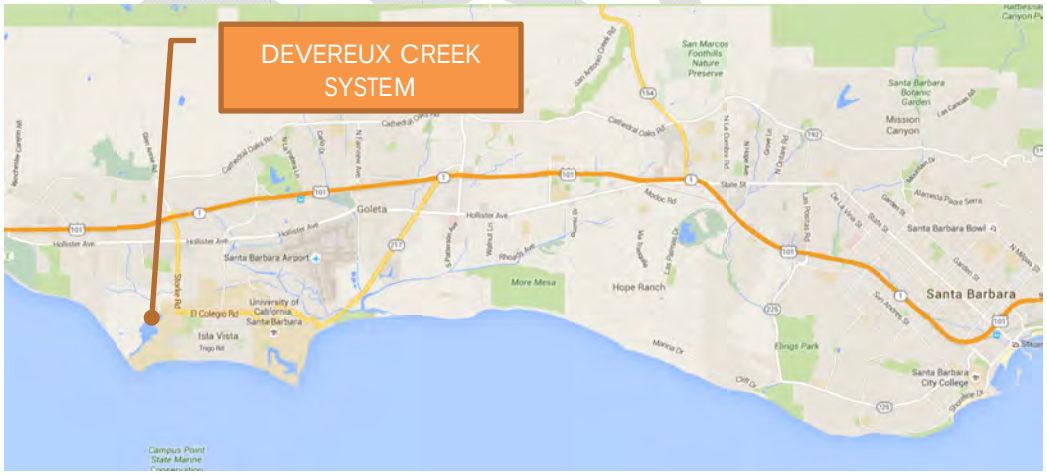


Figure 1 - Vicinity Map

Figure 2 - Location Map

3.0 BACKGROUND

In the early 1960s, Ocean Meadows Golf Course was developed by University Exchange Properties along the banks of Devereux Creek. The golf course was constructed by excavating adjacent hillsides to creek and filling in the creek banks to create gentle slopes along the Creek. This fill along with urban development within the watershed has created a situation where there has been a reduction in habitat values, increased shallow flooding in adjacent neighborhoods, and difficulty in maintaining the channel through the golf course.

In 2013, the Trust for Public Land purchased the Ocean Meadows Golf Course and donated to UCSB with the intention of restoring this reach of Devereux Creek to a more natural state. ESA

Inc. has entered into a contract with UCSB to prepare grading plans and evaluate the impacts of these grading improvements on the 100 year flood elevations. Stantec Consulting Services Inc. has been selected to assist ESA in evaluating the changes in flood conveyance and to prepare a submittal that would be forwarded to FEMA for a CLOMR.

4.0 METHODS AND ASSUMPTIONS

The following sections outline the methods and assumptions used in the analysis of Devereux Creek and its tributaries.

4.1 TOPOGRAPHIC INFORMATION

All elevation and survey information presented in this report is based on NAD83 horizontal datum and NAVD1988 vertical datum. Topographic mapping was prepared by Stantec Consulting Services Inc. based on aerial photography dated March 2016 and detailed survey fill-in. In addition to the aerial photography, ESA collected some bathymetric data in the Devereux Slough.

Using this survey information, two surfaces were prepared by ESA for the use of flood analysis:

- Pre-project (current condition)
- Post-project (with proposed grading)

Topographic data was visually verified and photographically documented.

4.2 MODELING

Hydraulic modeling was prepared using HEC-RAS version 5.0. Three models were prepared:

- Duplicate Effective Model – Using data received from FEMA[2], an effective model (representing the information that FEMA has used to determine current flood elevations) was prepared and checked against published water surface elevations. Data was available for the Main Reach and Tributary 2 (Phelps Ditch). No runs were available for Tributary 3 (unnamed creek).
- Existing Condition Model – Using sections cut from the Pre-Project surface and available survey and record information on bridges and culverts, a model was prepared evaluating the current condition of the study reaches of Devereux Creek. Elevations within the Devereux Slough were adjusted using bathymetric data from ESA to more accurately model ground elevations below the ponded water of the slough which was not accurately depicted in the aerial topography.

[2] LOMR 12-09-0332P reissued as LOMR 12-09-3093P

- Proposed Condition Model – Using the same sections cut from the Pre-Project surface in areas not subject to change and new sections cut from the post-project surface, a model was prepared showing proposed improvements which included:
    - Significant grading; and
    - Construction of four pedestrian access structures
- Proposed Condition Floodway Model – using the proposed condition model results, a floodway was calculated initially using Type 4 and Type 5 encroachments (equal conveyance reduction) and later fine-tuned using Type 1 encroachments.

Model results, including exhibits, MT-3 forms, and tables are included in Appendix C. Although the analysis extends from the Pacific Ocean to upstream of Phelps Road, the FEMA evaluation area will be limited to those areas affected by the proposed improvements which begin at the Pacific Ocean and extend upstream to where the proposed 100-year flood elevations and floodplain widths match the effective model.

4.3 FLOW RATES

The peak flow rates used in the analysis were taken from the FEMA data supplied from previous LOMRs. See Table 1. FEMA data only includes the 100-year flow rates.

Table 1 - Peak Flow Rates Used in the Analysis

Location	Peak 100-Year Flowrate, cfs
Main reach upstream of confluence with Tributary 2	3,500
Main reach between Tributary 2 and Tributary 3	4,100
Main reach downstream of Tributary 3 to the downstream end of the Devereux Slough	4,100
Main reach between the downstream end of the Devereux Slough to the Pacific Ocean	3,900
Tributary 2 from Phelps Road to the confluence with the main reach.	2,000
Tributary 3 from Storke Road to the confluence with the main reach.	150*
*No effective data was received from FEMA on Tributary 3. There is no flow change evident from the discharge of Tributary 3 to the main reach. An arbitrary flow rate was applied to Tributary 3.	

4.4 STARTING WATER SURFACE ELEVATIONS

Starting elevations at the confluence with the Pacific Ocean were based on starting water surface elevation used in the effective analysis. Additionally, initial cross section elevation (which represents a sand bar that washes out annually during high flow) was configured in accordance with data developed by ESA during the past year of observations and measurement.

4.5 MANNING ROUGHNESS VALUES AND MINOR LOSSES

Mannings roughness values were based on field observation, review of aerial photography and Google Earth. Devereux Creek Main Reach and Tributary 3 are both largely open grassed areas with little in the way of obstructions. Phelps Ditch has been successfully revegetated in the main channel area forming a dense canopy, but leaving the channel bottom (w = 10' to 15') clear of vegetation due to significant shading.

Expansion and Contraction losses were assumed to be 0.1 and 0.3 in most channel areas. Around bridges they were set to 0.3 and 0.5 in accordance with standard practice.

Areas that did not contribute to significant conveyance were modeled as ineffective.

4.6 SCOUR ESTIMATION AND COUNTERMEASURE DESIGN

Scour at the Venoco Bridge Crossing will be evaluated using the methodologies found in the following United States Department of Transportation publications:

- HEC-11, Design of Rip-Rap Revetment
- HEC-18, Evaluating Scour at Bridges
- HEC-23, Bridge Scour and Stream Instability counter Measures, 3rd Edition, Volume 1
- HEC-23, Bridge Scour and Stream Instability counter Measures, 3rd Edition, Volume 2

At this time, insufficient detail has been available to allow an evaluation of scour and countermeasures at this location.

5.0 FINDINGS

The following information was determined from the various analyses. Detailed results are included in the Appendices.

FEMA MT-2 Submittal forms have been roughly compiled in Appendix C. However, the information shown on them will likely eventually be converted to on-line submittals as this is the preferred method of data submission by FEMA.

5.1 DUPLICATE EFFECTIVE ANALYSIS

The duplicate effective was taken from the HEC-RAS data supplied by FEMA. The results were compared to the Flood Insurance Study (FIS) elevations, Table 6, the FIS profiles, and the Digital Flood Insurance Rate Maps (DFIRM). The typical range of accuracy is that the duplicate effective model elevations should be within about 0.5 ft of the published values.

Slight inconsistencies were found in the DFIRM section locations and the information presented on the FIS profile for the Main Reach of Devereux Creek. When compared to the hydraulic model, it was clear that the DFIRM location information for Section I and Section J were misplaced. The FIS profile and stationing found to correspond to the effective model.

Tributary 2 values from the FEMA-supplied Duplicate Effective model did not match up very well with the DFIRM values or the Effective data supplied with the LOMR report dated October 4, 2011 (also supplied by FEMA). Post-Project water surface elevations were compared to both the duplicate effective and pre-project values.

The work map in Appendix B contains the approximate cross section locations which were scaled from available information and cross checked against items of know locations.

Refer to the following tables and figures in the report.

Figures:

Tables:

Table 2 - Duplicate Effective Results for Devereux Creek, Main Reach

			HEC-RAS	DFIRM	FIS Table 6
FEMA			Effective	Effective	Effective
Section	River Sta	Q Total	W.S. Elev	W.S. Elev	W.S. Elev
		(cfs)	(ft)	(ft)	(ft)
	190				
	300	3900	7.77		
	500	3900	9.73		
	800	3900	10.46		
A	1100	3900	10.55	10.9	10.9
	1400	3900	10.73		
B	1700	3900	10.90	11.2	11.2
C	2020	4100	11.26	11.6	11.6
	2450	4100	11.26		
	2750	4100	11.27		
	3180	4100	11.27		
D	3767	4100	11.29	11.6	11.6
	3917	4100	11.30		
	3966	4100	11.94		
	3987	4100	12.01		
	4003	Bridge			
	4017	4100	13.40		
	4039	4100	13.59		
	4052	4100	13.53		
	4091	4100	13.50		
E	4302	4100	15.61	15.7	16.2
	4606	4100	15.88		
	4696	4100	16.01		
	4747	4100	16.04		
	4753.5	Bridge			
	4760	4100	16.07		
	4804	4100	16.10		
	5209	3500	16.20		
	5513	3500	16.21		
F	5764	3500	16.36	16.4	16.7
	6015	3500	16.50		
	6216	3500	16.52		
	6466	3500	16.78		
	6717	3500	16.94		
G	7028	3500	17.15		
	7316		17.27		
H	7621		17.40	17.3	17.3
	7900		17.55		
H (misplaced)	8200		17.61		
	8500		18.60		
	8732		19.38		
	9000		20.07		
	9232		21.63		
	9400		23.59		

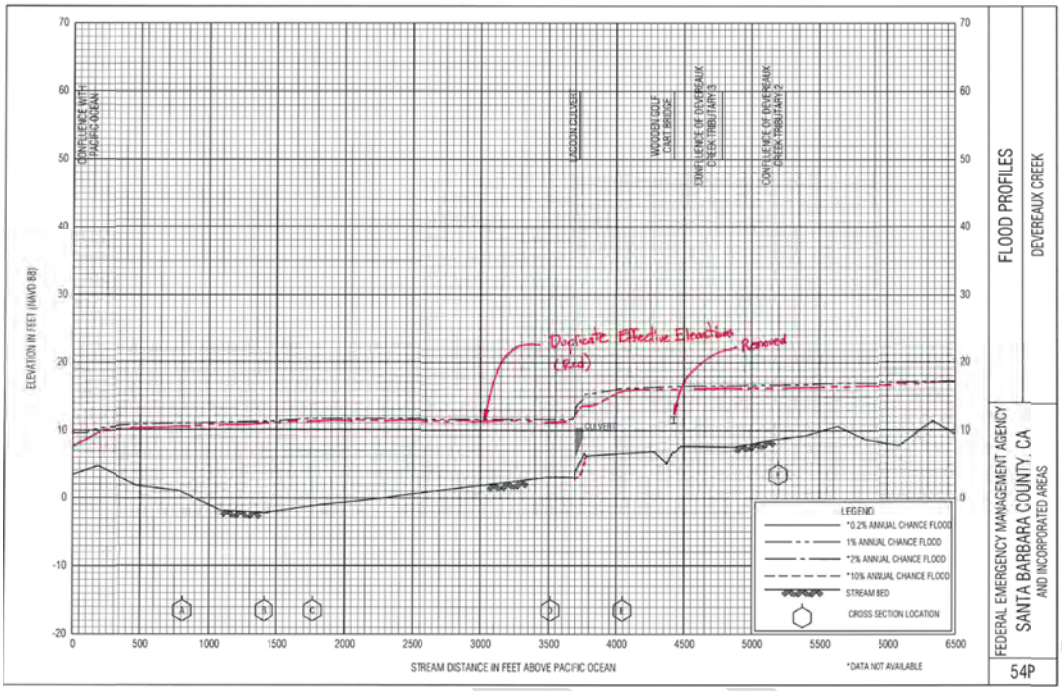


Figure 3 - Main Reach - Duplicate Effective Comparison

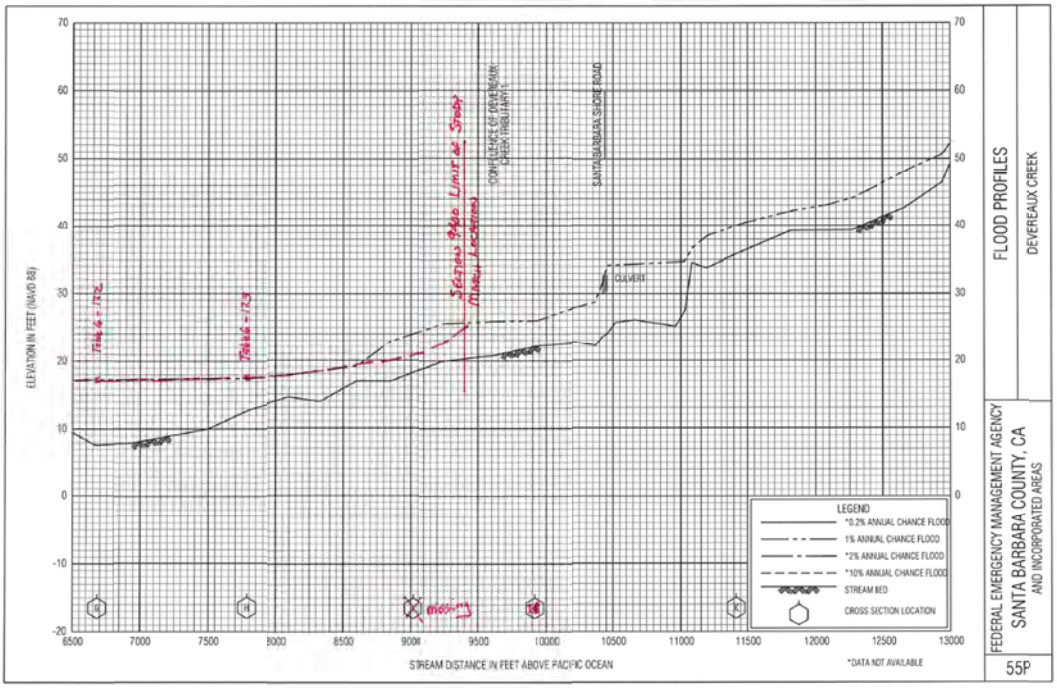


Figure 4 - Main Reach Duplicate Effective Comparison

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Devereaux Creek								
A	791[1]	133	1,218	3.2	10.9	10.9	11.7	0.8
B	1,400[1]	105	966	4.0	11.2	11.2	11.9	0.7
C	1,760[1]	545	6,684	0.6	11.6	11.6	12.3	0.7
D	3,495[1]	360	2,757	1.5	11.6	11.6	12.2	0.6
E	4,030[1]	213	1,272	3.2	16.2	16.2	17.1	0.9
F	5,178[1]	202	1,258	2.8	16.7	16.7	17.6	0.9
G	6,666[1]	203	1,370	1.2	17.2	17.2	18.2	1.0
H	7,791[1]	178	878	1.9	17.3	17.3	18.3	1.0
I	9,025[1]	44	178	6.8	23.9	23.9	24.0	0.1
J	9,929[1]	77	170	3.9	25.8	25.8	25.9	0.1
K	11,418[1]	85	211	3.1	39.9	39.9	40.7	0.8
L	13,184[1]	64	102	4.4	55.9	55.9	55.9	0.0
M	14,197[1]	58	135	3.3	70.3	70.3	70.3	0.0
N	14,729[1]	15	59	7.7	79.6	79.6	80.5	0.9
O	14,989[1]	18	50	9.0	90.7	90.7	91.0	0.3
P	15,595[1]	25	66	3.5	98.6	98.6	98.6	0.0
Devereaux Creek Tributary 1								
A	150[2]	123	427	1.2	25.7	25.7	26.7	1.0
B	1,349[2]	63	298	1.7	43.2	43.2	43.6	0.4
C	2,060[2]	33	125	2.9	49.6	49.6	49.9	0.3
D	2,505[2]	29	87	4.3	52.1	52.1	53.0	0.9
E	3,064[2]	13	46	3.3	58.1	58.1	58.1	0.0
F	3,569[2]	40	322	0.5	76.4	76.4	76.9	0.5

[1]Feet above Pacific Ocean
[2]Feet above confluence with Devereaux Creek

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

SANTA BARBARA COUNTY, CA AND INCORPORATED AREAS

FLOODWAY DATA

DEVEREAUX CREEK – DEVEREAUX CREEK TRIBUTARY 1

Figure 5 - Floodway Data for Devereux Creek Main Reach

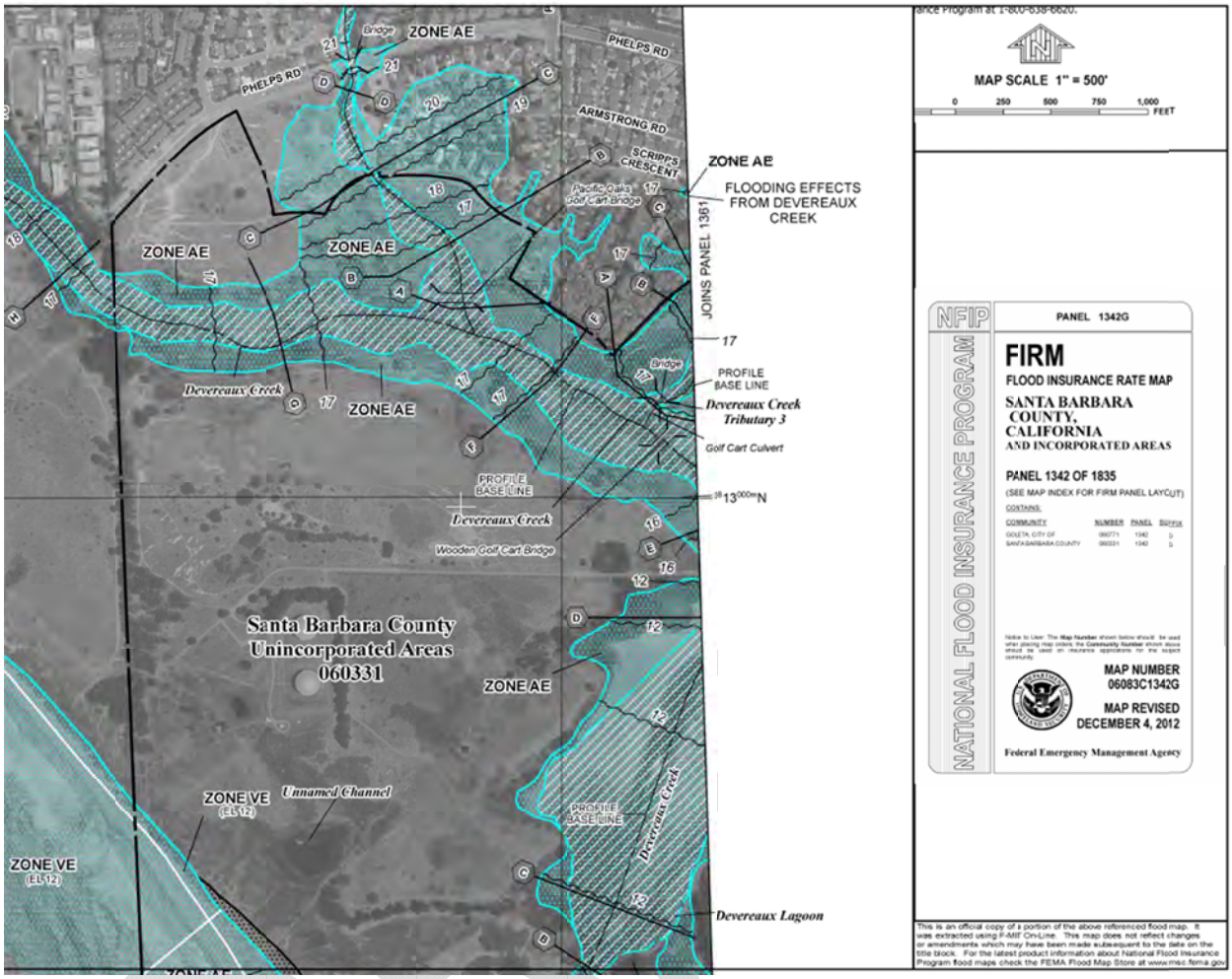


Figure 6 - Portion of FIRM Panel 1342

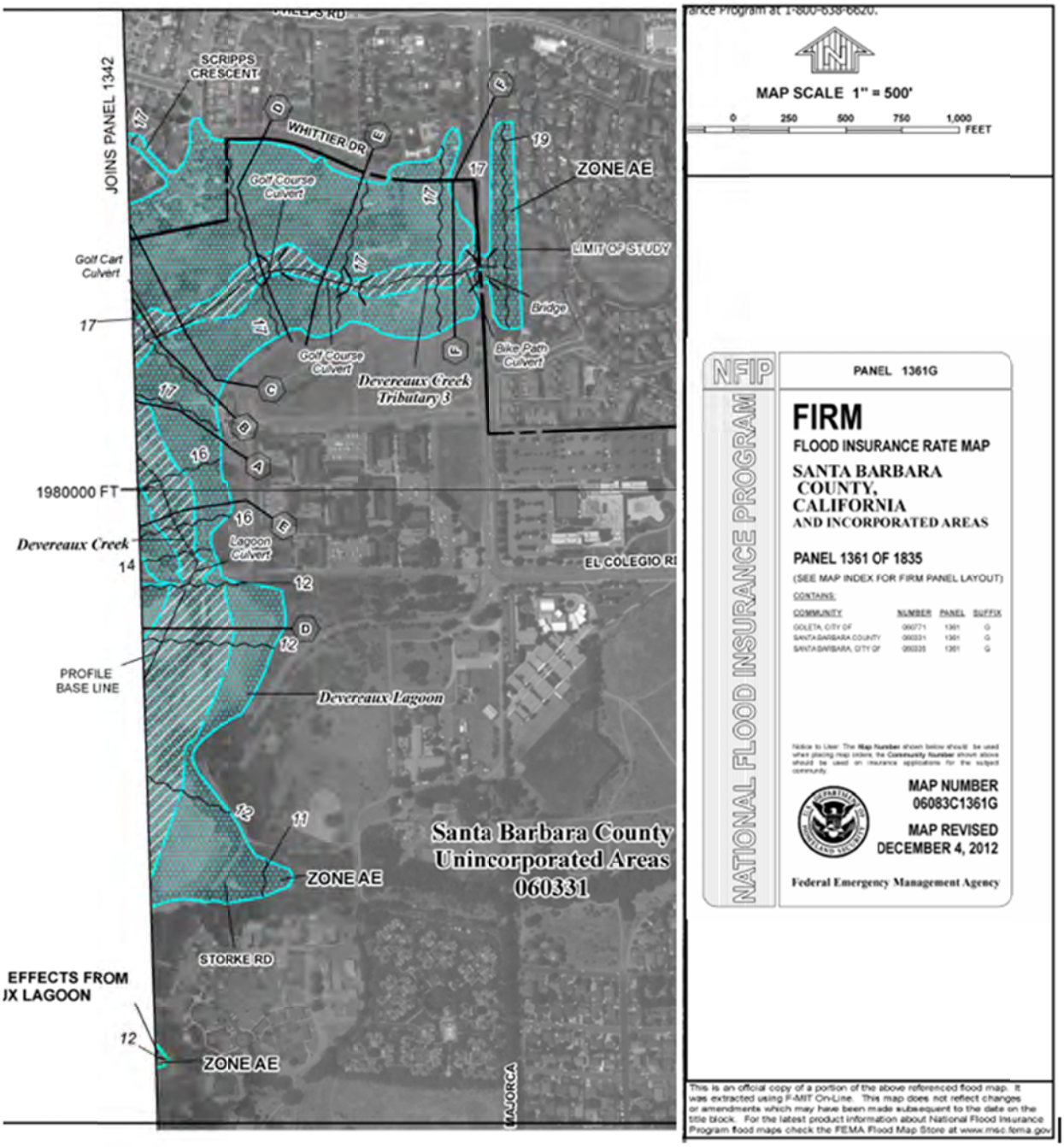


Figure 7 - Portion of FIRM Panel 1361

Table 3 - Duplicate Effective Results for Tributary 2

			HEC-RAS	DFIRM	FIS Table 6
FEMA	River Sta	Q Total	W.S. Elev	W.S. Elev	Effective
Section		(cfs)	(ft)	(ft)	W.S. Elev
	100	2000	16.50		
A	155	2000	16.55	16.6	17.1
	161.5	Bridge			
	168	2000	16.56		
B	215	2000	16.58	16.7	17.2
	444	2000	16.94		
	691	2000	17.73		
	940	2000	18.45		
	955	Bridge			
C	965	2000	18.49	18.6	19.4
	1000	2000	19.67		
	1163	2000	20.50		
	1400	2000	20.44		
D	1473	2000	20.88	21.0	20.5
	1529	2000	21.11		

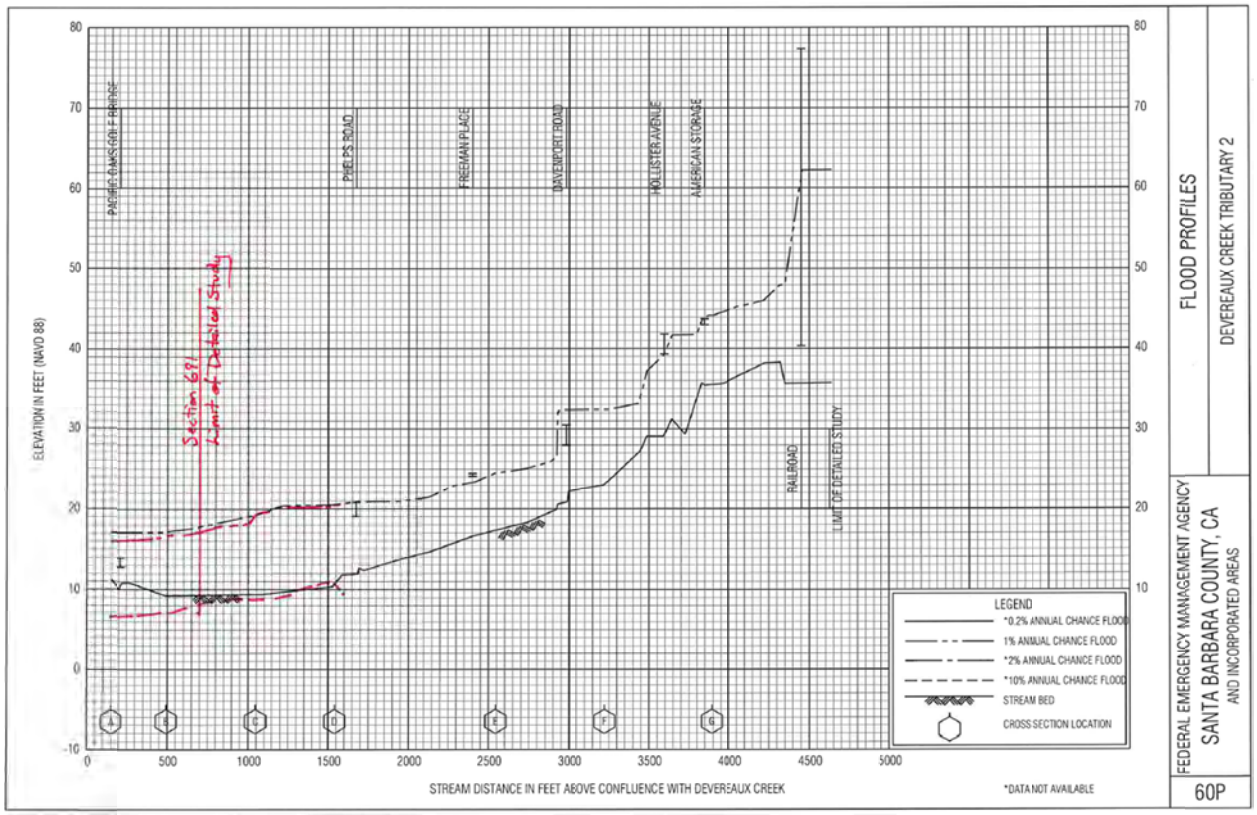
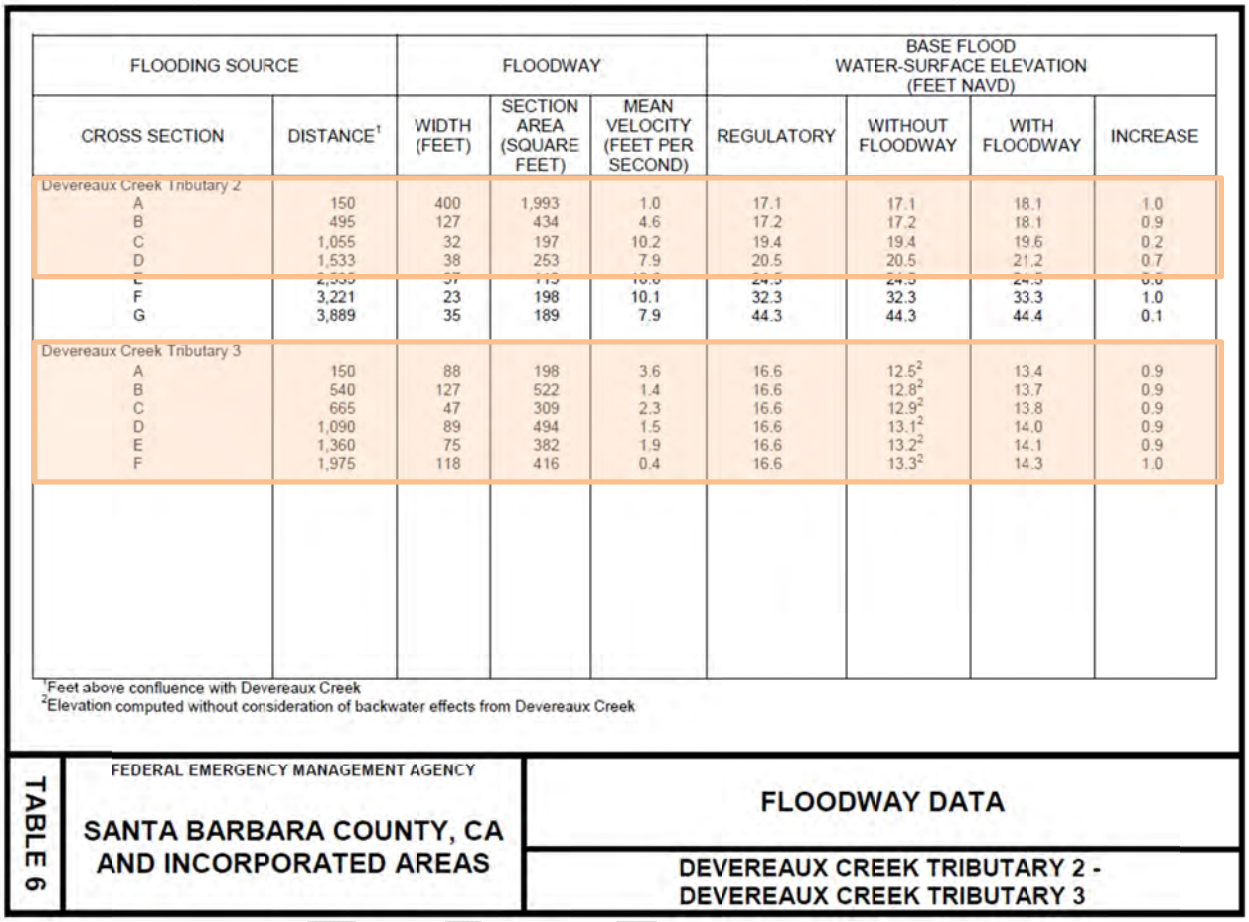


Figure 8 - Tributary 2 Duplicate Effective Comparison



FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Devereaux Creek Tributary 2								
A	150	400	1,993	1.0	17.1	17.1	18.1	1.0
B	495	127	434	4.6	17.2	17.2	18.1	0.9
C	1,055	32	197	10.2	19.4	19.4	19.6	0.2
D	1,533	38	253	7.9	20.5	20.5	21.2	0.7
E	2,535	37	115	16.6	24.5	24.5	24.5	0.0
F	3,221	23	198	10.1	32.3	32.3	33.3	1.0
G	3,889	35	189	7.9	44.3	44.3	44.4	0.1
Devereaux Creek Tributary 3								
A	150	88	198	3.6	16.6	12.5[2]	13.4	0.9
B	540	127	522	1.4	16.6	12.8[2]	13.7	0.9
C	665	47	309	2.3	16.6	12.9[2]	13.8	0.9
D	1,090	89	494	1.5	16.6	13.1[2]	14.0	0.9
E	1,360	75	382	1.9	16.6	13.2[2]	14.1	0.9
F	1,975	118	416	0.4	16.6	13.3[2]	14.3	1.0

[1]Feet above confluence with Devereaux Creek
[2]Elevation computed without consideration of backwater effects from Devereaux Creek

TABLE 6

FEDERAL EMERGENCY MANAGEMENT AGENCY

SANTA BARBARA COUNTY, CA AND INCORPORATED AREAS

FLOODWAY DATA

DEVEREAUX CREEK TRIBUTARY 2 - DEVEREAUX CREEK TRIBUTARY 3

Figure 9 - Floodway Data Table 6 for Tributary 2 and Tributary 3

Table 4 - Duplicate Effective Results for Tributary 3

			HEC-RAS	DFIRM	FIS Table 6
FEMA	River Sta	Q Total	W.S. Elev	W.S. Elev	Effective
Section		(cfs)	(ft)	(ft)	W.S. Elev
A	150	150	16.2	16.2	16.6
B	540	150		16.2	16.6
C	665	150		16.2	16.6
D	1090	150		16.2	16.6
E	1360	150		16.2	16.6
F	1975	150		16.2	16.6

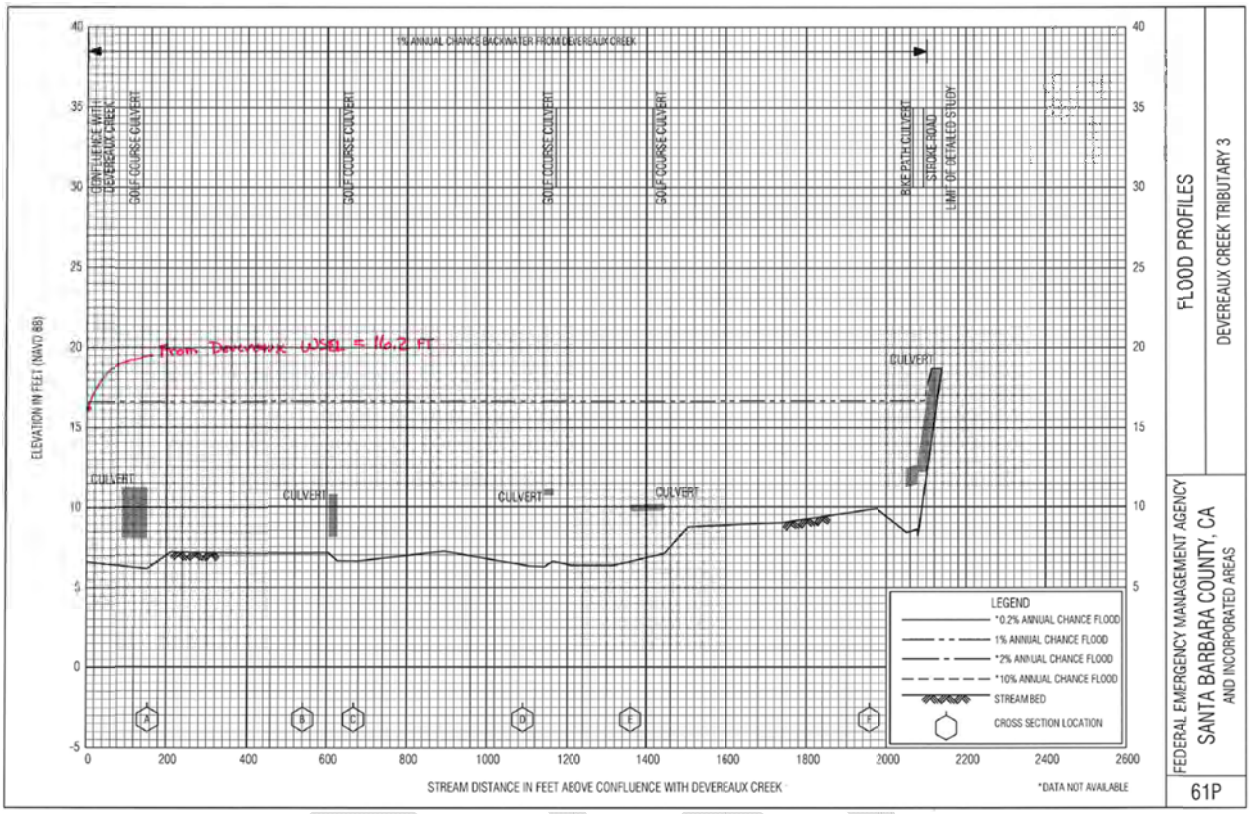


Figure 10 - Tributary 3 Duplicate Effective Comparison

5.2 EXISTING ANALYSIS

The existing conditions evaluation was prepared using a surface prepared by ESA from which cross sections were cut. Using these methods, cross sections and results are georeferenced. Specific changes that are reflected in the existing model that are different than the duplicate effective model are:

- Removal of a bridge in the main reach at Station 4425.
- Much more accurate and detailed topographic definition.

Table 5, Table 6, and Table 7 compare the existing 100-year flood elevation to the effective 100-year water surface elevation.

Figure 11 shows the 100-year water surface inundation limits (limits shown in cyan).

Table 5 - Main Reach Comparison of Existing Condition to Effective Condition

FEMA		Effective	Effective		Duplicate Effective		Existing/Pre-Project	
Section		DFIRM	LOMR Report Table 2		FEMA HEC-RAS		2016 Surface and FEMA	
Letter	SECNO	WSEL	WSEL	Diff.	WSEL	Diff.[1]	WSEL	Diff.[2]
	XX/190						8.12	
	300/XX				7.77			
	500/XX				9.73			
	XX/608						10.07	
	800/810				10.46		10.29	-0.17
A	1100/1110	10.90			10.55	-0.35	10.35	-0.20
	1400/1410				10.73		10.79	0.06
B	1700/1702	11.20			10.90	-0.30	11.20	0.30
C	2020/2047	11.60			11.26	-0.34	11.78	0.52
	2450/2368				11.26		11.80	0.54
	2750/XX				11.27			
	XX/3115						11.83	
	3180/XX				11.27			
	XX/3547						11.86	
D	3767/XX	11.60			11.29	-0.31		
	XX/3775						11.87	
	3917/3826				11.30		11.87	0.57
	3966/XX		11.90		11.94	0.04		
	3987/3906		12.00		12.01	0.01	11.86	-0.15
	4003				Bridge			
	4017/3979		13.40		13.40	0.00	14.94	1.54
	4039/XX		13.50		13.59	0.09		
	4052/XX		13.50		13.53	0.03		
	4091/XX		13.60		13.50	-0.10		
	XX/4055						14.36	
	XX/4118						15.80	
E	4302/4251	15.70	15.60	-0.10	15.61	0.01	15.95	0.34
	4606/XX		15.90		15.88	-0.02		
	XX/4570						16.11	
	4696/XX		16.00		16.01	0.01		
	4747/4675		16.00		16.04	0.04	16.13	0.09
	4753.5				Bridge			
	4760/4718		16.10		16.07	-0.03	16.15	0.08
	4804/4760		16.10		16.10	0.00	16.20	0.10
	5209/5096		16.20		16.20	0.00	16.30	0.10
	5513/5438		16.20		16.21	0.01	16.38	0.17
F	5764/5693	16.40	16.40	0.00	16.36	-0.04	16.57	0.21
	xx/5871						16.71	
	6015/xx		16.50		16.50	0.00		
	6216/6167		16.50		16.52	0.02	16.86	0.34
	6466/6418		16.80		16.78	-0.02	17.05	0.27
	6717/6698		16.90		16.94	0.04	17.21	0.27
G	7028/6990	17.20			17.15	-0.05	17.35	0.20
	7316/7254				17.27		17.56	0.29
	7621/7634				17.40		17.79	0.39
	XX/7702							
	7900/7953				17.55		17.93	0.38
	XX/8023							
	8200/				17.61		18.00	0.39
	8500/				18.60		19.31	0.71
	8732/				19.38		19.79	0.41
	9000/				20.07		20.29	0.22
	9232				21.63		21.58	-0.05
	9400/				23.59		22.95	-0.64

Notes:
[1] Compared to LOMR Report Table 2 or DFIRM data
[2] Compared to Duplicate Effective
[3] Compared to Duplicate Effective
[4] Compared to Existing/Pre-Project

Table 6 - Tributary 2 Comparison of Existing Condition to Proposed Condition

FEMA		Effective	Effective		Duplicate Effective		Existing/Pre-Project	
Section		DFIRM	LOMR Report Table 3		FEMA HEC-RAS		2016 Surface and FEMA	
Letter	SECNO	WSEL	WSEL	Diff.	WSEL	Diff.[1]	WSEL	Diff.[2]
A	100/70		17.00		16.50	-0.50	16.78	0.28
	XX/85						16.78	
							Bridge	
B	155/128	16.60			16.55	-0.05	16.77	0.22
	161.5		Bridge					
	168/154						16.80	
	215/201	16.70	17.00	0.30	16.58	-0.42	16.82	0.24
	444/432		17.10		16.94	-0.16	17.09	0.15
	691/662		17.90		17.73	-0.17	17.79	0.06
	940/900		19.00		18.45	-0.55	18.71	0.26
	955		Bridge					
C	965/XX	18.60	19.10	0.50	18.49	-0.61	19.16	0.67
	1000/1010		19.30		19.67	0.37	18.83	-0.84
	1163/1148		20.30		20.50	0.20	20.24	-0.26
	1400/1378		20.30		20.44	0.14	20.06	-0.38
D	1473/1470	21.00	20.40	-0.60	20.88	0.48	20.67	-0.21
	1529/1524		21.10		21.11	0.01	20.93	-0.18

Notes:
[1] Compared to LOMR Report Table 3 or DFIRM data
[2] Compared to Duplicate Effective
[3] Compared to Duplicate Effective
[4] Compared to Existing/Pre-Project

Table 7 - Tributary 3 Comparison of Existing Condition to Effective Condition

FEMA		Effective	Duplicate Effective		Existing/Pre-Project	
Section		DFIRM	FEMA HEC-RAS		2016 Surface and FEMA	
Letter	SECNO	WSEL	WSEL	Diff.	WSEL	Diff.[2]
A	150/141	16.20	na1		16.01	
B	541/517	16.20	na		16.01	
C	665/643	16.20	na		16.01	
	XX/788				16.01	
	XX/841				16.01	
D	1090/1075	16.20	na		16.01	
	XX/1181				16.01	
E	1360/1344	16.20	na		16.01	
	XX/1769				16.01	
	XX/1828				16.01	
F	1975-1954	16.20	na		16.01	
	XX/2004				16.01	

Notes:
[1] Not available.
[2] Compared to Duplicate Effective

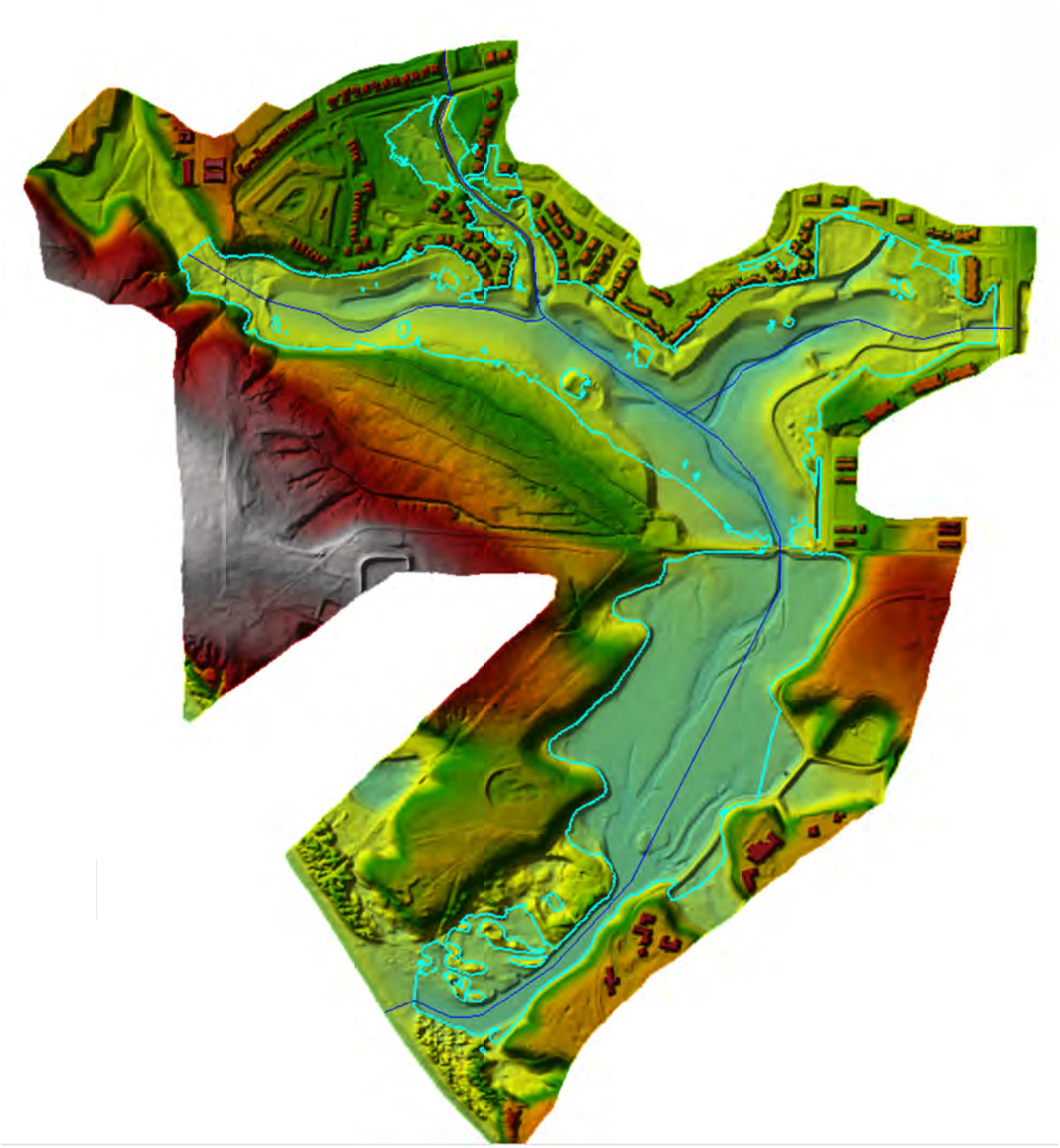


Figure 11- Existing Condition Inundation Limits

5.3 PROPOSED ANALYSIS

The proposed analysis is based on grading concepts prepared and delivered by ESA in the form of an electronic surface. The proposed grading and structural improvements include:

- Removal of an existing golf bridge on Tributary 2 at about Station 150
- Construction of 3 bridges in Tributary 3 (Bridges A, B, and C)
- Construction of a new pedestrian bridge in Tributary 2 at about Station 160
- Mass grading and soil removal throughout Devereux Main Reach, and Tributary 3. Relatively minor grading in Tributary 2.

A comparison of the proposed condition water surface elevations and the duplicate effective water surface elevations are provided in Table 9, Table 10, and Table 11.

Figure 12 shows the inundation limits of the proposed condition analysis outlined in cyan. More detailed inundation mapping is found in Appendix B. Table 8 identifies the parcels may be removed from the 100-year floodplain.

Table 8 - Residential Units Removed from the Floodplain

Single Family Residential Units	Condominium Units[3]	Condominium Units
073-181-001	073-290-001	073-290-017
073-181-002	073-290-002	073-290-018
073-181-003	073-290-003	073-290-019
073-181-004	073-290-004	073-290-020
073-181-005	073-290-005	073-290-021
073-181-006	073-290-006	073-290-022
073-181-007	073-290-015	073-290-023
073-181-008	073-290-016	073-290-024

A Floodway evaluation has been completed as part of the proposed analysis. Encroachments were applied using equal conveyance reduction methods until there was no more than a one foot rise. There are no negative surcharges. There is one section for which a greater than one foot rise was experienced which is within the Marymount Driveway Bridge in Tributary 2. A program bug has been reported indicating similar erroneous results for HEC-RAS V5.0.1.

[3] The exact number of condominiums will depend on foundation and wall conditions which will require field verification and possibly review of the architectural plans.

Table 9 - Main Reach Comparison of Proposed Condition to Effective Condition

FEMA		Effective	Effective		Duplicate Effective		Post-Project/FEMA Match		
Section		DFIRM	LOMR Report Table 2		FEMA HEC-RAS		2016 Surface and FEMA		
Letter	SECNO	WSEL	WSEL	Diff.	WSEL	Diff.[1]	WSEL	Diff.[3]	Diff[4]
	XX/190						8.12		
	300/XX				7.77				
	500/XX				9.73				
	XX/608						10.07		
	800/810				10.46		10.28	-0.18	
A	1100/1110	10.90			10.55	-0.35	10.35	-0.20	
	1400/1410				10.73		10.80	0.07	
B	1700/1702	11.20			10.90	-0.30	11.20	0.30	
C	2020/2047	11.60			11.26	-0.34	11.78	0.52	
	2450/2368				11.26		11.80	0.54	
	2750/XX				11.27				
	XX/3115						11.83		
	3180/XX				11.27				
	XX/3547						11.86		
D	3767/XX	11.60			11.29	-0.31			
	XX/3775						11.87		
	3917/3826				11.30		11.87	0.57	
	3966/XX		11.90		11.94	0.04			
	3987/3906		12.00		12.01	0.01	11.86	-0.15	
	4003				Bridge				
	4017/3979		13.40		13.40	0.00	14.49	1.09	
	4039/XX		13.50		13.59	0.09			
	4052/XX		13.50		13.53	0.03			
	4091/XX		13.60		13.50	-0.10			
	XX/4055						14.53		
	XX/4118						14.53		
E	4302/4251	15.70	15.60	-0.10	15.61	0.01	14.53	-1.08	
	4606/XX		15.90		15.88	-0.02			
	XX/4570						14.55		
	4696/XX		16.00		16.01	0.01			
	4747/4675		16.00		16.04	0.04	14.55	-1.49	
	4753.5				Bridge				
	4760/4718		16.10		16.07	-0.03	14.55	-1.52	
	4804/4760		16.10		16.10	0.00	14.55	-1.55	
	5209/5096		16.20		16.20	0.00	14.56	-1.64	
	5513/5438		16.20		16.21	0.01	14.56	-1.65	
F	5764/5693	16.40	16.40	0.00	16.36	-0.04	14.62	-1.74	
	xx/5871						14.64		
	6015/xx		16.50		16.50	0.00			
	6216/6167		16.50		16.52	0.02	14.69	-1.83	
	6466/6418		16.80		16.78	-0.02	14.86	-1.92	
	6717/6698		16.90		16.94	0.04	15.12	-1.82	
G	7028/6990	17.20			17.15	-0.05	15.25	-1.90	
	7316/7254				17.27		15.39	-1.88	
	7621/7634				17.40		15.80	-1.60	
	XX/7702							0.00	
	7900/7953				17.55		16.03	-1.52	
	XX/8023							0.00	
	8200/				17.61		16.10	-1.51	
	8500/				18.60		18.81	0.21	
	8732/				19.38		19.49	0.11	
	9000/				20.07		20.12	0.05	
	9232				21.63		21.62	-0.01	
	9400/				23.59		22.95	-0.64	

Notes:
[1] Compared to LOMR Report Table 2 or DFIRM data
[2] Compared to Duplicate Effective
[3] Compared to Duplicate Effective
[4] Compared to Existing/Pre-Project

Table 10 - Tributary 2 Comparison of Proposed Condition to Effective Condition

FEMA		Effective	Effective		Duplicate Effective		Post-Project/FEMA Match		
Section		DFIRM	LOMR Report Table 3		FEMA HEC-RAS		2016 Surface and FEMA		
Letter	SECNO	WSEL	WSEL	Diff.	WSEL	Diff.[1]	WSEL	Diff.[3]	Diff[4]
A	100/70		17.00		16.50	-0.50	14.63	-1.87	-2.15
	XX/85						14.64	14.64	-2.14
B	155/128	16.60			16.55	-0.05	14.93	-1.62	-1.84
	161.5		Bridge						
	168/154						14.80		-2.00
	215/201	16.70	17.00	0.30	16.58	-0.42	15.40	-1.18	-1.42
	444/432		17.10		16.94	-0.16	16.75	-0.19	-0.34
	691/662		17.90		17.73	-0.17	17.79	0.06	0.00
	940/900		19.00		18.45	-0.55			
	955		Bridge						
C	965/XX	18.60	19.10	0.50	18.49	-0.61			
	1000/1010		19.30		19.67	0.37			
	1163/1148		20.30		20.50	0.20			
	1400/1378		20.30		20.44	0.14			
D	1473/1470	21.00	20.40	-0.60	20.88	0.48			
	1529/1524		21.10		21.11	0.01			

Notes:
[1] Compared to LOMR Report Table 3 or DFIRM data
[2] Compared to Duplicate Effective
[3] Compared to Duplicate Effective
[4] Compared to Existing/Pre-Project

Table 11- Tributary 3 Comparison of Proposed Condition to Effective Condition

FEMA		Effective	Duplicate Effective		Existing/Pre-Project		Post-Project/FEMA Match		
Section		DFIRM	FEMA HEC-RAS		2016 Surface and FEMA		2016 Surface and FEMA		
Letter	SECNO	WSEL	WSEL[1]	Diff.	WSEL	Diff.[2]	WSEL	Diff.[3]	Diff[4]
A	150/141	16.20	na		16.01	-0.19	14.56	-1.64	-1.45
B	541/517	16.20	na		16.01	-0.19	14.56	-1.64	-1.45
C	665/643	16.20	na		16.01	-0.19	14.56	-1.64	-1.45
	XX/788				16.01		14.56		-1.45
	814.5						Bridge		
	XX/841				16.01		14.56		-1.45
D	1090/1075	16.20	na		16.01	-0.19	14.56	-1.64	-1.45
	XX/1181				16.01		14.56		-1.45
E	1360/1344	16.20	na		16.01	-0.19	14.56	-1.64	-1.45
	XX/1769				16.01		14.57		-1.44
	1798						Walkway		
	XX/1828				16.01		14.57		-1.44
F	1975-1954	16.20	na		16.01	-0.19	14.57	-1.63	-1.44
	XX/2004				16.01		14.57		-1.44

Notes:
[1] HEC-RAS model not available.
[2] Compared to DFIRM Effective
3 Compared to DFIRM Effective
4 Compared to Existing/Pre-Project

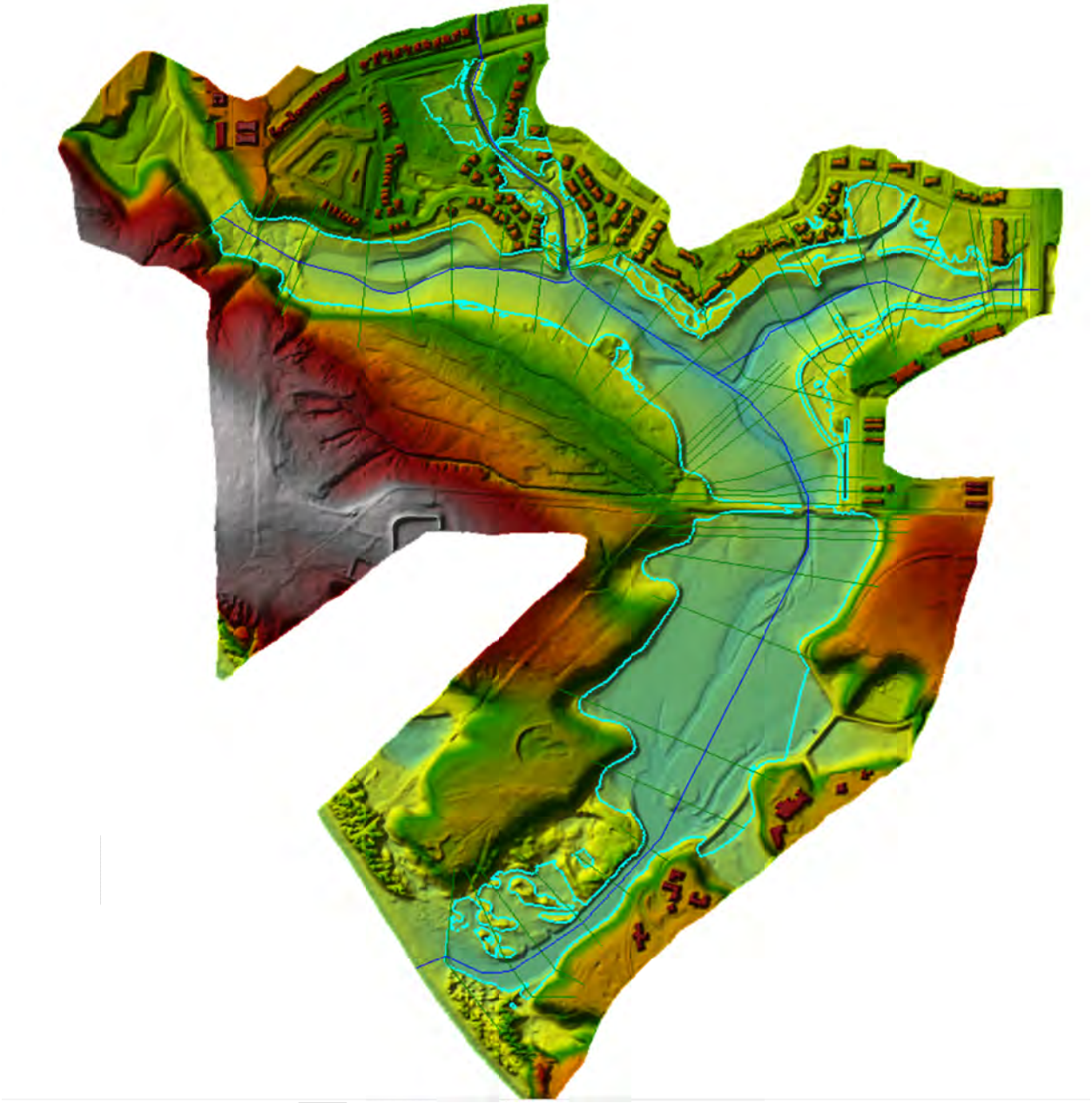


Figure 12 - Proposed Condition Inundation Limits

Floodway limits have been prepared for the Main Reach of Devereux Creek, Tributary 2 and Tributary 3.

6.0 CONCLUSIONS

Based on the evaluation provided in this report, we can make the following conclusions:

1. A duplicate effective model matches the effective data with the accepted level of precision (0.5 feet) for the Main Reach and Tributary 3.

2. The duplicate effective model for Tributary 2 was found to exceed the 0.5 margin at sections 940 and 965. This was not considered serious since the final matching location is downstream of both these sections.

3. The existing condition model substantially approximates the duplicate effective model. There are a few exceptions. Within the Devereux Slough, the water surface elevation is higher by less than 0.5 feet which may be due to historic sedimentation or more accurate topographic mapping. An increase in the 100-year water surface elevation of greater than 0.5 feet is also shown at section 4017 which may indicate a slight misalignment of one of the cross sections. Neither of these situations is considered serious because the entire affected inundated area is owned by the project partners which can accept this rise on its own property.

4. The proposed condition model shows significant (approximately 1.5 feet) reduction in the 100-year water surface elevation within the main reach upstream of the Venoco Crossing and throughout Tributary 3. Reduction of water surface elevations within Tributary 2 is limited to the area impacted by proposed grading.

5. The Proposed/Post-Project model for Devereux Creek Main Reach comes to match the Duplicate Effective model and Existing/Pre-Project Model in the vicinity of sections 9232 and 9400. Tributary 2 models match at section 691. Tributary 3 does not need to match as it is a ponded water condition.

6. A Regulatory Floodway was determined for all reaches.

7. Eight (8) single family residences and up to sixteen (16) condominium units may be removed from the 100-year floodplain.

APPENDIX A – NO RISE CERTFICATE

Appendix A

A.1 NO RISE CERTIFICATION

CERTIFICATION OF A "NO-RISE" DETERMINATION FOR A PROPOSED FLOODWAY DEVELOPMENT

Santa Barbara County
Community Name

UCSB North Campus Open Space Restoration Project
Development Name

APN 073-090-029, 056, 062, 067
Lot/Property Designation

UCSB
Property Owner

I hereby certify that the proposed remedial measures, in combination with the property development designated above, will result in no loss of flow conveyance during the occurrence of the 1 percent annual chance of exceedence (100-year flood) discharge. that will negatively impact adjacent neighbors.

I further certify that the data submitted herewith in support of this request are accurate to the best of my knowledge, that the analyses have been performed correctly and in accordance with sound engineering practice, and that the proposed structural works are designed in accordance with sound engineering practice.

June 3, 2016
Date

Craig A Steward, P.E., CFM
Registered Professional Engineer

REGISTERED PROFESSIONAL ENGINEER
CRAIG A. STEWARD
No. 37253
Exp. 06-30-2018
CIVIL
STATE OF CALIFORNIA

APPENDIX B– EXHIBITS

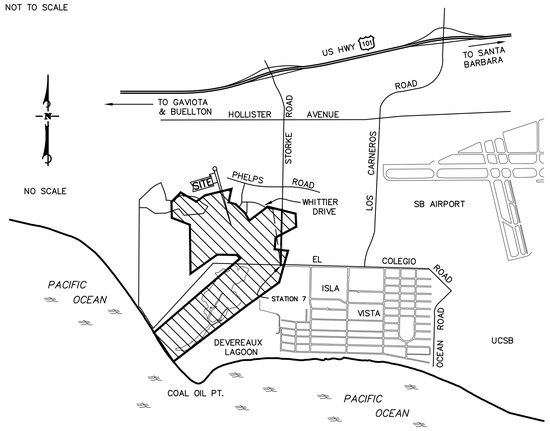
Appendix B

B.1 EXHIBITS

- Work Map
- Annotated Flood Insurance Rate Map (FIRM)
- Grading Plan (Progress Print Only)
- Bridge/Crossing Plans (Progress Prints Only

VICINITY MAP

NOT TO SCALE



SURVEYOR'S NOTES

1. MAPPING

AERIAL TOPOGRAPHY
TOPOGRAPHIC MAPPING WAS COMPILED AT A SCALE OF 1"=40', SHOWN HEREON AT A SCALE OF 1" = 250', WITH A 1' FOOT CONTOUR INTERVAL, USING STANDARD PHOTOGRAMMETRIC METHODS AND PROCEDURES BY VERTICAL MAPPING RESOURCES FROM AERIAL PHOTOGRAPHY DECEMBER 1, 2015.

SUPPLEMENTAL TOPOGRAPHY

AERIAL MAPPING WAS SUPPLEMENTED IN VARIOUS AREAS WITH A GROUND SURVEY CONDUCTED IN MARCH 2016.

AERIAL PHOTOGRAPHY
THE AERIAL PHOTOGRAPHY USED AS THE BACKGROUND FOR THIS MAP WAS OBTAINED ON DECEMBER 1, 2015 BY VERTICAL MAPPING RESOURCES. THE PHOTOGRAPHY HAS BEEN CONVERTED INTO A DIGITAL FORMAT AND CORRECTED FOR HORIZONTAL AND VERTICAL DISTORTION USING STANDARD PHOTOGRAMMETRIC METHODS.

2. BOUNDARY AND EASEMENT INFORMATION

THE BOUNDARY AND EASEMENT INFORMATION SHOWN HEREON WAS COMPILED FROM THE PARCEL MAP 14,784 FILED IN BOOK 64, PAGES 20–25 OF PARCEL MAPS AND IS FOR INFORMATIONAL PURPOSES ONLY. THIS SURVEY TIED TO THE SAME UCSB CONTROL NETWORK STATIONS AS SHOWN ON SAID PARCEL MAP IN ORDER TO ORIENT THE TOPOGRAPHIC AND PLANIMETRIC MAPPING TO THE SAME MAPPING SYSTEM. THIS MAP DOES NOT REPRESENT A BOUNDARY ESTABLISHMENT SURVEY, ALL EXISTING EASEMENTS MAY NOT BE SHOWN.

3. BASIS OF BEARINGS AND COORDINATES

BEARINGS SHOWN ON THIS MAP ARE REFERENCED TO THE CALIFORNIA COORDINATE SYSTEM, NAD 83, ZONE 5 GRID (EPOCH 2004.0), DEFINED LOCALLY BY THE UCSB CONTROL NETWORK AS SHOWN ON RECORD OF SURVEY FILED IN BOOK 175, PAGES 87–90 OF RECORD OF SURVEYS.

ALL DISTANCES AND COORDINATES ARE REFERENCED TO SAID CALIFORNIA COORDINATE SYSTEM AND ARE EXPRESSED IN US SURVEY FOOT UNITS.

SEE CONTROL POINT LISTING

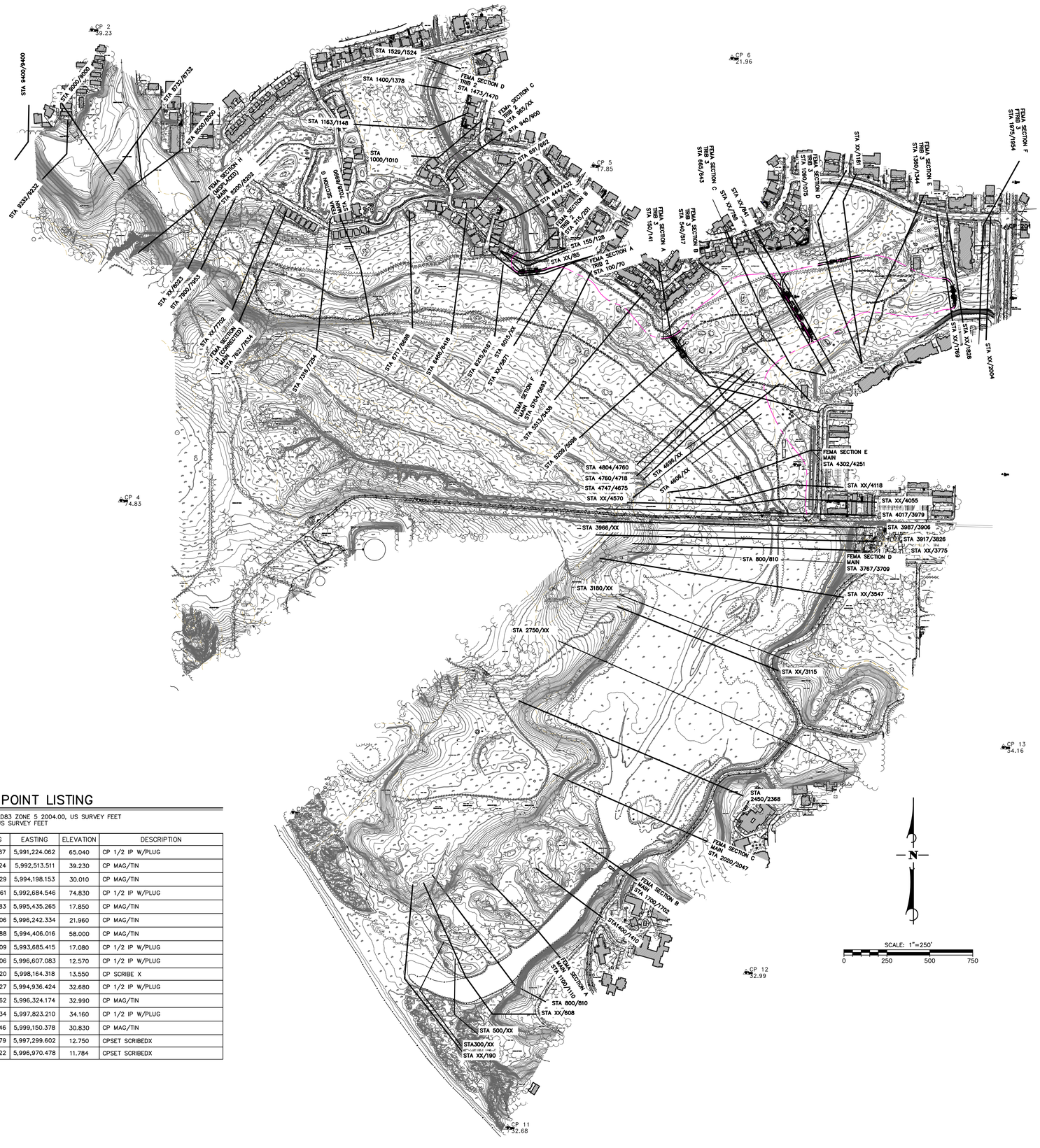
4. ELEVATIONS

ELEVATIONS SHOWN HEREON ARE EXPRESSED IN U.S. SURVEY FEET AND ARE REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88), DEFINED LOCALLY BY THE ABOVE MENTIONED UCSB CONTROL.

SEE CONTROL POINT LISTING

Default
Map Base

STA 800/810



CONTROL POINT LISTING

HORIZONTAL: CCS NAD83 ZONE 5 2004.00, US SURVEY FEET
VERTICAL: NAVD88, US SURVEY FEET

POINT	NORTHING	EASTING	ELEVATION	DESCRIPTION
1	1,981,481.987	5,991,224.062	65.040	CP 1/2 IP W/PLUG
2	1,982,439.124	5,992,513.511	39.230	CP MAG/TIN
3	1,983,432.329	5,994,198.153	30.010	CP MAG/TIN
4	1,979,697.261	5,992,684.546	74.830	CP 1/2 IP W/PLUG
5	1,981,647.383	5,995,435.265	17.850	CP MAG/TIN
6	1,982,273.606	5,996,242.334	21.960	CP MAG/TIN
7	1,979,703.488	5,994,406.016	58.000	CP MAG/TIN
8	1,977,880.609	5,993,685.415	17.080	CP 1/2 IP W/PLUG
9	1,979,906.006	5,996,607.083	12.570	CP 1/2 IP W/PLUG
10	1,980,948.920	5,998,164.318	13.550	CP SCRIBE X
11	1,976,043.027	5,994,936.424	32.680	CP 1/2 IP W/PLUG
12	1,976,946.762	5,996,324.174	32.990	CP MAG/TIN
13	1,978,258.634	5,997,823.210	34.160	CP 1/2 IP W/PLUG
14	1,979,495.146	5,999,150.378	30.830	CP MAG/TIN
15	1,981,008.279	5,997,299.602	12.750	CPSET SCRIBEDX
16	1,981,033.722	5,996,970.478	11.784	CPSET SCRIBEDX

NO.	DATE	REVISIONS	APPD.
1	2-1-16	SUBSURFACE UTILITIES AN MONITORING WELL LOCATIONS	
2	3-18-16	SUPPLEMENTAL MAPPING	

Stantec
111 East Victoria Street, Santa Barbara, CA 93101
Phone: (805) 963-9532 Fax: (805) 966-9801

FIELD CREW: HMG/CE/NJK
SURVEY COMPLETED: DECEMBER 1, 2015
OFFICE TECH: NJK/MAC
COMPILATION COMPLETED: MARCH 18, 2016

WORK MAP
UCSB NCOS RESTORATION PROJECT
CITY OF GOLETA, CALIFORNIA
MAY 2016

PROJECT NUMBER 2064109300
SHEET 1 OF 1
DWG FLOOD ANALYSIS BASE.DWG

SAVED DATE: 6/3/2016
PLOT DATE: 6/3/2016 6:40:01 PM
DWG PATH: V:\2064\ACTIVE\2064109300\FLOOD_ANALYSIS\FLOOD ANALYSIS BASE.DWG

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations (BFEs) shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations tables in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations tables should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) Zone 10. The **horizontal datum** was NAD 83, GRS80 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the Local Tidal Datum. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov/ or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713-3242** or visit its website at http://www.ngs.noaa.gov/.

Base map information shown on this FIRM was derived from digital orthophotography collected by the U.S. Department of Agriculture Farm Service Agency under its National Agriculture Imagery Program (NAIP). This imagery was flown in 2005 and was produced with a 1-meter ground sample distance.

This map may reflect more detailed and up-to-date **stream channel configurations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

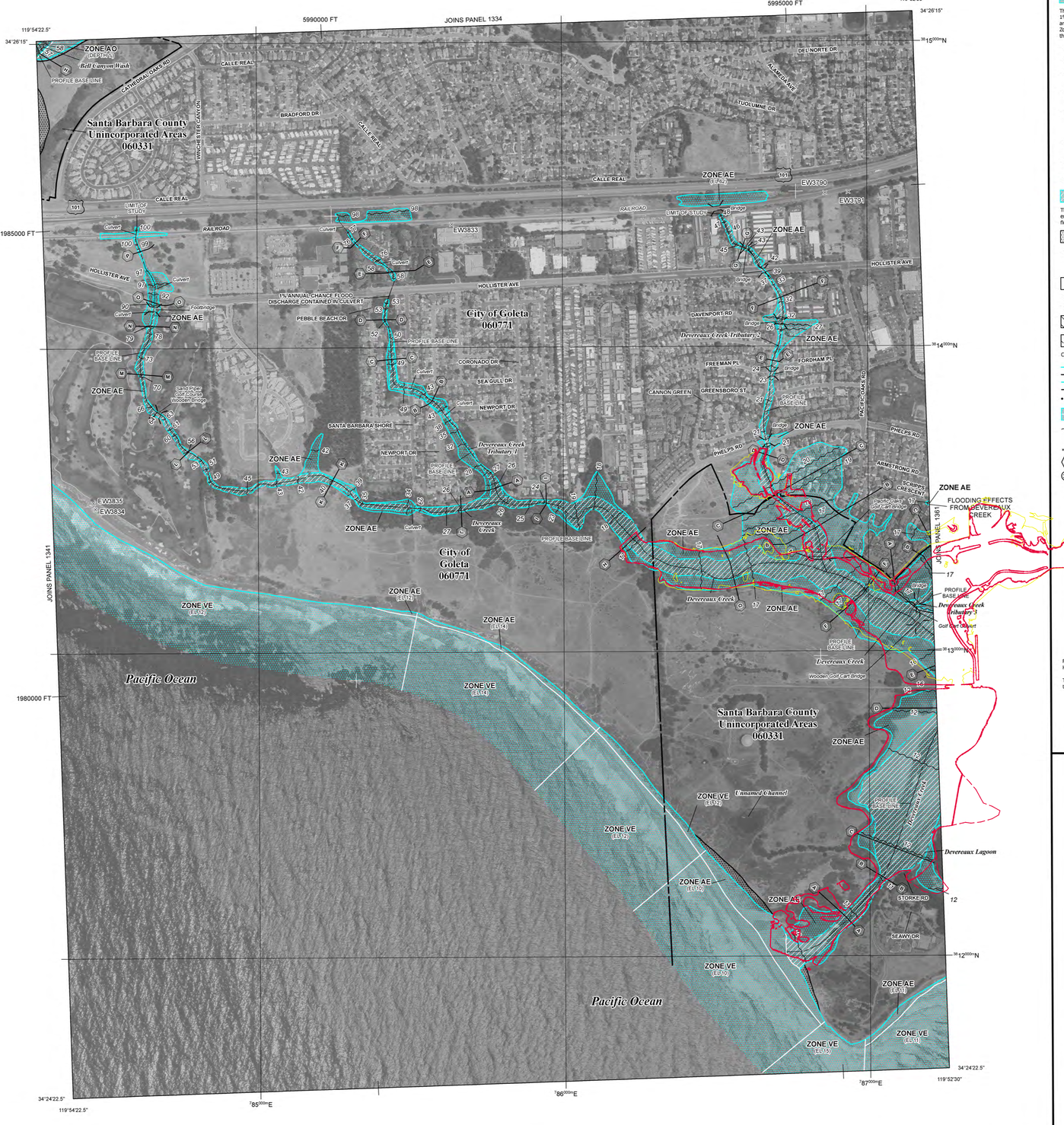
Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

Contact the **FEMA Map Information eXchange (FMIX)** at 1-877-336-2627 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study report, and/or digital versions of this map. The FMIX may also be reached at its website at http://www.msc.fema.gov/.

If you have **questions about this map**, or questions concerning the National Flood Insurance Program in general, please call the FEMA Map Information eXchange at **1-877-FEMA MAP** or visit the FEMA website at http://www.fema.gov/business/nfip/.

LEGEND

EXISTING
PROPOSED



LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A No Base Flood Elevations determined.

ZONE AE Base Flood Elevations determined.

ZONE AH Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.

ZONE AO Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.

ZONE AR Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.

ZONE A99 Areas to be protected from 1% annual chance flood event by a Federal flood protection system under construction; no Base Flood Elevations determined.

ZONE V Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.

ZONE VE Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X Areas determined to be outside the 0.2% annual chance floodplain.

ZONE D Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

1% annual chance floodplain boundary
0.2% annual chance floodplain boundary
Floodway boundary
Zone D boundary
CBRS and OPA boundary
Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities
513 — Base Flood Elevation line and value; elevation in feet*
(EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*
* Referenced to the North American Vertical Datum of 1988
A — A — Cross section line
23 — 23 — Transect line
97°07'30", 32°22'30" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere
4275000mE — 1000-meter Universal Transverse Mercator grid values, zone 10
6000000 FT — 5000-foot grid ticks: California State Plane coordinate system, Zone V (FIPSZONE = 405), Lambert projection
DX5510 — Bench mark (see explanation in Notes to Users section of this FIRM panel)
M1.5 — River Mile

MAP REPOSITORIES
Refer to Map Repositories List on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
SEPTEMBER 30, 2005

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
December 4, 2012 - to update map elevations to North American Vertical Datum of 1988.

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'

250 0 250 500 750 1,000 FEET
150 0 150 300 METERS

NFIP
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 1342G

FIRM

FLOOD INSURANCE RATE MAP

SANTA BARBARA COUNTY, CALIFORNIA AND INCORPORATED AREAS

PANEL 1342 OF 1835

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
GOLETA, CITY OF	060771	1342	G
SANTA BARBARA COUNTY	060331	1342	G

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
06083C1342G

MAP REVISED
DECEMBER 4, 2012

Federal Emergency Management Agency

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations (BFEs) shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations tables in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations tables should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) Zone 10. The **horizontal datum** was NAD 83, GRS80 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the Local Tidal Datum. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov/ or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713-3242** or visit its website at http://www.ngs.noaa.gov/.

Base map information shown on this FIRM was derived from digital orthophotography collected by the U.S. Department of Agriculture Farm Service Agency under its National Agriculture Imagery Program (NAIP). This imagery was flown in 2005 and was produced with a 1-meter ground sample distance.

This map may reflect more detailed and up-to-date **stream channel configurations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

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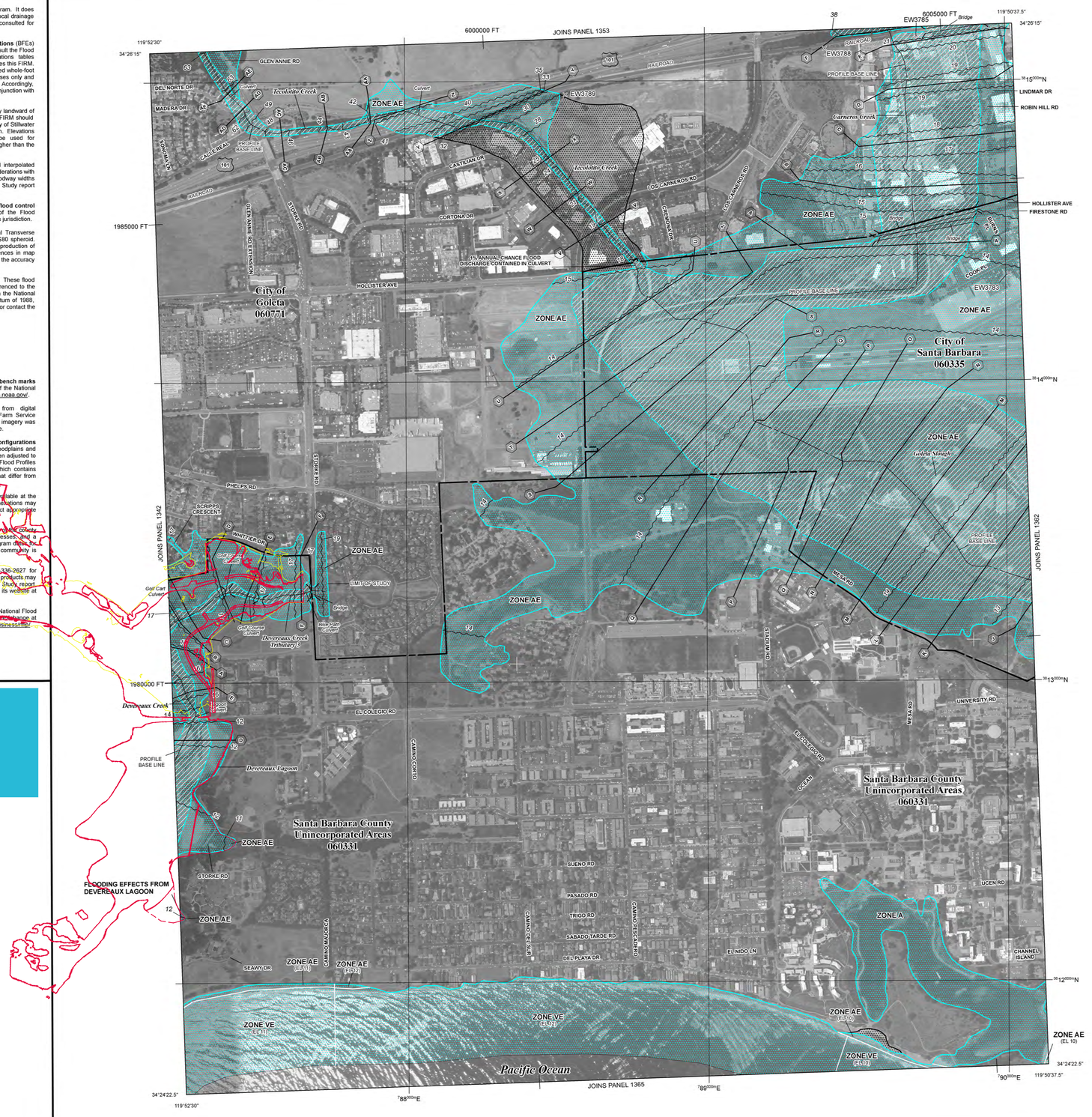
LEGEND

EXISTING
PROPOSED



LEGEND

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ZONE AE Base Flood Elevations determined.

ZONE AH Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.

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0.2% annual chance floodplain boundary
Floodway boundary
Zone D boundary
CBRS and OPA boundary
Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities
513 Base Flood Elevation line and value; elevation in feet*
(EL 987) Base Flood Elevation value where uniform within zone; elevation in feet*
* Referenced to the North American Vertical Datum of 1988
Cross section line
Transect line
97°07'30", 32°22'30" Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere
4275^{000}mE 1000-meter Universal Transverse Mercator grid values, zone 10
6000000 FT 5000-foot grid ticks: California State Plane coordinate system, Zone V (FIPSZONE = 405), Lambert projection
DX5510 Bench mark (see explanation in Notes to Users section of this FIRM panel)
M1.5 River Mile

MAP REPOSITORIES
Refer to Map Repositories List on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
SEPTEMBER 30, 2005

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
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MAP SCALE 1" = 500'

250 0 250 500 750 1,000 FEET
150 0 150 300 METERS

NFIP NATIONAL FLOOD INSURANCE PROGRAM

PANEL 1361G

FIRM

FLOOD INSURANCE RATE MAP

SANTA BARBARA COUNTY, CALIFORNIA AND INCORPORATED AREAS

PANEL 1361 OF 1835

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

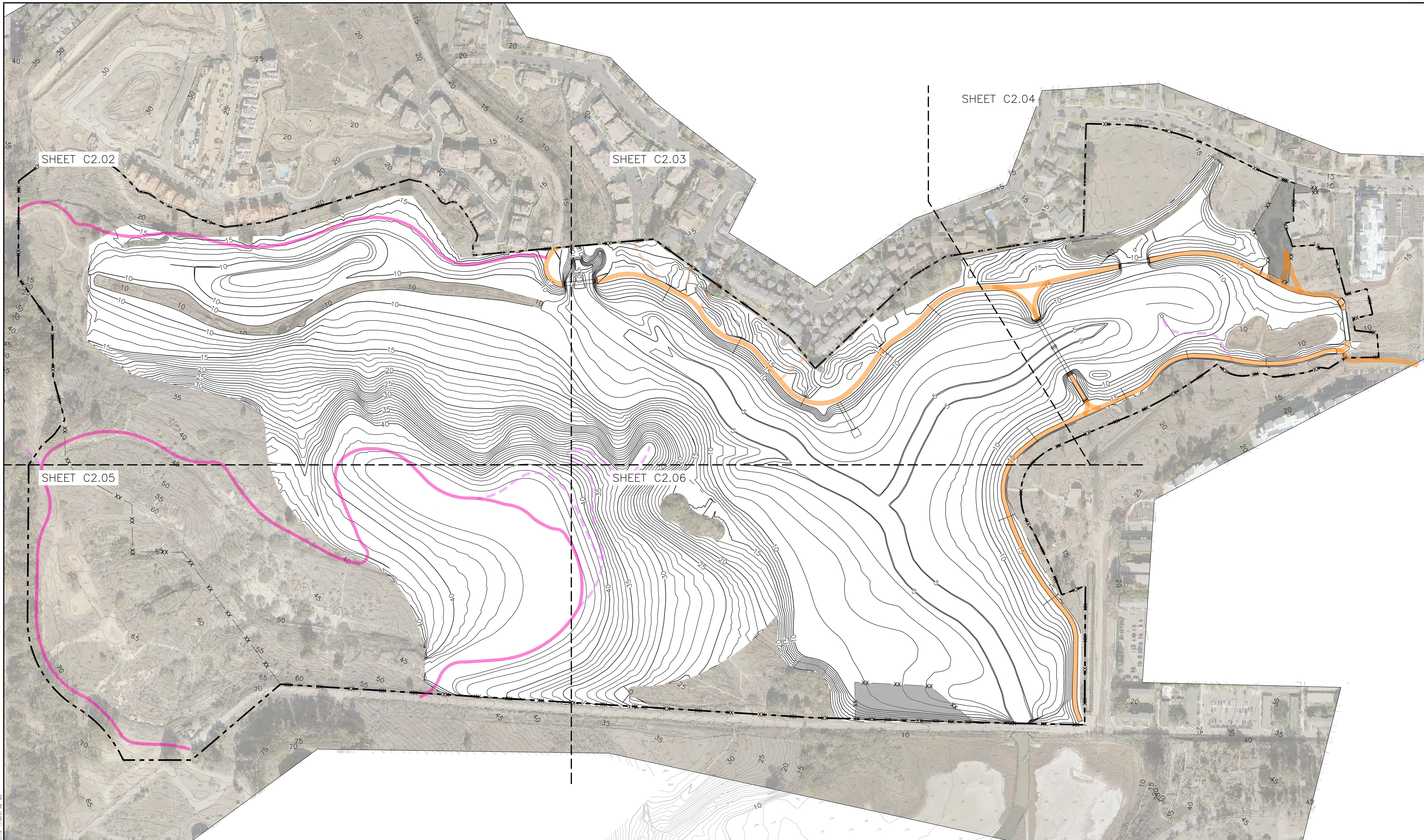
COMMUNITY	NUMBER	PANEL	SUFFIX
GOLETA, CITY OF	060771	1361	G
SANTA BARBARA COUNTY	060331	1361	G
SANTA BARBARA, CITY OF	060335	1361	G

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
06083C1361G

MAP REVISED
DECEMBER 4, 2012

Federal Emergency Management Agency



NOTES:

N

0 60 120 240
SCALE (FEET)

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING. IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY.

PRELIMINARY
NOT FOR CONSTRUCTION

PREPARED BY: ESA
550 Kearny Street
Suite 800
San Francisco, CA 94108
415.262.2300 phone

SHEET TITLE
PHASE 2 GRADING LAYOUT

PROJECT
NORTH CAMPUS OPEN SPACE
RESTORATION PROJECT

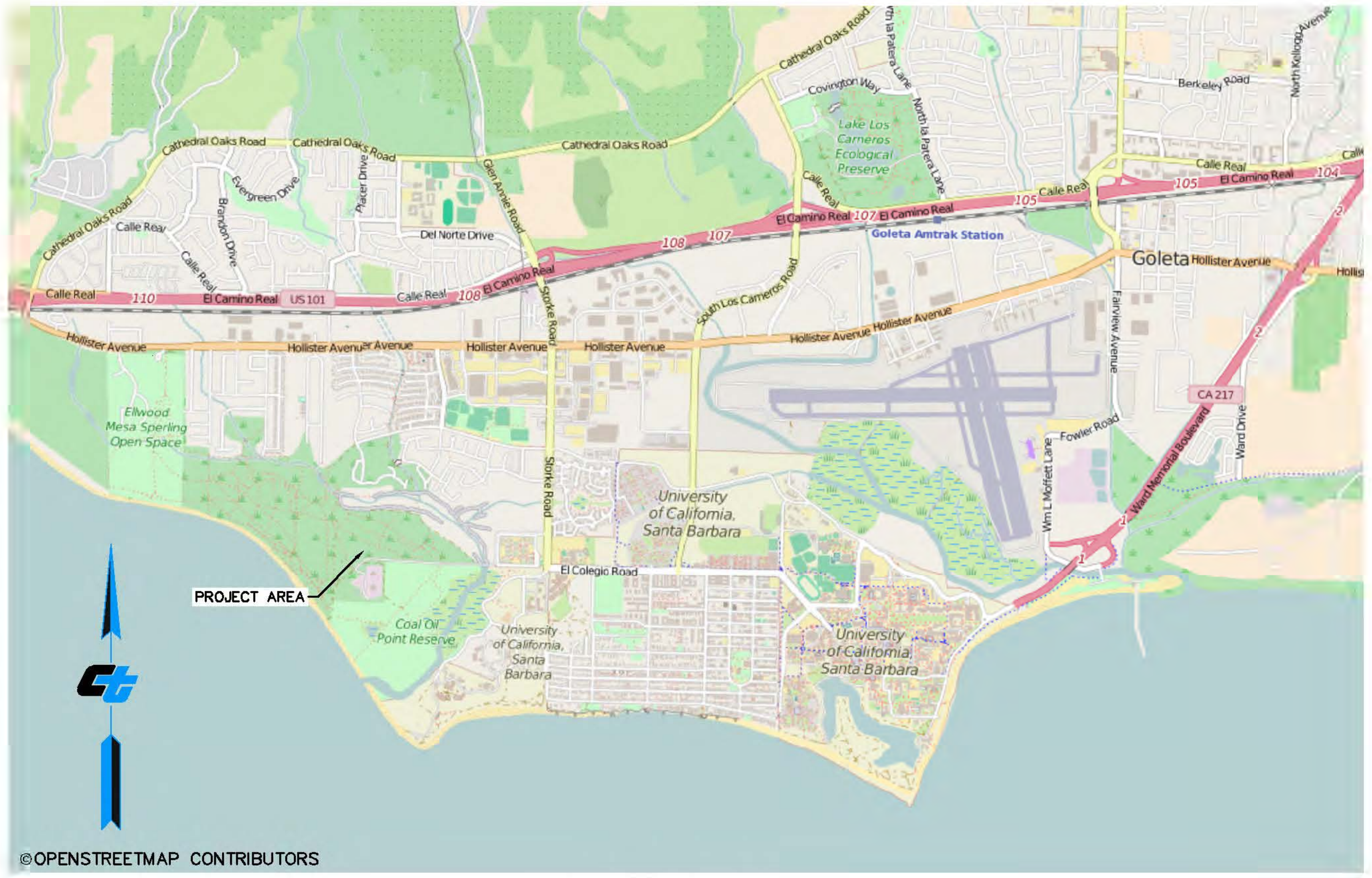
PREPARED FOR:
UNIVERSITY OF CALIFORNIA
SANTA BARBARA
SANTA BARBARA, CA 93106-1030

APPROVED	
DESIGNED	ESA
DRAWN	
INCHARGE	B. BATTALIO C41756
SCALE	AS NOTED
DATE	
SHEET	C2.01
-	OF

NORTH CAMPUS OPEN SPACE RESTORATION PROJECT

UNIVERSITY OF CALIFORNIA, SANTA BARBARA
SANTA BARBARA, CALIFORNIA

FEDERAL PROJECT NUMBER	Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
ATPL-6300(003)	05	SB	–	–		



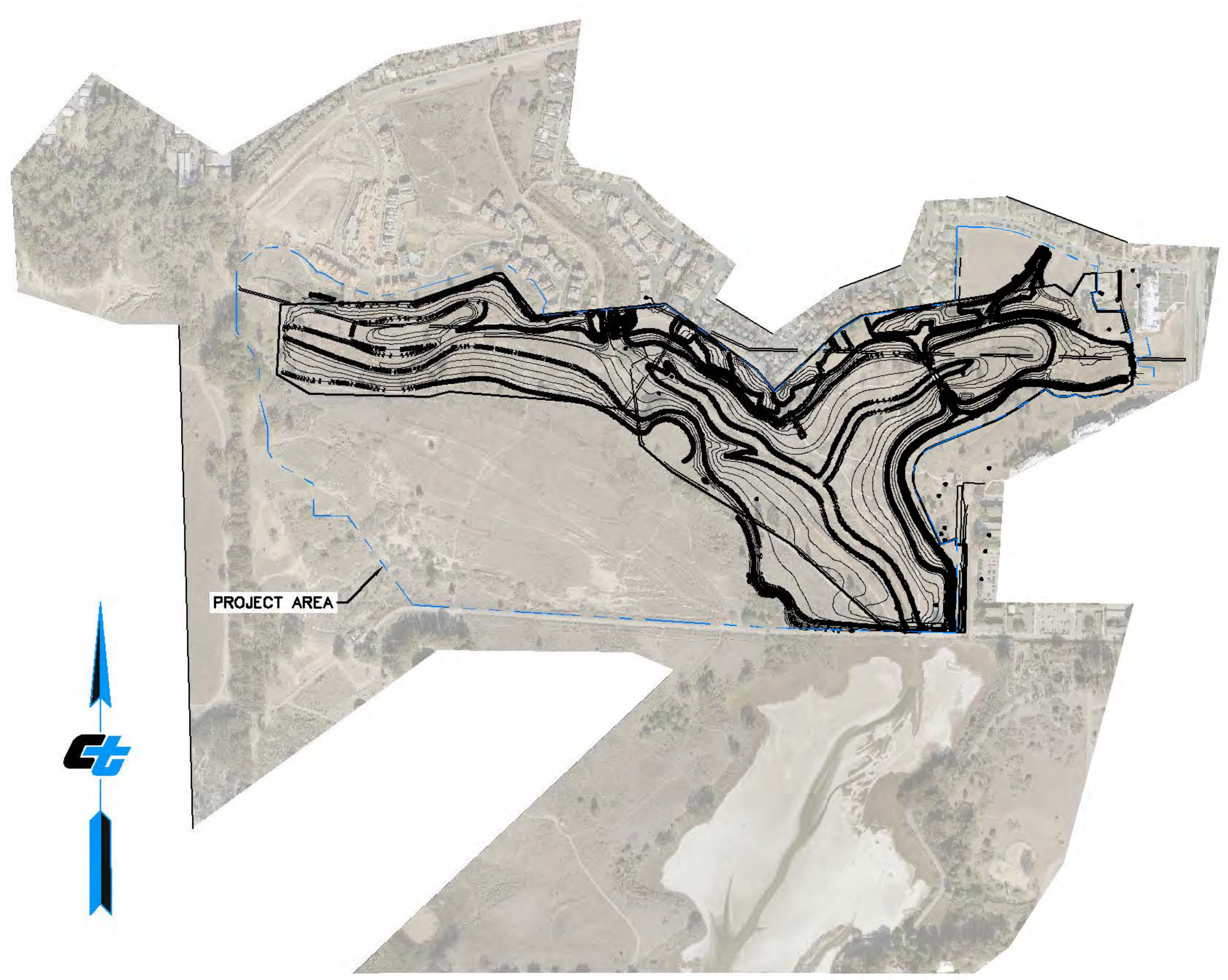
VICINITY MAP
NOT TO SCALE

SHEET INDEX

SHEET #	SHEET NAME
	TITLE SHEET
L1	LAYOUT PLAN
X1	TYPICAL CROSS SECTIONS
P1	PROFILE PLAN
P2	PROFILE PLAN
S1	STRUCTURAL PLAN
S2	STRUCTURAL PLAN
S3	STRUCTURAL PLAN
F1	FOUNDATION PLAN
C1	CONSTRUCTION DETAILS
C2	CONSTRUCTION DETAILS
C3	CONSTRUCTION DETAILS

NOT INCLUDED IN THIS SUBMITTAL (F1, C1, C2, C3)

LOCATION MAP



SITE MAP
SCALE: 1" = 500'

TITLE SHEET

REGISTERED CIVIL ENGINEER xx/xx/xx DATE

FOR REVIEW
PLANS APPROVAL DATE

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

REGISTERED PROFESSIONAL ENGINEER – BRETT E. FOSTER – No. 48267 – Exp. 6/30/18 – CIVIL – STATE OF CALIFORNIA

STANTEC CONSULTING LTD.
111 EAST VICTORIA STREET
SANTA BARBARA, CALIFORNIA 93101

UNIVERSITY OF CALIFORNIA, SANTA BARBARA

CONTRACT No. –
PROJECT ID 0516000102

DATE PLOTTED => 5-31-2016
TIME PLOTTED =>
LAST REVISION 05-31-16

PREPARED BY: ESA

SHEET TITLE: TITLE SHEET
PROJECT: NORTH CAMPUS OPEN SPACE RESTORATION PROJECT
PREPARED FOR: UNIVERSITY OF CALIFORNIA SANTA BARBARA, SANTA BARBARA, CA 93106-1030

APPROVED
DESIGNED ESA
DRAWN
INCHARGE B. BATTALIO C41756
SCALE AS NOTED
DATE
SHEET TITLE
1 OF

PRELIMINARY – NOT FOR CONSTRUCTION

STATE OF CALIFORNIA – DEPARTMENT OF TRANSPORTATION
CONSULTANT FUNCTIONAL SUPERVISOR –
CALCULATED-DESIGNED BY Bret Foster
CHECKED BY Steve Wang
REVISED BY
DATE REVISED

FEDERAL PROJECT NUMBER	ATPL-6300(003)	Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
		05	SB	–	–		

REGISTERED CIVIL ENGINEER xx/xx/xx DATE

FOR REVIEW

PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER BRETT E. FOSTER No. 48267 Exp. 6/30/18 CIVIL STATE OF CALIFORNIA

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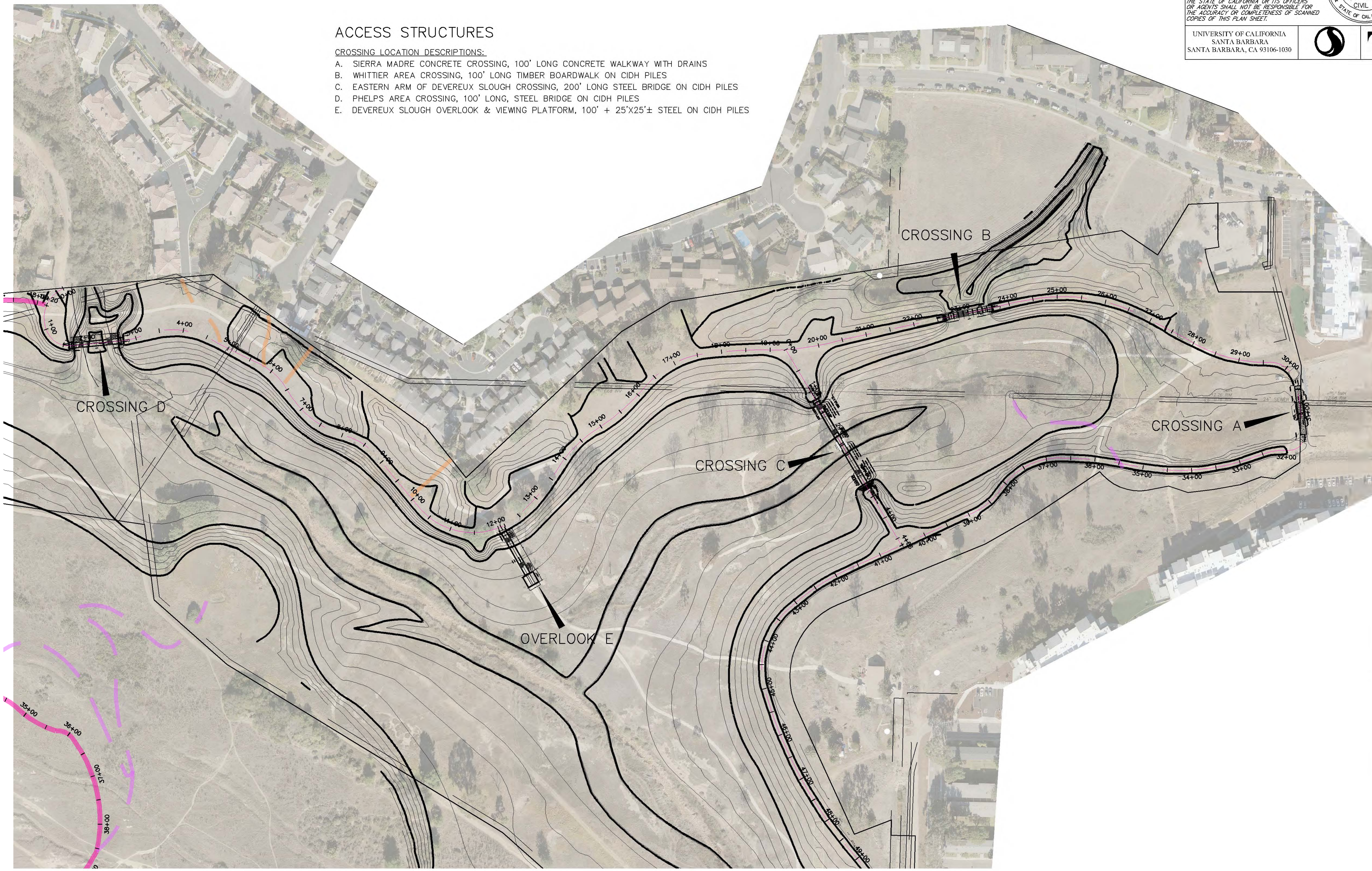
UNIVERSITY OF CALIFORNIA
SANTA BARBARA
SANTA BARBARA, CA 93106-1030

ESA

ACCESS STRUCTURES

CROSSING LOCATION DESCRIPTIONS:

A. SIERRA MADRE CONCRETE CROSSING, 100' LONG CONCRETE WALKWAY WITH DRAINS
B. WHITTIER AREA CROSSING, 100' LONG TIMBER BOARDWALK ON CIDH PILES
C. EASTERN ARM OF DEVEREUX SLOUGH CROSSING, 200' LONG STEEL BRIDGE ON CIDH PILES
D. PHELPS AREA CROSSING, 100' LONG, STEEL BRIDGE ON CIDH PILES
E. DEVEREUX SLOUGH OVERLOOK & VIEWING PLATFORM, 100' + 25'X25'± STEEL ON CIDH PILES



LAYOUT PLAN
SCALE: 1" = 80'

PREPARED BY: ESA

PREPARED FOR: UNIVERSITY OF CALIFORNIA SANTA BARBARA SANTA BARBARA, CA 93106-1030

PROJECT: NORTH CAMPUS OPEN SPACE RESTORATION PROJECT

SHEET TITLE: TITLE SHEET

PRELIMINARY
NOT FOR CONSTRUCTION

CALCULATED-DESIGNED BY	Bret Foster	REVISED BY
CHECKED BY	Steve Wong	DATE REVISED

CONSULTANT FUNCTIONAL SUPERVISOR –

STATE OF CALIFORNIA – DEPARTMENT OF TRANSPORTATION

Caltrans

LAYOUT PLAN

L–1

VERIFY SCALE

CONTRACT No. –

PROJECT ID 0516000102

LAST REVISION 05-31-16 | DATE PLOTTED => 5-31-2016 | TIME PLOTTED => –

APPROVED

DESIGNED ESA

DRAWN

INCHARGE B. GATTALIO

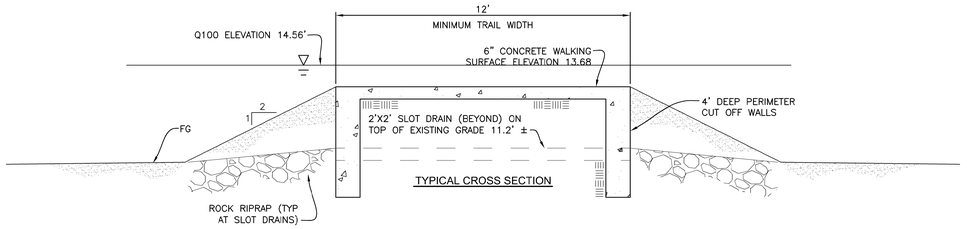
SCALE AS NOTED

DATE

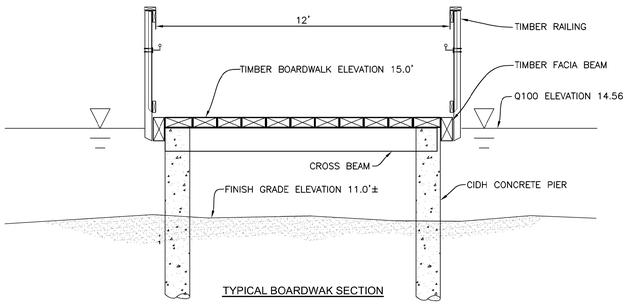
SHEET L1

1 OF

BORDER LAST REVISED 4/11/2008 | RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3 | Locator - 05-SB-0-UCSB Project ID 05160001.02 | USERNAME => NA DGN FILE => NA | UNIT 0000 | PROJECT NUMBER & PHASE 00000000001

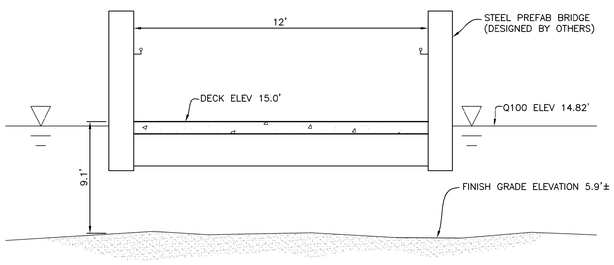


SIERRA MADRE CONCRETE CULVERT CROSSING
SCALE: 1"=5' CROSSING A

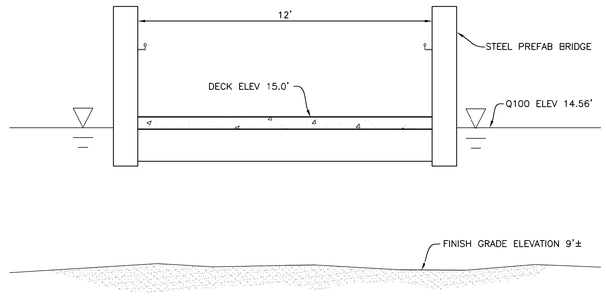


WHITTIER BOARDWALK CROSSING
SCALE: 1"=5' BRIDGE B

DEVEREUX BRIDGE CROSSING
SCALE: 1"=5' BRIDGE C



PHELPS BRIDGE CROSSING
SCALE: 1"=5' BRIDGE D



OVERLOOK & VIEWING PLATFORM
SCALE: 1"=5' BRIDGE E

FEDERAL PROJECT NUMBER ATPL-6300(003)

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
05	SB	–	–		

xx/xx/xx
REGISTERED CIVIL ENGINEER DATE

REGISTERED PROFESSIONAL ENGINEER — BRETT E FOSTER No. 48267 Exp. 6/30/18 CIVIL — STATE OF CALIFORNIA

FOR REVIEW
PLANS APPROVAL DATE

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UNIVERSITY OF CALIFORNIA
SANTA BARBARA
SANTA BARBARA, CA 93106-1030

ESA

PREPARED BY: ESA
550 Kearny Street Suite 800 San Francisco, CA 94108 415.896.5900 phone

SHEET TITLE: TITLE SHEET

PROJECT: NORTH CAMPUS OPEN SPACE RESTORATION PROJECT

PREPARED FOR: UNIVERSITY OF CALIFORNIA SANTA BARBARA SANTA BARBARA, CA 93106-1030

PRELIMINARY NOT FOR CONSTRUCTION

DATE PLOTTED => 5-31-2016
TIME PLOTTED => –

LAST REVISION 05-31-16

CROSS SECTION SHEET
X-1

VERIFY SCALE
0 1"
BAR IS ONE INCH ON ORIGINAL DRAWING. IF NOT ONE INCH ON THIS SHEET ADJUST SCALES ACCORDINGLY

CONTRACT No. –
PROJECT ID 0516000102

APPROVED	
DESIGNED	ESA
DRAWN	
INCHARGE	B. BATTALIO C41756
SCALE	AS NOTED
DATE	
SHEET	X1

1 OF

	REVISED BY	DATE REVISED
CALCULATED-DESIGNED BY	Bret Foster	
CHECKED BY	Steve Wong	
CONSULTANT FUNCTIONAL SUPERVISOR	–	
STATE OF CALIFORNIA – DEPARTMENT OF TRANSPORTATION	Caltrans	

BORDER LAST REVISED 4/11/2008 | RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3 | Locator - 05-SB-0-UCSB Project ID 0516000102 | USERNAME =>NA DGN FILE => NA | UNIT 0000 | PROJECT NUMBER & PHASE 00000000001

V:\2064\active\206419000\Structural\CAD\2000 Bridge - GMAD_2G Phase 3.dwg 5-31-16 02:41:43 PM bbattal

FEDERAL PROJECT NUMBER ATPL-6300(003)

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
05	SB	–	–		

REGISTERED CIVIL ENGINEER xx/xx/xx DATE

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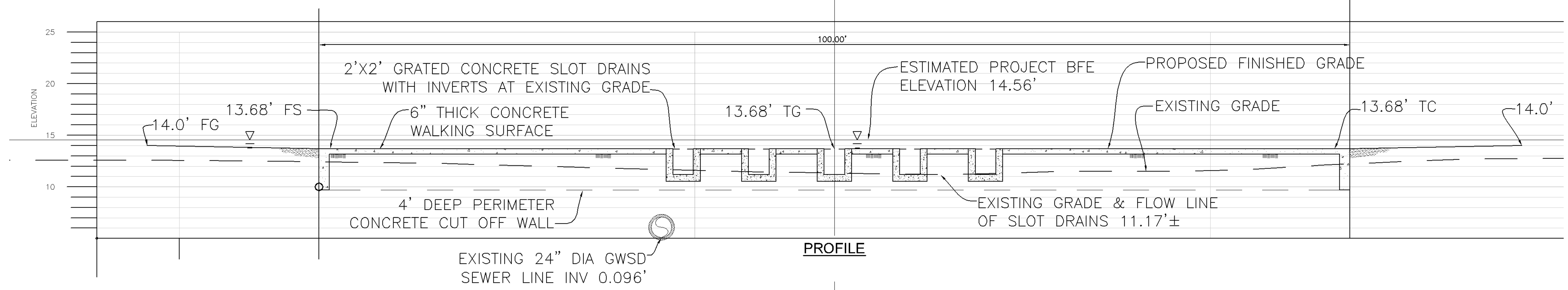
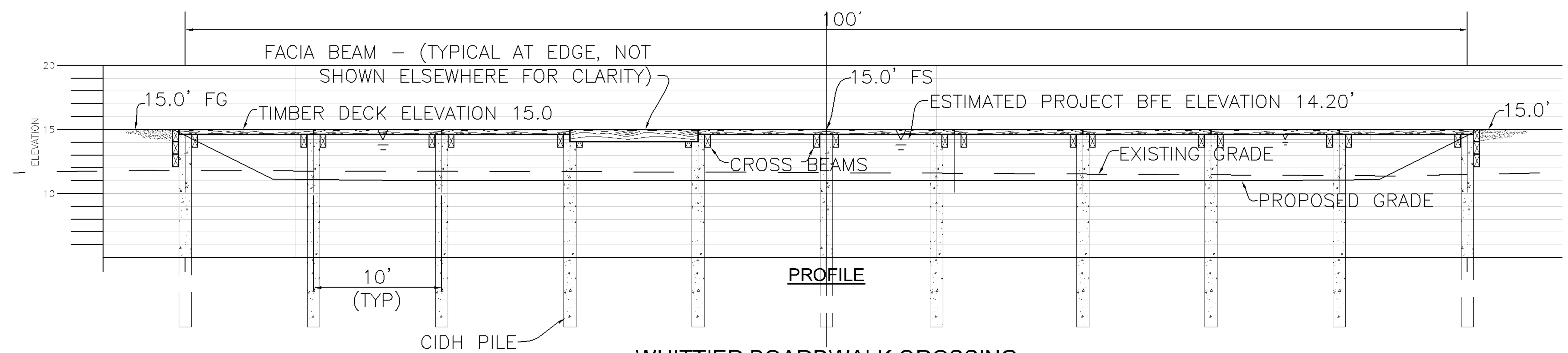
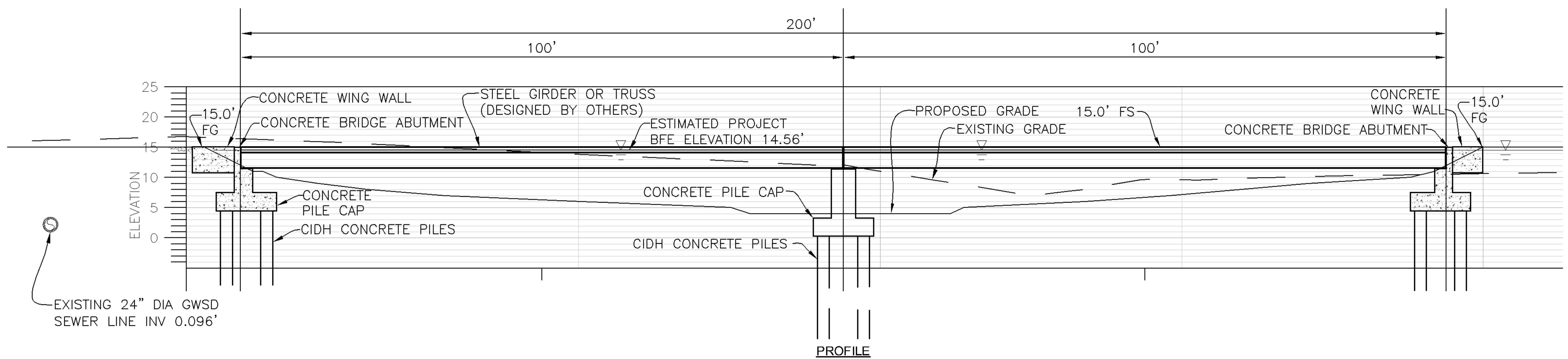
UNIVERSITY OF CALIFORNIA
SANTA BARBARA
SANTA BARBARA, CA 93106-1030



SIERRA MADRE CONCRETE CULVERT CROSSING
SCALE: 1"=5' **CROSSING A**



WHITTIER BOARDWALK CROSSING
SCALE: 1"=5' **BRIDGE B**



DEVEREUX BRIDGE CROSSING
SCALE: 1"=10' **BRIDGE C**

PRELIMINARY
NOT FOR CONSTRUCTION

PROFILES

P–1

VERIFY SCALE
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CONTRACT No. –
PROJECT ID 0516000102

LAST REVISION 05-31-16
DATE PLOTTED => 5-31-2016
TIME PLOTTED => –

PREPARED BY: ESA

SHEET TITLE: TITLE SHEET

PROJECT: NORTH CAMPUS OPEN SPACE RESTORATION PROJECT

PREPARED FOR: UNIVERSITY OF CALIFORNIA SANTA BARBARA SANTA BARBARA, CA 93106-1030

APPROVED
DESIGNED ESA
DRAWN
INCHARGE B. BATTALIO C41750
SCALE AS NOTED
DATE
SHEET P1
1 OF

STATE OF CALIFORNIA – DEPARTMENT OF TRANSPORTATION
Caltrans

CONSULTANT FUNCTIONAL SUPERVISOR –
CALCULATED-DESIGNED BY Bret Foster
CHECKED BY Steve Wong
REVISED BY
DATE REVISED

FEDERAL PROJECT NUMBER ATPL-6300(003)

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
05	SB	–	–		

REGISTERED CIVIL ENGINEER xx/xx/xx DATE

FOR REVIEW

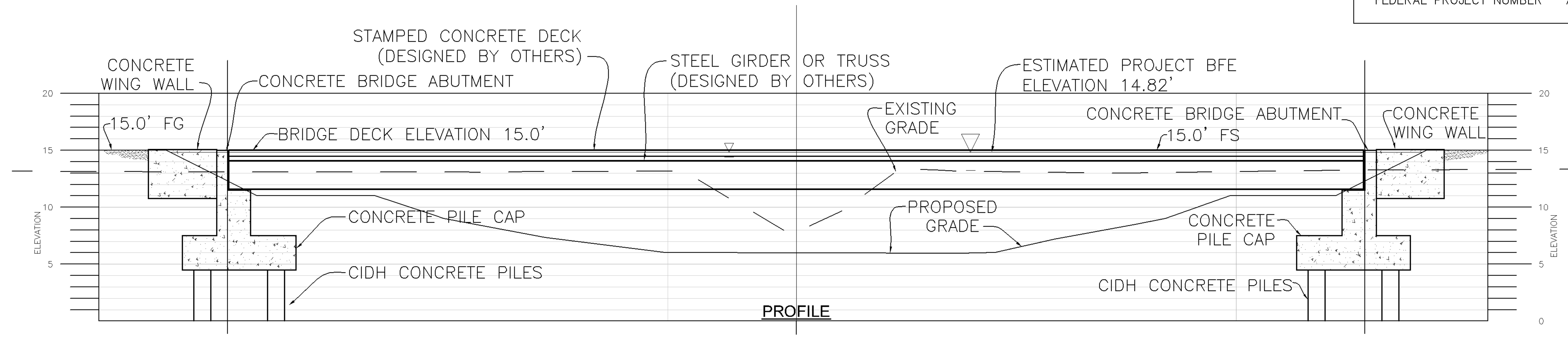
PLANS APPROVAL DATE

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

REGISTERED PROFESSIONAL ENGINEER BRETT E. FOSTER No. 48267 Exp. 6/30/18 CIVIL STATE OF CALIFORNIA

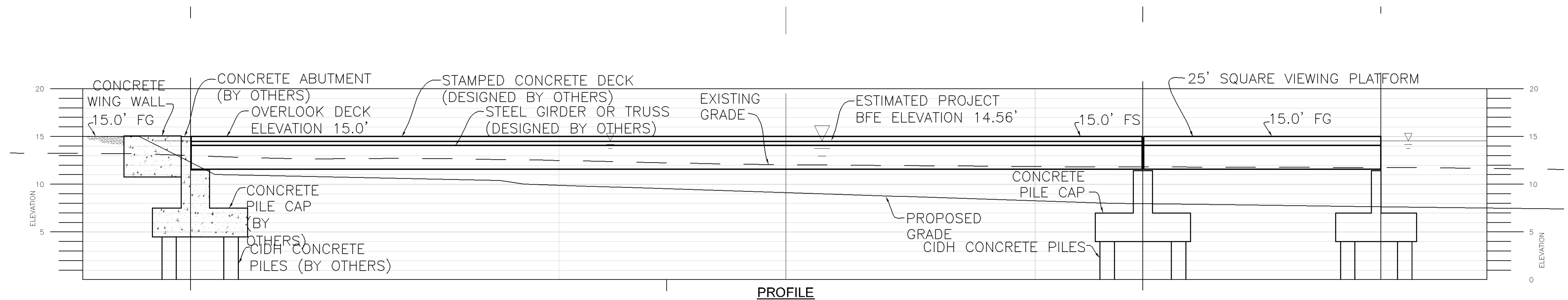
UNIVERSITY OF CALIFORNIA SANTA BARBARA SANTA BARBARA, CA 93106-1030

ESA



PHELPS BRIDGE CROSSING

SCALE: 1"=5' BRIDGE D



OVERLOOK & VIEWING PLATFORM

DESIGNED BY OTHERS BASED ON PERFORMANCE SPECIFICATION

SCALE: 1"=5'

PRELIMINARY NOT FOR CONSTRUCTION

REVISED BY	DATE REVISED

CALCULATED-DESIGNED BY	CHECKED BY
Bret Foster	Steve Wong

CONSULTANT FUNCTIONAL SUPERVISOR –

STATE OF CALIFORNIA – DEPARTMENT OF TRANSPORTATION

Caltrans

PREPARED BY: ESA

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APPROVED

DESIGNED ESA

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INCHARGE B. BATTALIO C41756

SCALE AS NOTED

DATE

SHEET P2

1 OF

PROFILES

P–2

VERIFY SCALE

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PROJECT ID 0516000102

LAST REVISION 05-31-16

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TIME PLOTTED => –

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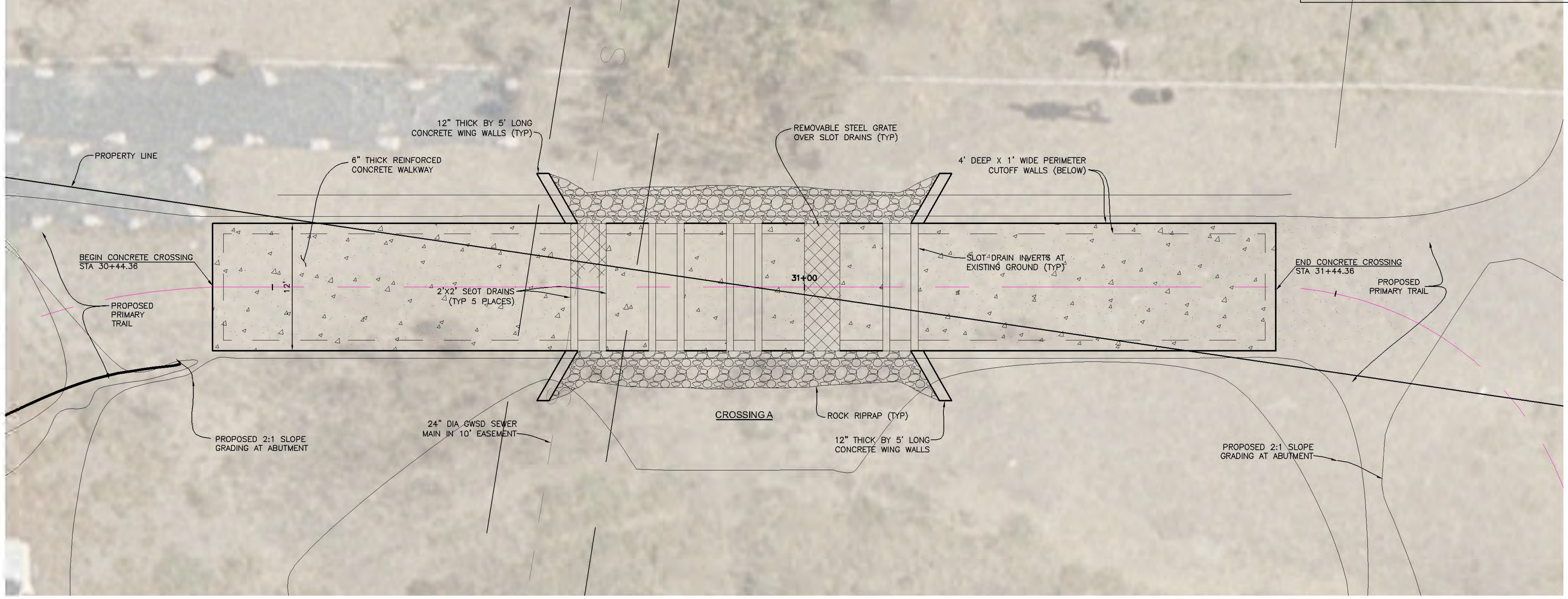
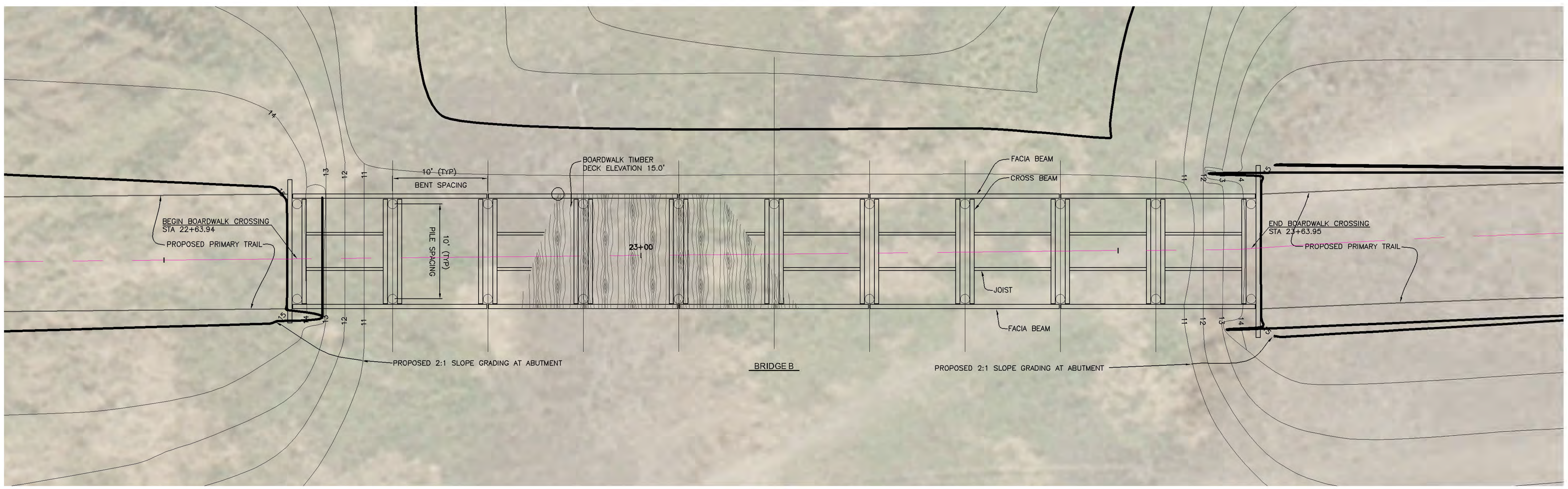


SIERRA MADRE CONCRETE CULVERT CROSSING
SCALE: 1"=5' CROSSING A



WHITTIER BOARDWALK CROSSING
SCALE: 1"=5' BRIDGE B

PRELIMINARY
NOT FOR CONSTRUCTION

STRUCTURAL PLAN

ST–1

VERIFY SCALE 0 1"

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CONTRACT No. –

PROJECT ID 0516000102

REVISED BY	DATE REVISED
Bret Foster	Steve Wong
CALCULATED-DESIGNED BY	CHECKED BY
CONSULTANT FUNCTIONAL SUPERVISOR	–

STATE OF CALIFORNIA – DEPARTMENT OF TRANSPORTATION

Caltrans®

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ESA

SHEET TITLE: TITLE SHEET

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APPROVED

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INCHARGE B. GATTALIO C41756

SCALE AS NOTED

DATE

SHEET ST1

1 of

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TIME PLOTTED => –

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XX/XX/XX
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FOR REVIEW
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER
BRETT E FOSTER
No. 48267
Exp. 6/30/18
CIVIL
STATE OF CALIFORNIA

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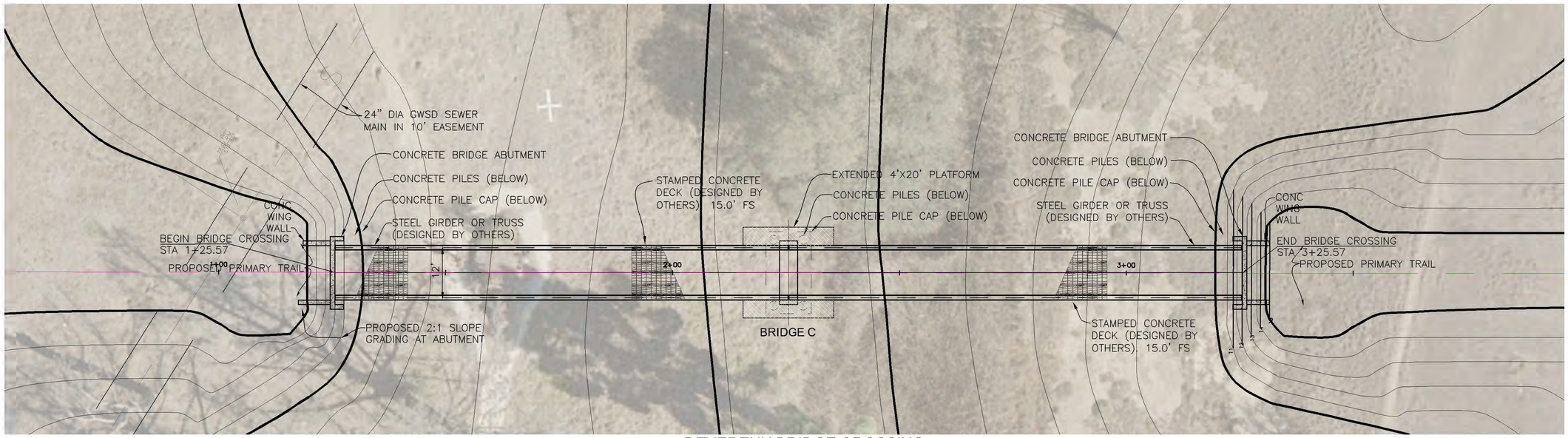
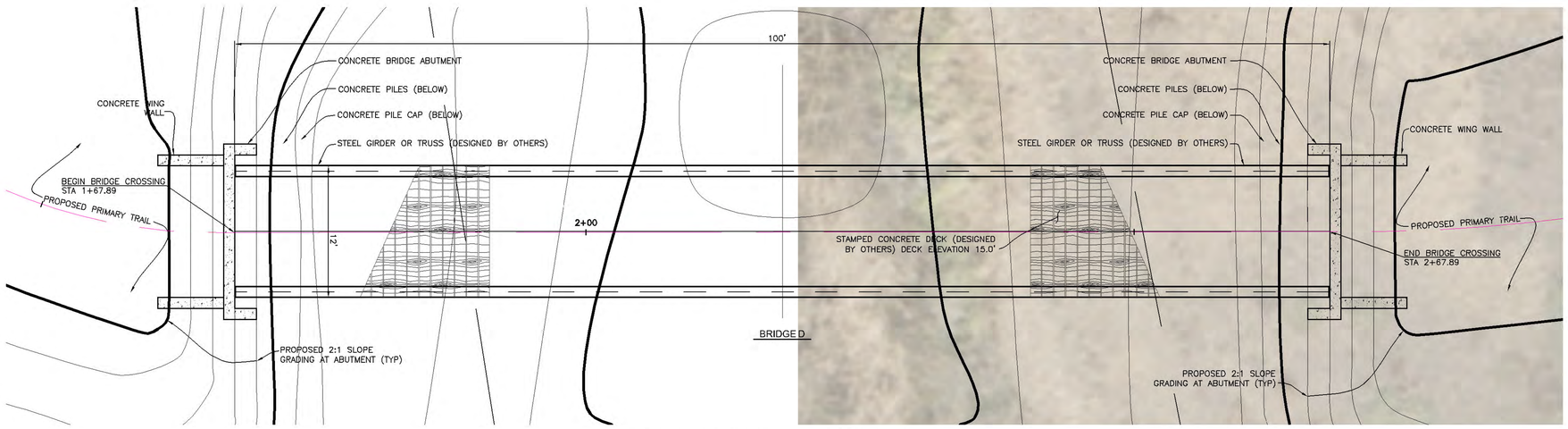
ESA



DEVEREUX BRIDGE CROSSING
SCALE: 1"=10' BRIDGE C



PHELPS BRIDGE CROSSING
SCALE: 1"=5' BRIDGE D

PREPARED BY: ESA
550 Kearny Street Suite 1000 San Francisco, Ca 94108 415.896.5900 phone

SHEET TITLE: TITLE SHEET
PROJECT: NORTH CAMPUS OPEN SPACE RESTORATION PROJECT

PREPARED FOR: UNIVERSITY OF CALIFORNIA SANTA BARBARA SANTA BARBARA, CA 93106-1030

PRELIMINARY
NOT FOR CONSTRUCTION

STRUCTURAL PLAN
ST–2

VERIFY SCALE
0 1"
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CONTRACT No. –
PROJECT ID 0516000102

LAST REVISION	05-31-16
DATE PLOTTED =>	5-31-2016
TIME PLOTTED =>	–
APPROVED	
DESIGNED	ESA
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INCHARGE	B. BATTALIO C-11758
SCALE	AS NOTED
DATE	
SHEET	ST2

1 OF

REVISED BY	DATE REVISED
Bret Foster	Steve Wong

CALCULATED–DESIGNED BY
CHECKED BY

CONSULTANT FUNCTIONAL SUPERVISOR –

STATE OF CALIFORNIA – DEPARTMENT OF TRANSPORTATION
Caltrans

BORDER LAST REVISED 4/11/2008 | RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3 | Locator - 05-SB-0-UCSB Project ID 05160001.02 | USERNAME =>NA DGN FILE => NA | UNIT 0000 | PROJECT NUMBER & PHASE 00000000001

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FEDERAL PROJECT NUMBER	ATPL-6300(003)

Dist	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET No.	TOTAL SHEETS
05	SB	–	–		

xx/xx/xx
REGISTERED CIVIL ENGINEER DATE

FOR REVIEW
PLANS APPROVAL DATE

REGISTERED PROFESSIONAL ENGINEER
BRETT F. FOSTER
No. 48267
Exp. 6/30/18
CIVIL
STATE OF CALIFORNIA

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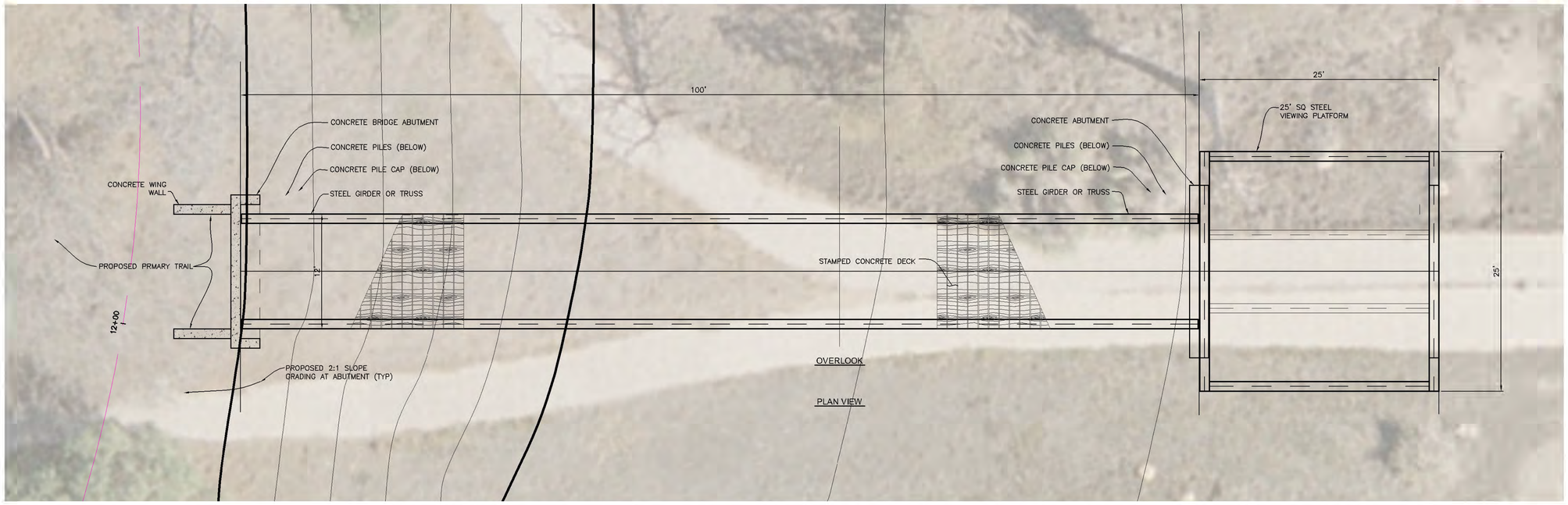
SANTA BARBARA
SANTA BARBARA, CA 93106-1030



OVERLOOK & VIEWING PLATFORM

DESIGNED BY OTHERS BASED ON
PERFORMANCE SPECIFICATION
SCALE: 1"=5'

PREPARED BY: ESA
550 Kearny Street
Suite 800
San Francisco, Ca 94108
415.896.5900 phone

SHEET TITLE: TITLE SHEET

PROJECT: NORTH CAMPUS OPEN SPACE RESTORATION PROJECT

PREPARED FOR: UNIVERSITY OF CALIFORNIA
SANTA BARBARA
SANTA BARBARA, CA 93106-1030

PRELIMINARY
NOT FOR CONSTRUCTION

STRUCTURAL PLAN

ST-3

VERIFY SCALE
0 1"
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CONTRACT No. –
PROJECT ID 0516000102

LAST REVISION	DATE PLOTTED
05-31-16	DATE PLOTTED => 5-31-2016
	TIME PLOTTED => –

APPROVED	
DESIGNED	ESA
DRAWN	
INCHARGE	B. BATTAGLIO C41756
SCALE	AS NOTED
DATE	
SHEET	ST3

1 OF

REVISED BY	DATE REVISED

CALCULATED-DESIGNED BY: Bret Foster
CHECKED BY: Steve Wong

CONSULTANT FUNCTIONAL SUPERVISOR: –

STATE OF CALIFORNIA – DEPARTMENT OF TRANSPORTATION
Caltrans

BORDER LAST REVISED 4/11/2008

RELATIVE BORDER SCALE IS IN INCHES 0 1 2 3

Locator - 05-SB-0-UCSB
Project ID 05160001.02

USERNAME =>NA
DGN FILE => NA

UNIT 0000

PROJECT NUMBER & PHASE 00000000001

V:\2061\active\206106300\Structural\CAD\0000 Bridge - BRIDGE_GO Plans 4.dwg 5-31-16 04:04:28 PM bfoster

APPENDIX C– MT-2 FORMS

Appendix C

C.1 MT-2 FORMS

C.1.1 Devereux Creek Main Reach

C.1.2 Tributary 2

C.1.3 Tributary 3

U.S. DEPARTMENT OF HOMELAND SECURITY
FEDERAL EMERGENCY MANAGEMENT AGENCY

OVERVIEW & CONCURRENCE FORM

O.M.B No. 1660-0016
Expires February 28, 2014

PAPERWORK BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average 1 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing, reviewing, and submitting the form. You are not required to respond to this collection of information unless it displays a valid OMB control number. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Department of Homeland Security, Federal Emergency Management Agency, 1800 South Bell Street, Arlington, VA 20958-3005, Paperwork Reduction Project (1660-0016). Submission of the form is required to obtain or retain benefits under the National Flood Insurance Program. **Please do not send your completed survey to the above address.**

PRIVACY ACT STATEMENT

AUTHORITY: The National Flood Insurance Act of 1968, Public Law 90-448, as amended by the Flood Disaster Protection Act of 1973, Public Law 93-234.

PRINCIPAL PURPOSE(S): This information is being collected for the purpose of determining an applicant's eligibility to request changes to National Flood Insurance Program (NFIP) Flood Insurance Rate Maps (FIRM).

ROUTINE USE(S): The information on this form may be disclosed as generally permitted under 5 U.S.C § 552a(b) of the Privacy Act of 1974, as amended. This includes using this information as necessary and authorized by the routine uses published in DHS/FEMA/NFIP/LOMA-1 National Flood Insurance Program (NFIP); Letter of Map Amendment (LOMA) February 15, 2006, 71 FR 7990.

DISCLOSURE: The disclosure of information on this form is voluntary; however, failure to provide the information requested may delay or prevent FEMA from processing a determination regarding a requested change to a (NFIP) Flood Insurance Rate Maps (FIRM).

A. REQUESTED RESPONSE FROM DHS-FEMA

This request is for a (check one):

☒ CLOMR: A letter from DHS-FEMA commenting on whether a proposed project, if built as proposed, would justify a map revision, or proposed hydrology changes (See 44 CFR Ch. 1, Parts 60, 65 & 72).

☐ LOMR: A letter from DHS-FEMA officially revising the current NFIP map to show the changes to floodplains, regulatory floodway or flood elevations. (See 44 CFR Ch. 1, Parts 60, 65 & 72)

B. OVERVIEW

1. The NFIP map panel(s) affected for all impacted communities is (are):

Community No.	Community Name	State	Map No.	Panel No.	Effective Date
Example: 480301 480287	City of Katy Harris County	TX TX	48473C 48201C	0005D 0220G	02/08/83 09/28/90
060331	Santa Barbara County	CA	06083C	1342G	12/4/201
060331	Santa Barbara County	CA	06083C	1361G	12/4/201

2. a. Flooding Source: Devereaux Creek

   b. Types of Flooding: ☒ Riverine ☐ Coastal ☐ Shallow Flooding (e.g., Zones AO and AH)
   ☐ Alluvial fan ☐ Lakes ☐ Other (Attach Description)

3. Project Name/Identifier: NCOS Creek Restoration

4. FEMA zone designations affected: AE (choices: A, AH, AO, A1-A30, A99, AE, AR, V, V1-V30, VE, B, C, D, X)

5. Basis for Request and Type of Revision:

   a. The basis for this revision request is (check all that apply)

   ☒ Physical Change ☒ Improved Methodology/Data ☒ Regulatory Floodway Revision ☐ Base Map Changes
   ☐ Coastal Analysis ☒ Hydraulic Analysis ☐ Hydrologic Analysis ☐ Corrections
   ☐ Weir-Dam Changes ☐ Levee Certification ☐ Alluvial Fan Analysis ☒ Natural Changes
   ☒ New Topographic Data ☐ Other (Attach Description)

   Note: A photograph and narrative description of the area of concern is not required, but is very helpful during review.

b. The area of revision encompasses the following structures (check all that apply)

Structures: ☐ Channelization ☐ Levee/Floodwall ☒ Bridge/Culvert

☐ Dam ☐ Fill ☐ Other (Attach Description)

6. ☐ Documentation of ESA compliance is submitted (required to initiate CLOMR review). Please refer to the instructions for more information.

C. REVIEW FEE

Has the review fee for the appropriate request category been included? ☒ Yes Fee amount: $$6,500.00

☐ No, Attach Explanation

Please see the DHS-FEMA Web site at http://www.fema.gov/plan/prevent/fhm/frm_fees.shtm **for Fee Amounts and Exemptions.**

D. SIGNATURE

All documents submitted in support of this request are correct to the best of my knowledge. I understand that any false statement may be punishable by fine or imprisonment under Title 18 of the United States Code, Section 1001.

Name: Craig A. Steward, P.E., CFM	Company: Stantec Consulting Services Inc.	
Mailing Address: 111 E. Victoria Street, Santa Barbara, C	Daytime Telephone No.: 805-308-9163	Fax No.: 805-966-9801
	E-Mail Address: Craig.Steward@Stantec.com	
Signature of Requester (required):	Date:	

As the community official responsible for floodplain management, I hereby acknowledge that we have received and reviewed this Letter of Map Revision (LOMR) or conditional LOMR request. Based upon the community's review, we find the completed or proposed project meets or is designed to meet all of the community floodplain management requirements, including the requirements for when fill is placed in the regulatory floodway, and that all necessary Federal, State, and local permits have been, or in the case of a conditional LOMR, will be obtained. For Conditional LOMR requests, the applicant has documented Endangered Species Act (ESA) compliance to FEMA prior to FEMA's review of the Conditional LOMR application. For LOMR requests, I acknowledge that compliance with Sections 9 and 10 of the ESA has been achieved independently of FEMA's process. For actions authorized, funded, or being carried out by Federal or State agencies, documentation from the agency showing its compliance with Section 7(a)(2) of the ESA will be submitted. In addition, we have determined that the land and any existing or proposed structures to be removed from the SFHA are or will be reasonably safe from flooding as defined in 44CFR 65.2(c), and that we have available upon request by FEMA, all analyses and documentation used to make this determination.

Community Official's Name and Title:	Community Name: Santa Barbara County	
Mailing Address: Santa Barbara County Flood Control Dist. 130 East Victoria Street, Suite 200 Sant	Daytime Telephone No.: 805-568-3440	Fax No.: 805-568-3434
	E-Mail Address:	
Community Official's Signature (required):	Date:	

CERTIFICATION BY REGISTERED PROFESSIONAL ENGINEER AND/OR LAND SURVEYOR

This certification is to be signed and sealed by a licensed land surveyor, registered professional engineer, or architect authorized by law to certify elevation information data, hydrologic and hydraulic analysis, and any other supporting information as per NFIP regulations paragraph 65.2(b) and as described in the MT-2 Forms Instructions. All documents submitted in support of this request are correct to the best of my knowledge. I understand that any false statement may be punishable by fine or imprisonment under Title 18 of the United States Code, Section 1001.

Certifier's Name: Craig A. Steward. P.E., CFM	License No.: 37253		Expiration Date:
Company Name: Stantec Consulting Services Inc.	Telephone No.: 805-308-9163		Fax No.: 805-966-9801
Signature:	Date:	E-Mail Address: Craig A. Steward, P.E., CFM	

Ensure the forms that are appropriate to your revision request are included in your submittal.

Form Name and (Number)	Required if …
☒ Riverine Hydrology and Hydraulics Form (Form 2)	New or revised discharges or water-surface elevations
☒ Riverine Structures Form (Form 3)	Channel is modified, addition/revision of bridge/culverts, addition/revision of levee/floodwall, addition/revision of dam
☐ Coastal Analysis Form (Form 4)	New or revised coastal elevations
☐ Coastal Structures Form (Form 5)	Addition/revision of coastal structure
☐ Alluvial Fan Flooding Form (Form 6)	Flood control measures on alluvial fans

Seal (Optional)

U.S. DEPARTMENT OF HOMELAND SECURITY
FEDERAL EMERGENCY MANAGEMENT AGENCY

RIVERINE HYDROLOGY & HYDRAULICS FORM

O.M.B No. 1660-0016
Expires February 28, 2014

PAPERWORK BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average 3.5 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing, reviewing, and submitting the form. You are not required to respond to this collection of information unless a valid OMB control number appears in the upper right corner of this form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Department of Homeland Security, Federal Emergency Management Agency, 1800 South Bell Street, Arlington VA 20958-3005, Paperwork Reduction Project (1660-0016). Submission of the form is required to obtain or retain benefits under the National Flood Insurance Program. **Please do not send your completed survey to the above address.**

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DISCLOSURE: The disclosure of information on this form is voluntary; however, failure to provide the information requested may delay or prevent FEMA from processing a determination regarding a requested change to a NFIP Flood Insurance Rate Maps (FIRM).

Flooding Source: Devereaux Creek

Note: Fill out one form for each flooding source studied

A. HYDROLOGY

1. Reason for New Hydrologic Analysis (check all that apply)

☒ Not revised (skip to section B) ☐ No existing analysis ☐ Improved data
☐ Alternative methodology ☐ Proposed Conditions (CLOMR) ☐ Changed physical condition of watershed

2. Comparison of Representative 1%-Annual-Chance Discharges

Location	Drainage Area (Sq. Mi.)	Effective/FIS (cfs)	Revised (cfs)

3. Methodology for New Hydrologic Analysis (check all that apply)

☐ Statistical Analysis of Gage Records ☐ Precipitation/Runoff Model → Specify Model: _____
☐ Regional Regression Equations ☐ Other (please attach description)

Please enclose all relevant models in digital format, maps, computations (including computation of parameters), and documentation to support the new analysis.

4. Review/Approval of Analysis

If your community requires a regional, state, or federal agency to review the hydrologic analysis, please attach evidence of approval/review.

5. Impacts of Sediment Transport on Hydrology

Is the hydrology for the revised flooding source(s) affected by sediment transport? ☐ Yes ☐ No

If yes, then fill out Section F (Sediment Transport) of Form 3. If No, then attach your explanation..

B. HYDRAULICS

1. Reach to be Revised

	Description	Cross Section	Water-Surface Elevations (ft.)	
			Effective	Proposed/Revised
Downstream Limit*	Pacific Ocean	100	16.5	14.58
Upstream Limit*	Phelps Road	1529	21.11	

*Proposed/Revised elevations must tie-into the Effective elevations within 0.5 foot at the downstream and upstream limits of revision.

2. Hydraulic Method/Model Used: HEC-RAS V5.0.1

3. Pre-Submittal Review of Hydraulic Models*

DHS-FEMA has developed two review programs, CHECK-2 and CHECK-RAS, to aid in the review of HEC-2 and HEC-RAS hydraulic models, respectively. We recommend that you review your HEC-2 and HEC-RAS models with CHECK-2 and CHECK-RAS.

4.

Models Submitted	Natural Run		Floodway Run		Datum
Duplicate Effective Model*	File Name: DevereauxMain	Plan Name: 100yr	File Name:	Plan Name:	NAVD1988
Corrected Effective Model*	File Name: DevereauxMain	Plan Name: 100yr	File Name:	Plan Name:	NAVD1988
Existing or Pre-Project Conditions Model	File Name: NCOSHydraulicEval	Plan Name: Pre-Project v1	File Name:	Plan Name:	
Revised or Post-Project Conditions Model	File Name: NCOSHydraulicEval	Plan Name: Post-Project v1	File Name:	Plan Name:	
Other - (attach description)	File Name:	Plan Name:	File Name:	Plan Name:	

* For details, refer to the corresponding section of the instructions.

☐ Digital Models Submitted? (Required)

C. MAPPING REQUIREMENTS

A **certified topographic work map** must be submitted showing the following information (where applicable): the boundaries of the effective, existing, and proposed conditions 1%-annual-chance floodplain (for approximate Zone A revisions) or the boundaries of the 1%- and 0.2%-annual-chance floodplains and regulatory floodway (for detailed Zone AE, AO, and AH revisions); location and alignment of all cross sections with stationing control indicated; stream, road, and other alignments (e.g., dams, levees, etc.); current community easements and boundaries; boundaries of the requester's property; certification of a registered professional engineer registered in the subject State; location and description of reference marks; and the referenced vertical datum (NGVD, NAVD, etc.).

☒ Digital Mapping (GIS/CADD) Data Submitted (preferred)

Topographic Information: Aerial Topo and Surface

Source: Stantec Consulting Services Inc. Date: March 2016

Accuracy: 1 ft.

Note that the boundaries of the existing or proposed conditions floodplains and regulatory floodway to be shown on the revised FIRM and/or FBFM must tie-in with the effective floodplain and regulatory floodway boundaries. Please attach **a copy of the effective FIRM and/or FBFM**, at the same scale as the original, annotated to show the boundaries of the revised 1%-and 0.2%-annual-chance floodplains and regulatory floodway that tie-in with the boundaries of the effective 1%-and 0.2%-annual-chance floodplain and regulatory floodway at the upstream and downstream limits of the area on revision.

☒ Annotated FIRM and/or FBFM (Required)

D. COMMON REGULATORY REQUIREMENTS*

1. For LOMR/CLOMR requests, do Base Flood Elevations (BFEs) increase? ☐ Yes ☒ No

   a. For CLOMR requests, if either of the following is true, please submit **evidence of compliance with Section 65.12 of the NFIP regulations**:

   - The proposed project encroaches upon a regulatory floodway and would result in increases above 0.00 foot compared to pre-project conditions.
   - The proposed project encroaches upon a SFHA with or without BFEs established and would result in increases above 1.00 foot compared to pre-project conditions.

   b. Does this LOMR request cause increase in the BFE and/or SFHA compared with the effective BFEs and/or SFHA? ☐ Yes ☒ No
   If Yes, please attach **proof of property owner notification and acceptance (if available)**. Elements of and examples of property owner notifications can be found in the MT-2 Form 2 Instructions.

2. Does the request involve the placement or proposed placement of fill? ☐ Yes ☒ No

   If Yes, the community must be able to certify that the area to be removed from the special flood hazard area, to include any structures or proposed structures, meets all of the standards of the local floodplain ordinances, and is reasonably safe from flooding in accordance with the NFIP regulations set forth at 44 CFR 60.3(A)(3), 65.5(a)(4), and 65.6(a)(14). Please see the MT-2 instructions for more information.

3. For LOMR requests, is the regulatory floodway being revised? ☐ Yes ☐ No

   If Yes, attach **evidence of regulatory floodway revision notification**. As per Paragraph 65.7(b)(1) of the NFIP Regulations, notification is required for requests involving revisions to the regulatory floodway. (Not required for revisions to approximate 1%-annual-chance floodplains [studied Zone A designation] unless a regulatory floodway is being established. Elements and examples of regulatory floodway revision notification can be found in the MT-2 Form 2 Instructions.)

4. For CLOMR requests, please submit documentation to FEMA and the community to show that you have complied with Sections 9 and 10 of the Endangered Species Act (ESA).

For actions authorized, funded, or being carried out by Federal or State agencies, please submit documentation from the agency showing its compliance with Section 7(a)(2) of the ESA. Please see the MT-2 instructions for more detail.

* Not inclusive of all applicable regulatory requirements. For details, see 44 CFR parts 60 and 65.

U.S. DEPARTMENT OF HOMELAND SECURITY
FEDERAL EMERGENCY MANAGEMENT AGENCY

RIVERINE HYDROLOGY & HYDRAULICS FORM

O.M.B No. 1660-0016
Expires February 28, 2014

PAPERWORK BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average 3.5 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing, reviewing, and submitting the form. You are not required to respond to this collection of information unless a valid OMB control number appears in the upper right corner of this form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Department of Homeland Security, Federal Emergency Management Agency, 1800 South Bell Street, Arlington VA 20958-3005, Paperwork Reduction Project (1660-0016). Submission of the form is required to obtain or retain benefits under the National Flood Insurance Program. **Please do not send your completed survey to the above address.**

PRIVACY ACT STATEMENT

AUTHORITY: The National Flood Insurance Act of 1968, Public Law 90-448, as amended by the Flood Disaster Protection Act of 1973, Public Law 93-234.

PRINCIPAL PURPOSE(S): This information is being collected for the purpose of determining an applicant's eligibility to request changes to National Flood Insurance Program (NFIP) Flood Insurance Rate Maps (FIRM).

ROUTINE USE(S): The information on this form may be disclosed as generally permitted under 5 U.S.C § 552a(b) of the Privacy Act of 1974, as amended. This includes using this information as necessary and authorized by the routine uses published in DHS/FEMA/NFIP/LOMA-1 National Flood Insurance Program (NFIP); Letter of Map Amendment (LOMA) February 15, 2006, 71 FR 7990.

DISCLOSURE: The disclosure of information on this form is voluntary; however, failure to provide the information requested may delay or prevent FEMA from processing a determination regarding a requested change to a NFIP Flood Insurance Rate Maps (FIRM).

Flooding Source: Devereaux Creek - Tributary 2

Note: Fill out one form for each flooding source studied

A. HYDROLOGY

1. Reason for New Hydrologic Analysis (check all that apply)

☒ Not revised (skip to section B) ☐ No existing analysis ☐ Improved data
☐ Alternative methodology ☐ Proposed Conditions (CLOMR) ☐ Changed physical condition of watershed

2. Comparison of Representative 1%-Annual-Chance Discharges

Location	Drainage Area (Sq. Mi.)	Effective/FIS (cfs)	Revised (cfs)

3. Methodology for New Hydrologic Analysis (check all that apply)

☐ Statistical Analysis of Gage Records ☐ Precipitation/Runoff Model → Specify Model: _____
☐ Regional Regression Equations ☐ Other (please attach description)

Please enclose all relevant models in digital format, maps, computations (including computation of parameters), and documentation to support the new analysis.

4. Review/Approval of Analysis

If your community requires a regional, state, or federal agency to review the hydrologic analysis, please attach evidence of approval/review.

5. Impacts of Sediment Transport on Hydrology

Is the hydrology for the revised flooding source(s) affected by sediment transport? ☐ Yes ☐ No

If yes, then fill out Section F (Sediment Transport) of Form 3. If No, then attach your explanation..

B. HYDRAULICS

1. Reach to be Revised

	Description	Cross Section	Water-Surface Elevations (ft.)	
			Effective	Proposed/Revised
Downstream Limit*	Confluence with Devereaux Ck	300	7.77	8.12
Upstream Limit*	Phelps Road	7059	17.2	16.98

*Proposed/Revised elevations must tie-into the Effective elevations within 0.5 foot at the downstream and upstream limits of revision.

2. Hydraulic Method/Model Used: HEC-RAS V5.0.1

3. Pre-Submittal Review of Hydraulic Models*

DHS-FEMA has developed two review programs, CHECK-2 and CHECK-RAS, to aid in the review of HEC-2 and HEC-RAS hydraulic models, respectively. We recommend that you review your HEC-2 and HEC-RAS models with CHECK-2 and CHECK-RAS.

4.

Models Submitted	Natural Run		Floodway Run		Datum
Duplicate Effective Model*	File Name: DevereauxTrib2	Plan Name: 100yr	File Name:	Plan Name:	NAVD1988
Corrected Effective Model*	File Name: DevereauxTrib2	Plan Name: 100yr	File Name:	Plan Name:	NAVD1988
Existing or Pre-Project Conditions Model	File Name: NCOSHydraulicEval	Plan Name: Pre-Project v1	File Name:	Plan Name:	
Revised or Post-Project Conditions Model	File Name: NCOSHydraulicEval	Plan Name: Post-Project v1	File Name:	Plan Name:	
Other - (attach description)	File Name:	Plan Name:	File Name:	Plan Name:	

* For details, refer to the corresponding section of the instructions.

☒ Digital Models Submitted? (Required)

C. MAPPING REQUIREMENTS

A **certified topographic work map** must be submitted showing the following information (where applicable): the boundaries of the effective, existing, and proposed conditions 1%-annual-chance floodplain (for approximate Zone A revisions) or the boundaries of the 1%- and 0.2%-annual-chance floodplains and regulatory floodway (for detailed Zone AE, AO, and AH revisions); location and alignment of all cross sections with stationing control indicated; stream, road, and other alignments (e.g., dams, levees, etc.); current community easements and boundaries; boundaries of the requester's property; certification of a registered professional engineer registered in the subject State; location and description of reference marks; and the referenced vertical datum (NGVD, NAVD, etc.).

☒ Digital Mapping (GIS/CADD) Data Submitted (preferred)

Topographic Information: Aerial Topo and Surface

Source: Stantec Consulting Services Inc. Date: March 2016

Accuracy: 1 ft.

Note that the boundaries of the existing or proposed conditions floodplains and regulatory floodway to be shown on the revised FIRM and/or FBFM must tie-in with the effective floodplain and regulatory floodway boundaries. Please attach **a copy of the effective FIRM and/or FBFM**, at the same scale as the original, annotated to show the boundaries of the revised 1%-and 0.2%-annual-chance floodplains and regulatory floodway that tie-in with the boundaries of the effective 1%-and 0.2%-annual-chance floodplain and regulatory floodway at the upstream and downstream limits of the area on revision.

☒ Annotated FIRM and/or FBFM (Required)

D. COMMON REGULATORY REQUIREMENTS*

1. For LOMR/CLOMR requests, do Base Flood Elevations (BFEs) increase? ☐ Yes ☒ No

   a. For CLOMR requests, if either of the following is true, please submit **evidence of compliance with Section 65.12 of the NFIP regulations**:

   - The proposed project encroaches upon a regulatory floodway and would result in increases above 0.00 foot compared to pre-project conditions.
   - The proposed project encroaches upon a SFHA with or without BFEs established and would result in increases above 1.00 foot compared to pre-project conditions.

   b. Does this LOMR request cause increase in the BFE and/or SFHA compared with the effective BFEs and/or SFHA? ☐ Yes ☒ No
   If Yes, please attach **proof of property owner notification and acceptance (if available)**. Elements of and examples of property owner notifications can be found in the MT-2 Form 2 Instructions.

2. Does the request involve the placement or proposed placement of fill? ☐ Yes ☒ No

   If Yes, the community must be able to certify that the area to be removed from the special flood hazard area, to include any structures or proposed structures, meets all of the standards of the local floodplain ordinances, and is reasonably safe from flooding in accordance with the NFIP regulations set forth at 44 CFR 60.3(A)(3), 65.5(a)(4), and 65.6(a)(14). Please see the MT-2 instructions for more information.

3. For LOMR requests, is the regulatory floodway being revised? ☐ Yes ☐ No

   If Yes, attach **evidence of regulatory floodway revision notification**. As per Paragraph 65.7(b)(1) of the NFIP Regulations, notification is required for requests involving revisions to the regulatory floodway. (Not required for revisions to approximate 1%-annual-chance floodplains [studied Zone A designation] unless a regulatory floodway is being established. Elements and examples of regulatory floodway revision notification can be found in the MT-2 Form 2 Instructions.)

4. For CLOMR requests, please submit documentation to FEMA and the community to show that you have complied with Sections 9 and 10 of the Endangered Species Act (ESA).

For actions authorized, funded, or being carried out by Federal or State agencies, please submit documentation from the agency showing its compliance with Section 7(a)(2) of the ESA. Please see the MT-2 instructions for more detail.

* Not inclusive of all applicable regulatory requirements. For details, see 44 CFR parts 60 and 65.

DEPARTMENT OF HOMELAND SECURITY
FEDERAL EMERGENCY MANAGEMENT AGENCY

RIVERINE STRUCTURES FORM

O.M.B. NO. 1660-0016
Expires February 28, 2014

PAPERWORK BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average 7 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing, reviewing, and submitting the form. You are not required to respond to this collection of information unless a valid OMB control number appears in the upper right corner of this form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Department of Homeland Security, Federal Emergency Management Agency, 1800 South Bell Street, Arlington, VA 20598-3005, Paperwork Reduction Project (1660-0016). Submission of the form is required to obtain or retain benefits under the National Flood Insurance Program. **Please do not send your completed survey to the above address.**

PRIVACY ACT STATEMENT

AUTHORITY: The National Flood Insurance Act of 1968, Public Law 90-448, as amended by the Flood Disaster Protection Act of 1973, Public Law 93-234.

PRINCIPAL PURPOSE(S): This information is being collected for the purpose of determining an applicant's eligibility to request changes to National Flood Insurance Program (NFIP) Flood Insurance Rate Maps (FIRM).

ROUTINE USE(S): The information on this form may be disclosed as generally permitted under 5 U.S.C § 552a(b) of the Privacy Act of 1974, as amended. This includes using this information as necessary and authorized by the routine uses published in DHS/FEMA/NFIP/LOMA-1 National Flood Insurance Program; Letter of Map Amendment (LOMA) February 15, 2006, 71 FR 7990.

DISCLOSURE: The disclosure of information on this form is voluntary; however, failure to provide the information requested may delay or prevent FEMA from processing a determination regarding a requested change to a NFIP Flood Insurance Rate Maps (FIRM).

Flooding Source: Devereaux Creek-Tributary 2

Note**:** Fill out one form for each flooding source studied.

A. GENERAL

Complete the appropriate section(s) for each Structure listed below:

Channelization.....complete Section B
Bridge/Culvert.....complete Section C
Dam.....complete Section D
Levee/Floodwall.....complete Section E
Sediment Transport.....complete Section F (if required)

Description Of Modeled Structure

1. Name of Structure: Bridge D

   Type (check one): ☐ Channelization ☒ Bridge/Culvert ☐ Levee/Floodwall ☐ Dam

   Location of Structure: Tributary 2 near confluence with Devereaux Creek Main channel

   Downstream Limit/Cross Section: 85

   Upstream Limit/Cross Section: 128

2. Name of Structure: _____

   Type (check one): ☐ Channelization ☐ Bridge/Culvert ☐ Levee/Floodwall ☐ Dam

   Location of Structure: _____

   Downstream Limit/Cross Section: _____

   Upstream Limit/Cross Section: _____

3. Name of Structure: _____

   Type (check one) ☐ Channelization ☐ Bridge/Culvert ☐ Levee/Floodwall ☐ Dam

   Location of Structure: _____

   Downstream Limit/Cross Section: _____

   Upstream Limit/Cross Section: _____

NOTE: FOR MORE STRUCTURES, ATTACH ADDITIONAL PAGES AS NEEDED.

B. CHANNELIZATION

Flooding Source: _____

Name of Structure: _____

1. Hydraulic Considerations

The channel was designed to carry _____ (cfs) and/or the _____-year flood.

The design elevation in the channel is based on (check one):

☐ Subcritical flow ☐ Critical flow ☐ Supercritical flow ☐ Energy grade line

If there is the potential for a hydraulic jump at the following locations, check all that apply and attach an explanation of how the hydraulic jump is controlled without affecting the stability of the channel.

☐ Inlet to channel ☐ Outlet of channel ☐ At Drop Structures ☐ At Transitions

☐ Other locations (specify): _____

2. Channel Design Plans

Attach the plans of the channelization certified by a registered professional engineer, as described in the instructions.

3. Accessory Structures

The channelization includes (check one):

☐ Levees [Attach Section E (Levee/Floodwall)] ☐ Drop structures ☐ Superelevated sections

☐ Transitions in cross sectional geometry ☐ Debris basin/detention basin [Attach Section D (Dam/Basin)] ☐ Energy dissipator

☐ Weir ☐ Other (Describe):

4. Sediment Transport Considerations

Are the hydraulics of the channel affected by sediment transport? ☐ Yes ☐ No

If yes, then fill out Section F (Sediment Transport) of Form 3. If No, then attach your explanation for why sediment transport was not considered.

C. BRIDGE/CULVERT

Flooding Source: Tributary 2 (aka Phelps Ditch)

Name of Structure: Bridge D

1. This revision reflects (check one):

☒ Bridge/culvert not modeled in the FIS

☐ Modified bridge/culvert previously modeled in the FIS

☐ Revised analysis of bridge/culvert previously modeled in the FIS

2. Hydraulic model used to analyze the structure (e.g., HEC-2 with special bridge routine, WSPRO, HY8): HEC-RAS
If different than hydraulic analysis for the flooding source, justify why the hydraulic analysis used for the flooding source could not analyze the structures. Attach justification.

3. Attach plans of the structures certified by a registered professional engineer. The plan detail and information should include the following (check the information that has been provided):

☒ Dimensions (height, width, span, radius, length)
☒ Shape (culverts only)
☒ Material
☒ Beveling or Rounding
☒ Wing Wall Angle
☒ Skew Angle
☐ Distances Between Cross Sections
☐ Erosion Protection
☒ Low Chord Elevations – Upstream and Downstream
☒ Top of Road Elevations – Upstream and Downstream
☒ Structure Invert Elevations – Upstream and Downstream
☒ Stream Invert Elevations – Upstream and Downstream
☐ Cross-Section Locations

4. Sediment Transport Considerations

Are the hydraulics of the structure affected by sediment transport? ☐ Yes ☒ No

If Yes, then fill out Section F (Sediment Transport) of Form 3. If no, then attach an explanation.

D. DAM/BASIN

Flooding Source: _____
Name of Structure: _____

1. This request is for (check one): ☐ Existing dam/basin ☐ New dam/basin ☐ Modification of existing dam/basin

2. The dam/basin was designed by (check one): ☐ Federal agency ☐ State agency ☐ Private organization ☐ Local government agency

   Name of the agency or organization: _____

3. The Dam was permitted as (check one): ☐ Federal Dam ☐ State Dam

   Provide the permit or identification number (ID) for the dam and the appropriate permitting agency or organization

   Permit or ID number _____ Permitting Agency or Organization _____

   a. ☐ Local Government Dam ☐ Private Dam

   Provided related drawings, specification and supporting design information.

4. Does the project involve revised hydrology? ☐ Yes ☐ No

   If Yes, complete the Riverine Hydrology & Hydraulics Form (Form 2).

   Was the dam/basin designed using critical duration storm? (must account for the maximum volume of runoff)

   ☐ Yes, provide supporting documentation with your completed Form 2.

   ☐ No, provide a written explanation and justification for not using the critical duration storm.

5. Does the submittal include debris/sediment yield analysis? ☐ Yes ☐ No

   If Yes, then fill out Section F (Sediment Transport). If No, then attach your explanation for why debris/sediment analysis was not considered?

6. Does the Base Flood Elevation behind the dam/basin or downstream of the dam/basin change? ☐ Yes ☐ No

   If Yes, complete the Riverine Hydrology & Hydraulics Form (Form 2) and complete the table below.

FREQUENCY (% annual chance)	Stillwater Elevation Behind the Dam/Basin FIS	REVISED
10-year (10%)	_____	_____
50-year (2%)	_____	_____
100-year (1%)	_____	_____
500-year (0.2%)	_____	_____
Normal Pool Elevation	_____	_____

7. Please attach a copy of the formal Operation and Maintenance Plan

E. LEVEE/FLOODWALL

1. System Elements

a. This Levee/Floodwall analysis is based on (check one): ☐ upgrading of an existing levee/floodwall system ☐ a newly constructed levee/floodwall system ☐ reanalysis of an existing levee/floodwall system

b. Levee elements and locations are (check one):

☐ earthen embankment, dike, berm, etc. Station _____ to _____
☐ structural floodwall Station _____ to _____
☐ Other (describe): Station _____ to _____

c. Structural Type (check one): ☐ monolithic cast-in place reinforced concrete ☐ reinforced concrete masonry block ☐ sheet piling ☐ Other (describe): _____

d. Has this levee/floodwall system been certified by a Federal agency to provide protection from the base flood?

☐ Yes ☐ No

If Yes, by which agency? _____

e. Attach certified drawings containing the following information (indicate drawing sheet numbers):

1. Plan of the levee embankment and floodwall structures. Sheet Numbers: _____
2. A profile of the levee/floodwall system showing the Base Flood Elevation (BFE), levee and/or wall crest and foundation, and closure locations for the total levee system. Sheet Numbers: _____
3. A profile of the BFE, closure opening outlet and inlet invert elevations, type and size of opening, and kind of closure. Sheet Numbers: _____
4. A layout detail for the embankment protection measures. Sheet Numbers: _____
5. Location, layout, and size and shape of the levee embankment features, foundation treatment, Floodwall structure, closure structures, and pump stations. Sheet Numbers: _____

2. Freeboard

a. The minimum freeboard provided above the BFE is:

Riverine

3.0 feet or more at the downstream end and throughout	☐ Yes	☐ No
3.5 feet or more at the upstream end	☐ Yes	☐ No
4.0 feet within 100 feet upstream of all structures and/or constrictions	☐ Yes	☐ No

Coastal

1.0 foot above the height of the one percent wave associated with the 1%-annual-chance stillwater surge elevation or maximum wave runup (whichever is greater).	☐ Yes	☐ No
2.0 feet above the 1%-annual-chance stillwater surge elevation	☐ Yes	☐ No

Please note, occasionally exceptions are made to the minimum freeboard requirement. If an exception is requested, attach documentation addressing Paragraph 65.10(b)(1)(ii) of the NFIP Regulations.

If No is answered to any of the above, please attach an explanation.

b. Is there an indication from historical records that ice-jamming can affect the BFE? ☐ Yes ☐ No

If Yes, provide ice-jam analysis profile and evidence that the minimum freeboard discussed above still exists.

3. Closures

a. Openings through the levee system (check one): ☐ exists ☐ does not exist

If opening exists, list all closures:

Channel Station	Left or Right Bank	Opening Type	Highest Elevation for Opening Invert	Type of Closure Device

(Extend table on an added sheet as needed and reference)

Note: Geotechnical and geologic data

In addition to the required detailed analysis reports, data obtained during field and laboratory investigations and used in the design analysis for the following system features should be submitted in a tabulated summary form. (Reference U.S. Army Corps of Engineers [USACE] EM-1110-2-1906 Form 2086.)

4. Embankment Protection

a. The maximum levee slope land side is: _____

b. The maximum levee slope flood side is: _____

c. The range of velocities along the levee during the base flood is: _____ (min.) to _____ (max.)

d. Embankment material is protected by (describe what kind): _____

e. Riprap Design Parameters (check one): ☐ Velocity ☐ Tractive stress
Attach references

Reach	Sideslope	Flow Depth	Velocity	Curve or Straight	Stone Riprap			Depth of Toedown
					D_{100}	D_{50}	Thickness	
Sta to								
Sta to								
Sta to								
Sta to								
Sta to								
Sta to								

(Extend table on an added sheet as needed and reference each entry)

f. Is a bedding/filter analysis and design attached? ☐ Yes ☐ No

g. Describe the analysis used for other kinds of protection used (include copies of the design analysis):

Attach engineering analysis to support construction plans.

5. Embankment And Foundation Stability

a. Identify locations and describe the basis for selection of critical location for analysis:
_____

☐ Overall height: Sta.: _____, height _____ ft.

☐ Limiting foundation soil strength:

Strength ϕ = _____ degrees, c = _____ psf

Slope: SS = _____ (h) to _____ (v)

(Repeat as needed on an added sheet for additional locations)

b. Specify the embankment stability analysis methodology used (e.g., circular arc, sliding block, infinite slope, etc.):
_____

c. Summary of stability analysis results:

E. LEVEE/FLOODWALL (CONTINUED)

5. Embankment And Foundation Stability (continued)

Case	Loading Conditions	Critical Safety Factor	Criteria (Min.)
I	End of construction		1.3
II	Sudden drawdown		1.0
III	Critical flood stage		1.4
IV	Steady seepage at flood stage		1.4
VI	Earthquake (Case I)		1.0

(Reference: USACE EM-1110-2-1913 Table 6-1)

d. Was a seepage analysis for the embankment performed? ☐ Yes ☐ No

If Yes, describe methodology used:

e. Was a seepage analysis for the foundation performed? ☐ Yes ☐ No

f. Were uplift pressures at the embankment landside toe checked? ☐ Yes ☐ No

g. Were seepage exit gradients checked for piping potential? ☐ Yes ☐ No

h. The duration of the base flood hydrograph against the embankment is _____ hours.

Attach engineering analysis to support construction plans.

6. Floodwall And Foundation Stability

a. Describe analysis submittal based on Code (check one): ☐ UBC (1988) ☐ Other (specify): _____

b. Stability analysis submitted provides for: ☐ Overturning ☐ Sliding If not, explain: _____

c. Loading included in the analyses were: ☐ Lateral earth @ P_A = _____ psf; P_p = _____ psf

☐ Surcharge-Slope @ _____, ☐ surface _____ psf

☐ Wind @ P_w = _____ psf

☐ Seepage (Uplift); _____ ☐ Earthquake @ P_{eq} = _____ %g

☐ 1%-annual-chance significant wave height: _____ ft.

☐ 1%-annual-chance significant wave period: _____ sec.

d. Summary of Stability Analysis Results: Factors of Safety.
Itemize for each range in site layout dimension and loading condition limitation for each respective reach.

Loading Condition	Criteria (Min)		Sta	To	Sta	To
	Overturn	Sliding	Overturn	Sliding	Overturn	Sliding
Dead & Wind	1.5	1.5				
Dead & Soil	1.5	1.5				
Dead, Soil, Flood, & Impact	1.5	1.5				
Dead, Soil, & Seismic	1.3	1.3				

(Ref: FEMA 114 Sept 1986; USACE EM 1110-2-2502)
Note: (Extend table on an added sheet as needed and reference)

E. LEVEE/FLOODWALL (CONTINUED)

6. Floodwall And Foundation Stability (continued)

e. Foundation bearing strength for each soil type:

Bearing Pressure	Sustained Load (psf)	Short Term Load (psf)
Computed design maximum		
Maximum allowable		

f. Foundation scour protection ☐ is, ☐ is not provided. If provided, attach explanation and supporting documentation:

Attach engineering analysis to support construction plans.

7. Settlement

a. Has anticipated potential settlement been determined and incorporated into the specified construction elevations to maintain the established freeboard margin? ☐ Yes ☐ No

b. The computed range of settlement is _____ ft. to _____ ft.

c. Settlement of the levee crest is determined to be primarily from : ☐ Foundation consolidation ☐ Embankment compression ☐ Other (Describe): _____

d. Differential settlement of floodwalls ☐ has ☐ has not been accommodated in the structural design and construction.

Attach engineering analysis to support construction plans.

8. Interior Drainage

a. Specify size of each interior watershed:

Draining to pressure conduit: _____ acres
Draining to ponding area: _____ acres

b. Relationships Established

Ponding elevation vs. storage	☐ Yes	☐ No
Ponding elevation vs. gravity flow	☐ Yes	☐ No
Differential head vs. gravity flow	☐ Yes	☐ No

c. The river flow duration curve is enclosed: ☐ Yes ☐ No

d. Specify the discharge capacity of the head pressure conduit: _____ cfs

e. Which flooding conditions were analyzed?

• Gravity flow (Interior Watershed)	☐ Yes	☐ No
• Common storm (River Watershed)	☐ Yes	☐ No
• Historical ponding probability	☐ Yes	☐ No
• Coastal wave overtopping	☐ Yes	☐ No

If No for any of the above, attach explanation.

e. Interior drainage has been analyzed based on joint probability of interior and exterior flooding and the capacities of pumping and outlet facilities to provide the established level of flood protection. ☐ Yes ☐ No If No, attach explanation.

g. The rate of seepage through the levee system for the base flood is _____ cfs

h. The length of levee system used to drive this seepage rate in item g: _____ ft.

E. LEVEE/FLOODWALL (CONTINUED)

8. Interior Drainage (continued)

i. Will pumping plants be used for interior drainage? ☐ Yes ☐ No

If Yes, include the number of pumping plants: _____ For each pumping plant, list:

	Plant #1	Plant #2
The number of pumps		
The ponding storage capacity		
The maximum pumping rate		
The maximum pumping head		
The pumping starting elevation		
The pumping stopping elevation		
Is the discharge facility protected?		
Is there a flood warning plan?		
How much time is available between warning and flooding?		

Will the operation be automatic? ☐ Yes ☐ No

If the pumps are electric, are there backup power sources? ☐ Yes ☐ No

(Reference: USACE EM-1110-2-3101, 3102, 3103, 3104, and 3105)

Include a copy of supporting documentation of data and analysis. Provide a map showing the flooded area and maximum ponding elevations for all interior watersheds that result in flooding.

9. Other Design Criteria

a. The following items have been addressed as stated:

Liquefaction ☐ is ☐ is not a problem

Hydrocompaction ☐ is ☐ is not a problem

Heave differential movement due to soils of high shrink/swell ☐ is ☐ is not a problem

b. For each of these problems, state the basic facts and corrective action taken:

Attach supporting documentation

c. If the levee/floodwall is new or enlarged, will the structure adversely impact flood levels and/or flow velocities floodside of the structure?
☐ Yes ☐ No Attach supporting documentation

d. Sediment Transport Considerations:

Was sediment transport considered? ☐ Yes ☐ No

If Yes, then fill out Section F (Sediment Transport). If No, then attach your explanation for why sediment transport was not considered.

10. Operational Plan And Criteria

a. Are the planned/installed works in full compliance with Part 65.10 of the NFIP Regulations? ☐ Yes ☐ No

b. Does the operation plan incorporate all the provisions for closure devices as required in Paragraph 65.10(c)(1) of the NFIP regulations?
☐ Yes ☐ No

c. Does the operation plan incorporate all the provisions for interior drainage as required in Paragraph 65.10(c)(2) of the NFIP regulations?
☐ Yes ☐ No If the answer is No to any of the above, please attach supporting documentation.

E. LEVEE/FLOODWALL (CONTINUED)

11. Maintenance Plan

Please attach a copy of the fomal maintenance plan for the levee/floodwall

12. Operations and Maintenance Plan

Please attach a copy of the formal Operations and Maintenance Plan for the levee/floodwall.

CERTIFICATION OF THE LEVEE DOCUMENTION

This certification is to be signed and sealed by a licensed registered professional engineer authorized by law to certify elevation information data, hydrologic and hydraulic analysis, and any other supporting information as per NFIP regulations paragraph 65.10(e) and as described in the MT-2 Forms Instructions. All documents submitted in support of this request are correct to the best of my knowledge. I understand that any false statement may be punishable by fine or imprisonment under Title 18 of the United States Code, Section 1001.

Certifier's Name: _____ License No.: _____ Expiration Date: _____

Company Name: _____ Telephone No.: _____ Fax No.: _____

Signature: _____ Date: _____ E-Mail Address: _____

F. SEDIMENT TRANSPORT

Flooding Source: _____

Name of Structure: _____

If there is any indication from historical records that sediment transport (including scour and deposition) can affect the Base Flood Elevation (BFE); and/or based on the stream morphology, vegetative cover, development of the watershed and bank conditions, there is a potential for debris and sediment transport (including scour and deposition) to affect the BFEs, then provide the following information along with the supporting documentation:

Sediment load associated with the base flood discharge: Volume _____ acre-feet

Debris load associated with the base flood discharge: Volume _____ acre-feet

Sediment transport rate _____ (percent concentration by volume)

Method used to estimate sediment transport: _____

Most sediment transport formulas are intended for a range of hydraulic conditions and sediment sizes; attach a detailed explanation for using the selected method.

Method used to estimate scour and/or deposition: _____

Method used to revise hydraulic or hydrologic analysis (model) to account for sediment transport: _____

Please note that bulked flows are used to evaluate the performance of a structure during the base flood; however, FEMA does not map BFEs based on bulked flows.

If a sediment analysis has not been performed, an explanation as to why sediment transport (including scour and deposition) will not affect the BFEs or structures must be provided.

U.S. DEPARTMENT OF HOMELAND SECURITY
FEDERAL EMERGENCY MANAGEMENT AGENCY

RIVERINE HYDROLOGY & HYDRAULICS FORM

O.M.B No. 1660-0016
Expires February 28, 2014

PAPERWORK BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average 3.5 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing, reviewing, and submitting the form. You are not required to respond to this collection of information unless a valid OMB control number appears in the upper right corner of this form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Department of Homeland Security, Federal Emergency Management Agency, 1800 South Bell Street, Arlington VA 20958-3005, Paperwork Reduction Project (1660-0016). Submission of the form is required to obtain or retain benefits under the National Flood Insurance Program. **Please do not send your completed survey to the above address.**

PRIVACY ACT STATEMENT

AUTHORITY: The National Flood Insurance Act of 1968, Public Law 90-448, as amended by the Flood Disaster Protection Act of 1973, Public Law 93-234.

PRINCIPAL PURPOSE(S): This information is being collected for the purpose of determining an applicant's eligibility to request changes to National Flood Insurance Program (NFIP) Flood Insurance Rate Maps (FIRM).

ROUTINE USE(S): The information on this form may be disclosed as generally permitted under 5 U.S.C § 552a(b) of the Privacy Act of 1974, as amended. This includes using this information as necessary and authorized by the routine uses published in DHS/FEMA/NFIP/LOMA-1 National Flood Insurance Program (NFIP); Letter of Map Amendment (LOMA) February 15, 2006, 71 FR 7990.

DISCLOSURE: The disclosure of information on this form is voluntary; however, failure to provide the information requested may delay or prevent FEMA from processing a determination regarding a requested change to a NFIP Flood Insurance Rate Maps (FIRM).

Flooding Source: Devereaux Creek - Tributary 3

Note: Fill out one form for each flooding source studied

A. HYDROLOGY

1. Reason for New Hydrologic Analysis (check all that apply)

☐ Not revised (skip to section B) ☒ No existing analysis ☐ Improved data
☐ Alternative methodology ☐ Proposed Conditions (CLOMR) ☐ Changed physical condition of watershed

2. Comparison of Representative 1%-Annual-Chance Discharges

Location	Drainage Area (Sq. Mi.)	Effective/FIS (cfs)	Revised (cfs)

3. Methodology for New Hydrologic Analysis (check all that apply)

☐ Statistical Analysis of Gage Records ☐ Precipitation/Runoff Model → Specify Model: _____
☐ Regional Regression Equations ☐ Other (please attach description)

Please enclose all relevant models in digital format, maps, computations (including computation of parameters), and documentation to support the new analysis.

4. Review/Approval of Analysis

If your community requires a regional, state, or federal agency to review the hydrologic analysis, please attach evidence of approval/review.

5. Impacts of Sediment Transport on Hydrology

Is the hydrology for the revised flooding source(s) affected by sediment transport? ☐ Yes ☐ No

If yes, then fill out Section F (Sediment Transport) of Form 3. If No, then attach your explanation..

B. HYDRAULICS

1. Reach to be Revised

	Description	Cross Section	Water-Surface Elevations (ft.)	
			Effective	Proposed/Revised
Downstream Limit*	Confluence with Devereaux Ck	150	16.2	16.01
Upstream Limit*	Storke Road	1975	16.2	16.01

*Proposed/Revised elevations must tie-into the Effective elevations within 0.5 foot at the downstream and upstream limits of revision.

2. Hydraulic Method/Model Used: HEC-RAS V5.0.1

3. Pre-Submittal Review of Hydraulic Models*

DHS-FEMA has developed two review programs, CHECK-2 and CHECK-RAS, to aid in the review of HEC-2 and HEC-RAS hydraulic models, respectively. We recommend that you review your HEC-2 and HEC-RAS models with CHECK-2 and CHECK-RAS.

4.

Models Submitted	Natural Run		Floodway Run		Datum
Duplicate Effective Model*	File Name: NA	Plan Name: ___	File Name:	Plan Name:	NAVD1988
Corrected Effective Model*	File Name: NA	Plan Name: ___	File Name:	Plan Name:	NAVD1988
Existing or Pre-Project Conditions Model	File Name: NCOSHydraulicEval	Plan Name: Pre-Project v1	File Name:	Plan Name:	
Revised or Post-Project Conditions Model	File Name: NCOSHydraulicEval	Plan Name: Post-Project v1	File Name:	Plan Name:	
Other - (attach description)	File Name:	Plan Name:	File Name:	Plan Name:	

* For details, refer to the corresponding section of the instructions.

☒ Digital Models Submitted? (Required)

C. MAPPING REQUIREMENTS

A **certified topographic work map** must be submitted showing the following information (where applicable): the boundaries of the effective, existing, and proposed conditions 1%-annual-chance floodplain (for approximate Zone A revisions) or the boundaries of the 1%- and 0.2%-annual-chance floodplains and regulatory floodway (for detailed Zone AE, AO, and AH revisions); location and alignment of all cross sections with stationing control indicated; stream, road, and other alignments (e.g., dams, levees, etc.); current community easements and boundaries; boundaries of the requester's property; certification of a registered professional engineer registered in the subject State; location and description of reference marks; and the referenced vertical datum (NGVD, NAVD, etc.).

☒ Digital Mapping (GIS/CADD) Data Submitted (preferred)

Topographic Information: Aerial Topo and Surface

Source: Stantec Consulting Services Inc. Date: March 2016

Accuracy: 1 ft.

Note that the boundaries of the existing or proposed conditions floodplains and regulatory floodway to be shown on the revised FIRM and/or FBFM must tie-in with the effective floodplain and regulatory floodway boundaries. Please attach **a copy of the effective FIRM and/or FBFM**, at the same scale as the original, annotated to show the boundaries of the revised 1%-and 0.2%-annual-chance floodplains and regulatory floodway that tie-in with the boundaries of the effective 1%-and 0.2%-annual-chance floodplain and regulatory floodway at the upstream and downstream limits of the area on revision.

☒ Annotated FIRM and/or FBFM (Required)

D. COMMON REGULATORY REQUIREMENTS*

1. For LOMR/CLOMR requests, do Base Flood Elevations (BFEs) increase? ☐ Yes ☒ No

   a. For CLOMR requests, if either of the following is true, please submit **evidence of compliance with Section 65.12 of the NFIP regulations**:

   - The proposed project encroaches upon a regulatory floodway and would result in increases above 0.00 foot compared to pre-project conditions.
   - The proposed project encroaches upon a SFHA with or without BFEs established and would result in increases above 1.00 foot compared to pre-project conditions.

   b. Does this LOMR request cause increase in the BFE and/or SFHA compared with the effective BFEs and/or SFHA? ☐ Yes ☒ No
   If Yes, please attach **proof of property owner notification and acceptance (if available)**. Elements of and examples of property owner notifications can be found in the MT-2 Form 2 Instructions.

2. Does the request involve the placement or proposed placement of fill? ☐ Yes ☒ No

   If Yes, the community must be able to certify that the area to be removed from the special flood hazard area, to include any structures or proposed structures, meets all of the standards of the local floodplain ordinances, and is reasonably safe from flooding in accordance with the NFIP regulations set forth at 44 CFR 60.3(A)(3), 65.5(a)(4), and 65.6(a)(14). Please see the MT-2 instructions for more information.

3. For LOMR requests, is the regulatory floodway being revised? ☐ Yes ☐ No

   If Yes, attach **evidence of regulatory floodway revision notification**. As per Paragraph 65.7(b)(1) of the NFIP Regulations, notification is required for requests involving revisions to the regulatory floodway. (Not required for revisions to approximate 1%-annual-chance floodplains [studied Zone A designation] unless a regulatory floodway is being established. Elements and examples of regulatory floodway revision notification can be found in the MT-2 Form 2 Instructions.)

4. For CLOMR requests, please submit documentation to FEMA and the community to show that you have complied with Sections 9 and 10 of the Endangered Species Act (ESA).

For actions authorized, funded, or being carried out by Federal or State agencies, please submit documentation from the agency showing its compliance with Section 7(a)(2) of the ESA. Please see the MT-2 instructions for more detail.

* Not inclusive of all applicable regulatory requirements. For details, see 44 CFR parts 60 and 65.

DEPARTMENT OF HOMELAND SECURITY
FEDERAL EMERGENCY MANAGEMENT AGENCY

RIVERINE STRUCTURES FORM

O.M.B. NO. 1660-0016
Expires February 28, 2014

PAPERWORK BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average 7 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing, reviewing, and submitting the form. You are not required to respond to this collection of information unless a valid OMB control number appears in the upper right corner of this form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Department of Homeland Security, Federal Emergency Management Agency, 1800 South Bell Street, Arlington, VA 20598-3005, Paperwork Reduction Project (1660-0016). Submission of the form is required to obtain or retain benefits under the National Flood Insurance Program. **Please do not send your completed survey to the above address.**

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AUTHORITY: The National Flood Insurance Act of 1968, Public Law 90-448, as amended by the Flood Disaster Protection Act of 1973, Public Law 93-234.

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ROUTINE USE(S): The information on this form may be disclosed as generally permitted under 5 U.S.C § 552a(b) of the Privacy Act of 1974, as amended. This includes using this information as necessary and authorized by the routine uses published in DHS/FEMA/NFIP/LOMA-1 National Flood Insurance Program; Letter of Map Amendment (LOMA) February 15, 2006, 71 FR 7990.

DISCLOSURE: The disclosure of information on this form is voluntary; however, failure to provide the information requested may delay or prevent FEMA from processing a determination regarding a requested change to a NFIP Flood Insurance Rate Maps (FIRM).

Flooding Source: Devereaux Creek-Tributary 3

Note**:** Fill out one form for each flooding source studied.

A. GENERAL

Complete the appropriate section(s) for each Structure listed below:

Channelization.....complete Section B
Bridge/Culvert.....complete Section C
Dam.....complete Section D
Levee/Floodwall.....complete Section E
Sediment Transport.....complete Section F (if required)

Description Of Modeled Structure

1. Name of Structure: Bridge A

   Type (check one): ☐ Channelization ☒ Bridge/Culvert ☐ Levee/Floodwall ☐ Dam

   Location of Structure: Tributary 3 near Storke Road

   Downstream Limit/Cross Section: 1769

   Upstream Limit/Cross Section: 1828

2. Name of Structure: Bridge C

   Type (check one): ☐ Channelization ☒ Bridge/Culvert ☐ Levee/Floodwall ☐ Dam

   Location of Structure: Midway between Storke Rd and Confluence with Devereaux Creek Main Channel

   Downstream Limit/Cross Section: 788

   Upstream Limit/Cross Section: 841

3. Name of Structure: _____

   Type (check one) ☐ Channelization ☐ Bridge/Culvert ☐ Levee/Floodwall ☐ Dam

   Location of Structure: _____

   Downstream Limit/Cross Section: _____

   Upstream Limit/Cross Section: _____

NOTE: FOR MORE STRUCTURES, ATTACH ADDITIONAL PAGES AS NEEDED.

B. CHANNELIZATION

Flooding Source: _____

Name of Structure: _____

1. Hydraulic Considerations

The channel was designed to carry _____ (cfs) and/or the _____-year flood.

The design elevation in the channel is based on (check one):

☐ Subcritical flow ☐ Critical flow ☐ Supercritical flow ☐ Energy grade line

If there is the potential for a hydraulic jump at the following locations, check all that apply and attach an explanation of how the hydraulic jump is controlled without affecting the stability of the channel.

☐ Inlet to channel ☐ Outlet of channel ☐ At Drop Structures ☐ At Transitions

☐ Other locations (specify): _____

2. Channel Design Plans

Attach the plans of the channelization certified by a registered professional engineer, as described in the instructions.

3. Accessory Structures

The channelization includes (check one):

☐ Levees [Attach Section E (Levee/Floodwall)] ☐ Drop structures ☐ Superelevated sections

☐ Transitions in cross sectional geometry ☐ Debris basin/detention basin [Attach Section D (Dam/Basin)] ☐ Energy dissipator

☐ Weir ☐ Other (Describe):

4. Sediment Transport Considerations

Are the hydraulics of the channel affected by sediment transport? ☐ Yes ☐ No

If yes, then fill out Section F (Sediment Transport) of Form 3. If No, then attach your explanation for why sediment transport was not considered.

C. BRIDGE/CULVERT

Flooding Source: Tributary 2 (aka Unnamed Channel)

Name of Structure: Bridge A and Bridge D

1. This revision reflects (check one):

☒ Bridge/culvert not modeled in the FIS

☐ Modified bridge/culvert previously modeled in the FIS

☐ Revised analysis of bridge/culvert previously modeled in the FIS

2. Hydraulic model used to analyze the structure (e.g., HEC-2 with special bridge routine, WSPRO, HY8): HEC-RAS
If different than hydraulic analysis for the flooding source, justify why the hydraulic analysis used for the flooding source could not analyze the structures. Attach justification.

3. Attach plans of the structures certified by a registered professional engineer. The plan detail and information should include the following (check the information that has been provided):

☒ Dimensions (height, width, span, radius, length)
☒ Shape (culverts only)
☒ Material
☒ Beveling or Rounding
☒ Wing Wall Angle
☒ Skew Angle
☐ Distances Between Cross Sections
☐ Erosion Protection
☒ Low Chord Elevations – Upstream and Downstream
☒ Top of Road Elevations – Upstream and Downstream
☒ Structure Invert Elevations – Upstream and Downstream
☒ Stream Invert Elevations – Upstream and Downstream
☐ Cross-Section Locations

4. Sediment Transport Considerations

Are the hydraulics of the structure affected by sediment transport? ☐ Yes ☒ No

If Yes, then fill out Section F (Sediment Transport) of Form 3. If no, then attach an explanation.

D. DAM/BASIN

Flooding Source: _____
Name of Structure: _____

1. This request is for (check one): ☐ Existing dam/basin ☐ New dam/basin ☐ Modification of existing dam/basin

2. The dam/basin was designed by (check one): ☐ Federal agency ☐ State agency ☐ Private organization ☐ Local government agency

   Name of the agency or organization: _____

3. The Dam was permitted as (check one): ☐ Federal Dam ☐ State Dam

   Provide the permit or identification number (ID) for the dam and the appropriate permitting agency or organization

   Permit or ID number _____ Permitting Agency or Organization _____

   a. ☐ Local Government Dam ☐ Private Dam

   Provided related drawings, specification and supporting design information.

4. Does the project involve revised hydrology? ☐ Yes ☐ No

   If Yes, complete the Riverine Hydrology & Hydraulics Form (Form 2).

   Was the dam/basin designed using critical duration storm? (must account for the maximum volume of runoff)

   ☐ Yes, provide supporting documentation with your completed Form 2.

   ☐ No, provide a written explanation and justification for not using the critical duration storm.

5. Does the submittal include debris/sediment yield analysis? ☐ Yes ☐ No

   If Yes, then fill out Section F (Sediment Transport). If No, then attach your explanation for why debris/sediment analysis was not considered?

6. Does the Base Flood Elevation behind the dam/basin or downstream of the dam/basin change? ☐ Yes ☐ No

   If Yes, complete the Riverine Hydrology & Hydraulics Form (Form 2) and complete the table below.

FREQUENCY (% annual chance)	Stillwater Elevation Behind the Dam/Basin FIS	REVISED
10-year (10%)	_____	_____
50-year (2%)	_____	_____
100-year (1%)	_____	_____
500-year (0.2%)	_____	_____
Normal Pool Elevation	_____	_____

7. Please attach a copy of the formal Operation and Maintenance Plan

E. LEVEE/FLOODWALL

1. System Elements

a. This Levee/Floodwall analysis is based on (check one): ☐ upgrading of an existing levee/floodwall system ☐ a newly constructed levee/floodwall system ☐ reanalysis of an existing levee/floodwall system

b. Levee elements and locations are (check one):

☐ earthen embankment, dike, berm, etc. Station _____ to _____
☐ structural floodwall Station _____ to _____
☐ Other (describe): Station _____ to _____

c. Structural Type (check one): ☐ monolithic cast-in place reinforced concrete ☐ reinforced concrete masonry block ☐ sheet piling ☐ Other (describe): _____

d. Has this levee/floodwall system been certified by a Federal agency to provide protection from the base flood?

☐ Yes ☐ No

If Yes, by which agency? _____

e. Attach certified drawings containing the following information (indicate drawing sheet numbers):

1. Plan of the levee embankment and floodwall structures. Sheet Numbers: _____
2. A profile of the levee/floodwall system showing the Base Flood Elevation (BFE), levee and/or wall crest and foundation, and closure locations for the total levee system. Sheet Numbers: _____
3. A profile of the BFE, closure opening outlet and inlet invert elevations, type and size of opening, and kind of closure. Sheet Numbers: _____
4. A layout detail for the embankment protection measures. Sheet Numbers: _____
5. Location, layout, and size and shape of the levee embankment features, foundation treatment, Floodwall structure, closure structures, and pump stations. Sheet Numbers: _____

2. Freeboard

a. The minimum freeboard provided above the BFE is:

Riverine

3.0 feet or more at the downstream end and throughout	☐ Yes	☐ No
3.5 feet or more at the upstream end	☐ Yes	☐ No
4.0 feet within 100 feet upstream of all structures and/or constrictions	☐ Yes	☐ No

Coastal

1.0 foot above the height of the one percent wave associated with the 1%-annual-chance stillwater surge elevation or maximum wave runup (whichever is greater).	☐ Yes	☐ No
2.0 feet above the 1%-annual-chance stillwater surge elevation	☐ Yes	☐ No

Please note, occasionally exceptions are made to the minimum freeboard requirement. If an exception is requested, attach documentation addressing Paragraph 65.10(b)(1)(ii) of the NFIP Regulations.

If No is answered to any of the above, please attach an explanation.

b. Is there an indication from historical records that ice-jamming can affect the BFE? ☐ Yes ☐ No

If Yes, provide ice-jam analysis profile and evidence that the minimum freeboard discussed above still exists.

3. Closures

a. Openings through the levee system (check one): ☐ exists ☐ does not exist

If opening exists, list all closures:

Channel Station	Left or Right Bank	Opening Type	Highest Elevation for Opening Invert	Type of Closure Device

(Extend table on an added sheet as needed and reference)

Note: Geotechnical and geologic data

In addition to the required detailed analysis reports, data obtained during field and laboratory investigations and used in the design analysis for the following system features should be submitted in a tabulated summary form. (Reference U.S. Army Corps of Engineers [USACE] EM-1110-2-1906 Form 2086.)

4. Embankment Protection

a. The maximum levee slope land side is: _____

b. The maximum levee slope flood side is: _____

c. The range of velocities along the levee during the base flood is: _____ (min.) to _____ (max.)

d. Embankment material is protected by (describe what kind): _____

e. Riprap Design Parameters (check one): ☐ Velocity ☐ Tractive stress
Attach references

Reach	Sideslope	Flow Depth	Velocity	Curve or Straight	Stone Riprap			Depth of Toedown
					D_{100}	D_{50}	Thickness	
Sta to								
Sta to								
Sta to								
Sta to								
Sta to								
Sta to								

(Extend table on an added sheet as needed and reference each entry)

f. Is a bedding/filter analysis and design attached? ☐ Yes ☐ No

g. Describe the analysis used for other kinds of protection used (include copies of the design analysis):

Attach engineering analysis to support construction plans.

5. Embankment And Foundation Stability

a. Identify locations and describe the basis for selection of critical location for analysis:
_____

☐ Overall height: Sta.: _____, height _____ ft.

☐ Limiting foundation soil strength:

Strength ϕ = _____ degrees, c = _____ psf

Slope: SS = _____ (h) to _____ (v)

(Repeat as needed on an added sheet for additional locations)

b. Specify the embankment stability analysis methodology used (e.g., circular arc, sliding block, infinite slope, etc.):
_____

c. Summary of stability analysis results:

E. LEVEE/FLOODWALL (CONTINUED)

5. Embankment And Foundation Stability (continued)

Case	Loading Conditions	Critical Safety Factor	Criteria (Min.)
I	End of construction		1.3
II	Sudden drawdown		1.0
III	Critical flood stage		1.4
IV	Steady seepage at flood stage		1.4
VI	Earthquake (Case I)		1.0

(Reference: USACE EM-1110-2-1913 Table 6-1)

d. Was a seepage analysis for the embankment performed? ☐ Yes ☐ No

If Yes, describe methodology used:

e. Was a seepage analysis for the foundation performed? ☐ Yes ☐ No

f. Were uplift pressures at the embankment landside toe checked? ☐ Yes ☐ No

g. Were seepage exit gradients checked for piping potential? ☐ Yes ☐ No

h. The duration of the base flood hydrograph against the embankment is _____ hours.

Attach engineering analysis to support construction plans.

6. Floodwall And Foundation Stability

a. Describe analysis submittal based on Code (check one): ☐ UBC (1988) ☐ Other (specify): _____

b. Stability analysis submitted provides for: ☐ Overturning ☐ Sliding If not, explain: _____

c. Loading included in the analyses were: ☐ Lateral earth @ P_A = _____ psf; P_p = _____ psf

☐ Surcharge-Slope @ _____, ☐ surface _____ psf

☐ Wind @ P_w = _____ psf

☐ Seepage (Uplift); _____ ☐ Earthquake @ P_{eq} = _____ %g

☐ 1%-annual-chance significant wave height: _____ ft.

☐ 1%-annual-chance significant wave period: _____ sec.

d. Summary of Stability Analysis Results: Factors of Safety.
Itemize for each range in site layout dimension and loading condition limitation for each respective reach.

Loading Condition	Criteria (Min)		Sta	To	Sta	To
	Overturn	Sliding	Overturn	Sliding	Overturn	Sliding
Dead & Wind	1.5	1.5				
Dead & Soil	1.5	1.5				
Dead, Soil, Flood, & Impact	1.5	1.5				
Dead, Soil, & Seismic	1.3	1.3				

(Ref: FEMA 114 Sept 1986; USACE EM 1110-2-2502)
Note: (Extend table on an added sheet as needed and reference)

E. LEVEE/FLOODWALL (CONTINUED)

6. Floodwall And Foundation Stability (continued)

e. Foundation bearing strength for each soil type:

Bearing Pressure	Sustained Load (psf)	Short Term Load (psf)
Computed design maximum		
Maximum allowable		

f. Foundation scour protection ☐ is, ☐ is not provided. If provided, attach explanation and supporting documentation:

Attach engineering analysis to support construction plans.

7. Settlement

a. Has anticipated potential settlement been determined and incorporated into the specified construction elevations to maintain the established freeboard margin? ☐ Yes ☐ No

b. The computed range of settlement is _____ ft. to _____ ft.

c. Settlement of the levee crest is determined to be primarily from : ☐ Foundation consolidation ☐ Embankment compression ☐ Other (Describe): _____

d. Differential settlement of floodwalls ☐ has ☐ has not been accommodated in the structural design and construction.

Attach engineering analysis to support construction plans.

8. Interior Drainage

a. Specify size of each interior watershed:

Draining to pressure conduit: _____ acres
Draining to ponding area: _____ acres

b. Relationships Established

Ponding elevation vs. storage	☐ Yes	☐ No
Ponding elevation vs. gravity flow	☐ Yes	☐ No
Differential head vs. gravity flow	☐ Yes	☐ No

c. The river flow duration curve is enclosed: ☐ Yes ☐ No

d. Specify the discharge capacity of the head pressure conduit: _____ cfs

e. Which flooding conditions were analyzed?

• Gravity flow (Interior Watershed)	☐ Yes	☐ No
• Common storm (River Watershed)	☐ Yes	☐ No
• Historical ponding probability	☐ Yes	☐ No
• Coastal wave overtopping	☐ Yes	☐ No

If No for any of the above, attach explanation.

e. Interior drainage has been analyzed based on joint probability of interior and exterior flooding and the capacities of pumping and outlet facilities to provide the established level of flood protection. ☐ Yes ☐ No If No, attach explanation.

g. The rate of seepage through the levee system for the base flood is _____ cfs

h. The length of levee system used to drive this seepage rate in item g: _____ ft.

E. LEVEE/FLOODWALL (CONTINUED)

8. Interior Drainage (continued)

i. Will pumping plants be used for interior drainage? ☐ Yes ☐ No

If Yes, include the number of pumping plants: _____ For each pumping plant, list:

	Plant #1	Plant #2
The number of pumps		
The ponding storage capacity		
The maximum pumping rate		
The maximum pumping head		
The pumping starting elevation		
The pumping stopping elevation		
Is the discharge facility protected?		
Is there a flood warning plan?		
How much time is available between warning and flooding?		

Will the operation be automatic? ☐ Yes ☐ No

If the pumps are electric, are there backup power sources? ☐ Yes ☐ No

(Reference: USACE EM-1110-2-3101, 3102, 3103, 3104, and 3105)

Include a copy of supporting documentation of data and analysis. Provide a map showing the flooded area and maximum ponding elevations for all interior watersheds that result in flooding.

9. Other Design Criteria

a. The following items have been addressed as stated:

Liquefaction ☐ is ☐ is not a problem

Hydrocompaction ☐ is ☐ is not a problem

Heave differential movement due to soils of high shrink/swell ☐ is ☐ is not a problem

b. For each of these problems, state the basic facts and corrective action taken:

Attach supporting documentation

c. If the levee/floodwall is new or enlarged, will the structure adversely impact flood levels and/or flow velocities floodside of the structure?
☐ Yes ☐ No Attach supporting documentation

d. Sediment Transport Considerations:

Was sediment transport considered? ☐ Yes ☐ No

If Yes, then fill out Section F (Sediment Transport). If No, then attach your explanation for why sediment transport was not considered.

10. Operational Plan And Criteria

a. Are the planned/installed works in full compliance with Part 65.10 of the NFIP Regulations? ☐ Yes ☐ No

b. Does the operation plan incorporate all the provisions for closure devices as required in Paragraph 65.10(c)(1) of the NFIP regulations?
☐ Yes ☐ No

c. Does the operation plan incorporate all the provisions for interior drainage as required in Paragraph 65.10(c)(2) of the NFIP regulations?
☐ Yes ☐ No If the answer is No to any of the above, please attach supporting documentation.

E. LEVEE/FLOODWALL (CONTINUED)

11. Maintenance Plan

Please attach a copy of the fomal maintenance plan for the levee/floodwall

12. Operations and Maintenance Plan

Please attach a copy of the formal Operations and Maintenance Plan for the levee/floodwall.

CERTIFICATION OF THE LEVEE DOCUMENTION

This certification is to be signed and sealed by a licensed registered professional engineer authorized by law to certify elevation information data, hydrologic and hydraulic analysis, and any other supporting information as per NFIP regulations paragraph 65.10(e) and as described in the MT-2 Forms Instructions. All documents submitted in support of this request are correct to the best of my knowledge. I understand that any false statement may be punishable by fine or imprisonment under Title 18 of the United States Code, Section 1001.

Certifier's Name: _____ License No.: _____ Expiration Date: _____

Company Name: _____ Telephone No.: _____ Fax No.: _____

Signature: _____ Date: _____ E-Mail Address: _____

F. SEDIMENT TRANSPORT

Flooding Source: _____

Name of Structure: _____

If there is any indication from historical records that sediment transport (including scour and deposition) can affect the Base Flood Elevation (BFE); and/or based on the stream morphology, vegetative cover, development of the watershed and bank conditions, there is a potential for debris and sediment transport (including scour and deposition) to affect the BFEs, then provide the following information along with the supporting documentation:

Sediment load associated with the base flood discharge: Volume _____ acre-feet

Debris load associated with the base flood discharge: Volume _____ acre-feet

Sediment transport rate _____ (percent concentration by volume)

Method used to estimate sediment transport: _____

Most sediment transport formulas are intended for a range of hydraulic conditions and sediment sizes; attach a detailed explanation for using the selected method.

Method used to estimate scour and/or deposition: _____

Method used to revise hydraulic or hydrologic analysis (model) to account for sediment transport: _____

Please note that bulked flows are used to evaluate the performance of a structure during the base flood; however, FEMA does not map BFEs based on bulked flows.

If a sediment analysis has not been performed, an explanation as to why sediment transport (including scour and deposition) will not affect the BFEs or structures must be provided.

Appendix D

D.1 FIELD PHOTOGRAPHS

Photo: 1 - Looking upstream from Marymount Way. Vegetation forms an open tunnel that shades the bottom and prevents for better flow characteristics.

Photo: 2 - Overbanks are generally open

Photo: 3-Overbanks are generally open

Photo: 4-Looking upstream on Phelps Ditch from Phelps Road.

Photo: 5-Looking downstream at Phelps Ditch at Phelps Road

Photo: 6-Open area of Main Devereaux Channel at confluence with Phelps Ditch.

Photo: 7-Looking downstream from Venoco Crossing.

Photo: 8-Looking from east to west along Venoco Crossing.

Photo: 9-Looking upstream from Venoco Crossing

Photo: 10-Upstream side of Venoco Crossing

Photo: 11-Downstream side of Venoco Crossing (looking east).

Photo: 12-looking across the Devereaux Slough from the Venoco Crossing

Photo: 13-Deverezux Slough from Slough Road

Photo: 14-Looking upstream from downstream constriction.

Photo: 15-Downstream constricted channel.