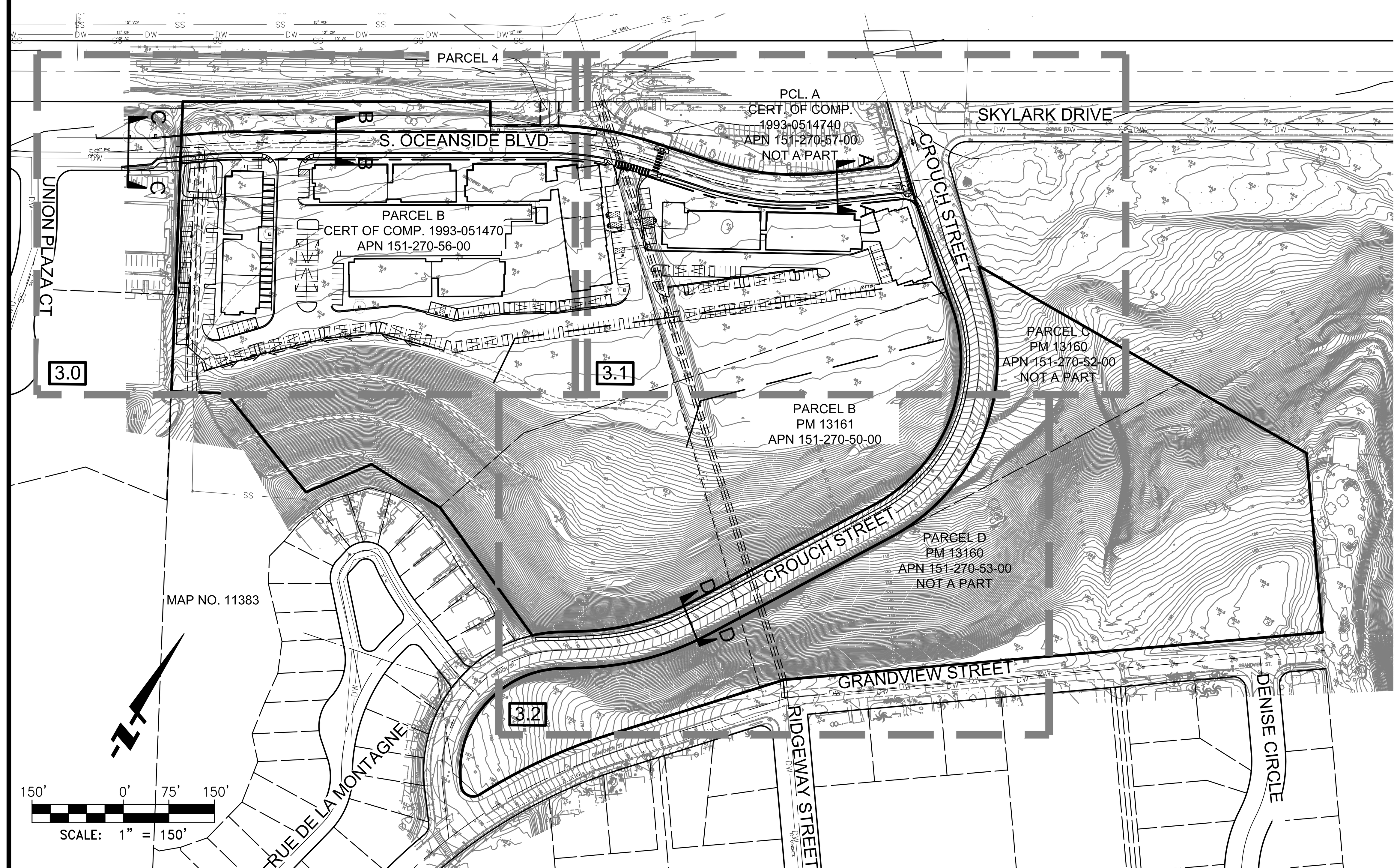
APPENDIX 2

CONCEPTUAL GRADING & UTILITY PLANS

CONCEPTUAL GRADING AND UTILITY PLANS

FOR

OCEAN CREEK



OWNER

THOMAS D. WEESE
TRUSTEE OF THE ROBERT. A WEESE FAMILY TRUST,
U/T/A DATED 12/23/78 TO AN UNDIVIDED ONE-HALF
INTEREST, AND TOMAS D, WEESE, AS TRUSTEE UNDER
THE BESSIE JANE WEESE TESTIMONY TRUST

APPLICANT

OCEAN CREEK, LLC
12250 EL CAMINO REAL
SUITE 380
SAN DIEGO, CA 92130
(858) 369-5670

SURVEY SOURCE

THE TOPOGRAPHIC MAPPING USED FOR THIS SURVEY IS BASED ON A FIELD SURVEY PERFORMED BY HUNSAKER & ASSOC. TOGETHER WITH AERIAL TOPOGRAPHY PRODUCED BY RJ LUNG PER FLIGHT OF DECEMBER 27, 2017. VERTICAL DATUM BASED ON NAVD 88 PER CITY OF OCEANSIDE BENCHMARK NO. 1013 PER RECORD OF SURVEY NO. 21787 EL=99.46.

LEGEND

- RIGHT OF WAY
- PARCEL LINE
- STREET CENTERLINE
- EASEMENT
- PROPOSED SEWER (SS)
- LANDSLIDE LIMITS
- SEWER MANHOLE
- SEWER CLEANOUT
- PROPOSED FIRE WATER (FW)
- DOMESTIC WATER (W)
- PROPOSED STORM DRAIN (SD)
- PROPOSED FIRE HYDRANT
- PROPOSED CONCRETE
- PROPOSED AC
- BIOFILTRATION BASIN
- UNDERGROUND CISTERN
- STORM DRAIN CLEANOUT
- STORM DRAIN INLET/CATCH BASIN
- SIDEWALK
- CURB AND GUTTER
- STREET TREE BMP PER COUNTY OF SAN DIEGO GREEN STREETS STANDARDS (SEE SWQMP FOR MORE INFORMATION) — S.T. — STRUCTURAL SOIL OUTLINE
- PROPOSED STREET LIGHT
- MODULAR WETLAND SYSTEM (MWS) POLLUTANT CONTROL BMP

ABBREVIATIONS

ADA	AMERICANS WITH DISABILITIES ACT
BS	BOTTOM OF STAIRS
CB	CATCH BASIN
CY	CUBIC YARDS
EX	EXISTING
FF	FINISH FLOOR ELEVATION
FG	FINISHED GRADE
FH	FIRE HYDRANT
FL	FLOW LINE
FS	FINISHED SURFACE
GB	GRADE BREAK
IE	INVERT ELEVATION
MWS	MODULAR WETLAND UNIT (SEE SWQMP)
PVC	POLYVINYL CHLORIDE
RCP	REINFORCED CONCRETE PIPE
RIM	RIM OF STRUCTURE ELEVATION
R/W	RIGHT-OF-WAY
SD	STORM DRAIN
SDCO	STORM DRAIN CLEAN OUT
SDRSD	SAN DIEGO REGIONAL STD DWG
SF	SQUARE FEET
SS	SANITARY SEWER
SSCO	SANITARY SEWER CLEAN OUT
S.T.	STREET TREE BMP
TC	TOP OF CURB
TD	TOP OF DITCH
TF	TOP OF FOOTING
TG	TOP OF GRATE
TOB	TOP OF BASIN
TS	TOP/TOE OF SLOPE
TW	TOP OF WALL
U.O.N.	UNLESS OTHERWISE NOTED
WAS	WATER AGENCIES STANDARD
WS	WATER SERVICE

ZONING

EXISTING ZONE: CC (COMMUNITY COMMERCIAL)

PARCEL AREA

EXISTING: 2 PARCELS

APN	EX. NET AREA	R/W DEDICATION(-)/ VACATION(+)	PROP. NET AREA
151-270-56-00	12.87AC	- 1.65AC	11.22AC
151-270-50-00	5.98AC	0	5.98AC

FLOOD ZONE

A PORTION OF THIS SITE IS LOCATED IN ZONE AE (BASE FLOOD ELEVATIONS DETERMINED) AS SHOWN ON THE FLOOD INSURANCE RATE MAP (F.I.R.M.), COMMUNITY-PANEL NO. 06073C0753J, EFFECTIVE DATE: DECEMBER 20, 2019. A CLOMR WILL BE PROCESSED FOR IMPROVEMENTS WITHIN THE FLOODPLAIN AND FLOODWAY.

UTILITIES

ELECTRIC – SDG&E
GAS – SDG&E
TELEPHONE – COX OR AT&T
STORM DRAIN – OCEANSIDE WATER UTILITIES DEPARTMENT
WATER – OCEANSIDE WATER UTILITIES DEPARTMENT
SEWER – OCEANSIDE WATER UTILITIES DEPARTMENT

EXISTING LEGAL DESCRIPTION

REAL PROPERTY IN THE CITY OF OCEANSIDE, COUNTY OF SAN DIEGO, STATE OF CALIFORNIA, DESCRIBED AS FOLLOWS:

APN: 151-270-56-00:

PARCEL "B" AS SHOWN ON CERTIFICATE OF COMPLIANCE NO. PLA-04-93 RECORDED AUGUST 9, 1993 AS INSTRUMENT NO. 93-0514740 OF OFFICIAL RECORDS, BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:

PARCEL A OF PARCEL MAP 13161, RECORDED: FEBRUARY 22, 1984, AS F/P 84-064016 OF OFFICIAL RECORDS OF SAN DIEGO COUNTY, BEING WITHIN THE CITY OF OCEANSIDE, COUNTY OF SAN DIEGO, STATE OF CALIFORNIA, EXCLUDING THAT PORTION BEING DESCRIBED AS FOLLOWS:

BEGINNING AT THE NORTHEASTERLY MOST CORNER OF SAID PARCEL "A"; THENCE SOUTHWESTERLY ALONG THE NORTHERLY LINE OF SAID PARCEL "A", SOUTH 59° 57' 17" WEST, 651.70 FEET (RECORD: SOUTH 59° 46' 47" WEST, P.M. 13161); THENCE LEAVING SAID NORTHERLY LINE, SOUTH 30° 02' 43" EAST, 39.22 FEET; THENCE PARALLEL WITH SAID NORTHERLY LINE OF PARCEL "A", NORTH 59° 57' 17" EAST, 96.00 FEET, TO THE BEGINNING OF A TANGENT 544.00 FOOT RADIUS CURVE, CONCAVE SOUTHEASTERLY, THENCE NORTHEASTERLY, ALONG THE ARC OF SAID CURVE, THROUGH A CENTRAL ANGLE OF 17° 51' 54", A DISTANCE OF 169.62 FEET; THENCE TANGENT TO SAID CURVE, NORTH 77° 49' 11" EAST, 106.22 FEET, TO THE BEGINNING OF A TANGENT 456.00 FOOT RADIUS CURVE, CONCAVE NORTHWESTERLY, THENCE NORTHEASTERLY ALONG THE ARC OF SAID CURVE, THROUGH A CENTRAL ANGLE OF 24° 00' 00", A DISTANCE OF 191.01 FEET; THENCE TANGENT TO SAID CURVE NORTH 53° 49' 11" EAST, 100 FEET, TO THE BEGINNING OF A TANGENT 25.00 FOOT RADIUS CURVE, CONCAVE NORTHWESTERLY, THENCE NORTHEASTERLY AND NORTHERLY ALONG THE ARC OF SAID CURVE, THROUGH A CENTRAL ANGLE OF 100° 00' 00", A DISTANCE OF 43.63 FEET, TO AN INTERSECTION WITH THE EASTERLY LINE OF THE ABOVE DESCRIBED PARCEL "A"; THENCE NORTHWESTERLY ALONG SAID EASTERLY LINE, AND TANGENT TO SAID CURVE, NORTH 46° 10' 49" WEST, 78 FEET, (RECORD: NORTH 46° 19' 24" WEST, PM 13161) TO THE POINT OF BEGINNING.

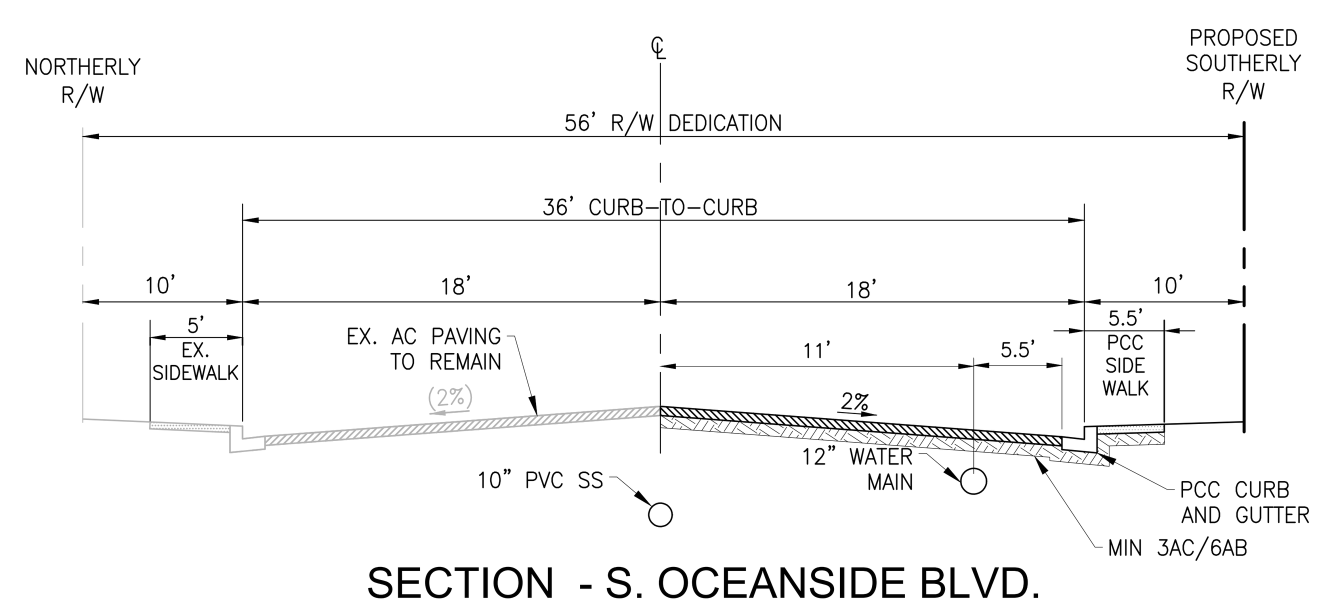
APN 151-270-50-00:

PARCEL B OF PARCEL MAP NO. 13161, IN THE CITY OF OCEANSIDE, COUNTY OF SAN DIEGO, STATE OF CALIFORNIA, FILED IN THE OFFICE OF THE COUNTY RECORDER OF SAN DIEGO COUNTY, FEBRUARY 22, 1984 AS INSTRUMENT NO. 84-064016 OF OFFICIAL RECORDS.

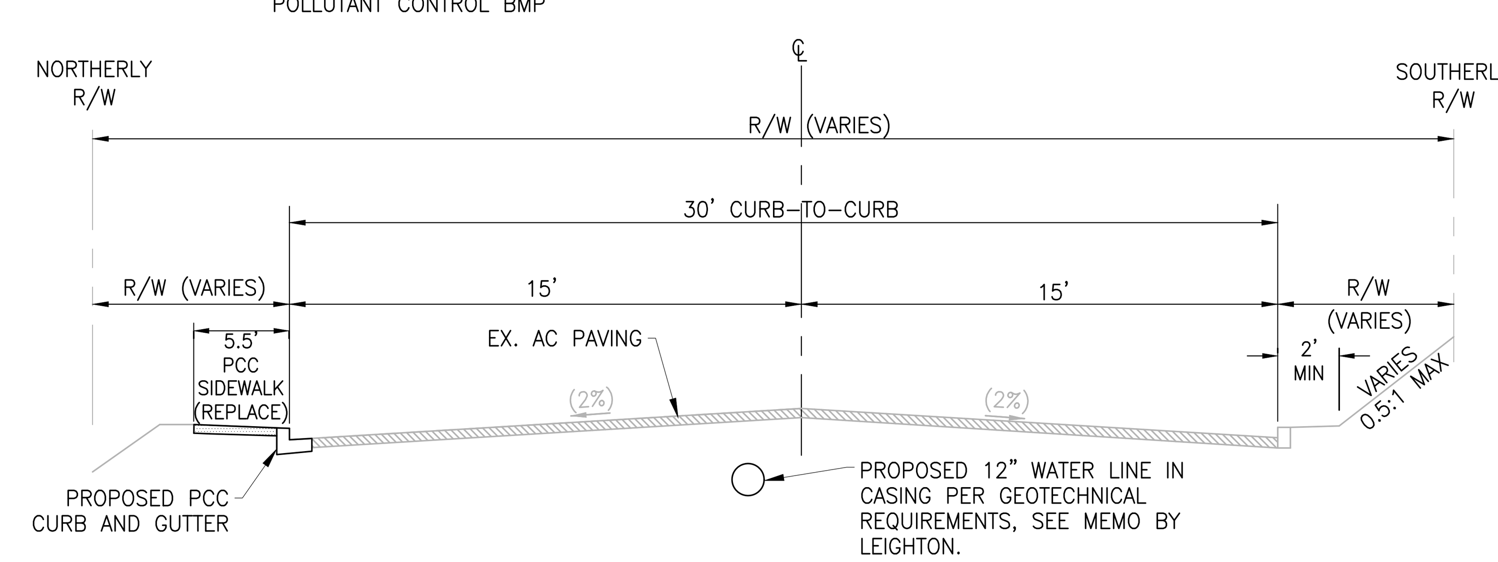
KEY MAP LEGEND

SHEET LAYOUT
SHEET NUMBER #

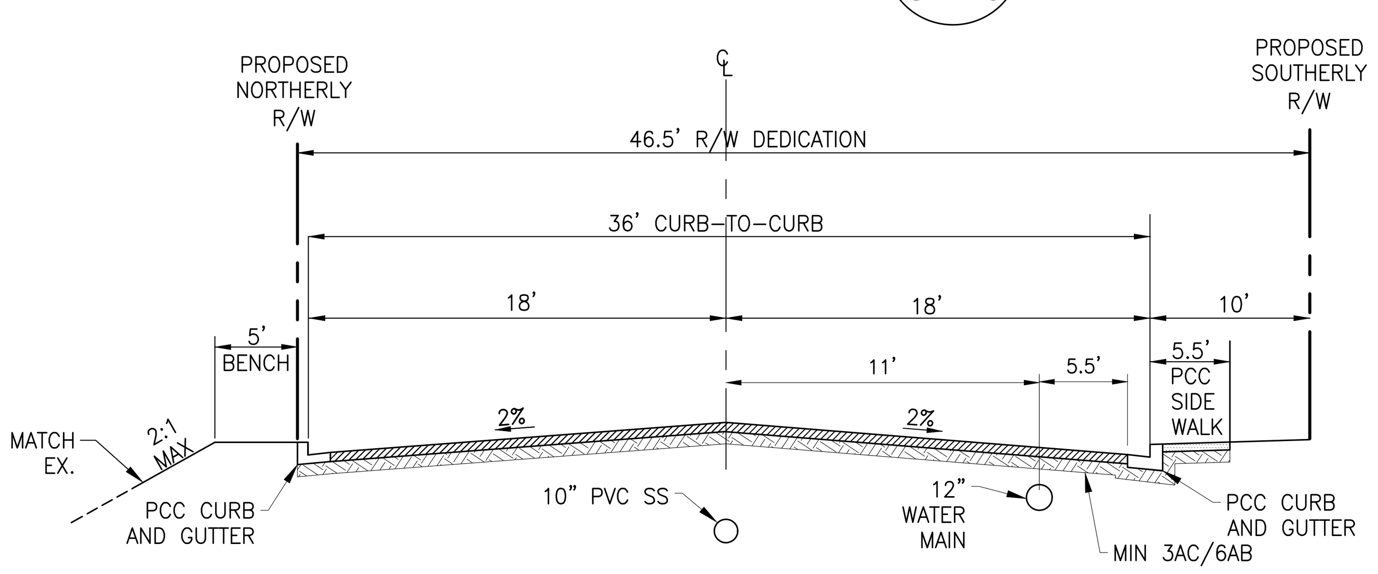
SHEET INDEX



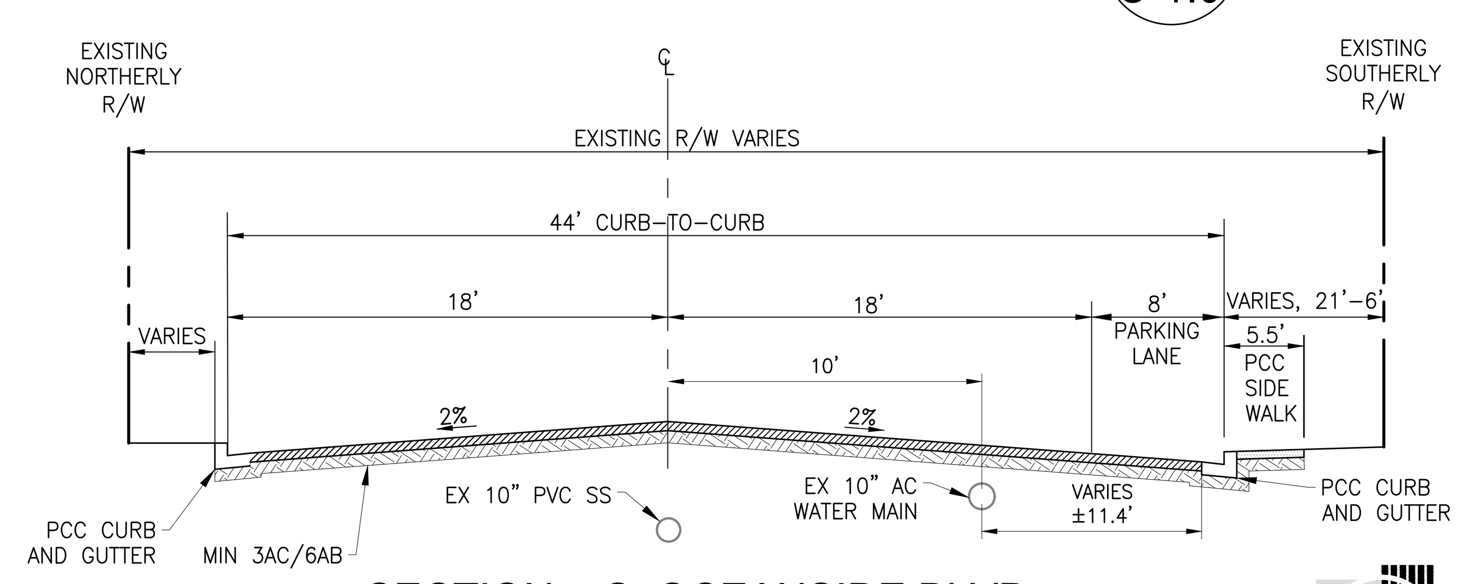
SECTION - S. OCEANSIDE BLVD.
ADJACENT TO NCTD PROPERTY
STA 11+24.66 - 17+41.17
A-A / C-1.0 SCALE: N.T.S.



SECTION - CROUCH STREET
SOUTH OF PROJECT PROPERTY
D-D / C-1.0 SCALE: N.T.S.



SECTION - S. OCEANSIDE BLVD.
FROM WESTERN PL TO NCTD PROPERTY
STA 17+41.17 - 22+49.80
B-B / C-1.0 SCALE: N.T.S.



SECTION - S. OCEANSIDE BLVD.
WEST OF PROJECT PROPERTY
STA 22+49.80 - 23+89.84
C-C / C-1.0 SCALE: N.T.S.

GRADING QUANTITIES

TOTAL DISTURBED AREA:	9.91 AC
PROJECT MAX DEPTH OF CUT:	6 FT
PROJECT MAX DEPTH OF FILL:	4 FT
MAX CUT SLOPE RATIO:	2:1
MAX FILL SLOPE RATIO:	2:1

ON-SITE GRADING:

DISTURBED AREA:	9.91 AC
AMOUNT OF CUT:	13,600 CY
AMOUNT OF FILL:	3,500 CY
AMOUNT OF EXPORT:	10,100 CY

GRADING QUANTITIES ARE APPROXIMATE AND SUBJECT TO CHANGE BASED ON FINAL DESIGN. QUANTITIES SHALL NOT BE USED FOR BIDDING PURPOSES.

FUSCOE ENGINEERING
6390 Greenwich Dr., Suite 170, San Diego, California 92122
tel 858.554.1500 ◦ fax 858.597.0335 ◦ www.fuscoe.com

REGISTERED PROFESSIONAL ENGINEER
BRIAN D. SMITH
C 75822
EXP. 06-30-22
CIVIL
STATE OF CALIFORNIA

adc
architecture design collaborative
23231 South Pointe Dr
Laguna Hills, CA 92653
www.adcollaborative.com
949.267.1660

ADC Project No: 190147

Project Contact: Chris Weimholt
Email: cweimholt@adcollaborative.com
Principal: Chris Weimholt
Project Manager:

Client

Company: Ocean Creek, LLC
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Phone No. (858) 699-7510

OCEAN CREEK, LLC

OCEANSIDE, CA

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2ND SUBMITTAL 06/07/2021

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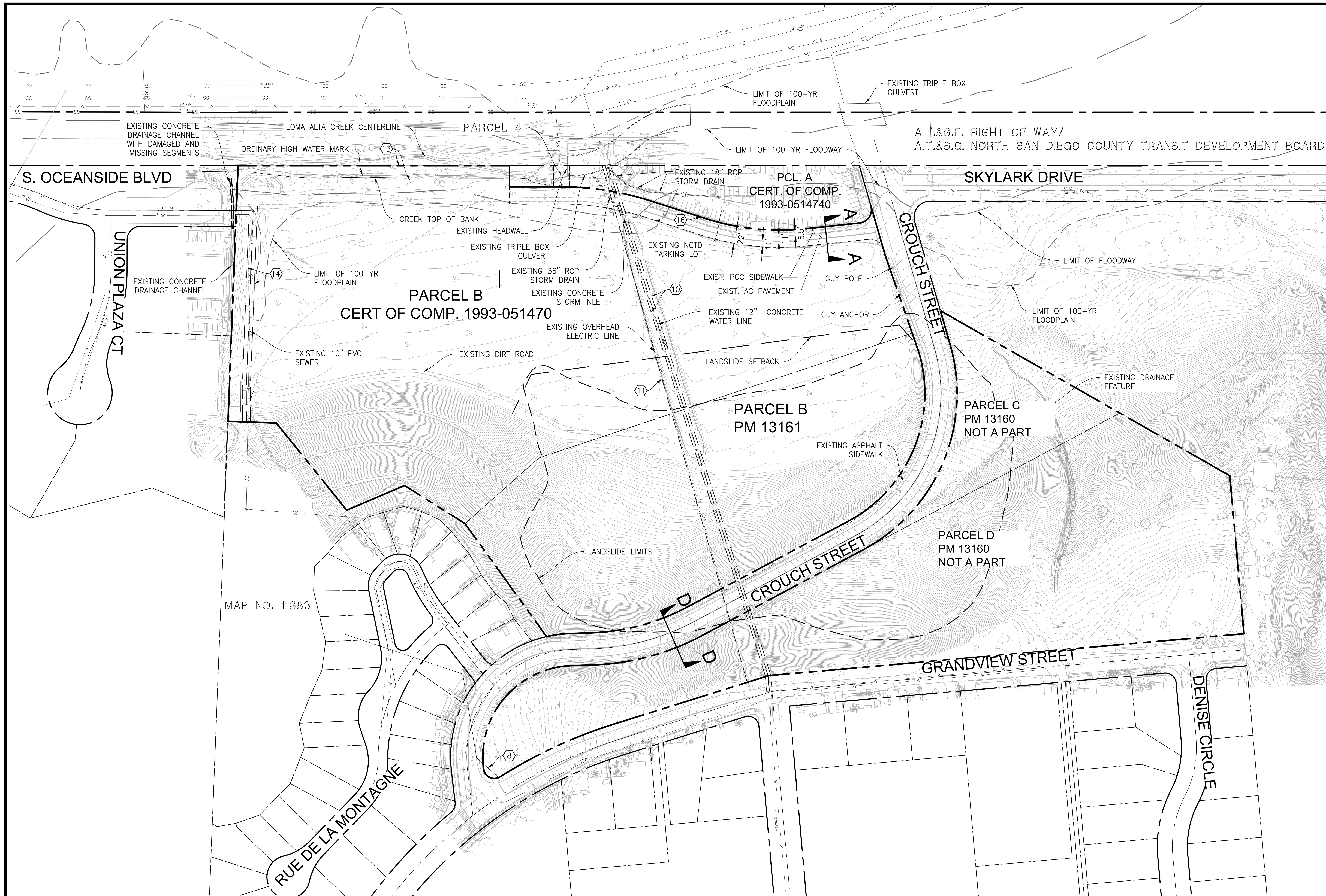
4TH SUBMITTAL 02/23/2022

TITLE SHEET

C-1.0

F:\PROJECTS\557\010\PLANS\CONCEPTUAL GRADING PLAN\557-010-CPGC01TS.DWG By: Bryan Smith



LEGEND

RIGHT OF WAY	
PROPERTY LINE	
PARCEL LOT LINE	
STREET CENTERLINE	
EASEMENT	
100-YR FLOODWAY	
100-YR FLOOD PLAIN	
LANDSLIDE LIMITS	
EXISTING STORM DRAIN	SD
EXISTING SEWER	SS
EXISTING WATER	W
EXISTING OVERHEAD UTILITY	(E-OH)

EASEMENT NOTES

8. AN EASEMENT FOR PUBLIC UTILITIES AND INCIDENTAL PURPOSES RECORDED JANUARY 30, 1934 AS BOOK 262, PAGE 435 OF OFFICIAL RECORDS.
IN FAVOR OF: SAN DIEGO CONSOLIDATED GAS AND ELECTRIC COMPANY
AFFECTS: PARCEL D OF PARCEL 1

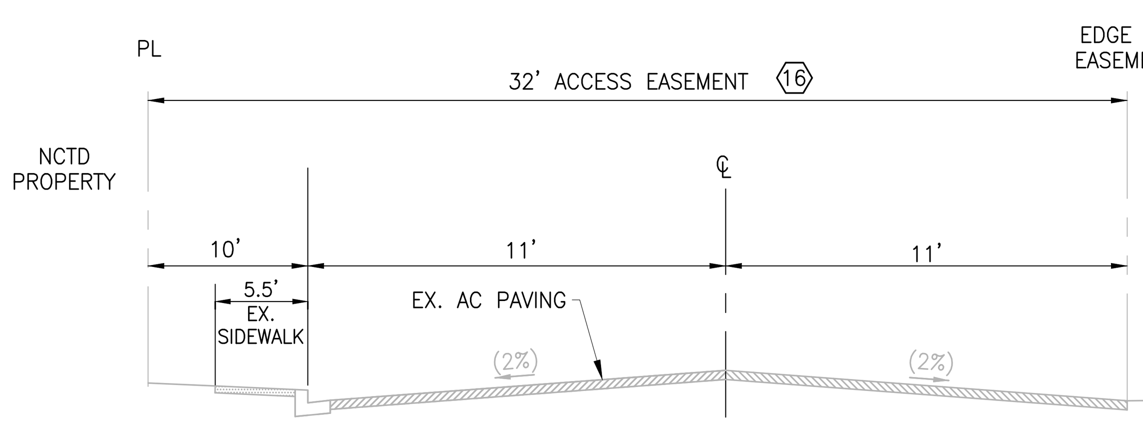
10. AN EASEMENT FOR PUBLIC UTILITIES AND INCIDENTAL PURPOSES, RECORDED JUNE 7, 1954 AS BOOK 5261, PAGE 195 OF OFFICIAL RECORDS.
IN FAVOR OF: CITY OF OCEANSIDE
AFFECTS: PARCEL D OF PARCEL 1, PARCEL 2 AND PARCEL 3
TO BE QUITCLAIMED

11. AN EASEMENT FOR PUBLIC UTILITIES AND INCIDENTAL PURPOSES, RECORDED FEBRUARY 16, 1955 AS BOOK 5534, PAGE 585 OF OFFICIAL RECORDS
IN FAVOR OF: SAN DIEGO GAS AND ELECTRIC COMPANY
AFFECTS: PARCEL D OF PARCEL 1, PARCEL 2 AND PARCEL 3
TO BE QUITCLAIMED

13. AN EASEMENT SHOWN OR DEDICATED ON THE MAP AS REFERRED TO IN THE LEGAL DESCRIPTION FOR: DRAINAGE CHANNEL RESERVATION PER LOT SPLIT MAP NO. 458 AND INCIDENTAL PURPOSES.
AFFECTS: PARCEL 2

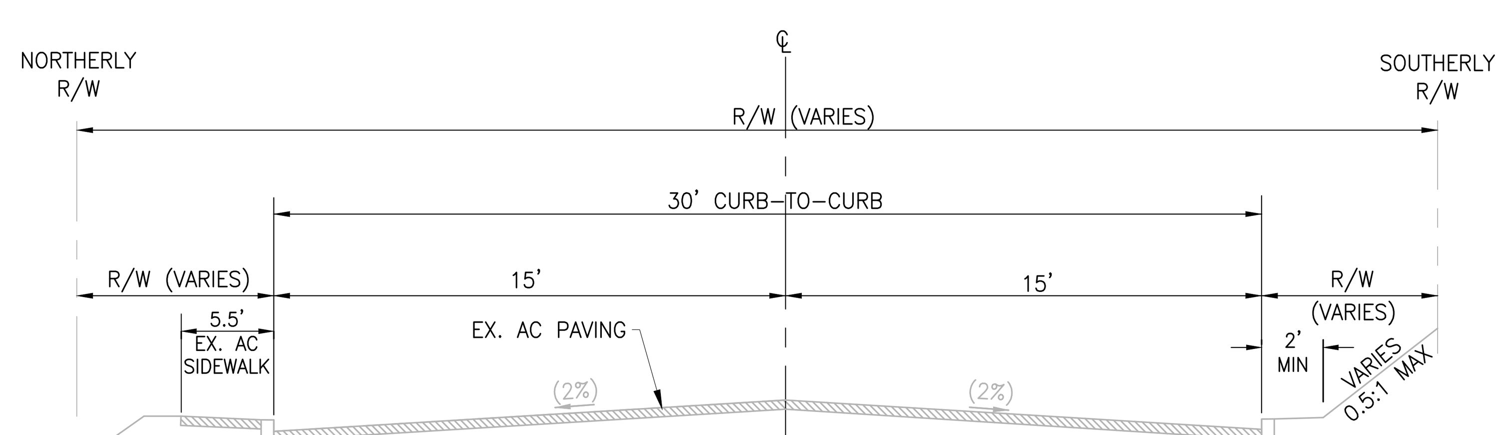
14. AN EASEMENT FOR PUBLIC UTILITIES AND INCIDENTAL PURPOSES, RECORDED DECEMBER 13, 1985 AS INSTRUMENT NO. 85-470870 OF OFFICIAL RECORDS.
IN FAVOR OF: CITY OF OCEANSIDE
AFFECTS: PARCEL 2

16. THE TERMS, PROVISIONS AND EASEMENT(S) CONTAINED IN THE DOCUMENT ENTITLED "AGREEMENT REGARDING ACCESS EASEMENT" RECORDED AUGUST 22, 2006 AS INSTRUMENT NO. 2006-0600028 OF OFFICIAL RECORDS. TO BE SUPERCEDED BY PUBLIC RIGHT-OF-WAY DEDICATION



SECTION - S. OCEANSIDE BLVD.
ADJACENT TO NCTD PROPERTY
STA 11+24.66 - 17+41.17

A-A
C-2.0
SCALE: N.T.S.



SECTION - CROUCH STREET
SOUTH OF PROJECT PROPERTY

D-D
C-2.0
SCALE: N.T.S.

REGISTERED PROFESSIONAL ENGINEER
BRYAN D. SMITH
C 75822
EXP. 06-30-22
CIVIL
STATE OF CALIFORNIA

NOTE: EXISTING CONDITIONS SHOWN ON THIS MAP ARE BASED ON SURVEY PROVIDED BY OTHERS (AS NOTED ON TITLE SHEET, "SURVEY SOURCE"). A SURVEY WAS NOT PREPARED UNDER RESPONSIBLE CHARGE OF ENGINEER OF RECORD OF THESE CONCEPTS PLANS

100' 0' 50' 100'
SCALE: 1" = 100'

FUSCOE
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tel 858.554.1500 ◦ fax 858.597.0335 ◦ www.fuscoe.com

F:\PROJECTS\557\010\PLANS\CONCEPTUAL GRADING PLAN\557-010-CPGC02EX.DWG By: Bryan Smith

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ADC Project No: 190147

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Email: cweimholt@adcollaborative.com
Principal: Chris Weimholt
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OCEAN CREEK, LLC

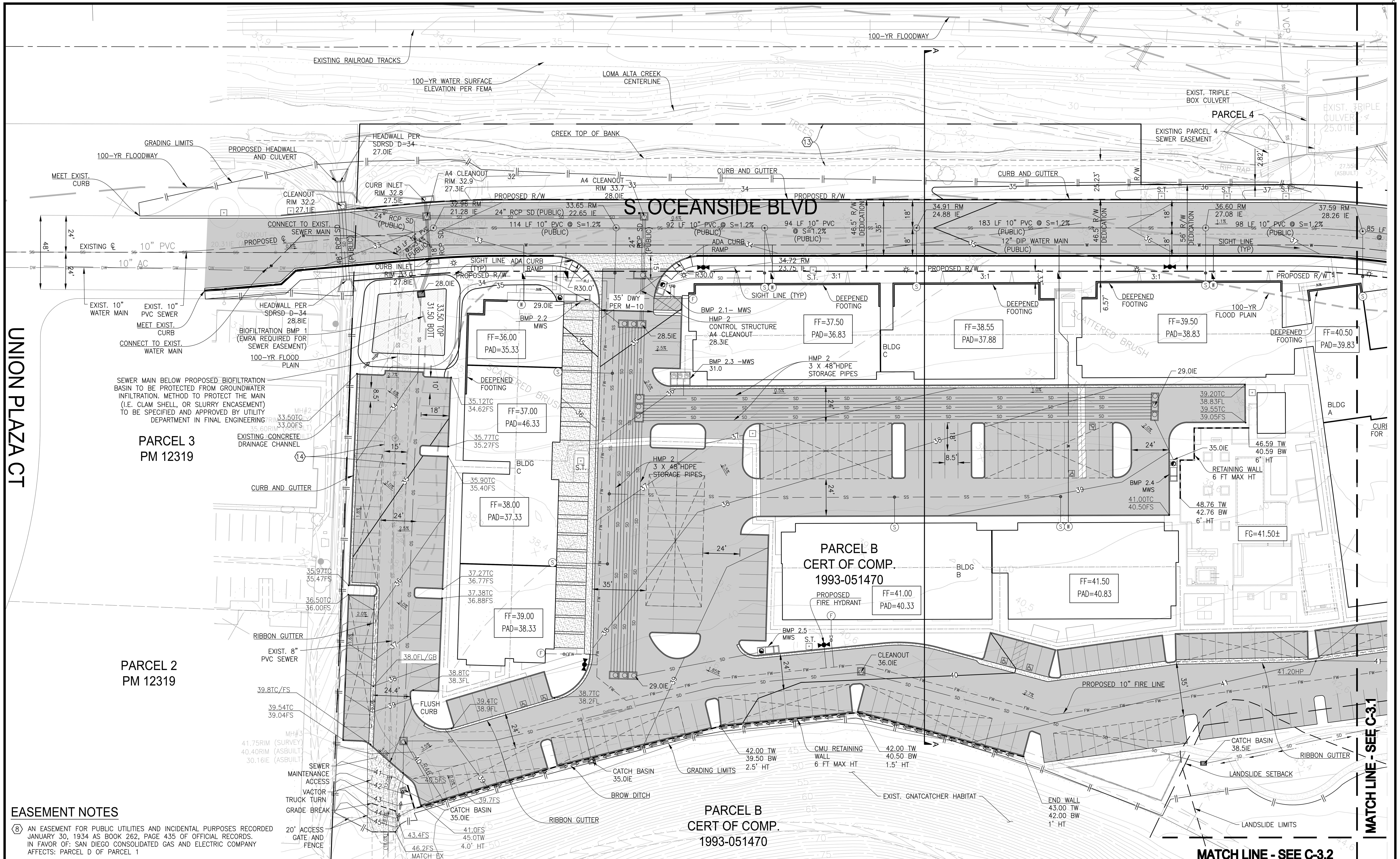
OCEANSIDE, CA

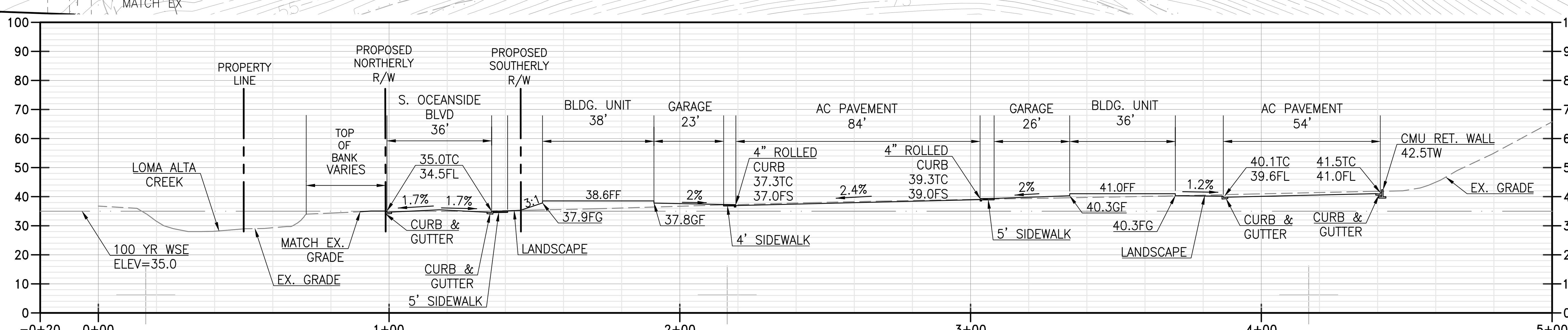
Issue Date

1ST SUBMITTAL 03/09/2020
2ND SUBMITTAL 06/07/2021
3RD SUBMITTAL 09/01/2021
4TH SUBMITTAL 02/23/2022

EXISTING CONDITIONS

C-2.0





A-A C-3.0 SITE SECTION

EASEMENT NOTES

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14. AN EASEMENT FOR PUBLIC UTILITIES AND INCIDENTAL PURPOSES, RECORDED DECEMBER 13, 1985 AS INSTRUMENT NO. 85-470870 OF OFFICIAL RECORDS. IN FAVOR OF: CITY OF OCEANSIDE AFFECTS: PARCEL 2

16. THE TERMS, PROVISIONS AND EASEMENT(S) CONTAINED IN THE DOCUMENT ENTITLED "AGREEMENT REGARDING ACCESS EASEMENT" RECORDED AUGUST 22, 2006 AS INSTRUMENT NO. 2006-0600028 OF OFFICIAL RECORDS. TO BE SUPERCEDED BY PUBLIC RIGHT-OF-WAY DEDICATION.

NOTE:
- EXISTING ON SITE OVERHEAD UTILITIES & OVERHEAD UTILITIES ALONG THE PROPERTY LINE ON CROUCH STREET MUST BE PLACED UNDERGROUND

SCALE: 1" = 30'

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949.267.1660

ADC Project No: 190147

Project Contact: Chris Weimholt
Email: cweimholt@adcollaborative.com
Principal: Chris Weimholt
Project Manager:

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OCEANSIDE, CA

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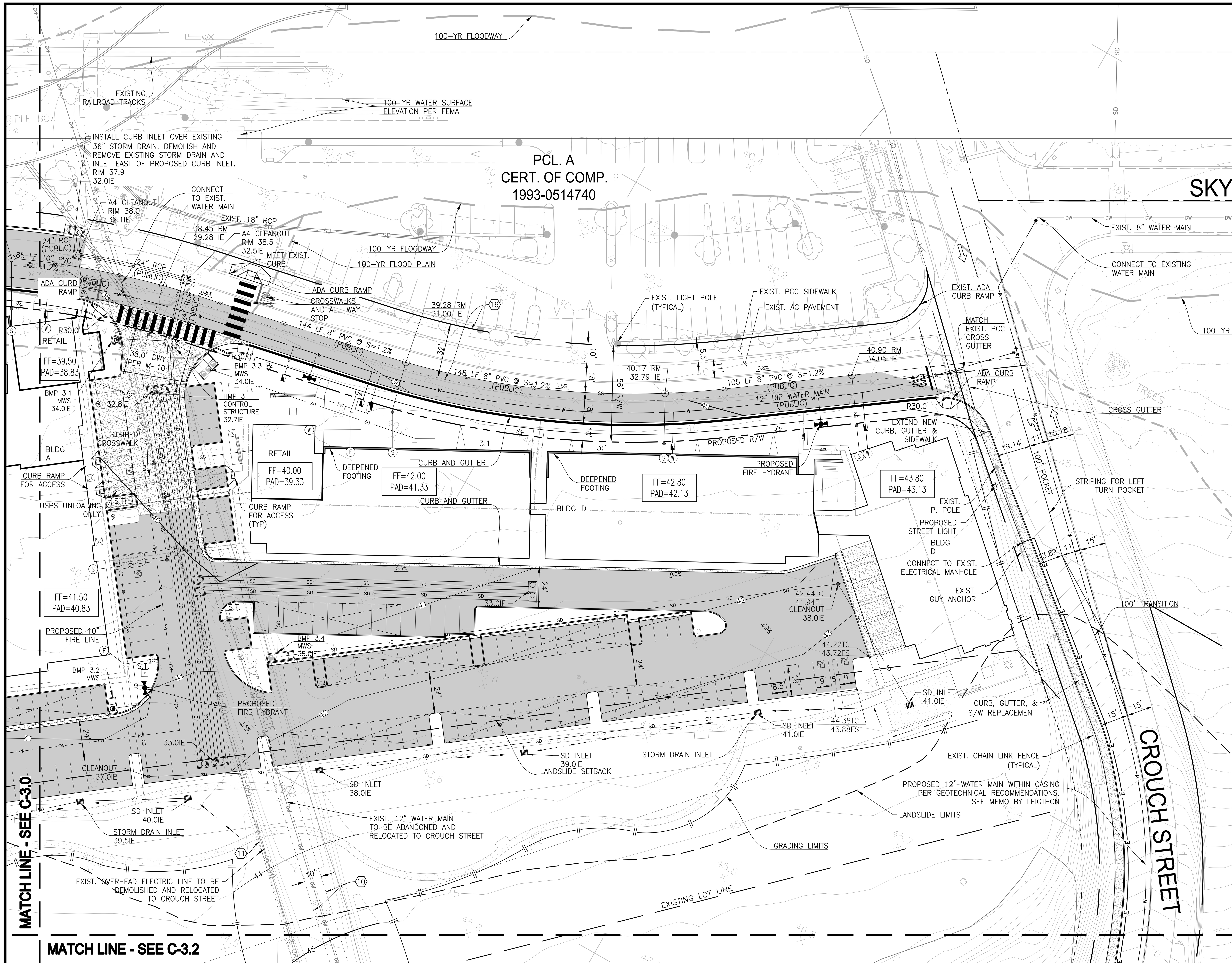
CONCEPTUAL GRADING AND UTILITIES

C-3.0



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AFFECTS: PARCEL 2

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REGISTERED PROFESSIONAL ENGINEER
BRYAN D. SMITH
C 75822
EXP. 06-30-22
CIVIL
STATE OF CALIFORNIA

NOTE:
- EXISTING ON SITE OVERHEAD UTILITIES & OVERHEAD UTILITIES ALONG THE PROPERTY LINE ON CROUCH STREET MUST BE PLACED UNDERGROUND

30' 0' 15' 30'
SCALE: 1" = 30'

FUSCOE ENGINEERING
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tel 858.554.1500 ∘ fax 858.597.0335 ∘ www.fuscoe.com

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OCEANSIDE, CA

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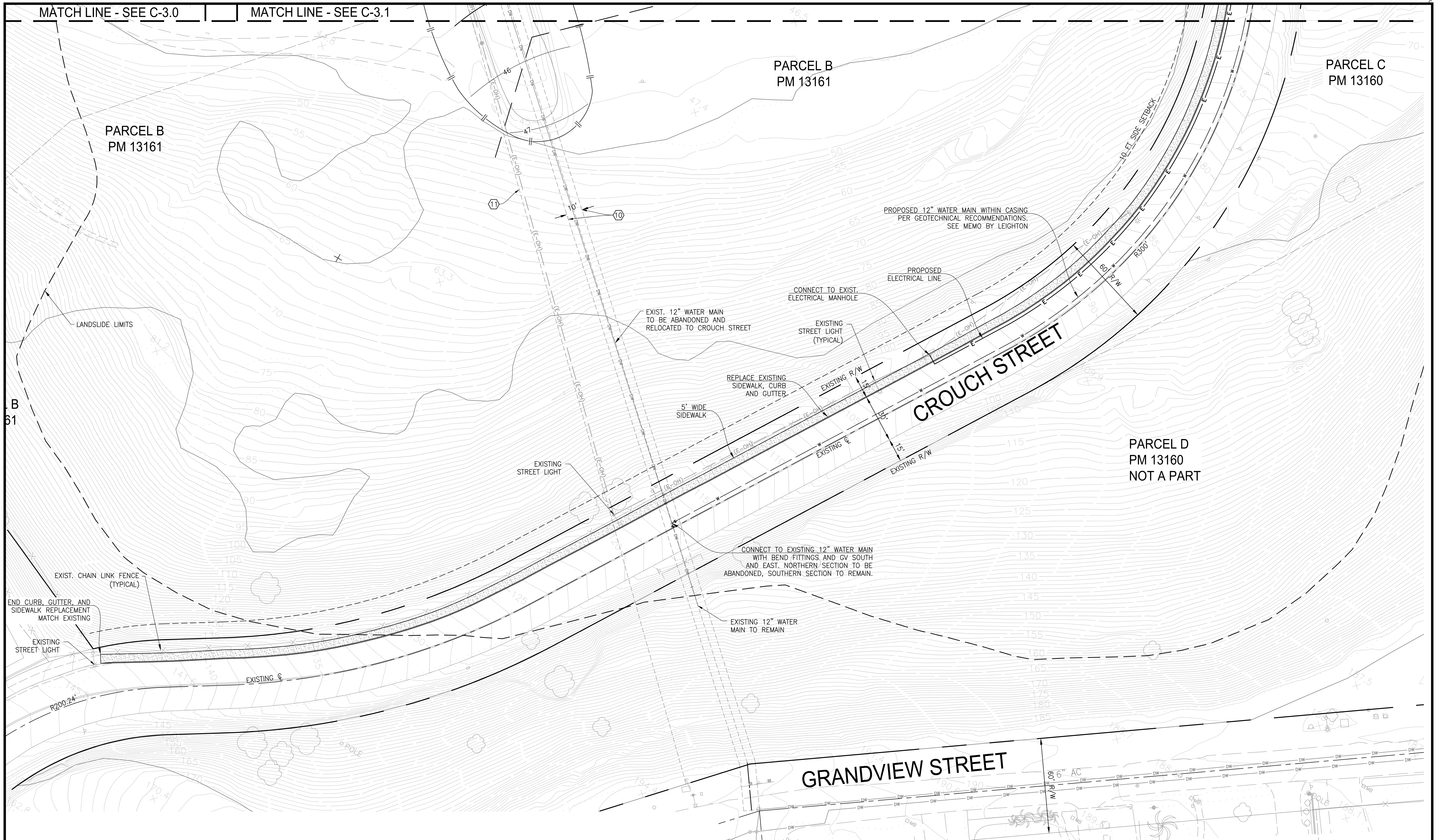
4TH SUBMITTAL 02/23/2022

CONCEPTUAL GRADING AND UTILITIES

C-3.1



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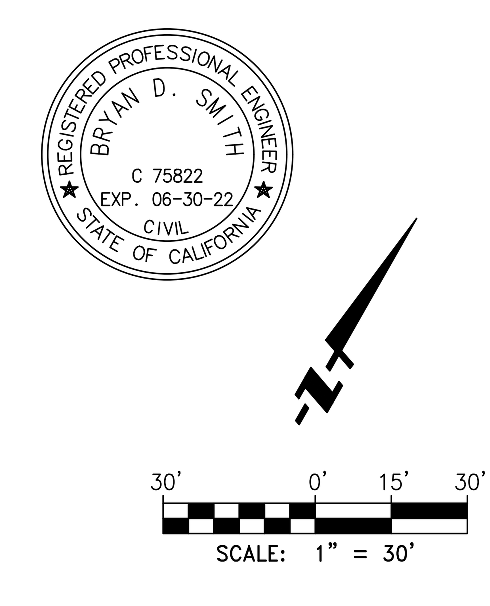

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OFF-SITE PUBLIC IMPROVEMENTS OCEAN CREEK, LLC

OCEANSIDE, CA

Issue Date

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3RD SUBMITTAL 09/01/2021

4TH SUBMITTAL 02/23/2022

CONCEPTUAL GRADING AND UTILITIES

C-3.2

APPENDIX 3

EXISTING HYDROLOGY CALCULATIONS

FUSCOE
ENGINEERING
6390 Greenwich Drive, Suite 170
San Diego, California 92122
[illegible]
www.fuscoe.com

Job Name: Jefferson Oceanside
Job #: 557-010
Run Name: Existing Series 3
Date: 3/3/2020
Notes:

Node 1	Node 2	Code	Elev 1 (feet)	Elev 2 (feet)	Length (feet)	C Factor	Area (acres)	Comments	BANK 1	BANK 2	BANK 3
305	304	2	120	84	100	0.35	0.111				
304	303	5	84	33.8	650	0.35	6.070				
303	300	4	33.8	30.37	54.5	-	0.000				
300	300	1	-	-	-	-	-				
302	301	2	42	40	100	0.87	0.074				
301	300	6	40	30.37	435	0.85	0.337				
						total	6.591				

FUSCOE
ENGINEERING
6390 Greenwich Drive, Suite 170
San Diego, California 92122
tel 858.554.1500 • fax 858.597.0335
www.fuscoe.com

Job Name: Jefferson Oceanside
Job #: 557-010
Run Name: Existing Series 4
Date: 3/3/2020
Notes:

Node 1	Node 2	Code	Elev 1 (feet)	Elev 2 (feet)	Length (feet)	C Factor	Area (acres)	Comments	BANK 1	BANK 2	BANK 3
411	410	2	194	193.5	100	0.52	0.123				
410	409	6	193.5	145	946.19	0.79	1.850				
410	409	8	-	-	-	0.58	13.305				
409	408	3	136.05	94	454.5	-	-				
408	404	5	99	29	1061	0.39	21.391				
404	404	1	-	-	-		-				
407	406	2	127	107	100	0.35	0.141				
406	405	5	107	39	143.21	0.35	0.415				
405	404	6	39	29	596.69	0.87	0.688				
404	404	1	-	-	-		--				
404	400	9	29	25	92	0.35	0.112				
400	400	1	-	-	-		-				
403	402	2	146	107	100	0.35	0.156				
402	401	5	107	31	1355	0.35	11.774				
401	400	9	31	28.6	32		0.112				
400	400	1	-	-	-		-				
						total	50.067				

```
****************************************************************************

              RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
              Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                           2003,1985,1981 HYDROLOGY MANUAL
           (c) Copyright 1982-2016 Advanced Engineering Software (aes)
               Ver. 23.0 Release Date: 07/01/2016  License ID 1355

                            Analysis prepared by:

                              Fuscoe Engineering
                           6390 Greenwich Dr Ste 170
                                San Diego, CA
                                    92122

 ************************* DESCRIPTION OF STUDY *************************
* JEFFERSON OCEANSIDE PRE-DEVELOPMENT STUDY                                *
* SERIES 3                                                                 *
* OCEANSIDE, CALIFORNIA                                                    *
 **************************************************************************

  FILE NAME: EX100S3.DAT
  TIME/DATE OF STUDY: 14:13 03/04/2020
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   2.700
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   4.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150
  2   21.0      1.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.50 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  1.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

****************************************************************************
  FLOW PROCESS FROM NODE    305.00 TO NODE    304.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    120.00
```

```
  DOWNSTREAM ELEVATION(FEET) =     84.00
  ELEVATION DIFFERENCE(FEET) =     36.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.267
     100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.150
  SUBAREA RUNOFF(CFS) =      0.24
  TOTAL AREA(ACRES) =      0.11   TOTAL RUNOFF(CFS) =      0.24

****************************************************************************
  FLOW PROCESS FROM NODE    304.00 TO NODE    303.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     84.00  DOWNSTREAM(FEET) =     33.80
  CHANNEL LENGTH THRU SUBAREA(FEET) =   650.00   CHANNEL SLOPE =  0.0772
  CHANNEL BASE(FEET) =   15.00   "Z" FACTOR =   3.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   5.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.633
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       5.27
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.14
  AVERAGE FLOW DEPTH(FEET) =   0.11   TRAVEL TIME(MIN.) =   3.45
  Tc(MIN.) =    9.72
  SUBAREA AREA(ACRES) =     6.07       SUBAREA RUNOFF(CFS) =    9.84
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =        6.2         PEAK FLOW RATE(CFS) =      10.02

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.16   FLOW VELOCITY(FEET/SEC.) =   3.97
  LONGEST FLOWPATH FROM NODE    305.00 TO NODE    303.00 =     750.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    303.00 TO NODE    300.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    33.80  DOWNSTREAM(FEET) =    30.37
  FLOW LENGTH(FEET) =    54.50   MANNING'S N =  0.011
  DEPTH OF FLOW IN  36.0 INCH PIPE IS   5.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  14.37
  GIVEN PIPE DIAMETER(INCH) =  36.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      10.02
  PIPE TRAVEL TIME(MIN.) =   0.06    Tc(MIN.) =    9.78
  LONGEST FLOWPATH FROM NODE    305.00 TO NODE    300.00 =     804.50 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    300.00 TO NODE    300.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    9.78
  RAINFALL INTENSITY(INCH/HR) =   4.61
  TOTAL STREAM AREA(ACRES) =     6.18
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     10.02
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    302.00 TO NODE    301.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8700
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =     42.00
  DOWNSTREAM ELEVATION(FEET) =     40.00
  ELEVATION DIFFERENCE(FEET) =      2.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.030
      100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.114
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.46
  TOTAL AREA(ACRES) =      0.07   TOTAL RUNOFF(CFS) =      0.46

****************************************************************************
  FLOW PROCESS FROM NODE    301.00 TO NODE    300.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =   40.00  DOWNSTREAM ELEVATION(FEET) =   30.37
  STREET LENGTH(FEET) =   435.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 21.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   1.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.39
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.25
    HALFSTREET FLOOD WIDTH(FEET) =    6.31
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.70
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.68
  STREET FLOW TRAVEL TIME(MIN.) =   2.68   Tc(MIN.) =    5.71
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.529
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.854
  SUBAREA AREA(ACRES) =    0.34      SUBAREA RUNOFF(CFS) =    1.87
  TOTAL AREA(ACRES) =        0.4        PEAK FLOW RATE(CFS) =       2.29

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.29   HALFSTREET FLOOD WIDTH(FEET) =   8.04
  FLOW VELOCITY(FEET/SEC.) =  3.00   DEPTH*VELOCITY(FT*FT/SEC.) =   0.86
  LONGEST FLOWPATH FROM NODE    302.00 TO NODE    300.00 =     535.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    300.00 TO NODE    300.00 IS CODE =   1
----------------------------------------------------------------------------
```

>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
>>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<

==

TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:
TIME OF CONCENTRATION(MIN.) = 5.71
RAINFALL INTENSITY(INCH/HR) = 6.53
TOTAL STREAM AREA(ACRES) = 0.41
PEAK FLOW RATE(CFS) AT CONFLUENCE = 2.29

** CONFLUENCE DATA **

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)	AREA (ACRE)
1	10.02	9.78	4.614	6.18
2	2.29	5.71	6.529	0.41

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
CONFLUENCE FORMULA USED FOR 2 STREAMS.

** PEAK FLOW RATE TABLE **

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)
1	8.14	5.71	6.529
2	11.64	9.78	4.614

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) = 11.64 Tc(MIN.) = 9.78
TOTAL AREA(ACRES) = 6.6
LONGEST FLOWPATH FROM NODE 305.00 TO NODE 300.00 = 804.50 FEET.

==

END OF STUDY SUMMARY:
TOTAL AREA(ACRES) = 6.6 TC(MIN.) = 9.78
PEAK FLOW RATE(CFS) = 11.64

==
==

END OF RATIONAL METHOD ANALYSIS

```
____________________________________________________________________________
****************************************************************************

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
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             Ver. 23.0 Release Date: 07/01/2016  License ID 1355

                          Analysis prepared by:

                            Fuscoe Engineering
                          6390 Greenich Dr Ste 170
                               San Diego, CA
                                   92122

 ************************** DESCRIPTION OF STUDY **************************
 * JEFFERSON OCEANSIDE PRE-DEVELOPMENT STUDY                                *
 * SERIES 4                                                                 *
 * OCEANSIDE, CALIFORNIA                                                    *
 **************************************************************************

  FILE NAME: EX100S4.DAT
  TIME/DATE OF STUDY: 14:20 03/04/2020
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   2.700
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   4.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150
  2   18.0      1.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150
  3   23.0      1.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.50 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  1.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

****************************************************************************
  FLOW PROCESS FROM NODE    411.00 TO NODE    410.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .5200
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
```

```
  UPSTREAM ELEVATION(FEET) =    194.00
  DOWNSTREAM ELEVATION(FEET) =    193.50
  ELEVATION DIFFERENCE(FEET) =      0.50
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    9.301
      100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.767
  SUBAREA RUNOFF(CFS) =      0.30
  TOTAL AREA(ACRES) =      0.12   TOTAL RUNOFF(CFS) =      0.30

****************************************************************************
  FLOW PROCESS FROM NODE    410.00 TO NODE    409.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  193.50  DOWNSTREAM ELEVATION(FEET) =  145.00
  STREET LENGTH(FEET) =   946.19   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 18.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   1.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.05
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.23
    HALFSTREET FLOOD WIDTH(FEET) =    5.28
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.84
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.89
  STREET FLOW TRAVEL TIME(MIN.) =   4.11   Tc(MIN.) =   13.41
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.765
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .7900
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.773
  SUBAREA AREA(ACRES) =    1.85      SUBAREA RUNOFF(CFS) =    5.50
  TOTAL AREA(ACRES) =        2.0        PEAK FLOW RATE(CFS) =       5.74

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.27   HALFSTREET FLOOD WIDTH(FEET) =   7.34
  FLOW VELOCITY(FEET/SEC.) =  4.37   DEPTH*VELOCITY(FT*FT/SEC.) =   1.19
  LONGEST FLOWPATH FROM NODE    411.00 TO NODE    409.00 =    1046.19 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    409.00 TO NODE    409.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.765
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .5800
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6050
  SUBAREA AREA(ACRES) =   13.30   SUBAREA RUNOFF(CFS) =   29.04
  TOTAL AREA(ACRES) =       15.3   TOTAL RUNOFF(CFS) =      34.78
  TC(MIN.) =   13.41
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    409.00 TO NODE    408.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   136.05  DOWNSTREAM(FEET) =    94.00
  FLOW LENGTH(FEET) =   454.50   MANNING'S N =  0.013
  DEPTH OF FLOW IN  30.0 INCH PIPE IS  11.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  21.37
  GIVEN PIPE DIAMETER(INCH) =  30.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      34.78
  PIPE TRAVEL TIME(MIN.) =   0.35    Tc(MIN.) =   13.77
  LONGEST FLOWPATH FROM NODE    411.00 TO NODE    408.00 =    1500.69 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    408.00 TO NODE    404.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     99.00  DOWNSTREAM(FEET) =     29.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1061.00   CHANNEL SLOPE =  0.0660
  CHANNEL BASE(FEET) =    4.00   "Z" FACTOR =   1.000
  MANNING'S FACTOR = 0.023   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.475
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3900
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      49.33
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =  12.46
  AVERAGE FLOW DEPTH(FEET) =   0.82   TRAVEL TIME(MIN.) =   1.42
  Tc(MIN.) =   15.18
  SUBAREA AREA(ACRES) =    21.39       SUBAREA RUNOFF(CFS) =   28.99
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.480
  TOTAL AREA(ACRES) =       36.7         PEAK FLOW RATE(CFS) =      61.09

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.93   FLOW VELOCITY(FEET/SEC.) =  13.26
  LONGEST FLOWPATH FROM NODE    411.00 TO NODE    404.00 =    2561.69 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    404.00 TO NODE    404.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   15.18
  RAINFALL INTENSITY(INCH/HR) =   3.47
  TOTAL STREAM AREA(ACRES) =    36.66
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     61.09

****************************************************************************
  FLOW PROCESS FROM NODE    407.00 TO NODE    406.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
```

```
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    127.00
  DOWNSTREAM ELEVATION(FEET) =    107.00
  ELEVATION DIFFERENCE(FEET) =     20.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.267
     100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.150
  SUBAREA RUNOFF(CFS) =      0.30
  TOTAL AREA(ACRES) =      0.14   TOTAL RUNOFF(CFS) =      0.30

****************************************************************************
  FLOW PROCESS FROM NODE    406.00 TO NODE    405.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    107.00  DOWNSTREAM(FEET) =     39.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   143.21   CHANNEL SLOPE =  0.4748
  CHANNEL BASE(FEET) =    2.00   "Z" FACTOR =   4.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.869
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.73
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   5.06
  AVERAGE FLOW DEPTH(FEET) =   0.06   TRAVEL TIME(MIN.) =   0.47
  Tc(MIN.) =    6.74
  SUBAREA AREA(ACRES) =     0.41       SUBAREA RUNOFF(CFS) =    0.85
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =        0.6         PEAK FLOW RATE(CFS) =       1.14

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.08   FLOW VELOCITY(FEET/SEC.) =   6.06
  LONGEST FLOWPATH FROM NODE    407.00 TO NODE    405.00 =     243.21 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    405.00 TO NODE    404.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  3 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =   39.00  DOWNSTREAM ELEVATION(FEET) =   29.00
  STREET LENGTH(FEET) =   596.69   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 23.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   1.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.45
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.30
    HALFSTREET FLOOD WIDTH(FEET) =    8.83
```

```
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.73
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.83
  STREET FLOW TRAVEL TIME(MIN.) =   3.64   Tc(MIN.) =   10.38
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.441
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8700
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.638
  SUBAREA AREA(ACRES) =    0.69      SUBAREA RUNOFF(CFS) =    2.66
  TOTAL AREA(ACRES) =        1.2        PEAK FLOW RATE(CFS) =       3.52

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.33   HALFSTREET FLOOD WIDTH(FEET) =  10.35
  FLOW VELOCITY(FEET/SEC.) =  2.96   DEPTH*VELOCITY(FT*FT/SEC.) =   0.99
  LONGEST FLOWPATH FROM NODE    407.00 TO NODE    404.00 =     839.90 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    404.00 TO NODE    404.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   10.38
  RAINFALL INTENSITY(INCH/HR) =   4.44
  TOTAL STREAM AREA(ACRES) =     1.24
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      3.52

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       61.09    15.18        3.475         36.66
      2        3.52    10.38        4.441          1.24

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1       45.29    10.38       4.441
      2       63.85    15.18       3.475

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      63.85   Tc(MIN.) =   15.18
  TOTAL AREA(ACRES) =       37.9
  LONGEST FLOWPATH FROM NODE    411.00 TO NODE    404.00 =    2561.69 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    404.00 TO NODE    400.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     29.00  DOWNSTREAM(FEET) =     25.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =    92.00   CHANNEL SLOPE =  0.0435
  CHANNEL BASE(FEET) =    2.00   "Z" FACTOR =   3.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   5.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.448
```

```
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      63.92
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   8.48
  AVERAGE FLOW DEPTH(FEET) =   1.29   TRAVEL TIME(MIN.) =   0.18
  Tc(MIN.) =   15.37
  SUBAREA AREA(ACRES) =     0.11       SUBAREA RUNOFF(CFS) =    0.14
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.484
  TOTAL AREA(ACRES) =       38.0         PEAK FLOW RATE(CFS) =      63.85

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  1.29   FLOW VELOCITY(FEET/SEC.) =   8.47
  LONGEST FLOWPATH FROM NODE    411.00 TO NODE    400.00 =    2653.69 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    400.00 TO NODE    400.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   15.37
  RAINFALL INTENSITY(INCH/HR) =   3.45
  TOTAL STREAM AREA(ACRES) =    38.02
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     63.85

****************************************************************************
  FLOW PROCESS FROM NODE    403.00 TO NODE    402.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    146.00
  DOWNSTREAM ELEVATION(FEET) =    107.00
  ELEVATION DIFFERENCE(FEET) =     39.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.267
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.150
  SUBAREA RUNOFF(CFS) =      0.34
  TOTAL AREA(ACRES) =      0.16   TOTAL RUNOFF(CFS) =      0.34

****************************************************************************
  FLOW PROCESS FROM NODE    402.00 TO NODE    401.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    107.00  DOWNSTREAM(FEET) =     31.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =     0.35   CHANNEL SLOPE = *******
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   4.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.150
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      13.01
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =  64.46
```

```
  AVERAGE FLOW DEPTH(FEET) =   0.02   TRAVEL TIME(MIN.) =   0.00
  Tc(MIN.) =    6.27
  SUBAREA AREA(ACRES) =    11.78       SUBAREA RUNOFF(CFS) =   25.35
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =       11.9         PEAK FLOW RATE(CFS) =      25.69

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.03   FLOW VELOCITY(FEET/SEC.) =  75.95
  LONGEST FLOWPATH FROM NODE    403.00 TO NODE    401.00 =     100.35 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    401.00 TO NODE    400.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     31.00  DOWNSTREAM(FEET) =     28.60
  CHANNEL LENGTH THRU SUBAREA(FEET) =    32.00   CHANNEL SLOPE =  0.0750
  CHANNEL BASE(FEET) =    4.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.015   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.124
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      25.81
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =  13.17
  AVERAGE FLOW DEPTH(FEET) =   0.41   TRAVEL TIME(MIN.) =   0.04
  Tc(MIN.) =    6.31
  SUBAREA AREA(ACRES) =     0.11       SUBAREA RUNOFF(CFS) =    0.24
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =       12.0         PEAK FLOW RATE(CFS) =      25.82

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.41   FLOW VELOCITY(FEET/SEC.) =  13.17
  LONGEST FLOWPATH FROM NODE    403.00 TO NODE    400.00 =     132.35 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    400.00 TO NODE    400.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    6.31
  RAINFALL INTENSITY(INCH/HR) =   6.12
  TOTAL STREAM AREA(ACRES) =    12.05
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     25.82

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       63.85    15.37        3.448         38.02
      2       25.82     6.31        6.124         12.05

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
```

```
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1       61.78     6.31       6.124
      2       78.39    15.37       3.448

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      78.39   Tc(MIN.) =   15.37
  TOTAL AREA(ACRES) =       50.1
  LONGEST FLOWPATH FROM NODE    411.00 TO NODE    400.00 =    2653.69 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =       50.1  TC(MIN.) =     15.37
  PEAK FLOW RATE(CFS)   =      78.39
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

APPENDIX 4

PROPOSED HYDROLOGY CALCULATIONS

FUSCOE
ENGINEERING
6390 Greenwich Drive, Suite 170
San Diego, California 92122
tel 858.554.1500 • fax 858.597.0335
www.fuscoe.com

Job Name: Jefferson Oceanside
Job #: 557-010
Run Name: Proposed Series 3
Date: 3/3/2020
Notes:

Node 1	Node 2	Code	Elev 1 (feet)	Elev 2 (feet)	Length (feet)	C Factor	Area (acres)	Comments	BANK 1	BANK 2	BANK 3
307	306	2	72.1	45.7	100	0.35	0.080	0% IMP			
306	305	5	45.7	43.5	95.2	0.35	0.310				
305	304	3	40.5	38.4	81.3	-	-	D=8"			
304	304	8	-	-	-	0.87	0.210	100% IMP			
304	303	3	38.4	36.9	325.6	-	-	D=8"			
303	303	8	-	-	-	0.87	0.400	100% IMP			
303	302	3	36.9	32.7	221.35	0.79	-	80% IMP, ASSUMED			
302	302	8	-	-	-	0.35	0.130	0% IMP			
302	302	8	-	-	-	0.79	0.190	80% IMP, ASSUMED			
302	302	8	-	-	-	0.79	1.280	80% IMP, ASSUMED			
302	301	3	32.7	32.1	102	-	-	D= 24"			
301	301	1	-	-	-	-	-	1 OF 2			
312	311	2	122.8	84	100	0.35	0.130				
311	310	5	84	42.9	363.7	0.35	3.460	n=0.30, W=10', Z=4			
310	301	3	39.9	32.1	401	-	-				
301	301	1	-	-	-	-	-	2 OF 2			
301	300	3	32.1	32	10.3	-	-	d=36"			
300	300	1	-	-	-	-	-	1 OF 2			
309	308	2	42	38	100	0.87	0.100				
308	300	6	38	32	435	0.87	0.240				
300	300	1	-	-	-	-	-	2 OF 2			
						TOTAL	6.530				

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Job Name: Jefferson Oceanside
Job #: 557-010
Run Name: Proposed Series 4
Date: 3/3/2020
Notes:

Node 1	Node 2	Code	Elev 1 (feet)	Elev 2 (feet)	Length (feet)	C Facto	Area (acres)	Comments	BANK 1	2	3
426	425	2	194	193.5	100	0.52	0.123				
425	424	6	193.5	145	946.19	0.79	1.85	18' half width, 1 side			
424	424	8	-	-	-	0.58	13.305				
424	423	4	136.05	99	454.5	-	-	n=0.013			
423	422	5	99	29	1061	0.39	21.14	n=0.023, W=4', Z=1			
422	421	3	29	27.2	56.13	-	-	n=0.013			
421	421	10	-	-	-	-	-		X		
421	421	13	-	-	-	-	-				
420	419	2	146	107	100	0.35	0.156				
419	418	5	107	43	475	0.35	6.06				
418	417	3	35	33	735	-	-	n=0.011			
417	416	3	33	27.8	287	-	-	n=0.013			
416	416	8	-	-	-	0.85	0.75				
416	412	3	27.8	27.6	20	-	-	n=0.013			
412	412	1	-	-	-	-	-	1 of 2			
415	414	2	127	107	100	0.35	0.14				
414	413	5	107	39	143.21	0.35	0.41	n=0.03			
413	412	6	39	32.54	646	0.87	0.51	18' half width, 1 side			
412	412	8	-	-	-	0.79	0.73	S. side of OC Blvd E. of Inlet			
412	412	1	-	-	-	-	-	2 of 2			
412	401	3	27.6	27.3	30	-	-	n=0.013			
401	401	1	-	-	-	-	-	1 of 3			
404	403	2	36.8	35.4	100	0.87	0.06	S. side of OC Blvd W. of Inlet			
403	402	6	35.4	32.54	533	0.79	0.44	18' half width, 1 side			
402	402	8	-	-	-	0.87	0.11	N. side of OC Blvd W. of Inlet			
402	401	3	27.6	27.3	16	-	-	n=0.013			
401	401	1	-	-	-	-	-	2 of 3			
411	410	2	42	40.7	100	0.87	0.12				
410	409	9	40.7	39.25	288	0.79	0.66	width =3', depth 0.13'			
409	408	3	30.69	29.09	80	-	-	n=0.011			
408	407	3	29.09	28.65	175	-	-	n=0.011			
407	407	8	-	-	-	0.85	0.52	DMA W. of U.G. Det. Sys.			
407	407	8	-	-	-	0.87	1.12	DMA S. of U.G. Det. Sys.			
407	406	3	28.65	28.5	55	-	-	n=0.011			
406	406	8	-	-	-	0.87	1	DMA E. of U.G. Det. Sys.			
406	405	3	28.5	28.3	20	-	-	n=0.011			
405	405	8	-	-	-	0.87	0.37	S. Half of Bldg.			
405	405	8	-	-	-	0.35	0.07	Area between Bldg & ROW			
405	401	3	28.3	27.3	185	-	-	n=0.013			
401	401	1	-	-	-	-	-	3 of 3			
401	421	3	27.3	27.2	57	-	-	n=0.013			
421	421	11	-	-	-	-	-		X		
421	400	3	27.2	27	8.3	-	-	n=0.013			
						TOTAL	49.644				

```
____________________________________________________________________________
****************************************************************************

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
         (c) Copyright 1982-2016 Advanced Engineering Software (aes)
             Ver. 23.0 Release Date: 07/01/2016  License ID 1355

                           Analysis prepared by:

                             Fuscoe Engineering
                          6390 Greenwich Dr Ste 170
                               San Diego, CA
                                   92122

 ************************** DESCRIPTION OF STUDY **************************
 * JEFFERSON OCEANSIDE POST-DEVELOPMENT STUDY                               *
 * SERIES 3                                                                 *
 * OCEANSIDE, CALIFORNIA                                                    *
 **************************************************************************

  FILE NAME: PR100S3.DAT
  TIME/DATE OF STUDY: 13:36 03/05/2020
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   2.700
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   4.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150
  2   18.0      1.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.50 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  1.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

****************************************************************************
  FLOW PROCESS FROM NODE    307.00 TO NODE    306.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =     72.10
```

```
  DOWNSTREAM ELEVATION(FEET) =     45.70
  ELEVATION DIFFERENCE(FEET) =     26.40
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.267
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.150
  SUBAREA RUNOFF(CFS) =      0.17
  TOTAL AREA(ACRES) =      0.08   TOTAL RUNOFF(CFS) =      0.17

****************************************************************************
  FLOW PROCESS FROM NODE    306.00 TO NODE    305.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     45.70  DOWNSTREAM(FEET) =     43.50
  CHANNEL LENGTH THRU SUBAREA(FEET) =    95.20   CHANNEL SLOPE =  0.0231
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   4.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.265
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.46
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.93
  AVERAGE FLOW DEPTH(FEET) =   0.05   TRAVEL TIME(MIN.) =   1.71
  Tc(MIN.) =    7.97
  SUBAREA AREA(ACRES) =     0.31       SUBAREA RUNOFF(CFS) =    0.57
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =        0.4         PEAK FLOW RATE(CFS) =       0.72

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.06   FLOW VELOCITY(FEET/SEC.) =   1.10
  LONGEST FLOWPATH FROM NODE    307.00 TO NODE    305.00 =     195.20 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    305.00 TO NODE    304.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    40.50  DOWNSTREAM(FEET) =    38.40
  FLOW LENGTH(FEET) =    81.30   MANNING'S N =  0.011
  DEPTH OF FLOW IN   6.0 INCH PIPE IS   3.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.71
  ESTIMATED PIPE DIAMETER(INCH) =   6.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.72
  PIPE TRAVEL TIME(MIN.) =   0.24    Tc(MIN.) =    8.21
  LONGEST FLOWPATH FROM NODE    307.00 TO NODE    304.00 =     276.50 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    304.00 TO NODE    304.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.167
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8700
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.5320
  SUBAREA AREA(ACRES) =    0.21   SUBAREA RUNOFF(CFS) =    0.94
```

```
  TOTAL AREA(ACRES) =        0.6   TOTAL RUNOFF(CFS) =       1.65
  TC(MIN.) =    8.21

****************************************************************************
  FLOW PROCESS FROM NODE    304.00 TO NODE    303.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    38.40  DOWNSTREAM(FEET) =    36.90
  FLOW LENGTH(FEET) =   325.60   MANNING'S N =  0.011
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   6.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.70
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.65
  PIPE TRAVEL TIME(MIN.) =   1.47    Tc(MIN.) =    9.68
  LONGEST FLOWPATH FROM NODE    307.00 TO NODE    303.00 =     602.10 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    303.00 TO NODE    303.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.646
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8700
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6672
  SUBAREA AREA(ACRES) =    0.40   SUBAREA RUNOFF(CFS) =    1.62
  TOTAL AREA(ACRES) =        1.0   TOTAL RUNOFF(CFS) =       3.10
  TC(MIN.) =    9.68

****************************************************************************
  FLOW PROCESS FROM NODE    303.00 TO NODE    302.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    36.90  DOWNSTREAM(FEET) =    32.70
  FLOW LENGTH(FEET) =   221.35   MANNING'S N =  0.011
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   6.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.36
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.10
  PIPE TRAVEL TIME(MIN.) =   0.50    Tc(MIN.) =   10.18
  LONGEST FLOWPATH FROM NODE    307.00 TO NODE    302.00 =     823.45 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    302.00 TO NODE    302.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.498
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6307
  SUBAREA AREA(ACRES) =    0.13   SUBAREA RUNOFF(CFS) =    0.20
  TOTAL AREA(ACRES) =        1.1   TOTAL RUNOFF(CFS) =       3.21
  TC(MIN.) =   10.18
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    302.00 TO NODE    302.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.498
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .7900
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6536
  SUBAREA AREA(ACRES) =    0.19   SUBAREA RUNOFF(CFS) =    0.68
  TOTAL AREA(ACRES) =        1.3   TOTAL RUNOFF(CFS) =       3.88
  TC(MIN.) =   10.18

****************************************************************************
  FLOW PROCESS FROM NODE    302.00 TO NODE    302.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.498
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .7900
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.7208
  SUBAREA AREA(ACRES) =    1.28   SUBAREA RUNOFF(CFS) =    4.55
  TOTAL AREA(ACRES) =        2.6   TOTAL RUNOFF(CFS) =       8.43
  TC(MIN.) =   10.18

****************************************************************************
  FLOW PROCESS FROM NODE    302.00 TO NODE    301.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    32.70  DOWNSTREAM(FEET) =    32.10
  FLOW LENGTH(FEET) =   102.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  13.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.95
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =        8.43
  PIPE TRAVEL TIME(MIN.) =   0.29    Tc(MIN.) =   10.46
  LONGEST FLOWPATH FROM NODE    307.00 TO NODE    301.00 =     925.45 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    301.00 TO NODE    301.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   10.46
  RAINFALL INTENSITY(INCH/HR) =   4.42
  TOTAL STREAM AREA(ACRES) =     2.60
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      8.43

****************************************************************************
  FLOW PROCESS FROM NODE    312.00 TO NODE    311.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
```

```
==========================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    122.80
  DOWNSTREAM ELEVATION(FEET) =     84.00
  ELEVATION DIFFERENCE(FEET) =     38.80
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.267
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.150
  SUBAREA RUNOFF(CFS) =      0.28
  TOTAL AREA(ACRES) =      0.13   TOTAL RUNOFF(CFS) =      0.28

**************************************************************************
  FLOW PROCESS FROM NODE    311.00 TO NODE    310.00 IS CODE =  51
--------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     84.00  DOWNSTREAM(FEET) =     42.90
  CHANNEL LENGTH THRU SUBAREA(FEET) =   363.70   CHANNEL SLOPE =  0.1130
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   4.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.251
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.49
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   3.48
  AVERAGE FLOW DEPTH(FEET) =   0.10   TRAVEL TIME(MIN.) =   1.74
  Tc(MIN.) =    8.01
  SUBAREA AREA(ACRES) =     3.46       SUBAREA RUNOFF(CFS) =    6.36
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =        3.6         PEAK FLOW RATE(CFS) =       6.60

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.14   FLOW VELOCITY(FEET/SEC.) =   4.39
  LONGEST FLOWPATH FROM NODE    312.00 TO NODE    310.00 =     463.70 FEET.

**************************************************************************
  FLOW PROCESS FROM NODE    310.00 TO NODE    301.00 IS CODE =  31
--------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    39.90  DOWNSTREAM(FEET) =    32.10
  FLOW LENGTH(FEET) =   401.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  15.0 INCH PIPE IS   8.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   8.96
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       6.60
  PIPE TRAVEL TIME(MIN.) =   0.75    Tc(MIN.) =    8.75
  LONGEST FLOWPATH FROM NODE    312.00 TO NODE    301.00 =     864.70 FEET.

**************************************************************************
  FLOW PROCESS FROM NODE    301.00 TO NODE    301.00 IS CODE =   1
--------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
```

```
================================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.75
  RAINFALL INTENSITY(INCH/HR) =   4.96
  TOTAL STREAM AREA(ACRES) =     3.59
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      6.60

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
     1         8.43    10.46        4.418          2.60
     2         6.60     8.75        4.958          3.59

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
     1        13.65     8.75       4.958
     2        14.31    10.46       4.418

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      14.31   Tc(MIN.) =   10.46
  TOTAL AREA(ACRES) =        6.2
  LONGEST FLOWPATH FROM NODE    307.00 TO NODE    301.00 =     925.45 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    301.00 TO NODE    300.00 IS CODE =  31
--------------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    32.10  DOWNSTREAM(FEET) =    32.00
  FLOW LENGTH(FEET) =    10.30   MANNING'S N =  0.011
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  14.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   8.30
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      14.31
  PIPE TRAVEL TIME(MIN.) =   0.02    Tc(MIN.) =   10.48
  LONGEST FLOWPATH FROM NODE    307.00 TO NODE    300.00 =     935.75 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    300.00 TO NODE    300.00 IS CODE =   1
--------------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
================================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   10.48
  RAINFALL INTENSITY(INCH/HR) =   4.41
  TOTAL STREAM AREA(ACRES) =     6.19
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     14.31

****************************************************************************
  FLOW PROCESS FROM NODE    309.00 TO NODE    308.00 IS CODE =  21
--------------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
================================================================================
```

```
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8700
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =     42.00
  DOWNSTREAM ELEVATION(FEET) =     38.00
  ELEVATION DIFFERENCE(FEET) =      4.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.608
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.114
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.62
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.62

****************************************************************************
  FLOW PROCESS FROM NODE    308.00 TO NODE    300.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =   38.00  DOWNSTREAM ELEVATION(FEET) =   32.00
  STREET LENGTH(FEET) =   435.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 18.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   1.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.29
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.26
    HALFSTREET FLOOD WIDTH(FEET) =    6.86
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.19
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.58
  STREET FLOW TRAVEL TIME(MIN.) =   3.31   Tc(MIN.) =    5.92
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.379
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8700
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.870
  SUBAREA AREA(ACRES) =    0.24      SUBAREA RUNOFF(CFS) =    1.33
  TOTAL AREA(ACRES) =        0.3        PEAK FLOW RATE(CFS) =       1.89

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.29   HALFSTREET FLOOD WIDTH(FEET) =   8.19
  FLOW VELOCITY(FEET/SEC.) =  2.39   DEPTH*VELOCITY(FT*FT/SEC.) =   0.69
  LONGEST FLOWPATH FROM NODE    309.00 TO NODE    300.00 =     535.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    300.00 TO NODE    300.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
```

```
____________________________________________________________________________
****************************************************************************

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
         (c) Copyright 1982-2014 Advanced Engineering Software (aes)
             Ver. 21.0 Release Date: 06/01/2014  License ID 1355

                           Analysis prepared by:

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 ************************** DESCRIPTION OF STUDY **************************
 * JEFFERSON OCEANSIDE POST-DEVELOPMENT STUDY                               *
 * SERIES 4                                                                 *
 * OCEANSIDE CALIFORNIA                                                     *
 **************************************************************************

  FILE NAME: SMIT4.DAT
  TIME/DATE OF STUDY: 16:12 04/09/2021
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   2.700
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   4.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150
  2   18.0      1.0    0.020/0.020/0.020   0.50    1.50 0.0313 0.125 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.50 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  1.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

****************************************************************************
  FLOW PROCESS FROM NODE    426.00 TO NODE    425.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .5200
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    194.00
```

```
  DOWNSTREAM ELEVATION(FEET) =    193.50
  ELEVATION DIFFERENCE(FEET) =      0.50
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    9.301
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    50.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.767
  SUBAREA RUNOFF(CFS) =      0.30
  TOTAL AREA(ACRES) =      0.12   TOTAL RUNOFF(CFS) =      0.30

****************************************************************************
  FLOW PROCESS FROM NODE    425.00 TO NODE    424.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  193.50  DOWNSTREAM ELEVATION(FEET) =  145.00
  STREET LENGTH(FEET) =   946.16   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 18.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   1.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.05
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.23
    HALFSTREET FLOOD WIDTH(FEET) =    5.28
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.84
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.89
  STREET FLOW TRAVEL TIME(MIN.) =   4.11   Tc(MIN.) =   13.41
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.765
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .7900
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.773
  SUBAREA AREA(ACRES) =    1.85      SUBAREA RUNOFF(CFS) =    5.50
  TOTAL AREA(ACRES) =        2.0        PEAK FLOW RATE(CFS) =       5.74

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.27   HALFSTREET FLOOD WIDTH(FEET) =   7.34
  FLOW VELOCITY(FEET/SEC.) =  4.37   DEPTH*VELOCITY(FT*FT/SEC.) =   1.19
  LONGEST FLOWPATH FROM NODE    426.00 TO NODE    424.00 =    1046.16 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    424.00 TO NODE    424.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.765
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .5800
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6049
```

```
  SUBAREA AREA(ACRES) =   13.31   SUBAREA RUNOFF(CFS) =   29.05
  TOTAL AREA(ACRES) =       15.3   TOTAL RUNOFF(CFS) =      34.79
  TC(MIN.) =   13.41

****************************************************************************
  FLOW PROCESS FROM NODE    424.00 TO NODE    423.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   136.05  DOWNSTREAM(FEET) =    99.00
  FLOW LENGTH(FEET) =   454.50   MANNING'S N =  0.011
  DEPTH OF FLOW IN  30.0 INCH PIPE IS  10.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  23.04
  GIVEN PIPE DIAMETER(INCH) =  30.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      34.79
  PIPE TRAVEL TIME(MIN.) =   0.33    Tc(MIN.) =   13.74
  LONGEST FLOWPATH FROM NODE    426.00 TO NODE    423.00 =    1500.66 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    423.00 TO NODE    422.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     99.00  DOWNSTREAM(FEET) =     29.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =  1061.00   CHANNEL SLOPE =  0.0660
  CHANNEL BASE(FEET) =    4.00   "Z" FACTOR =   1.000
  MANNING'S FACTOR = 0.023   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.474
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3900
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      49.16
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =  12.19
  AVERAGE FLOW DEPTH(FEET) =   0.83   TRAVEL TIME(MIN.) =   1.45
  Tc(MIN.) =   15.19
  SUBAREA AREA(ACRES) =    21.14       SUBAREA RUNOFF(CFS) =   28.64
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.480
  TOTAL AREA(ACRES) =       36.4         PEAK FLOW RATE(CFS) =      60.75

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.94   FLOW VELOCITY(FEET/SEC.) =  13.06
  LONGEST FLOWPATH FROM NODE    426.00 TO NODE    422.00 =    2561.66 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    422.00 TO NODE    421.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    29.00  DOWNSTREAM(FEET) =    27.20
  FLOW LENGTH(FEET) =    56.13   MANNING'S N =  0.013
  DEPTH OF FLOW IN  30.0 INCH PIPE IS  21.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  16.37
  ESTIMATED PIPE DIAMETER(INCH) =  30.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      60.75
  PIPE TRAVEL TIME(MIN.) =   0.06    Tc(MIN.) =   15.25
  LONGEST FLOWPATH FROM NODE    426.00 TO NODE    421.00 =    2617.79 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    421.00 TO NODE    421.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    421.00 TO NODE    421.00 IS CODE =  13
----------------------------------------------------------------------------
  >>>>>CLEAR THE MAIN-STREAM MEMORY<<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE    420.00 TO NODE    419.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    146.00
  DOWNSTREAM ELEVATION(FEET) =    107.00
  ELEVATION DIFFERENCE(FEET) =     39.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.267
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.150
  SUBAREA RUNOFF(CFS) =      0.34
  TOTAL AREA(ACRES) =      0.16   TOTAL RUNOFF(CFS) =      0.34

****************************************************************************
  FLOW PROCESS FROM NODE    419.00 TO NODE    418.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    107.00  DOWNSTREAM(FEET) =     43.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   475.00   CHANNEL SLOPE =  0.1347
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   4.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.233
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       5.92
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   4.44
  AVERAGE FLOW DEPTH(FEET) =   0.13   TRAVEL TIME(MIN.) =   1.78
  Tc(MIN.) =    8.05
  SUBAREA AREA(ACRES) =     6.06       SUBAREA RUNOFF(CFS) =   11.10
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =        6.2         PEAK FLOW RATE(CFS) =      11.38

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.19   FLOW VELOCITY(FEET/SEC.) =   5.70
  LONGEST FLOWPATH FROM NODE    420.00 TO NODE    418.00 =     575.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    418.00 TO NODE    417.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
```

```
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    35.00  DOWNSTREAM(FEET) =    33.00
  FLOW LENGTH(FEET) =   735.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  16.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.85
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      11.38
  PIPE TRAVEL TIME(MIN.) =   2.53    Tc(MIN.) =   10.58
  LONGEST FLOWPATH FROM NODE    420.00 TO NODE    417.00 =    1310.00 FEET.

******************************************************************************
  FLOW PROCESS FROM NODE    417.00 TO NODE    416.00 IS CODE =  31
------------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    33.00  DOWNSTREAM(FEET) =    27.80
  FLOW LENGTH(FEET) =   287.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  11.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   9.97
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      11.38
  PIPE TRAVEL TIME(MIN.) =   0.48    Tc(MIN.) =   11.06
  LONGEST FLOWPATH FROM NODE    420.00 TO NODE    416.00 =    1597.00 FEET.

******************************************************************************
  FLOW PROCESS FROM NODE    416.00 TO NODE    416.00 IS CODE =  81
------------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.264
   *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.4038
  SUBAREA AREA(ACRES) =    0.75   SUBAREA RUNOFF(CFS) =    2.72
  TOTAL AREA(ACRES) =        7.0   TOTAL RUNOFF(CFS) =      11.99
  TC(MIN.) =   11.06

******************************************************************************
  FLOW PROCESS FROM NODE    416.00 TO NODE    412.00 IS CODE =  31
------------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    27.80  DOWNSTREAM(FEET) =    27.60
  FLOW LENGTH(FEET) =    20.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  14.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.80
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      11.99
  PIPE TRAVEL TIME(MIN.) =   0.04    Tc(MIN.) =   11.10
  LONGEST FLOWPATH FROM NODE    420.00 TO NODE    412.00 =    1617.00 FEET.

******************************************************************************
  FLOW PROCESS FROM NODE    412.00 TO NODE    412.00 IS CODE =   1
------------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
==============================================================================
```

```
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   11.10
  RAINFALL INTENSITY(INCH/HR) =   4.25
  TOTAL STREAM AREA(ACRES) =     6.97
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     11.99

****************************************************************************
  FLOW PROCESS FROM NODE    415.00 TO NODE    414.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =    127.00
  DOWNSTREAM ELEVATION(FEET) =    107.00
  ELEVATION DIFFERENCE(FEET) =     20.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.267
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.150
  SUBAREA RUNOFF(CFS) =      0.30
  TOTAL AREA(ACRES) =      0.14   TOTAL RUNOFF(CFS) =      0.30

****************************************************************************
  FLOW PROCESS FROM NODE    414.00 TO NODE    413.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    107.00  DOWNSTREAM(FEET) =     39.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   143.21   CHANNEL SLOPE =  0.4748
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   4.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.652
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.71
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.72
  AVERAGE FLOW DEPTH(FEET) =   0.03   TRAVEL TIME(MIN.) =   0.88
  Tc(MIN.) =    7.14
  SUBAREA AREA(ACRES) =     0.41       SUBAREA RUNOFF(CFS) =    0.81
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =        0.6         PEAK FLOW RATE(CFS) =       1.09

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.03   FLOW VELOCITY(FEET/SEC.) =   3.22
  LONGEST FLOWPATH FROM NODE    415.00 TO NODE    413.00 =     243.21 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    413.00 TO NODE    412.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =   39.00  DOWNSTREAM ELEVATION(FEET) =   32.54
  STREET LENGTH(FEET) =   646.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 18.00
```

```
  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   1.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      1.96
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.31
    HALFSTREET FLOOD WIDTH(FEET) =    8.98
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.12
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.65
  STREET FLOW TRAVEL TIME(MIN.) =   5.07   Tc(MIN.) =   12.21
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.999
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8700
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.600
  SUBAREA AREA(ACRES) =    0.51      SUBAREA RUNOFF(CFS) =    1.77
  TOTAL AREA(ACRES) =        1.1        PEAK FLOW RATE(CFS) =       2.54

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.33   HALFSTREET FLOOD WIDTH(FEET) =  10.07
  FLOW VELOCITY(FEET/SEC.) =  2.25   DEPTH*VELOCITY(FT*FT/SEC.) =   0.74
  LONGEST FLOWPATH FROM NODE    415.00 TO NODE    412.00 =     889.21 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    412.00 TO NODE    412.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.999
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .7900
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.6776
  SUBAREA AREA(ACRES) =    0.73   SUBAREA RUNOFF(CFS) =    2.31
  TOTAL AREA(ACRES) =        1.8   TOTAL RUNOFF(CFS) =       4.85
  TC(MIN.) =   12.21

****************************************************************************
  FLOW PROCESS FROM NODE    412.00 TO NODE    412.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   12.21
  RAINFALL INTENSITY(INCH/HR) =   4.00
  TOTAL STREAM AREA(ACRES) =     1.79
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      4.85

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
```

```
     1       11.99    11.10       4.253          6.97
     2        4.85    12.21       3.999          1.79

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
     1       16.40    11.10       4.253
     2       16.13    12.21       3.999

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      16.40   Tc(MIN.) =   11.10
  TOTAL AREA(ACRES) =        8.8
  LONGEST FLOWPATH FROM NODE    420.00 TO NODE    412.00 =    1617.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    412.00 TO NODE    401.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    27.60  DOWNSTREAM(FEET) =    27.30
  FLOW LENGTH(FEET) =    30.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  15.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   8.59
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      16.40
  PIPE TRAVEL TIME(MIN.) =   0.06    Tc(MIN.) =   11.16
  LONGEST FLOWPATH FROM NODE    420.00 TO NODE    401.00 =    1647.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    401.00 TO NODE    401.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   11.16
  RAINFALL INTENSITY(INCH/HR) =   4.24
  TOTAL STREAM AREA(ACRES) =     8.76
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     16.40

****************************************************************************
  FLOW PROCESS FROM NODE    404.00 TO NODE    403.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8700
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =     36.80
  DOWNSTREAM ELEVATION(FEET) =     35.40
  ELEVATION DIFFERENCE(FEET) =      1.40
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.226
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    76.00
           (Reference: Table 3-1B of Hydrology Manual)
```

```
         THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.114
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.37
  TOTAL AREA(ACRES) =      0.06   TOTAL RUNOFF(CFS) =      0.37

****************************************************************************
  FLOW PROCESS FROM NODE    403.00 TO NODE    402.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =   35.40  DOWNSTREAM ELEVATION(FEET) =   32.54
  STREET LENGTH(FEET) =   533.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 18.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   1.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0300

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.24
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.29
    HALFSTREET FLOOD WIDTH(FEET) =    8.37
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.51
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.44
  STREET FLOW TRAVEL TIME(MIN.) =   5.89   Tc(MIN.) =    9.12
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.829
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .7900
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.800
  SUBAREA AREA(ACRES) =    0.44      SUBAREA RUNOFF(CFS) =    1.68
  TOTAL AREA(ACRES) =        0.5        PEAK FLOW RATE(CFS) =       1.93

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.33   HALFSTREET FLOOD WIDTH(FEET) =  10.19
  FLOW VELOCITY(FEET/SEC.) =  1.67   DEPTH*VELOCITY(FT*FT/SEC.) =   0.55
  LONGEST FLOWPATH FROM NODE    404.00 TO NODE    402.00 =     633.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    402.00 TO NODE    402.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.829
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8700
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8123
  SUBAREA AREA(ACRES) =    0.11   SUBAREA RUNOFF(CFS) =    0.46
  TOTAL AREA(ACRES) =        0.6   TOTAL RUNOFF(CFS) =       2.39
  TC(MIN.) =    9.12

****************************************************************************
```

```
  FLOW PROCESS FROM NODE    402.00 TO NODE    401.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    27.60  DOWNSTREAM(FEET) =    27.30
  FLOW LENGTH(FEET) =    16.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN   9.0 INCH PIPE IS   6.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.69
  ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =        2.39
  PIPE TRAVEL TIME(MIN.) =   0.04    Tc(MIN.) =    9.16
  LONGEST FLOWPATH FROM NODE    404.00 TO NODE    401.00 =     649.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    401.00 TO NODE    401.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    9.16
  RAINFALL INTENSITY(INCH/HR) =   4.81
  TOTAL STREAM AREA(ACRES) =     0.61
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      2.39

****************************************************************************
  FLOW PROCESS FROM NODE    411.00 TO NODE    410.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8700
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =     42.00
  DOWNSTREAM ELEVATION(FEET) =     40.70
  ELEVATION DIFFERENCE(FEET) =      1.30
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.274
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    74.50
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.114
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.74
  TOTAL AREA(ACRES) =      0.12   TOTAL RUNOFF(CFS) =      0.74

****************************************************************************
  FLOW PROCESS FROM NODE    410.00 TO NODE    409.00 IS CODE =  91
----------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =     40.70
  DOWNSTREAM NODE ELEVATION(FEET) =     39.25
  CHANNEL LENGTH THRU SUBAREA(FEET) =   288.00
  "V" GUTTER WIDTH(FEET) =   3.00   GUTTER HIKE(FEET) =  0.050
  PAVEMENT LIP(FEET) =  0.100   MANNING'S N = .0150
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.08600
  MAXIMUM DEPTH(FEET) =   2.00
```

```
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.898
 *USER SPECIFIED(SUBAREA):
 USER-SPECIFIED RUNOFF COEFFICIENT = .7900
 S.C.S. CURVE NUMBER (AMC II) =   0
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      2.55
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.44
 AVERAGE FLOW DEPTH(FEET) =   0.29   FLOOD WIDTH(FEET) =    6.34
 "V" GUTTER FLOW TRAVEL TIME(MIN.) =   1.97   Tc(MIN.) =    5.25
 SUBAREA AREA(ACRES) =    0.66       SUBAREA RUNOFF(CFS) =    3.60
 AREA-AVERAGE RUNOFF COEFFICIENT =  0.802
 TOTAL AREA(ACRES) =        0.8         PEAK FLOW RATE(CFS) =       4.32

 END OF SUBAREA "V" GUTTER HYDRAULICS:
 DEPTH(FEET) =  0.37   FLOOD WIDTH(FEET) =    8.10
 FLOW VELOCITY(FEET/SEC.) =   2.71   DEPTH*VELOCITY(FT*FT/SEC) =   1.00
 LONGEST FLOWPATH FROM NODE    411.00 TO NODE    409.00 =     388.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    409.00 TO NODE    408.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    30.69  DOWNSTREAM(FEET) =    29.09
 FLOW LENGTH(FEET) =    80.00   MANNING'S N =  0.011
 DEPTH OF FLOW IN  12.0 INCH PIPE IS   7.7 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   8.10
 ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =        4.32
 PIPE TRAVEL TIME(MIN.) =   0.16    Tc(MIN.) =    5.41
 LONGEST FLOWPATH FROM NODE    411.00 TO NODE    408.00 =     468.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    408.00 TO NODE    407.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    29.09  DOWNSTREAM(FEET) =    28.65
 FLOW LENGTH(FEET) =   175.00   MANNING'S N =  0.011
 DEPTH OF FLOW IN  18.0 INCH PIPE IS  11.2 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   3.73
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =        4.32
 PIPE TRAVEL TIME(MIN.) =   0.78    Tc(MIN.) =    6.19
 LONGEST FLOWPATH FROM NODE    411.00 TO NODE    407.00 =     643.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    407.00 TO NODE    407.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.197
 *USER SPECIFIED(SUBAREA):
 USER-SPECIFIED RUNOFF COEFFICIENT = .8500
 S.C.S. CURVE NUMBER (AMC II) =   0
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.8214
 SUBAREA AREA(ACRES) =    0.52   SUBAREA RUNOFF(CFS) =    2.74
 TOTAL AREA(ACRES) =        1.3   TOTAL RUNOFF(CFS) =       6.62
 TC(MIN.) =    6.19
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    407.00 TO NODE    407.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.197
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8700
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8439
  SUBAREA AREA(ACRES) =    1.12   SUBAREA RUNOFF(CFS) =    6.04
  TOTAL AREA(ACRES) =        2.4   TOTAL RUNOFF(CFS) =      12.66
  TC(MIN.) =    6.19

****************************************************************************
  FLOW PROCESS FROM NODE    407.00 TO NODE    406.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    28.65  DOWNSTREAM(FEET) =    28.50
  FLOW LENGTH(FEET) =    55.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  18.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.92
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      12.66
  PIPE TRAVEL TIME(MIN.) =   0.19    Tc(MIN.) =    6.38
  LONGEST FLOWPATH FROM NODE    411.00 TO NODE    406.00 =     698.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    406.00 TO NODE    406.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.080
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8700
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8515
  SUBAREA AREA(ACRES) =    1.00   SUBAREA RUNOFF(CFS) =    5.29
  TOTAL AREA(ACRES) =        3.4   TOTAL RUNOFF(CFS) =      17.71
  TC(MIN.) =    6.38

****************************************************************************
  FLOW PROCESS FROM NODE    406.00 TO NODE    406.00 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
============================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN) =  18.00   RAIN INTENSITY(INCH/HOUR) =  3.11
  TOTAL AREA(ACRES) =     3.40   TOTAL RUNOFF(CFS) =      1.86

****************************************************************************
  FLOW PROCESS FROM NODE    406.00 TO NODE    405.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    28.50  DOWNSTREAM(FEET) =    28.30
```

```
  FLOW LENGTH(FEET) =    20.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN   9.0 INCH PIPE IS   7.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.92
  ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =        1.86
  PIPE TRAVEL TIME(MIN.) =   0.07    Tc(MIN.) =   18.07
  LONGEST FLOWPATH FROM NODE    411.00 TO NODE    405.00 =     718.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    405.00 TO NODE    405.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.106
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .8700
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.2438
  SUBAREA AREA(ACRES) =    0.37   SUBAREA RUNOFF(CFS) =    1.00
  TOTAL AREA(ACRES) =        3.8   TOTAL RUNOFF(CFS) =       2.86
  TC(MIN.) =   18.07

****************************************************************************
  FLOW PROCESS FROM NODE    405.00 TO NODE    405.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.106
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.2458
  SUBAREA AREA(ACRES) =    0.07   SUBAREA RUNOFF(CFS) =    0.08
  TOTAL AREA(ACRES) =        3.8   TOTAL RUNOFF(CFS) =       2.93
  TC(MIN.) =   18.07

****************************************************************************
  FLOW PROCESS FROM NODE    405.00 TO NODE    401.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    28.30  DOWNSTREAM(FEET) =    27.30
  FLOW LENGTH(FEET) =   185.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   9.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.38
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =        2.93
  PIPE TRAVEL TIME(MIN.) =   0.70    Tc(MIN.) =   18.77
  LONGEST FLOWPATH FROM NODE    411.00 TO NODE    401.00 =     903.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    401.00 TO NODE    401.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
  TIME OF CONCENTRATION(MIN.) =   18.77
```

```
  RAINFALL INTENSITY(INCH/HR) =   3.03
  TOTAL STREAM AREA(ACRES) =     3.84
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      2.93

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       16.40    11.16        4.239         8.76
      2        2.39     9.16        4.815         0.61
      3        2.93    18.77        3.031         3.84

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  3 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1       18.26     9.16       4.815
      2       20.25    11.16       4.239
      3       16.16    18.77       3.031

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      20.25   Tc(MIN.) =   11.16
  TOTAL AREA(ACRES) =       13.2
  LONGEST FLOWPATH FROM NODE    420.00 TO NODE    401.00 =    1647.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    401.00 TO NODE    421.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    27.30  DOWNSTREAM(FEET) =    27.20
  FLOW LENGTH(FEET) =    57.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  33.0 INCH PIPE IS  22.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.77
  ESTIMATED PIPE DIAMETER(INCH) =  33.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      20.25
  PIPE TRAVEL TIME(MIN.) =   0.20    Tc(MIN.) =   11.36
  LONGEST FLOWPATH FROM NODE    420.00 TO NODE    421.00 =    1704.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    421.00 TO NODE    421.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1       20.25    11.36       4.191       13.21
  LONGEST FLOWPATH FROM NODE    420.00 TO NODE    421.00 =    1704.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1       60.75    15.25       3.466       36.42
  LONGEST FLOWPATH FROM NODE    426.00 TO NODE    421.00 =    2617.79 FEET.

  ** PEAK FLOW RATE TABLE **
```

```
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1      65.50      11.36        4.191
      2      77.50      15.25        3.466

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      77.50   Tc(MIN.) =   15.25
  TOTAL AREA(ACRES) =       49.6

****************************************************************************
  FLOW PROCESS FROM NODE    421.00 TO NODE    400.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    27.20  DOWNSTREAM(FEET) =    27.00
  FLOW LENGTH(FEET) =     8.30   MANNING'S N =  0.011
  DEPTH OF FLOW IN  33.0 INCH PIPE IS  22.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  17.76
  ESTIMATED PIPE DIAMETER(INCH) =  33.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      77.50
  PIPE TRAVEL TIME(MIN.) =   0.01    Tc(MIN.) =   15.26
  LONGEST FLOWPATH FROM NODE    426.00 TO NODE    400.00 =    2626.09 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =       49.6  TC(MIN.) =     15.26
  PEAK FLOW RATE(CFS)   =      77.50
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1      65.50      11.36        4.191
      2      77.50      15.25        3.466

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      77.50   Tc(MIN.) =   15.25
  TOTAL AREA(ACRES) =       49.6

****************************************************************************
  FLOW PROCESS FROM NODE    421.00 TO NODE    400.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    27.20  DOWNSTREAM(FEET) =    27.00
  FLOW LENGTH(FEET) =     8.30   MANNING'S N =  0.011
  DEPTH OF FLOW IN  33.0 INCH PIPE IS  22.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  17.76
  ESTIMATED PIPE DIAMETER(INCH) =  33.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      77.50
  PIPE TRAVEL TIME(MIN.) =   0.01    Tc(MIN.) =   15.26
  LONGEST FLOWPATH FROM NODE    426.00 TO NODE    400.00 =    2626.09 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =       49.6  TC(MIN.) =     15.26
  PEAK FLOW RATE(CFS)   =      77.50
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

Culvert

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.03125	ft/ft
Normal Depth	1.50	ft
Height	1.50	ft
Bottom Width	5.00	ft

Results

Discharge	105.02	ft³/s
Flow Area	7.50	ft²
Wetted Perimeter	13.00	ft
Hydraulic Radius	0.58	ft
Top Width	5.00	ft
Critical Depth	2.39	ft
Percent Full	100.0	%
Critical Slope	0.00451	ft/ft
Velocity	14.00	ft/s
Velocity Head	3.05	ft
Specific Energy	4.55	ft
Froude Number	2.02	
Discharge Full	105.02	ft³/s
Slope Full	0.03125	ft/ft
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	100.00	%
Downstream Velocity	Infinity	ft/s

Culvert

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	1.50	ft
Critical Depth	2.39	ft
Channel Slope	0.03125	ft/ft
Critical Slope	0.00451	ft/ft

APPENDIX 5

FEMA FLOOD MAP

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 table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table 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 11. The **horizontal datum** was NAD83, GRS1980 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 North American Vertical Datum of 1988. 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 provided in digital format by the USDA National Agriculture Imagery Program (NAIP). this information was photogrammetrically compiled at a scale of 1:24,000 from aerial photography dated 2009.

This map reflects 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 Service Center** at 1-877-FEMA MAP (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 FEMA Map Service Center may also be reached by Fax at 1-800-358-9620 and its website at http://msc.fema.gov/.

If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMA MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip/.

The **"profile base lines"** depicted on this map represent the hydraulic modeling baselines that match the flood profiles in the FIS report. As a result of improved topographic data, the "profile base line", in some cases, may deviate significantly from the channel centerline or appear outside the SFHA.

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 ticks, zone 11
6000000 FT	5000-foot grid values: California State Plane coordinate system, Zone VI (FIPSZONE – 406), 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
June 19, 1997

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
May 16, 2012 – to update corporate limits, to add roads and road names, to incorporate previously issued Letters of Map Revision, and 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" = 1000'

500 0 500 1,000 1,500 2,000 FEET
300 0 300 600 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 1885G

FIRM
FLOOD INSURANCE RATE MAP
SAN DIEGO COUNTY, CALIFORNIA
AND INCORPORATED AREAS

PANEL 1885 OF 2375

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

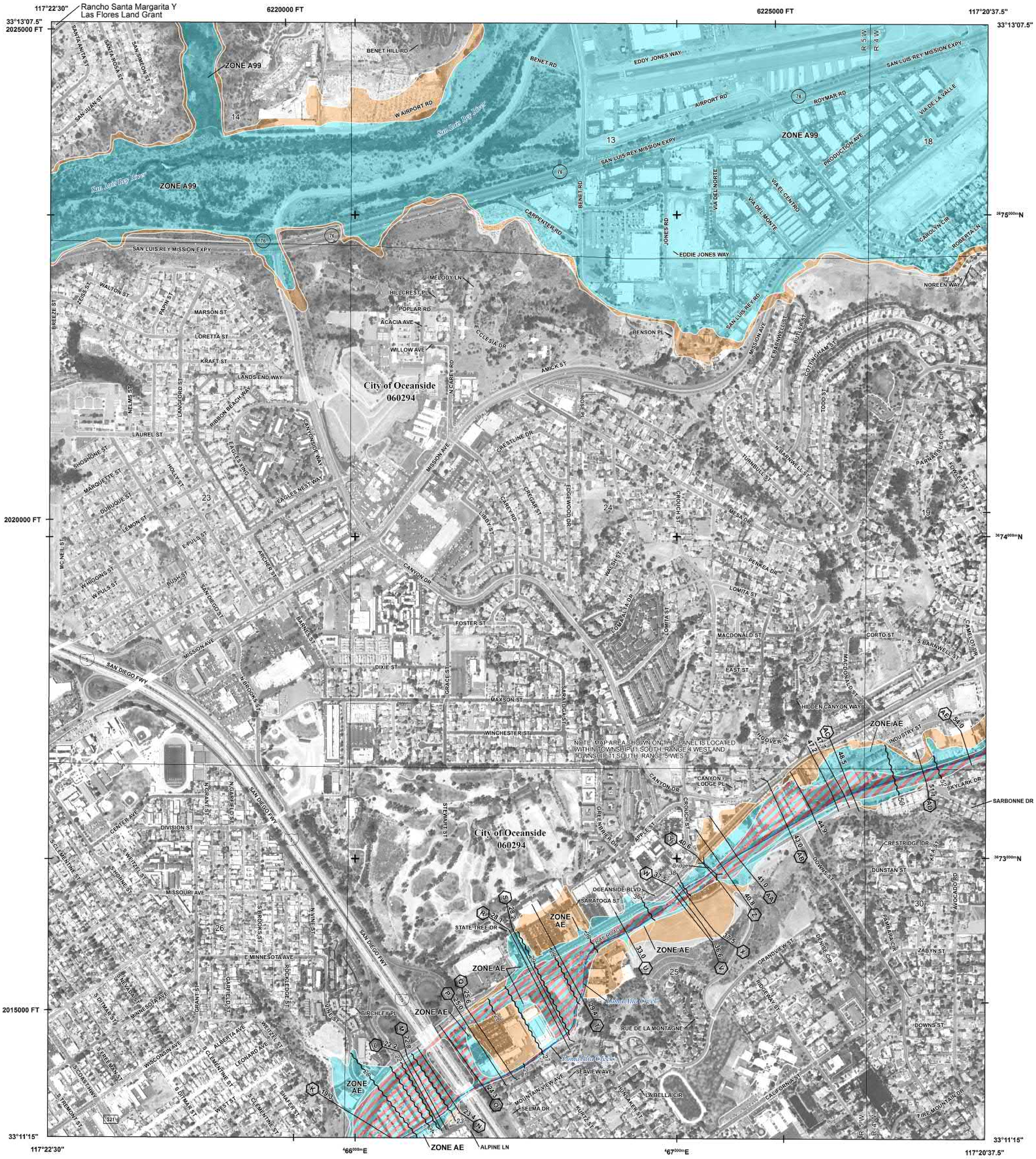
COMMUNITY	NUMBER	PANEL	SUFFIX
CORONADO, CITY OF	060287	1885	G
SAN DIEGO, CITY OF	060295	1885	G

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 06073C1885G

MAP REVISED MAY 16, 2012

Federal Emergency Management Agency



FLOOD HAZARD INFORMATION

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

THE INFORMATION DEPICTED ON THIS MAP AND SUPPORTING DOCUMENTATION ARE ALSO AVAILABLE IN DIGITAL FORMAT AT

HTTPS://MSC.FEMA.GOV

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A,V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN — Area of Minimal Flood Hazard *Zone X*
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- E 18.2 / 17.5 — Cross Sections with 1% Annual Chance Water Surface Elevation
- 8 — Coastal Transect
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature
- 513 — Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary

NOTES TO USERS

For information and questions about this Flood Insurance Rate Map (FIRM), available products associated with this FIRM, including historic versions, the current map date for each FIRM panel, how to order products, or the National Flood Insurance Program (NFIP) in general, please call the FEMA Map Information eXchange at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA Flood Map Service Center website at https://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the website.

Communities annexing land on adjacent FIRM panels must obtain a current copy of the adjacent panel as well as the current FIRM Index. These may be ordered directly from the Flood Map Service Center at the number listed above.

For community and countywide map dates refer to 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.

Base map information shown on this FIRM was derived from digital orthophotography collected by the U.S. Department of Agriculture Farm Service Agency. Department of Agriculture imagery was flown in 2016 and was produced with a 1-meter ground sample distance.

Coastal Base Flood Elevations shown on the map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Coastal flood elevations are also provided in the Coastal Transect Parameters table in the FIS Report for this jurisdiction. Elevations shown in the Coastal Transect Parameters table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on the FIRM.

SCALE

N

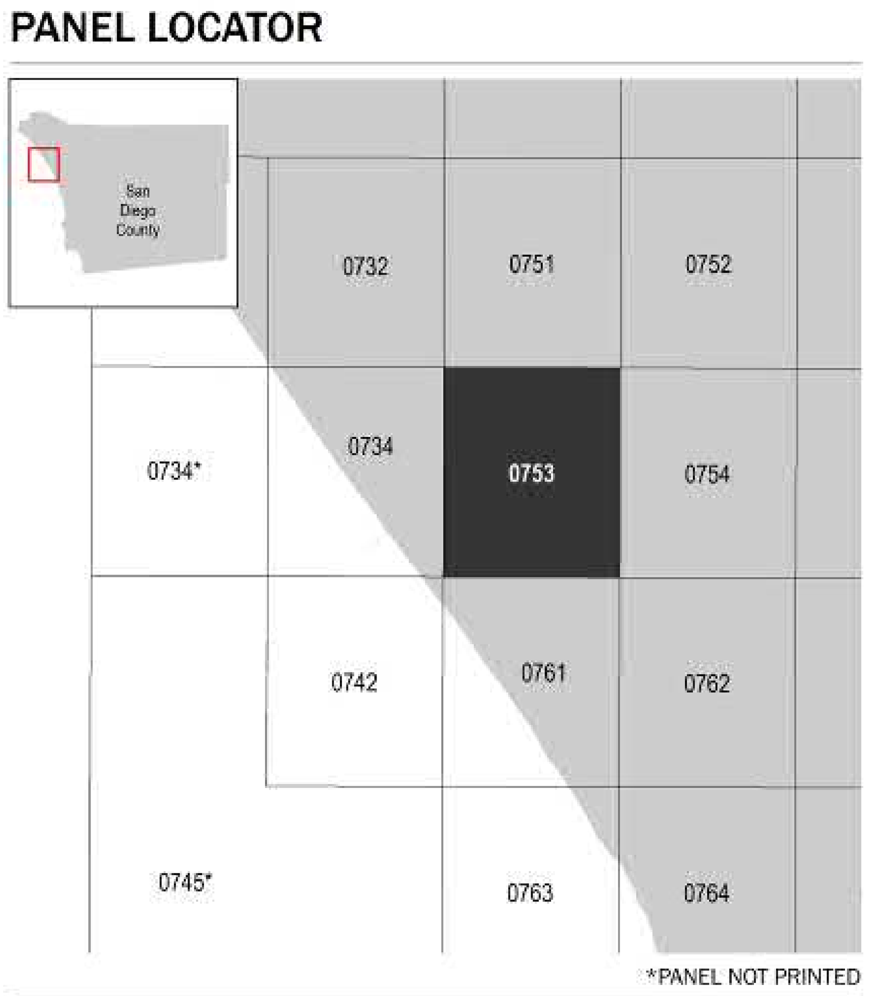
Map Projection:
Universal Transverse Mercator Zone 11N; North American Datum 1983; Western Hemisphere; Vertical Datum: NAVD 88

1 inch = 500 feet — 1:6,000

0 250 500 750 1,000 2,000 Feet

0 125 250 500 Meters

PANEL LOCATOR



*PANEL NOT PRINTED

FEMA

National Flood Insurance Program

NATIONAL FLOOD INSURANCE PROGRAM
FLOOD INSURANCE RATE MAP

SAN DIEGO COUNTY, CALIFORNIA
and Incorporated Areas

PANEL **753** OF **2375**

FEMA

Panel Contains:

COMMUNITY	NUMBER	PANEL	SUFFIX
OCEANSIDE, CITY OF	060294	0753	J

VERSION NUMBER
2.3.3.3

MAP NUMBER
06073C0753J

MAP REVISED
DECEMBER 20, 2019

APPENDIX 6

FEMA LETTERS OF MAP REVISION

Marlea ~~R. Pilgrim~~

Federal Emergency Management Agency

RECEIVED

APR 2 8 2004 APR 2 3 2004

REC'D APR 2 6 2004

CERTIFIED MAIL CITY MANAGER OFFICE
RETURN RECEIPT REQUESTED

IN REPLY REFER TO:
Case No.: 02-09-1057P

The Honorable Terry Johnson
Mayor, City of Oceanside
300 North Coast Highway
Oceanside, CA 92054

Community: City of Oceanside, CA
Community No.: 060294
Map Panel Affected: 06073C0759 F

116

Dear Mayor Johnson:

In a Letter of Map Revision (LOMR) dated November 21, 2003, you were notified of proposed modified flood elevation determinations affecting the Flood Insurance Rate Map (FIRM) and Flood Insurance Study (FIS) report for the City of Oceanside, San Diego County, California. These determinations were for Loma Alta Creek from approximately 500 feet northwest of the intersection of Seasons Road and North Avenue to approximately 600 feet southwest of the intersection of Temple Heights and the Atchison, Topeka & Santa Fe Railway. The 90-day appeal period that was initiated on January 15, 2004, when the Department of Homeland Security's Federal Emergency Management Agency (FEMA) published a notice of proposed Base (1-percent-annual-chance) Flood Elevations (BFEs) in the *North County Times*, has elapsed.

FEMA received no valid requests for changes to the modified BFEs. Therefore, the modified BFEs that became effective on November 21, 2003, remain valid and revise the FIRM and FIS report that were in effect prior to that date.

The modifications are pursuant to Section 206 of the Flood Disaster Protection Act of 1973 (Public Law 93-234) and are in accordance with the National Flood Insurance Act of 1968, as amended (Title XIII of the Housing and Urban Development Act of 1968, Public Law 90-448), 42 U.S.C. 4001-4128, and 44 CFR Part 65. The community number and suffix code are unaffected by this revision. The community number and appropriate suffix code as shown above will be used by the National Flood Insurance Program (NFIP) for all flood insurance policies and renewals issued for your community.

FEMA has developed criteria for floodplain management as required under the above-mentioned Acts of 1968 and 1973. To continue participation in the NFIP, your community must use the modified BFEs to carry out the floodplain management regulations for the NFIP. The modified BFEs will also be used to calculate the appropriate flood insurance premium rates for all new buildings and their contents and for the second layer of insurance on existing buildings and their contents.

If you have any questions regarding the necessary floodplain management measures for your community or the NFIP in general, please call the Director, Federal Insurance and Mitigation Division of FEMA in Oakland, California at (510) 627-7103. If you have any questions regarding the LOMR, the proposed modified BFEs, or mapping issues in general, please call the FEMA Map Assistance Center, toll free, at 1-877-FEMA MAP (1-877-336-2627).

Sincerely,

Doug Bellomo, P.E., CFM, Acting Chief
Hazard Identification Section
Mitigation Division
Emergency Preparedness and Response Directorate

cc: Mr. Donald See
Associate Civil Engineer
County of San Diego

Ms. Marla Doyle, P.E.
City Engineer
Engineering Division
Public Works Department
City of Oceanside

Mr. Ernest Espinoza

Mr. Adolph Lugo, P.E.
Project Design Consultants

Mr. Richard Muelheim

Federal Emergency Management Agency
Washington, D.C. 20472

NOV 21 2003

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

The Honorable Terry Johnson
Mayor, City of Oceanside
300 North Coast Highway
Oceanside, CA 92054

IN REPLY REFER TO:

Case No.:	02-09-1057P
Community Name:	City of Oceanside, CA
Community No.:	060294
Effective Date of This Revision:	NOV 21 2003

Dear Mayor Johnson:

The Flood Insurance Study report and Flood Insurance Rate Map for your community have been revised by this Letter of Map Revision (LOMR). Please use the enclosed annotated map panel(s) revised by this LOMR for floodplain management purposes and for all flood insurance policies and renewals issued in your community.

Additional documents are enclosed which provide information regarding this LOMR. Please see the List of Enclosures below to determine which documents are included. Other attachments specific to this request may be included as referenced in the Determination Document. If you have any questions regarding floodplain management regulations for your community or the National Flood Insurance Program (NFIP) in general, please contact the Consultation Coordination Officer for your community. If you have any technical questions regarding this LOMR, please contact the Chief, National Flood Insurance Program Branch, Federal Insurance and Mitigation Division of the Department of Homeland Security's Federal Emergency Management Agency (FEMA) in Oakland, California, at (510) 627-7184, or the FEMA Map Assistance Center toll free at 1-877-336-2627 (1-877-FEMA MAP). Additional information about the NFIP is available on our website at http://www.fema.gov/nfip.

Sincerely,

Max H. Yuan, P.E., Project Engineer
Hazard Identification Section
Mitigation Division
Emergency Preparedness
and Response Directorate

For: Doug Bellomo, P.E., CFM, Acting Chief
Hazard Identification Section
Mitigation Division
Emergency Preparedness
and Response Directorate

List of Enclosures:
- Letter of Map Revision Determination Document
- Annotated Flood Insurance Rate Map
- Annotated Flood Insurance Study Report

cc: Mr. Donald See
Associate Civil Engineer
County of San Diego

Ms. Marla Doyle, P.E.
City Engineer
Engineering Division
Public Works Department
City of Oceanside

Mr. Earnest Espinoza

Mr. Adolph Lugo, P.E.
Project Design Consultants

Mr. Richard Muelheim

Page 1 of 4	Issue Date:	Effective Date:	Case No.: 02-09-1057P	LOMR-APP

Federal Emergency Management Agency
Washington, D.C. 20472

LETTER OF MAP REVISION DETERMINATION DOCUMENT

COMMUNITY AND REVISION INFORMATION		PROJECT DESCRIPTION	BASIS OF REQUEST
COMMUNITY	City of Oceanside San Diego County California COMMUNITY NO.: 060294	CHANNELIZATION	HYDRAULIC ANALYSIS NEW TOPOGRAPHIC DATA
IDENTIFIER	4586 and 4590 Maple Drive	APPROXIMATE LATITUDE & LONGITUDE: 33.225, -117.310 SOURCE: USGS QUADRANGLE DATUM: NAD 27	

FLOODING SOURCE(S) & REVISED REACH(ES)	Loma Alta Creek – from approximately 500 feet northwest of the intersection of Seasons Road and North Avenue to approximately 600 feet southwest of the intersection of Temple Heights and the Atchison, Topeka & Santa Fe Railway (AT&SF)

SUMMARY OF REVISIONS

Effective Flooding:	Zone AE	BFEs*	Floodway	Zone AE	Zone X (shaded)
Revised Flooding:	Zone AE	BFEs*	Floodway	Zone X (unshaded)	Zone X (shaded)
Increases:	NONE	YES	NONE	NONE	YES
Decreases:	YES	YES	YES	YES	YES

* BFEs – Base Flood Elevations

ANNOTATED MAPPING ENCLOSURES	ANNOTATED STUDY ENCLOSURES
TYPE: FIRM* NO: 06073C0759 F Date: June 19, 1997	DATE OF EFFECTIVE FLOOD INSURANCE STUDY REPORT: July 2, 2002 FLOODWAY DATA TABLE 8 PROFILE: 169P

* FIRM – Flood Insurance Rate Map; ** FBFM – Flood Boundary and Floodway Map; *** FHBM – Flood Hazard Boundary Map

DETERMINATION

This document provides the determination from the Department of Homeland Security's Federal Emergency Management Agency (FEMA) regarding a request for a Letter of Map Revision (LOMR) for the area described above. Using the information submitted, we have determined that a revision to the flood hazards depicted in the Flood Insurance Study (FIS) report and/or National Flood Insurance Program (NFIP) map is warranted. This document revises the effective NFIP map, as indicated in the attached documentation. Please use the enclosed annotated map panels revised by this LOMR for floodplain management purposes and for all flood insurance policies and renewals in your community.

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Map Assistance Center toll free at 1-877-336-2677 (1-877-FEMA MAP) or by letter addressed to the LOMR Depot, 3601 Eisenhower Avenue, Alexandria, VA 22304. Additional information about the NFIP is available on our website at http://www.fema.gov/nfip.

Doug Bellomo, P.E., CFM, Acting Chief
Hazard Identification Section
Mitigation Division
Emergency Preparedness and Response Directorate

Federal Emergency Management Agency

Washington, D.C. 20472

LETTER OF MAP REVISION DETERMINATION DOCUMENT (CONTINUED)

COMMUNITY INFORMATION

APPLICABLE NFIP REGULATIONS/COMMUNITY OBLIGATION

We have made this determination pursuant to Section 206 of the Flood Disaster Protection Act of 1973 (P.L. 93-234) and in accordance with the National Flood Insurance Act of 1968, as amended (Title XIII of the Housing and Urban Development Act of 1968, P.L. 90-448), 42 U.S.C. 4001-4128, and 44 CFR Part 65. Pursuant to Section 1361 of the National Flood Insurance Act of 1968, as amended, communities participating in the NFIP are required to adopt and enforce floodplain management regulations that meet or exceed NFIP criteria. These criteria, including adoption of the FIS report and FIRM, and the modifications made by this LOMR, are the minimum requirements for continued NFIP participation and do not supersede more stringent State/Commonwealth or local requirements to which the regulations apply.

We provide the floodway designation to your community as a tool to regulate floodplain development. Therefore, the floodway revision we have described in this letter, while acceptable to us, must also be acceptable to your community and adopted by appropriate community action, as specified in Paragraph 60.3(d) of the NFIP regulations.

NFIP regulations Subparagraph 60.3(b)(7) requires communities to ensure that the flood-carrying capacity within the altered or relocated portion of any watercourse is maintained. This provision is incorporated into your community's existing floodplain management 'nances; therefore, responsibility for maintenance of the modified channel rests with your community. We may request that your community submit a description and schedule of channel activities.

COMMUNITY REMINDERS

We based this determination on the 1-percent-annual-chance flood discharges computed in the FIS for your community without considering subsequent changes in watershed characteristics that could increase flood discharges. Future development of projects upstream could cause increased flood discharges, which could cause increased flood hazards. A comprehensive restudy of your community's flood hazards would consider the cumulative effects of development on flood discharges subsequent to the publication of the FIS report for your community and could, therefore, establish greater flood hazards in this area.

Your community must regulate all proposed floodplain development and ensure that permits required by Federal and/or State/Commonwealth law have been obtained. State/Commonwealth or community officials, based on knowledge of local conditions and in the interest of safety, may set higher standards for construction or may limit development in floodplain areas. If your State/Commonwealth or community has adopted more restrictive or comprehensive floodplain management criteria, those criteria take precedence over the minimum NFIP requirements.

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Map Assistance Center toll free at 1-877-336-2677 (1-877-FEMA MAP) or by letter addressed to the LOMR Depot, 3601 Eisenhower Avenue, Alexandria, VA 22304. Additional information about the NFIP is available on our website at http://www.fema.gov/nfip.

Doug Bellomo, P.E., CFM, Acting Chief
Hazard Identification Section
Mitigation Division
Emergency Preparedness and Response Directorate

Federal Emergency Management Agency

Washington, D.C. 20472

LETTER OF MAP REVISION DETERMINATION DOCUMENT (CONTINUED)

COMMUNITY INFORMATION (CONTINUED)

We will not print and distribute this LOMR to primary users, such as local insurance agents or mortgage lenders; instead, the community will serve as a repository for the new data. We encourage you to disseminate the information in this LOMR by preparing a news release for publication in your community's newspaper that describes the revision and explains how your community will provide the data and help interpret the NFIP maps. In that way, interested persons, such as property owners, insurance agents, and mortgage lenders, can benefit from the information.

We have designated a Consultation Coordination Officer (CCO) to assist your community. The CCO will be the primary liaison between your community and FEMA. For information regarding your CCO, please contact:

Mr. Jack Eldridge
Chief, National Flood Insurance Program Branch
Federal Emergency Management Agency, Region IX
1111 Broadway Street, Suite 1200
Oakland, CA 94607-4052
(510) 627-7184

STATUS OF THE COMMUNITY NFIP MAPS

We will not physically revise and republish the FIRM and FIS report for your community to reflect the modifications made by this LOMR at this time. When changes to the previously cited FIRM panel and FIS report warrant physical revision and republication in the future, we will incorporate the modifications made by this LOMR at that time.

Our review of the submitted information revealed that the BFEs along Loma Alta Creek increased as a result of the channel constructed between North Avenue and the Atchison, Topeka & Santa Fe Railway embankment. Because the BFEs increased as a result of construction in the regulatory floodway, the City of Oceanside is potentially in violation of Paragraph 60.3(d)(3) of the NFIP regulations, which prohibits encroachments, including new construction, in the regulatory floodway that would cause an increase in flood levels.

Doug Bellomo, P.E., CFM, Acting Chief
Hazard Identification Section
Mitigation Division
Emergency Preparedness and Response Directorate

Federal Emergency Management Agency

Washington, D.C. 20472

LETTER OF MAP REVISION DETERMINATION DOCUMENT (CONTINUED)

PUBLIC NOTIFICATION OF REVISION

Within 90 days of the second publication in the local newspaper, a citizen may request that we reconsider this determination. Any request for reconsideration must be based on scientific or technical data. This revision is effective as of the date of this letter. However, until the 90-day period has elapsed, the revised BFEs presented in this LOMR may be changed.

This information will be published in the *Federal Register* and your local newspaper as detailed below.

LOCAL NEWSPAPER — Name: *North County Times*
Dates: 01/08/2004 01/15/2004

PUBLIC NOTIFICATION

FLOODING SOURCE	LOCATION OF REFERENCED ELEVATION	BFE (FEET NGVD) EFFECTIVE	BFE (FEET NGVD) REVISED	MAP PANEL NUMBER(S)
[illegible]ma Alta Creek	Approximately 150 feet northwest of intersection of Seasons Road and North Avenue	263	262	06073C0759 F
	Approximately 600 feet southwest of intersection of Temple Heights and AT&SF	306	311	06073C0759 F

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Map Assistance Center toll free at 1-877-336-2677 (1-877-FEMA MAP) or by letter addressed to the LOMR Depot, 3601 Eisenhower Avenue, Alexandria, VA 22304. Additional information about the NFIP is available on our website at http://www.fema.gov/nfip.

Doug Bellomo, P.E., CFM, Acting Chief
Hazard Identification Section
Mitigation Division
Emergency Preparedness and Response Directorate

10080301DA02091057E102IAC

CHANGES ARE MADE IN DETERMINATIONS OF BASE FLOOD ELEVATIONS FOR THE CITY OF OCEANSIDE, SAN DIEGO COUNTY, CALIFORNIA, UNDER THE NATIONAL FLOOD INSURANCE PROGRAM

On June 19, 1997, the Department of Homeland Security's Federal Emergency Management Agency identified Special Flood Hazard Areas (SFHAs) in the City of Oceanside, San Diego County, California, through issuance of a Flood Insurance Rate Map (FIRM). The Mitigation Division has determined that modification of the elevations of the flood having a 1-percent chance of being equaled or exceeded in any given year (base flood) for certain locations in this community is appropriate. The modified Base Flood Elevations (BFEs) revise the FIRM for the community.

The changes are being made pursuant to Section 206 of the Flood Disaster Protection Act of 1973 (Public Law 93-234) and are in accordance with the National Flood Insurance Act of 1968, as amended (Title XIII of the Housing and Urban Development Act of 1968, Public Law 90-448), 42 U.S.C. 4001-4128, and 44 CFR Part 65.

A hydraulic analysis was performed to incorporate the effects of updated topographic information and the channelization of Loma Alta Creek from approximately 500 feet northwest of the intersection of Seasons Road and North Avenue to approximately 600 feet southwest of the intersection of Temple Heights and the Atchison, Topeka & Santa Fe Railway. This has resulted in a revised delineation of the regulatory floodway, a decrease in SFHA width, and increased and decreased BFEs for Loma Alta Creek. The table below indicates existing and modified BFEs for selected locations along the affected lengths of the flooding source(s) cited above.

Location	Existing BFE (feet)*	Modified BFE (feet)*
Approximately 150 feet northwest of intersection of Seasons Road and North Avenue	263	262
Approximately 600 feet southwest of intersection of Temple Heights and Atchison, Topeka & Santa Fe Railway	306	311

*National Geodetic Vertical Datum, rounded to nearest whole foot

Under the above-mentioned Acts of 1968 and 1973, the Mitigation Division must develop criteria for floodplain management. To participate in the National Flood Insurance Program (NFIP), the community must use the modified BFEs to administer the floodplain management measures of the NFIP. These modified BFEs will also be used to calculate the appropriate flood insurance premium rates for new buildings and their contents and for the second layer of insurance on existing buildings and contents.

Upon the second publication of notice of these changes in this newspaper, any person has 90 days in which he or she can request, through the Chief Executive Officer of the community, that the Mitigation Division reconsider the determination. Any request for reconsideration must be based on knowledge of changed conditions or new scientific or technical data. All interested parties are on notice that until the 90-day period elapses, the Mitigation Division's determination to modify the BFEs may itself be changed.

Any person having knowledge or wishing to comment on these changes should immediately notify:

The Honorable Terry Johnson
Mayor, City of Oceanside
300 North Coast Highway
Oceanside, CA 92054

Federal Emergency Management Agency
Washington, D.C. 20472

FEE SCHEDULE FOR PROCESSING REQUESTS FOR MAP CHANGES

This notice contains the revised fee schedule for processing certain types of requests for changes to National Flood Insurance Program (NFIP) maps. The change in the fee schedule will allow FEMA to further reduce the expenses to the NFIP by more fully recovering the costs associated with processing conditional and final map change requests. The revised fee schedule for map changes is effective for all requests dated September 1, 2002, or later and supersedes the current fee schedule, which was established on June 1, 2000.

To develop the revised fee schedule for conditional and final map change requests, FEMA evaluated the actual costs of reviewing and processing requests for Conditional Letters of Map Amendment (CLOMAs), Conditional Letters of Map Revision – based on Fill (CLOMR-Fs), Conditional Letters of Map Revision (CLOMRs), Letters of Map Revision – based on Fill (LOMR-Fs), Letters of Map Revision (LOMRs), and Physical Map Revisions (PMRs).

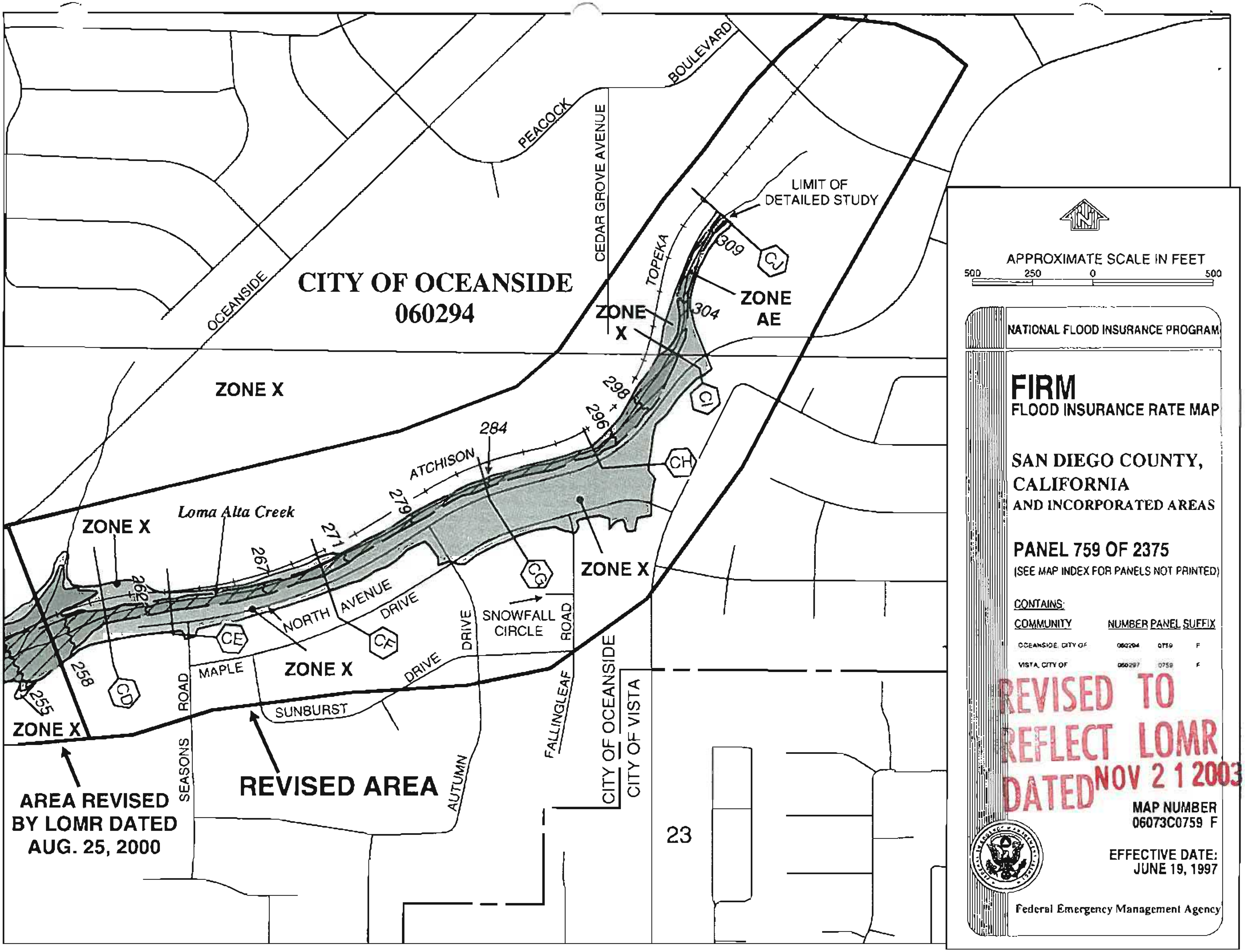
Based on our review of actual cost data for Fiscal Years 2000 and 2001, FEMA has established the following review and processing fees, which are to be submitted with all requests submitted on or after September 1, 2002, that are not otherwise exempted under 44 CFR 72.5. Those fees below shown in bold format reflect a change in the fee established in June 1, 2000.

Fee Schedule for Requests for CLOMAs, CLOMR-Fs, and LOMR-Fs

Request for single-lot/single-structure CLOMA and CLOMR-F **$500**
Request for single-lot/single-structure LOMR-F **$425**
Request for single-lot/single-structure LOMR-F based on as-built information (CLOMR-F previously issued by us) **$325**
Request for multiple-lot/multiple-structure CLOMA **$700**
Request for multiple-lot/multiple-structure CLOMR-F and LOMR-F **$800**
Request for multiple-lot/multiple-structure LOMR-F based on as-built information (CLOMR-F previously issued) $700

Fee Schedule for Requests for CLOMRs

Request based on new hydrology, bridge, culvert, channel, or combination of any of these **$4,000**
Request based on levee, berm, or other structural measure **$4,500**



CITY OF OCEANSIDE
060294
ZONE X
ZONE X
ZONE X
ZONE AE
ZONE X
ZONE X
ZONE X
Loma Alta Creek
LIMIT OF
DETAILED STUDY
OCEANSIDE
PEACOCK
BOULEVARD
CEDAR GROVE AVENUE
TOPEKA
ATCHISON
NORTH AVENUE
DRIVE
MAPLE
SUNBURST
DRIVE
SNOWFALL
CIRCLE
ROAD
DRIVE
SEASONS
ROAD
AUTUMN
FALLINGLEAF
CITY OF OCEANSIDE
CITY OF VISTA
23
255
258
262
267
271
279
284
296
298
304
309
CD
CE
CF
CG
CH
CI
CJ
REVISED AREA
AREA REVISED
BY LOMR DATED
AUG. 25, 2000
APPROXIMATE SCALE IN FEET
500 250 0 500
NATIONAL FLOOD INSURANCE PROGRAM
FIRM
FLOOD INSURANCE RATE MAP
SAN DIEGO COUNTY,
CALIFORNIA
AND INCORPORATED AREAS
PANEL 759 OF 2375
(SEE MAP INDEX FOR PANELS NOT PRINTED)
CONTAINS:
COMMUNITY NUMBER PANEL SUFFIX
OCEANSIDE, CITY OF 060294 0759 F
VISTA, CITY OF 060297 0759 F
REVISED TO
REFLECT LOMR
DATED NOV 2 1 2003
MAP NUMBER
06073C0759 F
EFFECTIVE DATE:
JUNE 19, 1997
Federal Emergency Management Agency

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Loma Alta Creek (Cont'd)								
CA	30,490	280	283	6.0	234.3	234.3	234.4	0.1
CB	31,094	84	182	7.2	243.3	243.3	243.5	0.2
CC	31,888	168	178	7.3	252.0	252.0	252.3	0.3
CD	32,433	56	131	5.4	259.2	259.2	259.2	0.0
CE	32,715	36	92	7.7	263.7	263.7	263.7	0.0
CF	33,359	25	72	9.8	269.1	269.1	269.1	0.0
CG	34,123	33	99	7.2	283.5	283.5	283.5	0.0
CH	34,585	27	77	9.3	288.8	288.8	288.8	0.0
CI	35,117	36	97	7.3	299.7	299.7	299.7	0.0
CJ	35,747	40	98	7.3	310.9	310.9	310.9	0.0
~~CK~~	~~36,382~~	~~121~~	~~300~~	~~5.7~~	~~313.4~~	~~313.4~~	~~313.6~~	~~0.2~~
~~CL~~	~~37,022~~	~~81~~	~~192~~	~~8.9~~	~~326.9~~	~~326.9~~	~~326.9~~	~~0.0~~

THESE DATA WERE REVISED BY LOMR DATED AUGUST 25, 2000

REVISED DATA

1Feet Above Pacific Street

TABLE 8

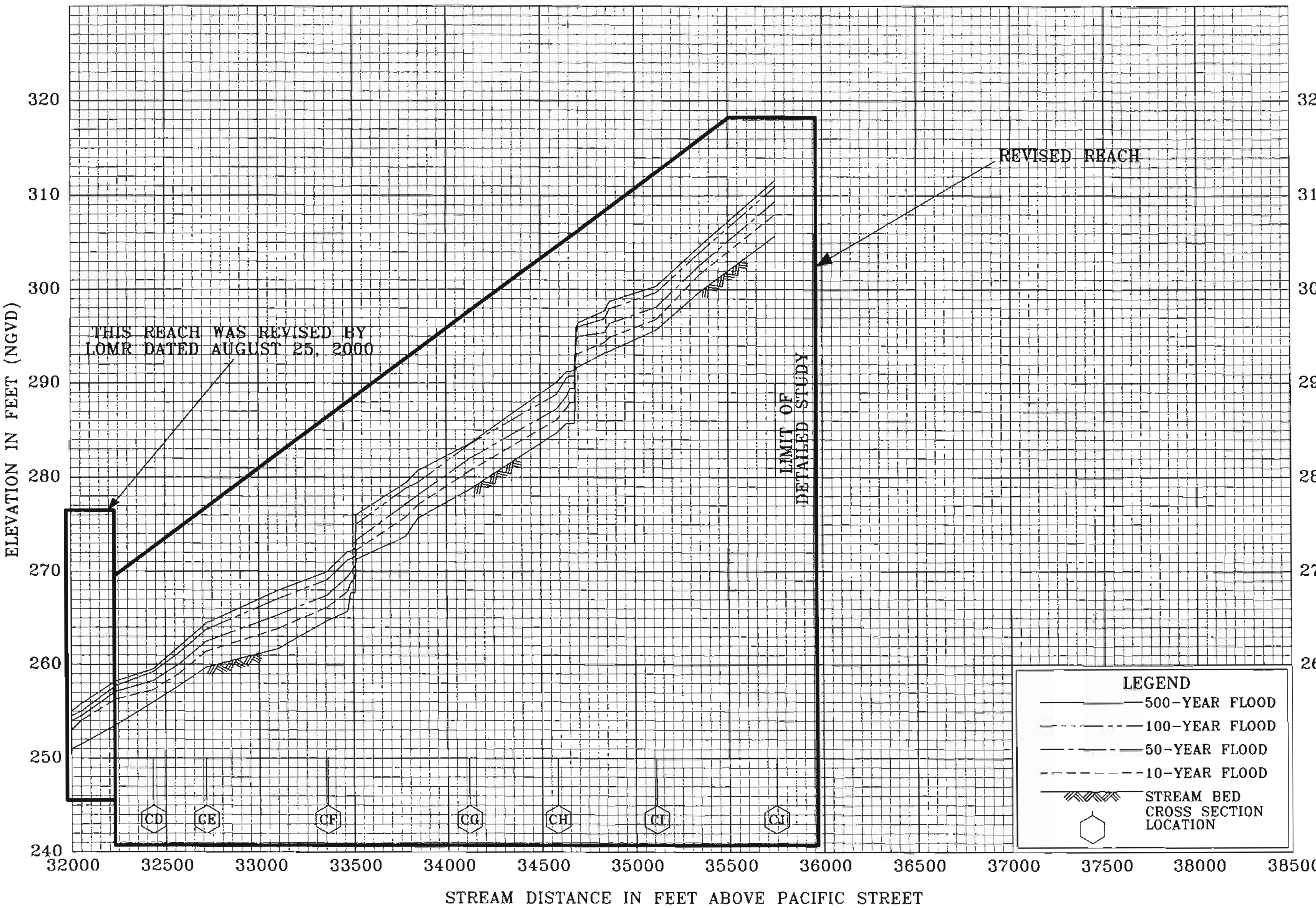
FEDERAL EMERGENCY MANAGEMENT AGENCY

SAN DIEGO COUNTY, CA AND INCORPORATED AREAS

FLOODWAY DATA

LOMA ALTA CREEK

REVISED TO REFLECT LOMR DATED NOV 2 1 200?



REVISED TO REFLECT LOMR DATED NOV 2 1 200

FLOOD PROFILES

LOMA ALTA CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

SAN DIEGO COUNTY, CA

AND INCORPORATED AREAS

169P

SCOTT

REC'D AUG 19 REC'D

Federal Emergency Management Agency

Washington, D.C. 20472

August 13, 2013

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

PW

The Honorable Jim Wood
Mayor, City of Oceanside
300 North Coast Highway
Oceanside, CA 92054

IN REPLY REFER TO:

Case No.:	13-09-2315P
Community Name:	City of Oceanside, CA
Community No.:	060294
Effective Date of This Revision:	**August 13, 2013**

Dear Mayor Wood:

The Flood Insurance Study report and Flood Insurance Rate Map for your community have been revised by this Letter of Map Revision (LOMR). Please use the enclosed annotated map panel revised by this LOMR for floodplain management purposes and for all flood insurance policies and renewals issued in your community.

Additional documents are enclosed which provide information regarding this LOMR. Please see the List of Enclosures below to determine which documents are included. Other attachments specific to this request may be included as referenced in the Determination Document. If you have any questions regarding floodplain management regulations for your community or the National Flood Insurance Program (NFIP) in general, please contact the Consultation Coordination Officer for your community. If you have any technical questions regarding this LOMR, please contact the Director, Mitigation Division of the Department of Homeland Security's Federal Emergency Management Agency (FEMA) in Oakland, California, at (510) 627-7175, or the FEMA Map Information eXchange (FMIX) toll free at 1-877-336-2627 (1-877-FEMA MAP). Additional information about the NFIP is available on our website at http://www.fema.gov/business/nfip.

Sincerely,

Siamak Esfandiary, Ph.D., P.E., Program Specialist
Engineering Management Branch
Federal Insurance and Mitigation Administration

For: Luis Rodriguez, P.E., Chief
Engineering Management Branch
Federal Insurance and Mitigation Administration

List of Enclosures:

- Letter of Map Revision Determination Document
- Annotated Flood Insurance Rate Map
- Annotated Flood Insurance Study Report

cc: Ms. Maryam Wagner
Senior Engineering Assistant
City of Oceanside Engineering Division

Federal Emergency Management Agency

Washington, D.C. 20472

LETTER OF MAP REVISION DETERMINATION DOCUMENT

COMMUNITY AND REVISION INFORMATION		PROJECT DESCRIPTION	BASIS OF REQUEST
COMMUNITY	City of Oceanside San Diego County California COMMUNITY NO.: 060294	NO PROJECT	REISSUANCE
IDENTIFIER	Loma Alta Creek (Reissuance of LOMR 96-09-207P)	APPROXIMATE LATITUDE & LONGITUDE: 33.194, -117.354 SOURCE: USGS QUADRANGLE DATUM: NAD 83	

ANNOTATED MAPPING ENCLOSURES	ANNOTATED STUDY ENCLOSURES
TYPE: FIRM* NO.: 06073C0753F DATE: May16, 2012	DATE OF EFFECTIVE FLOOD INSURANCE STUDYREPORT: May 16, 2012 PROFILE(S): 210P FLOODWAY DATA TABLE: 13

Enclosures reflect changes to flooding sources affected by this revision.
* FIRM - Flood Insurance Rate Map; ** FBFM - Flood Boundary and Floodway Map; *** FHBM - Flood Hazard Boundary Map

FLOODING SOURCE(S) & REVISED REACH(ES)

LOMA ALTA CREEK - from approximately 2,430 feet downstream to approximately 880 feet upstream of Crouch Street

SUMMARY OF REVISIONS

This Letter of Map Revision (LOMR) is a reissuance of a LOMR dated March 4, 1997 (Case No. 96-09-207P), which revised the Special Flood Hazard Area (SFHA), the area subject to inundation by the base (1-percent-annual-chance) flood, the regulatory floodway, the 0.2-percent-annual-chance floodplain and the Base Flood Elevations (BFEs) along Loma Alta Creek. A portion of the 0.2-percent-annual-chance floodplain presented in the March 4 LOMR was inadvertently omitted when it was incorporated into the updated FIRM for San Diego County, California and Incorporated Areas, dated May 16, 2012. Additionally, a portion of the updates made to the FIS report in the March 4 LOMR was also inadvertently omitted when it was incorporated into the updated FIS report for San Diego County. Therefore, this LOMR reissues the March 4 LOMR on the current effective FIRM and FIS report. This LOMR does not revise the BFEs or SFHA along Loma Alta Creek presented in the March 4 LOMR.

* BFEs - Base Flood Elevations

DETERMINATION

This document provides the determination from the Department of Homeland Security's Federal Emergency Management Agency (FEMA) regarding a request for a LOMR for the area described above. Using the information submitted, we have determined that a revision to the flood hazards depicted in the FIS report and/or National Flood Insurance Program (NFIP) map is warranted. This document revises the effective NFIP map, as indicated in the attached documentation. Please use the enclosed annotated map panels revised by this LOMR for floodplain management purposes and for all flood insurance policies and renewals in your community.

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA MAP Information eXchange (FMIX) toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMC Clearinghouse, 847 South Pickett Street, Alexandria, VA 22304-4605. Additional Information about the NFIP is available on our website at http://www.fema.gov/business/nfip.

Siamak Esfandiary, Ph.D., P.E., Program Specialist
Engineering Management Branch
Federal Insurance and Mitigation Administration

Federal Emergency Management Agency

Washington, D.C. 20472

LETTER OF MAP REVISION DETERMINATION DOCUMENT (CONTINUED)

COMMUNITY INFORMATION

APPLICABLE NFIP REGULATIONS/COMMUNITY OBLIGATION

We have made this determination pursuant to Section 206 of the Flood Disaster Protection Act of 1973 (P.L. 93-234) and in accordance with the National Flood Insurance Act of 1968, as amended (Title XIII of the Housing and Urban Development Act of 1968, P.L. 90-448), 42 U.S.C. 4001-4128, and 44 CFR Part 65. Pursuant to Section 1361 of the National Flood Insurance Act of 1968, as amended, communities participating in the NFIP are required to adopt and enforce floodplain management regulations that meet or exceed NFIP criteria. These criteria, including adoption of the FIS report and FIRM, and the modifications made by this LOMR, are the minimum requirements for continued NFIP participation and do not supersede more stringent State/Commonwealth or local requirements to which the regulations apply.

COMMUNITY REMINDERS

We based this determination on the base flood discharges computed in the FIS for your community without considering subsequent changes in watershed characteristics that could increase flood discharges. Future development of projects upstream could cause increased flood discharges, which could cause increased flood hazards. A comprehensive restudy of your community's flood hazards would consider the cumulative effects of development on flood discharges subsequent to the publication of the FIS report for your community and could, therefore, establish greater flood hazards in this area.

Your community must regulate all proposed floodplain development and ensure that permits required by Federal and/or State/Commonwealth law have been obtained. State/Commonwealth or community officials, based on knowledge of local conditions and in the interest of safety, may set higher standards for construction or may limit development in floodplain areas. If your State/Commonwealth or community has adopted more restrictive or comprehensive floodplain management criteria, those criteria take precedence over the minimum NFIP requirements.

We will not print and distribute this LOMR to primary users, such as local insurance agents or mortgage lenders; instead, the community will serve as a repository for the new data. We encourage you to disseminate the information in this LOMR by preparing a news release for publication in your community's newspaper that describes the revision and explains how your community will provide the data and help interpret the NFIP maps. In that way, interested persons, such as property owners, insurance agents, and mortgage lenders, can benefit from the information.

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA MAP Information eXchange (FMIX) toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMC Clearinghouse, 847 South Pickett Street, Alexandria, VA 22304-4605. Additional Information about the NFIP is available on our website at http://www.fema.gov/business/nfip.

Siamak Esfandiary, Ph.D., P.E., Program Specialist
Engineering Management Branch
Federal Insurance and Mitigation Administration

Federal Emergency Management Agency
Washington, D.C. 20472

LETTER OF MAP REVISION
DETERMINATION DOCUMENT (CONTINUED)

We have designated a Consultation Coordination Officer (CCO) to assist your community. The CCO will be the primary liaison between your community and FEMA. For information regarding your CCO, please contact:

Ms. Sally M. Ziolkowski
Director, Mitigation Division
Federal Emergency Management Agency, Region IX
1111 Broadway Street, Suite 1200
Oakland, CA 94607-4052
(510) 627-7175

STATUS OF THE COMMUNITY NFIP MAPS

We will not physically revise and republish the FIRM and FIS report for your community to reflect the modifications made by this LOMR at this time. When changes to the previously cited FIRM panel and FIS report warrant physical revision and republication in the future, we will incorporate the modifications made by this LOMR at that time.

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA MAP Information eXchange (FMIX) toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMC Clearinghouse, 847 South Pickett Street, Alexandria, VA 22304-4605. Additional Information about the NFIP is available on our website at http://www.fema.gov/business/nfip.

Siamak Esfandiary, Ph.D., P.E., Program Specialist
Engineering Management Branch
Federal Insurance and Mitigation Administration

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL CHANCE 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
Loma Alta Creek								
A	0	300	1,297	2.9	14.3	14.3	15.3	1.0
B	440	400	2,605	1.5	14.8	14.8	15.7	0.9
C	520	350	2,174	1.7	14.8	14.8	15.7	0.9
D	1,260	300	1,794	2.1	14.9	14.9	15.9	1.0
E	1,370	300	1,917	2.0	15.1	15.1	16.0	0.9
F	1,930	130	634	6.0	15.1	15.1	16.0	0.9
G	2,300	222	639	5.9	15.6	15.6	16.2	0.6
H	3,155	334	922	4.1	18.0	18.0	18.4	0.4
I	3,200	341	1,073	3.5	18.3	18.3	18.6	0.3
J	3,865	337	946	4.0	18.9	18.9	19.1	0.2
K	4,150	565	1,380	2.8	19.3	19.3	19.5	0.2
L	4,595	696	1,009	3.8	22.2	22.2	22.2	0.0
M	4,610	696	1,353	2.8	22.8	22.8	22.8	0.0
N	4,845	675	908	4.2	23.4	23.4	23.4	0.0
O	5,160	708	3,109	1.2	24.3	24.3	24.3	0.0
P	5,420	755[2]	648	5.9	25.0	25.0	25.0	0.0
Q	5,537	770[2]	566	6.7	25.6	25.6	25.6	0.0
R	6,275	800	1,562	2.4	28.1	28.1	28.5	0.4
S	6,325	800	1,040	3.7	28.2	28.2	28.6	0.4
T	6,730	475	1,429	2.7	29.4	29.4	29.7	0.3
U	7,518	150	497	7.7	33.0	33.0	33.5	0.5
V	8,107	130	526	7.2	36.6	36.6	36.8	0.2
W	8,151	125	821	4.6	37.5	37.5	37.6	0.1
X	8,200	111	378	10.0	37.5	37.5	37.6	0.1
Y	8,522	141	834	4.6	40.6	40.6	41.0	0.4
Z	8,630	200	1,066	3.6	40.8	40.8	41.1	0.3

REVISED DATA

[1] Feet Above Pacific Street

[2] Width includes Islands

REVISED TO REFLECT LOMR EFFECTIVE: August 13, 2013

TABLE 13

FEDERAL EMERGENCY MANAGEMENT AGENCY

SAN DIEGO COUNTY, CA

AND INCORPORATED AREAS

FLOODWAY DATA

LOMA ALTA CREEK

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL CHANCE 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
Loma Alta Creek (cont'd)								
AA	8,829	170	629	6.0	41.0	41.0	41.4	0.4
AB	9,443	414	1,187	3.2	43.0	43.0	43.7	0.7
AC	10,160	314	626	6.1	46.8	46.8	46.8	0.0
AD	10,960	140	618	6.1	51.5	51.5	51.8	0.3
AE	11,465	112	457	8.3	54.0	54.0	54.4	0.4
AF	11,970	288	747	5.1	57.8	57.8	58.2	0.4
AG	12,500	319	832	4.3	59.9	59.9	60.2	0.3
AH	12,810	285	546	7.0	61.7	61.7	62.5	0.8
AI	13,300	277	939	4.0	64.8	64.8	65.6	0.8
AJ	13,830	224	827	2.7	66.2	66.2	66.7	0.5
AK	14,460	60	213	10.3	68.8	68.8	69.1	0.3
AL	15,120	246	578	3.8	74.8	74.8	75.3	0.5
AM	15,510	110	255	8.6	78.0	78.0	78.5	0.5
AN	15,690	279	528	4.2	81.9	81.9	82.4	0.5
AO	16,050	84	265	8.3	84.6	84.6	84.6	0.0
AP	16,742	68	230	9.6	92.2	92.2	92.8	0.6
AQ	17,175	54	221	10.0	97.6	97.6	98.6	1.0
AR	17,740	268[2]	378	5.8	104.9	104.9	105.2	0.3
AS	17,780	327[2]	338	6.5	107.0	107.0	107.1	0.1
AT	17,835	267	957	2.3	107.8	107.8	107.8	0.0
AU	17,995	140[2]	700	3.2	110.5	110.5	110.5	0.0
AV	18,075	138[2]	699	3.1	113.0	113.0	113.0	0.0
AW	18,540	84	231	9.5	113.3	113.3	113.3	0.0
AX	18,610	49	194	11.4	114.6	114.6	114.7	0.1
AY	18,780	161[2]	473	4.7	117.0	117.0	118.0	1.0
AZ	18,960	172[2]	291	7.6	118.7	118.7	118.8	0.1

REVISED DATA

[1] Feet Above Pacific Street
[2] Width includes Islands

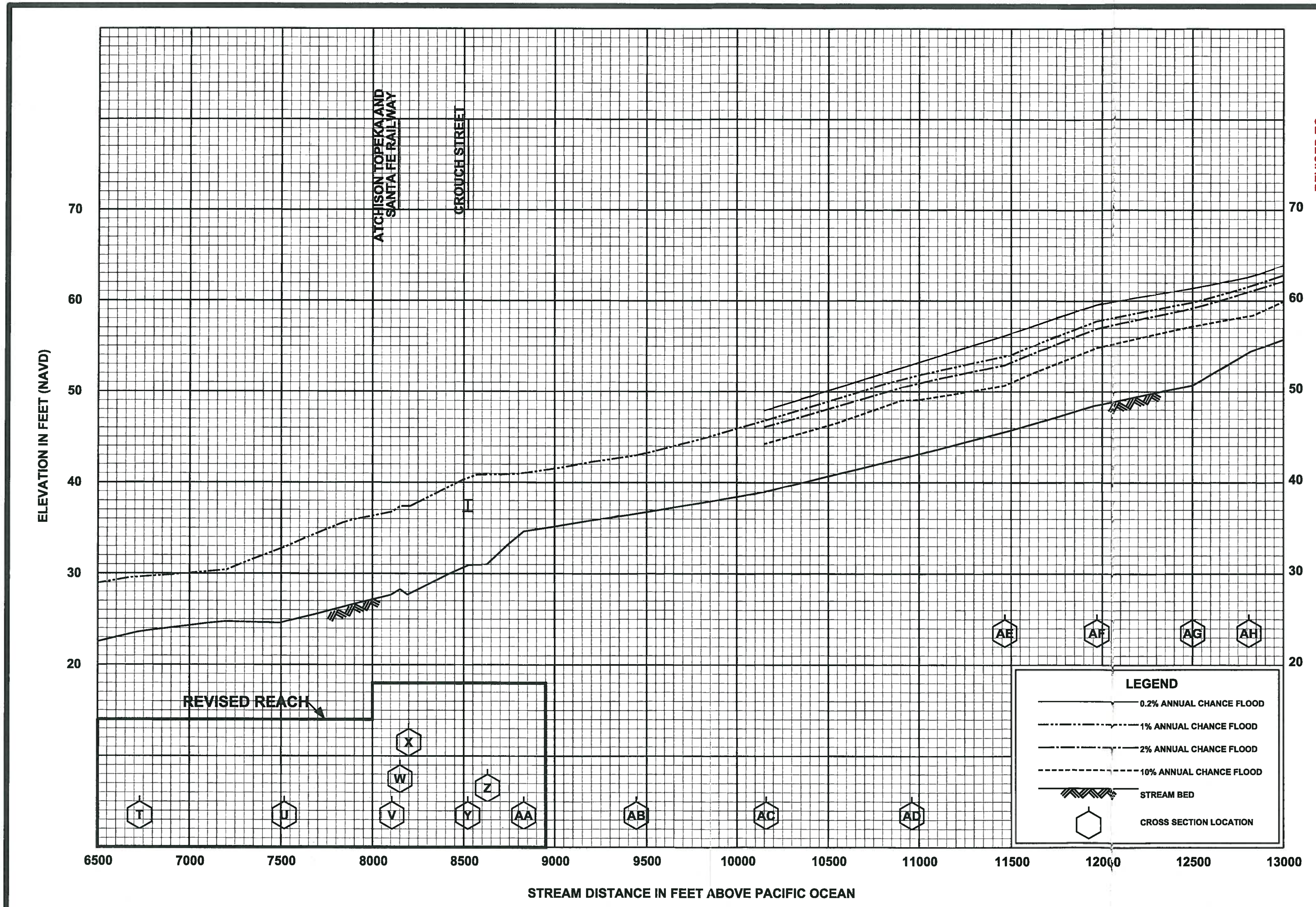
REVISED TO
REFLECT LOMR
EFFECTIVE: August 13, 2013

TABLE 13

FEDERAL EMERGENCY MANAGEMENT AGENCY
SAN DIEGO COUNTY, CA
AND INCORPORATED AREAS

FLOODWAY DATA

LOMA ALTA CREEK



REVISED TO REFLECT LOMR EFFECTIVE: August 13, 2013

FLOOD PROFILES

LOMA ALTA CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

SAN DIEGO COUNTY, CA

(AND INCORPORATED AREAS)

210P

Legend

1% annual chance (100-Year) Floodplain

1% annual chance (100-Year) Floodway

0.2% annual chance (500-Year) Floodplain

N

MAP SCALE 1" = 500'

250 0 500 FEET

150 0 150 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0753H

FIRM
FLOOD INSURANCE RATE MAP

SAN DIEGO COUNTY,

CALIFORNIA

AND INCORPORATED AREAS

PANEL 753 OF 2375

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
OCEANSIDE, CITY OF	060294	0753	H

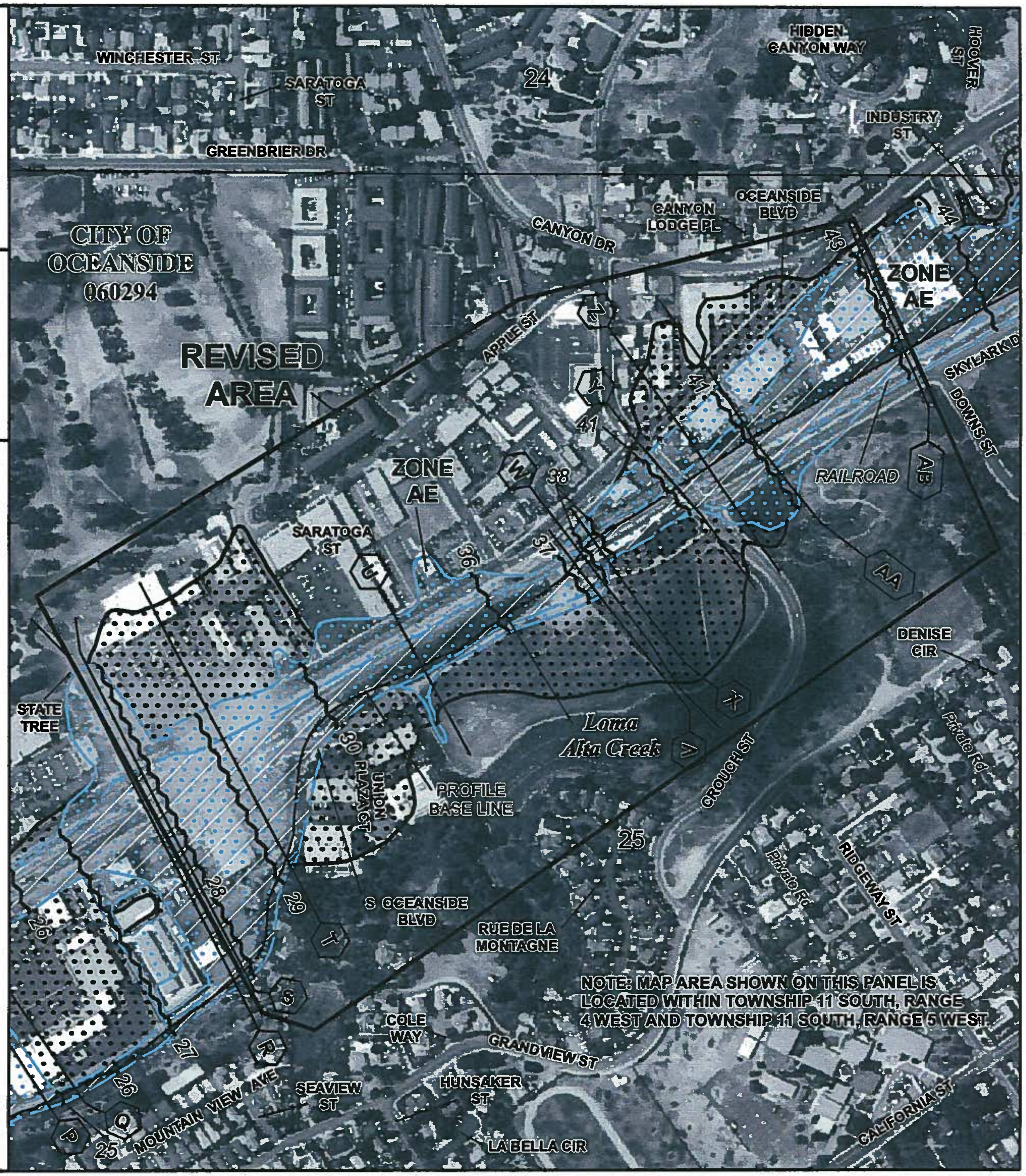
REVISED TO REFLECT LOMR EFFECTIVE: August 13, 2013

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 06073C0753H

MAP REVISED MAY 16, 2012

Federal Emergency Management Agency



Federal Emergency Management Agency

Washington, D.C. 20472

July 5, 2018

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

IN REPLY REFER TO:
Case No.: 17-09-0571P

The Honorable Peter Weiss
Mayor, City of Oceanside
300 North Coast Highway
Oceanside, CA 92054

Follows Conditional
Case No.: 14-09-3743R
Community Name: City of Oceanside, CA
Community No.: 060294
FIRM Panel Affected: 06073C0753H

116

Dear Mayor Weiss:

In a Letter of Map Revision (LOMR) dated February 16, 2018, you were notified of proposed flood hazard determinations affecting the Flood Insurance Rate Map (FIRM) and Flood Insurance Study (FIS) report for the City of Oceanside, San Diego County, CA. These determinations were for Loma Alta Creek - from approximately 925 feet upstream of Crouch Street to approximately 2,425 feet upstream of Crouch Street. The 90-day appeal period that was initiated on March 5, 2018, when the Department of Homeland Security's Federal Emergency Management Agency (FEMA) published a notice of proposed Flood Hazard Determinations in *The San Diego Union-Tribune* has elapsed.

FEMA received no valid requests for changes to the modified flood hazard information. Therefore, the modified flood hazard information for your community that became effective on July 3, 2018, remains valid and revises the FIRM and FIS report that were in effect prior to that date.

The modifications are pursuant to Section 206 of the Flood Disaster Protection Act of 1973 (Public Law 93-234) and are in accordance with the National Flood Insurance Act of 1968, as amended (Title XIII of the Housing and Urban Development Act of 1968, Public Law 90-448), 42 U.S.C. 4001-4128, and 44 CFR Part 65. The community number(s) and suffix code(s) are unaffected by this revision. The community number and appropriate suffix code as shown above will be used by the National Flood Insurance Program (NFIP) for all flood insurance policies and renewals issued for your community.

FEMA has developed criteria for floodplain management as required under the above-mentioned Acts of 1968 and 1973. To continue participation in the NFIP, your community must use the modified flood hazard information to carry out the floodplain management regulations for the NFIP. The modified flood hazard information will also be used to calculate the appropriate flood insurance premium rates for all new buildings and their contents and for the second layer of insurance on existing buildings and their contents.

If you have any questions regarding the necessary floodplain management measures for your community or the NFIP in general, please contact the Mitigation Division Director, FEMA Region IX, in Oakland, California, either by telephone at (510) 627-7175, or in writing at 1111 Broadway, Suite 1200, Oakland, California, 94607-4052.

If you have any questions regarding the LOMR, the proposed flood hazard determinations, or mapping issues in general, please call the FEMA Map Information eXchange, toll free, at (877) 336-2627 (877-FEMA MAP).

Sincerely,

Patrick "Rick" F. Sacbibit, P.E., Branch Chief
Engineering Services Branch
Federal Insurance and Mitigation Administration

cc: Mr. Marty Eslambolchi
City Development Engineer
City of Oceanside

Mr. Kenneth Ryan
District Manager
Waste Management, Inc.

Mr. David Cline, P.E., WA, CFM
Vice President
Shannon & Wilson, Inc.

Follows Conditional Case No.: 14-09-3743R

Federal Emergency Management Agency

Washington, D.C. 20472

LETTER OF MAP REVISION DETERMINATION DOCUMENT

COMMUNITY AND REVISION INFORMATION		PROJECT DESCRIPTION	BASIS OF REQUEST
COMMUNITY	City of Oceanside San Diego County California COMMUNITY NO.: 060294	FILL	HYDRAULIC ANALYSIS FLOODWAY UPDATED TOPOGRAPHIC DATA
IDENTIFIER	WM CNG (As Built Follow Up To 14-09-3743R)	APPROXIMATE LATITUDE & LONGITUDE: 33.196, -117.350 SOURCE: USGS QUADRANGLE DATUM: NAD 83	

ANNOTATED MAPPING ENCLOSURES	ANNOTATED STUDY ENCLOSURES
TYPE: FIRM* NO.: 06073C0753H DATE: May 16, 2012	DATE OF EFFECTIVE FLOOD INSURANCE STUDY: April 05, 2016 PROFILE(S): 210P FLOODWAY DATA TABLE: 13

Enclosures reflect changes to flooding sources affected by this revision.
* FIRM - Flood Insurance Rate Map

FLOODING SOURCE(S) & REVISED REACH(ES)

Loma Alta Creek - From approximately 925 feet upstream of Crouch Street to approximately 2,425 feet upstream of Crouch Street.

SUMMARY OF REVISIONS

Flooding Source	Effective Flooding	Revised Flooding	Increases	Decreases
Loma Alta Creek	Zone AE	Zone AE	YES	NONE
	Zone X (shaded)	Zone X (shaded)	YES	NONE
	Floodway	Floodway	NONE	NONE
	BFEs*	BFEs	YES	YES

* BFEs - Base Flood Elevations

DETERMINATION

This document provides the determination from the Department of Homeland Security's Federal Emergency Management Agency (FEMA) regarding a request for a Letter of Map Revision (LOMR) for the area described above. Using the information submitted, we have determined that a revision to the flood hazards depicted in the Flood Insurance Study (FIS) report and/or National Flood Insurance Program (NFIP) map is warranted. This document revises the effective NFIP map, as indicated in the attached documentation. Please use the enclosed annotated map panels revised by this LOMR for floodplain management purposes and for all flood insurance policies and renewals in your community.

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Map Information eXchange toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMC Clearinghouse, 3601 Eisenhower Avenue, Suite 500, Alexandria, VA 22304-6426. Additional Information about the NFIP is available on our website at http://www.fema.gov/nfip.

Patrick "Rick" F. Sacbibit, P.E., Branch Chief
Engineering Services Branch
Federal Insurance and Mitigation Administration

Federal Emergency Management Agency

Washington, D.C. 20472

LETTER OF MAP REVISION DETERMINATION DOCUMENT (CONTINUED)

COMMUNITY INFORMATION

APPLICABLE NFIP REGULATIONS/COMMUNITY OBLIGATION

We have made this determination pursuant to Section 206 of the Flood Disaster Protection Act of 1973 (P.L. 93-234) and in accordance with the National Flood Insurance Act of 1968, as amended (Title XIII of the Housing and Urban Development Act of 1968, P.L. 90-448), 42 U.S.C. 4001-4128, and 44 CFR Part 65. Pursuant to Section 1361 of the National Flood Insurance Act of 1968, as amended, communities participating in the NFIP are required to adopt and enforce floodplain management regulations that meet or exceed NFIP criteria. These criteria, including adoption of the FIS report and FIRM, and the modifications made by this LOMR, are the minimum requirements for continued NFIP participation and do not supersede more stringent State/Commonwealth or local requirements to which the regulations apply.

We provide the floodway designation to your community as a tool to regulate floodplain development. Therefore, the floodway revision we have described in this letter, while acceptable to us, must also be acceptable to your community and adopted by appropriate community action, as specified in Paragraph 60.3(d) of the NFIP regulations.

COMMUNITY REMINDERS

We based this determination on the 1-percent-annual-chance flood discharges computed in the FIS for your community without considering subsequent changes in watershed characteristics that could increase flood discharges. Future development of projects upstream could cause increased flood discharges, which could cause increased flood hazards. A comprehensive restudy of your community's flood hazards would consider the cumulative effects of development on flood discharges subsequent to the publication of the FIS report for your community and could, therefore, establish greater flood hazards in this area.

Your community must regulate all proposed floodplain development and ensure that permits required by Federal and/or State/Commonwealth law have been obtained. State/Commonwealth or community officials, based on knowledge of local conditions and in the interest of safety, may set higher standards for construction or may limit development in floodplain areas. If your State/Commonwealth or community has adopted more restrictive or comprehensive floodplain management criteria, those criteria take precedence over the minimum NFIP requirements.

We will not print and distribute this LOMR to primary users, such as local insurance agents or mortgage lenders; instead, the community will serve as a repository for the new data. We encourage you to disseminate the information in this LOMR by preparing a news release for publication in your community's newspaper that describes the revision and explains how your community will provide the data and help interpret the NFIP maps. In that way, interested persons, such as property owners, insurance agents, and mortgage lenders, can benefit from the information.

This revision has met our criteria for removing an area from the 1-percent-annual-chance floodplain to reflect the placement of fill. However, we encourage you to require that the lowest adjacent grade and lowest floor (including basement) of any structure placed within the subject area be elevated to or above the Base (1-percent-annual-chance) Flood Elevation.

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Map Information eXchange toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMC Clearinghouse, 3601 Eisenhower Avenue, Suite 500, Alexandria, VA 22304-6426. Additional Information about the NFIP is available on our website at http://www.fema.gov/nfip.

Patrick "Rick" F. Sacbibit, P.E., Branch Chief
Engineering Services Branch
Federal Insurance and Mitigation Administration

Federal Emergency Management Agency

Washington, D.C. 20472

LETTER OF MAP REVISION DETERMINATION DOCUMENT (CONTINUED)

We have designated a Consultation Coordination Officer (CCO) to assist your community. The CCO will be the primary liaison between your community and FEMA. For information regarding your CCO, please contact:

Mr. Jeffrey Lusk
Director, Mitigation Division
Federal Emergency Management Agency, Region IX
1111 Broadway Street, Suite 1200
Oakland, CA 94607-4052
(510) 627-7175

STATUS OF THE COMMUNITY NFIP MAPS

We will not physically revise and republish the FIRM and FIS report for your community to reflect the modifications made by this LOMR at this time. When changes to the previously cited FIRM panel(s) and FIS report warrant physical revision and republication in the future, we will incorporate the modifications made by this LOMR at that time.

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Map Information eXchange toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMC Clearinghouse, 3601 Eisenhower Avenue, Suite 500, Alexandria, VA 22304-6426. Additional Information about the NFIP is available on our website at http://www.fema.gov/nfip.

Patrick "Rick" F. Sacbibit, P.E., Branch Chief
Engineering Services Branch
Federal Insurance and Mitigation Administration

Federal Emergency Management Agency
Washington, D.C. 20472

LETTER OF MAP REVISION DETERMINATION DOCUMENT (CONTINUED)

PUBLIC NOTIFICATION OF REVISION

A notice of changes will be published in the *Federal Register*. This information also will be published in your local newspaper on or about the dates listed below, and through FEMA's Flood Hazard Mapping website at https://www.floodmaps.fema.gov/fhm/bfe_status/bfe_main.asp

LOCAL NEWSPAPER

Name: *The San Diego Union-Tribune*
Dates: February 26, 2018 and March 5, 2018

Within 90 days of the second publication in the local newspaper, any interested party may request that we reconsider this determination. Any request for reconsideration must be based on scientific or technical data. Therefore, this letter will be effective only after the 90-day appeal period has elapsed and we have resolved any appeals that we receive during this appeal period. Until this LOMR is effective, the revised flood hazard determination presented in this LOMR may be changed.

This determination is based on the flood data presently available. The enclosed documents provide additional information regarding this determination. If you have any questions about this document, please contact the FEMA Map Information eXchange toll free at 1-877-336-2627 (1-877-FEMA MAP) or by letter addressed to the LOMC Clearinghouse, 3601 Eisenhower Avenue, Suite 500, Alexandria, VA 22304-6426. Additional Information about the NFIP is available on our website at http://www.fema.gov/nfip.

Patrick "Rick" F. Sacbibit, P.E., Branch Chief
Engineering Services Branch
Federal Insurance and Mitigation Administration

FLOODING SOURCE		FLOODWAY			1-PERCENT-ANNUAL-CHANCE 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
Loma Alta Creek (cont'd)	**DATA REVISED BY LOMR EFFECTIVE AUGUST 13, 2013**							
AA	8,829	170	629	6.0	41.0	41.0	41.4	0.4
AB	9,443	414	1195	3.2	43.0	43.0	43.7	0.7
AC	10,160	314	1194	3.2	48.5	48.5	48.5	0.0
AD	10,960	140	540	7.0	51.1	51.1	51.2	0.1
AE	11,465	112	457	8.3	54.0	54.0	54.4	0.4
AF	11,970	288	747	5.1	57.8	57.8	58.2	0.4
AG	12,500	319	832	4.3	59.9	59.9	60.2	0.3
AH	12,810	285	546	7.0	61.7	61.7	62.5	0.8
AI	13,300	277	939	4.0	64.8	64.8	65.6	0.8
AJ	13,830	224	827	2.7	66.2	66.2	66.7	0.5
AK	14,460	60	213	10.3	68.8	68.8	69.1	0.3
AL	15,120	246	578	3.8	74.8	74.8	75.3	0.5
AM	15,510	110	255	8.6	78.0	78.0	78.5	0.5
AN	15,690	279	528	4.2	81.9	81.9	82.4	0.5
AO	16,050	84	265	8.3	84.6	84.6	84.6	0.0
AP	16,742	68	230	9.6	92.2	92.2	92.8	0.6
AQ	17,175	54	221	10.0	97.6	97.6	98.6	1.0
AR	17,740	268[2]	378	5.8	104.9	104.9	105.2	0.3
AS	17,780	327[2]	338	6.5	107.0	107.0	107.1	0.1
AT	17,835	267	957	2.3	107.8	107.8	107.8	0.0
AU	17,995	140[2]	700	3.2	110.5	110.5	110.5	0.0
AV	18,075	138[2]	699	3.1	113.0	113.0	113.0	0.0
AW	18,540	84	231	9.5	113.3	113.3	113.3	0.0
AX	18,610	49	194	11.4	114.6	114.6	114.7	0.1
AY	18,780	161[2]	473	4.7	117.0	117.0	118.0	1.0
AZ	18,960	172[2]	291	7.6	118.7	118.7	118.8	0.1

[1] Feet Above Pacific Street
[2] Width includes Islands

REVISED DATA

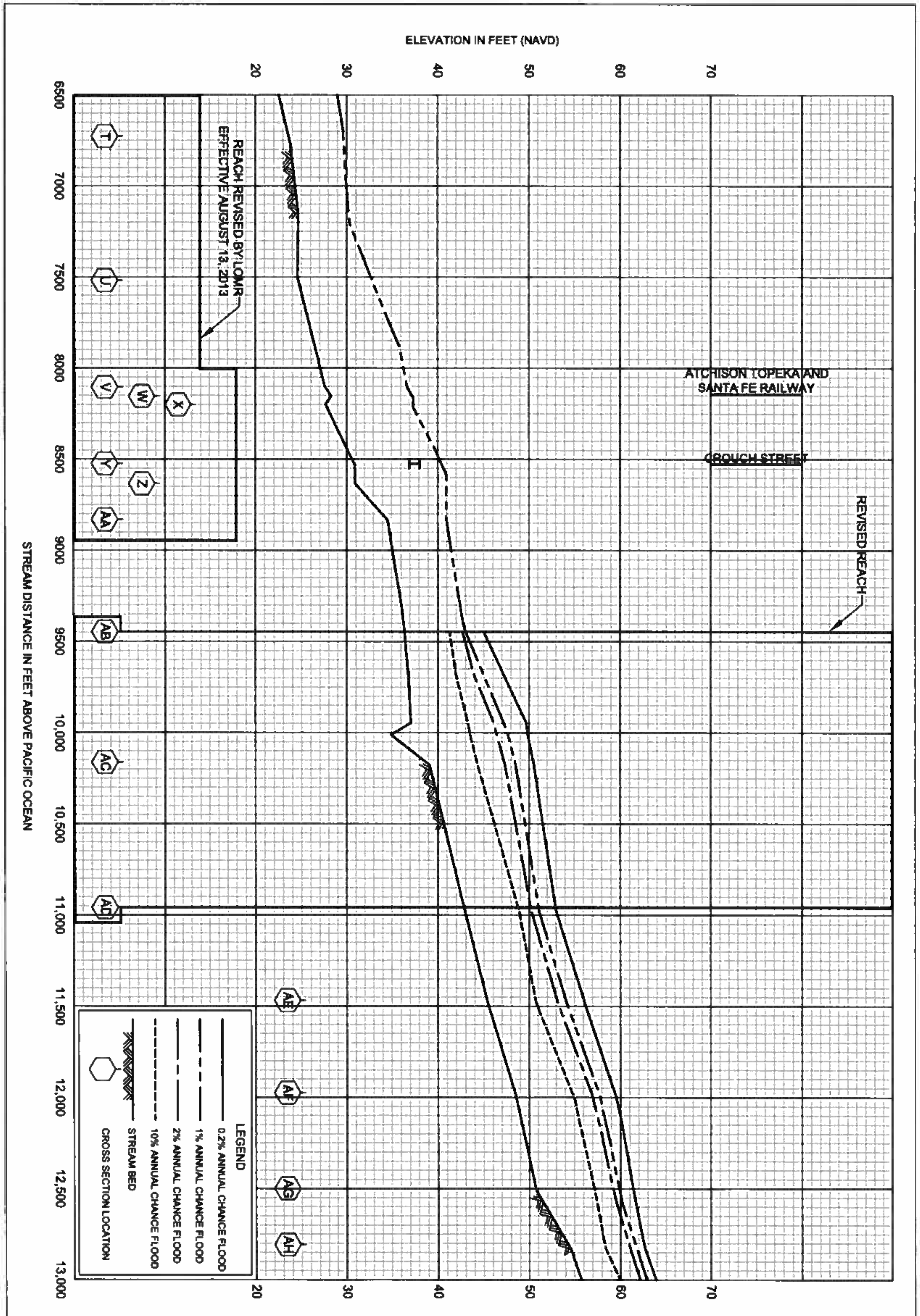
TABLE 13

FEDERAL EMERGENCY MANAGEMENT AGENCY

SAN DIEGO COUNTY, CA
AND INCORPORATED AREAS

FLOODWAY DATA

LOMA ALTA CREEK



210P	FEDERAL EMERGENCY MANAGEMENT AGENCY SAN DIEGO COUNTY, CA (AND INCORPORATED AREAS)	FLOOD PROFILES LOMA ALTA CREEK

NOTE: MAP AREA SHOWN ON THIS PANEL IS LOCATED WITHIN TOWNSHIP 11 SOUTH, RANGE 4 WEST AND TOWNSHIP 11 SOUTH, RANGE 5 WEST

JOINS PANEL 0754

2015000 FT

SPECIAL FLOOD HAZARD AREAS		Without Base Flood Elevation (BFE) Zone A, V, A99
		With BFE or Depth Zone AE, AO, AH, VE, AR
		Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD		0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile
		Future Conditions 1% Annual Chance Flood Hazard
		Area with Reduced Flood Risk due to Levee See Notes.
OTHER AREAS		Area of Undetermined Flood Hazard

SCALE

Map Projection: NAD 1983 UTM Zone 11N
Western Hemisphere; Vertical Datum: NAVD 88

N

1 inch = 500 feet 1:6,000

0 250 500 1,000 Feet

0 75 150 300 Meters

NATIONAL FLOOD INSURANCE PROGRAM
FLOOD INSURANCE RATE MAP
SAN DIEGO COUNTY, CALIFORNIA
and Incorporated Areas

PANEL 753 OF 2375

FEMA

COMMUNITY	NUMBER	PANEL	SUFFIX
OCEANSIDE, CITY OF	060294	0753	H

VERSION NUMBER
1.1.1.0

MAP NUMBER
06073C0753H

EFFECTIVE DATE
MAY 16, 2012

□□□□□ D□□ 7

HYDROGRAPHS, STORAGE CURVES & INFLOW HYDROGRAPH INPUTS

Hydrograph Report

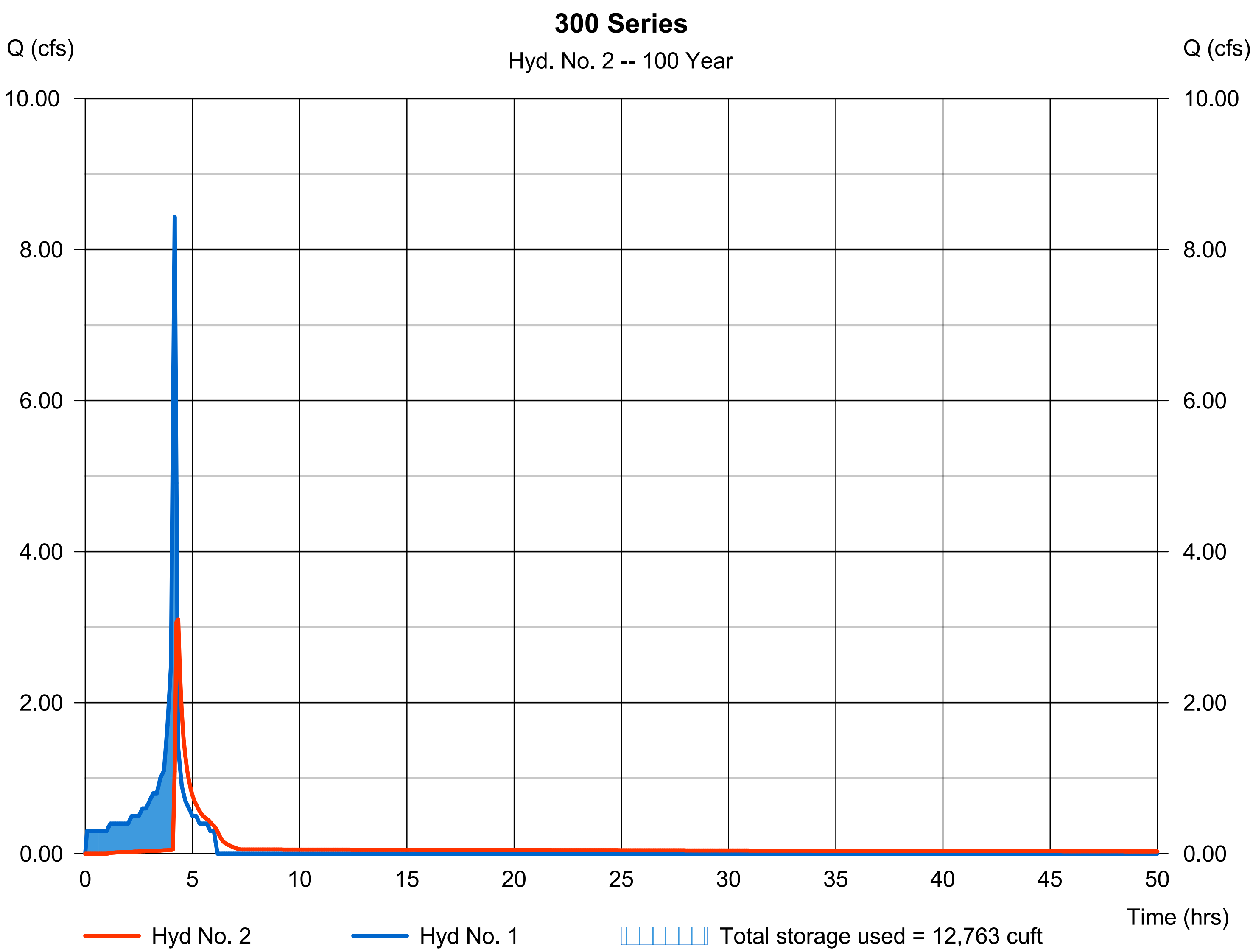
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Thursday, 04 / 8 / 2021

Hyd. No. 2

300 Series

Hydrograph type	= Reservoir	Peak discharge	= 3.101 cfs
Storm frequency	= 100 yrs	Time to peak	= 4.33 hrs
Time interval	= 5 min	Hyd. volume	= 17,217 cuft
Inflow hyd. No.	= 1 - 300-series	Max. Elevation	= 35.49 ft
Reservoir name	= UG detention	Max. Storage	= 12,763 cuft

Storage Indication method used.



Pond Report

SERIES 300

Pond No. 1 - UG detention

Pond Data

UG Chambers -Invert elev. = 32.70 ft, Rise x Span = 4.00 x 4.00 ft, Barrel Len = 340.33 ft, No. Barrels = 3, Slope = 0.00%, Headers = No
Encasement -Invert elev. = 32.20 ft, Width = 6.32 ft, Height = 6.00 ft, Voids = 30.00%

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	32.20	n/a	0	0
0.60	32.80	n/a	1,218	1,218
1.20	33.40	n/a	2,159	3,376
1.80	34.00	n/a	2,638	6,014
2.40	34.60	n/a	2,838	8,853
3.00	35.20	n/a	2,864	11,717
3.60	35.80	n/a	2,725	14,442
4.20	36.40	n/a	2,370	16,812
4.80	37.00	n/a	1,467	18,279
5.40	37.60	n/a	1,162	19,441
6.00	38.20	n/a	1,162	20,603

Culvert / Orifice Structures

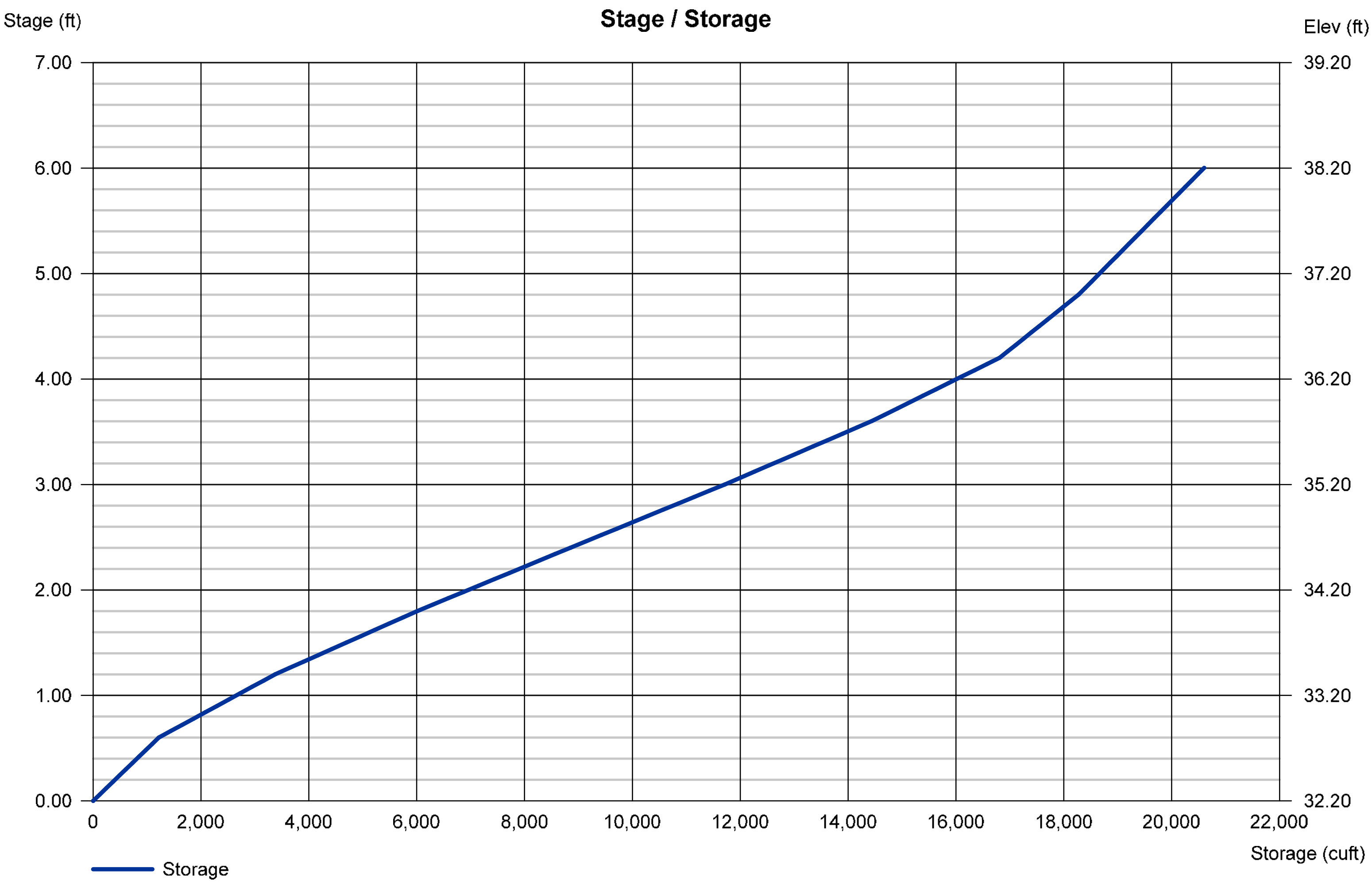
		[A]	[B]	[C]	[PrfRsr]
Rise (in)	=	1.50	0.00	0.00	0.00
Span (in)	=	1.50	0.00	0.00	0.00
No. Barrels	=	1	0	0	0
Invert El. (ft)	=	32.70	0.00	0.00	0.00
Length (ft)	=	10.00	0.00	0.00	0.00
Slope (%)	=	1.00	0.00	0.00	n/a
N-Value	=	.013	.013	.013	n/a
Orifice Coeff.	=	0.60	0.60	0.60	0.60
Multi-Stage	=	n/a	No	No	No

Weir Structures

		[A]	[B]	[C]	[D]
Crest Len (ft)	=	2.00	Inactive	0.00	0.00
Crest El. (ft)	=	34.84	35.40	0.00	0.00
Weir Coeff.	=	3.33	3.33	3.33	3.33
Weir Type	=	Rect	Rect	---	---
Multi-Stage	=	No	No	No	No

Exfil.(in/hr) = 0.000 (by Wet area)
TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



RATIONAL METHOD HYDROGRAPH PROGRAM

SERIES 300

RUN DATE 4/8/2021
HYDROGRAPH FILE NAME Text1
TIME OF CONCENTRATION 10 MIN.
6 HOUR RAINFALL 2.7 INCHES
BASIN AREA 2.6 ACRES
RUNOFF COEFFICIENT 0.72
PEAK DISCHARGE 8.43 CFS

TIME (MIN) = 0	DISCHARGE (CFS) = 0
TIME (MIN) = 10	DISCHARGE (CFS) = 0.3
TIME (MIN) = 20	DISCHARGE (CFS) = 0.3
TIME (MIN) = 30	DISCHARGE (CFS) = 0.3
TIME (MIN) = 40	DISCHARGE (CFS) = 0.3
TIME (MIN) = 50	DISCHARGE (CFS) = 0.3
TIME (MIN) = 60	DISCHARGE (CFS) = 0.3
TIME (MIN) = 70	DISCHARGE (CFS) = 0.4
TIME (MIN) = 80	DISCHARGE (CFS) = 0.4
TIME (MIN) = 90	DISCHARGE (CFS) = 0.4
TIME (MIN) = 100	DISCHARGE (CFS) = 0.4
TIME (MIN) = 110	DISCHARGE (CFS) = 0.4
TIME (MIN) = 120	DISCHARGE (CFS) = 0.4
TIME (MIN) = 130	DISCHARGE (CFS) = 0.5
TIME (MIN) = 140	DISCHARGE (CFS) = 0.5
TIME (MIN) = 150	DISCHARGE (CFS) = 0.5
TIME (MIN) = 160	DISCHARGE (CFS) = 0.6
TIME (MIN) = 170	DISCHARGE (CFS) = 0.6
TIME (MIN) = 180	DISCHARGE (CFS) = 0.7
TIME (MIN) = 190	DISCHARGE (CFS) = 0.8
TIME (MIN) = 200	DISCHARGE (CFS) = 0.8
TIME (MIN) = 210	DISCHARGE (CFS) = 1
TIME (MIN) = 220	DISCHARGE (CFS) = 1.1
TIME (MIN) = 230	DISCHARGE (CFS) = 1.7
TIME (MIN) = 240	DISCHARGE (CFS) = 2.5
TIME (MIN) = 250	DISCHARGE (CFS) = 8.43
TIME (MIN) = 260	DISCHARGE (CFS) = 1.4
TIME (MIN) = 270	DISCHARGE (CFS) = 0.9
TIME (MIN) = 280	DISCHARGE (CFS) = 0.7
TIME (MIN) = 290	DISCHARGE (CFS) = 0.6
TIME (MIN) = 300	DISCHARGE (CFS) = 0.5
TIME (MIN) = 310	DISCHARGE (CFS) = 0.5
TIME (MIN) = 320	DISCHARGE (CFS) = 0.4
TIME (MIN) = 330	DISCHARGE (CFS) = 0.4
TIME (MIN) = 340	DISCHARGE (CFS) = 0.4
TIME (MIN) = 350	DISCHARGE (CFS) = 0.3
TIME (MIN) = 360	DISCHARGE (CFS) = 0.3
TIME (MIN) = 370	DISCHARGE (CFS) = 0

Hydrograph Report

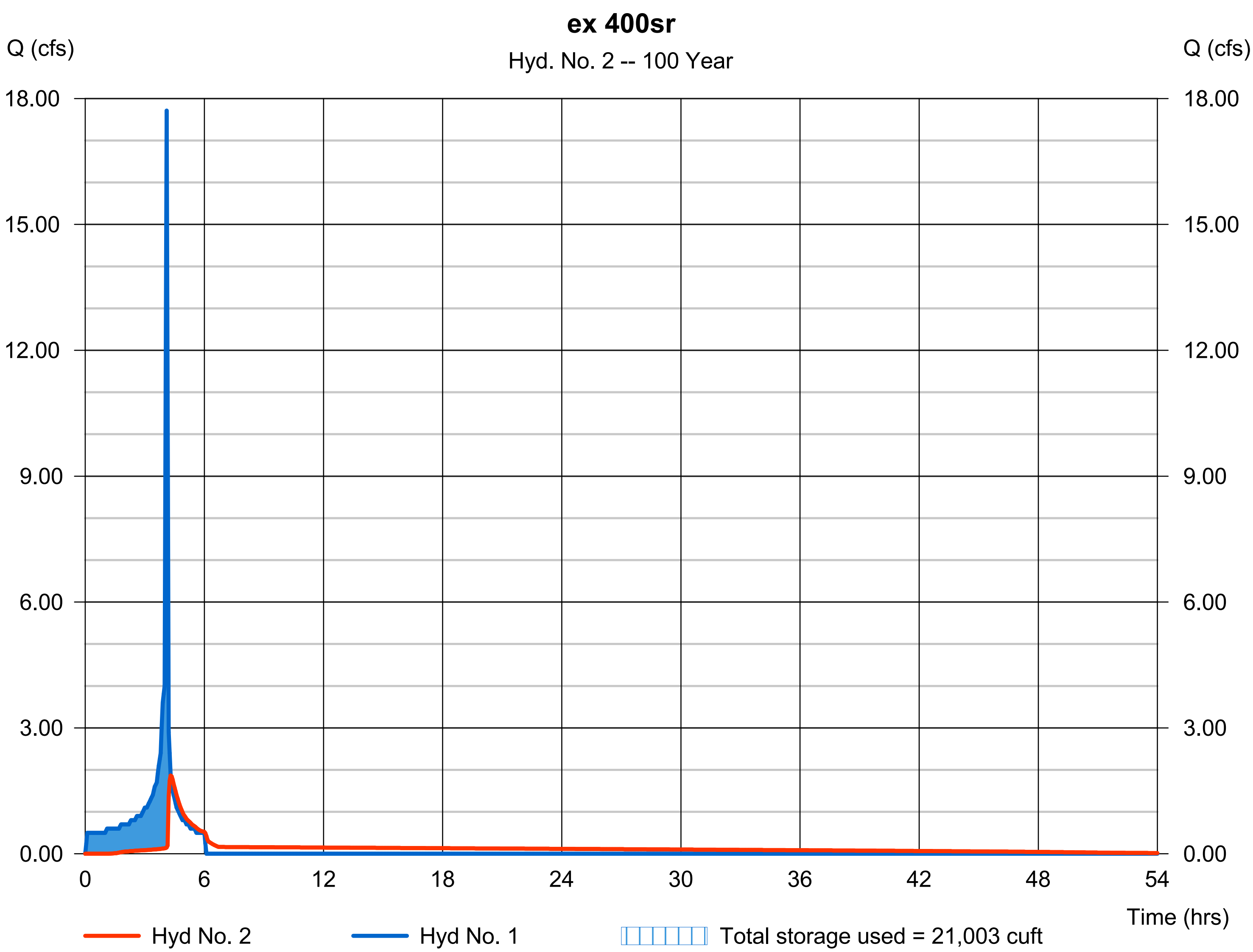
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Friday, 04 / 9 / 2021

Hyd. No. 2

ex 400sr

Hydrograph type	= Reservoir	Peak discharge	= 1.864 cfs
Storm frequency	= 100 yrs	Time to peak	= 4.30 hrs
Time interval	= 3 min	Hyd. volume	= 25,524 cuft
Inflow hyd. No.	= 1 - existing 400-series	Max. Elevation	= 31.26 ft
Reservoir name	= underground chambers	Max. Storage	= 21,003 cuft

Storage Indication method used.



Pond Report

Series 400

Pond No. 1 - underground chambers

Pond Data

UG Chambers -Invert elev. = 28.50 ft, Rise x Span = 4.00 x 4.00 ft, Barrel Len = 555.00 ft, No. Barrels = 3, Slope = 0.00%, Headers = No
Encasement -Invert elev. = 28.00 ft, Width = 6.30 ft, Height = 6.00 ft, Voids = 30.00%

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	28.00	n/a	0	0
0.60	28.60	n/a	1,976	1,976
1.20	29.20	n/a	3,513	5,489
1.80	29.80	n/a	4,299	9,789
2.40	30.40	n/a	4,623	14,412
3.00	31.00	n/a	4,666	19,077
3.60	31.60	n/a	4,442	23,519
4.20	32.20	n/a	3,857	27,376
4.80	32.80	n/a	2,386	29,762
5.40	33.40	n/a	1,890	31,652
6.01	34.01	n/a	1,890	33,543

Culvert / Orifice Structures

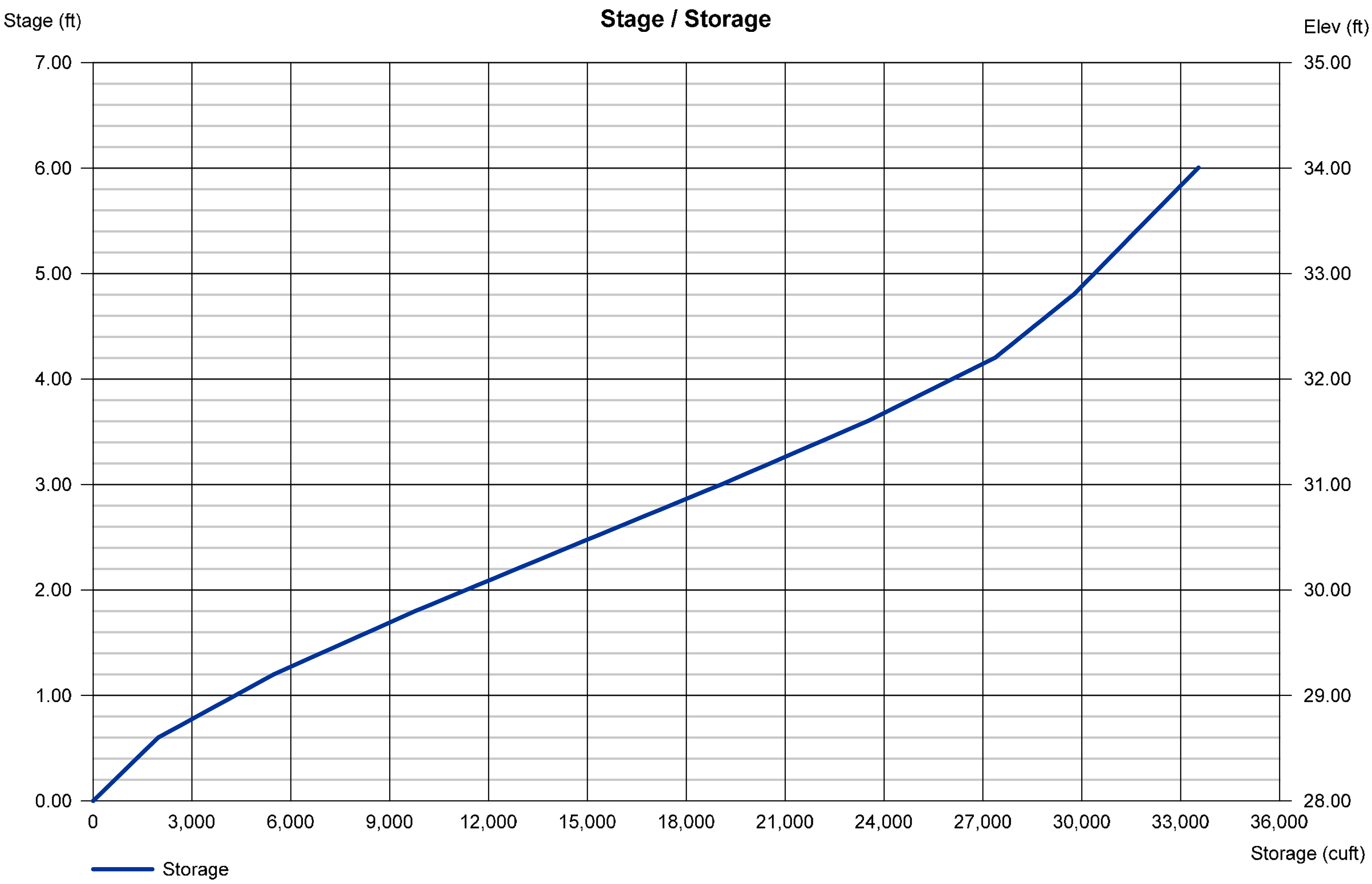
	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 2.00	0.00	0.00	0.00
Span (in)	= 2.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 28.60	0.00	0.00	0.00
Length (ft)	= 1.00	0.00	0.00	0.00
Slope (%)	= 1.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 7.00	0.00	0.00	0.00
Crest El. (ft)	= 31.09	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Rect	---	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 0.000 (by Contour)
TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



RATIONAL METHOD HYDROGRAPH PROGRAM

SERIES 400

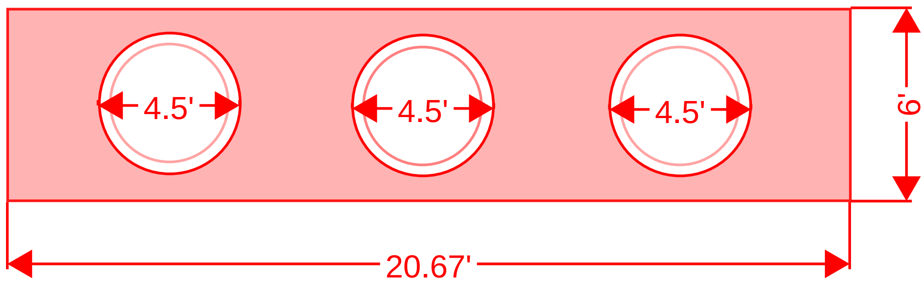
RUN DATE 4/7/2021
HYDROGRAPH FILE NAME Text1
TIME OF CONCENTRATION 6 MIN.
6 HOUR RAINFALL 2.7 INCHES
BASIN AREA 3.4 ACRES
RUNOFF COEFFICIENT 0.84
PEAK DISCHARGE 19.14 CFS

TIME (MIN) = 0	DISCHARGE (CFS) = 0
TIME (MIN) = 6	DISCHARGE (CFS) = 0.5
TIME (MIN) = 12	DISCHARGE (CFS) = 0.5
TIME (MIN) = 18	DISCHARGE (CFS) = 0.5
TIME (MIN) = 24	DISCHARGE (CFS) = 0.5
TIME (MIN) = 30	DISCHARGE (CFS) = 0.5
TIME (MIN) = 36	DISCHARGE (CFS) = 0.5
TIME (MIN) = 42	DISCHARGE (CFS) = 0.5
TIME (MIN) = 48	DISCHARGE (CFS) = 0.5
TIME (MIN) = 54	DISCHARGE (CFS) = 0.5
TIME (MIN) = 60	DISCHARGE (CFS) = 0.5
TIME (MIN) = 66	DISCHARGE (CFS) = 0.6
TIME (MIN) = 72	DISCHARGE (CFS) = 0.6
TIME (MIN) = 78	DISCHARGE (CFS) = 0.6
TIME (MIN) = 84	DISCHARGE (CFS) = 0.6
TIME (MIN) = 90	DISCHARGE (CFS) = 0.6
TIME (MIN) = 96	DISCHARGE (CFS) = 0.6
TIME (MIN) = 102	DISCHARGE (CFS) = 0.6
TIME (MIN) = 108	DISCHARGE (CFS) = 0.7
TIME (MIN) = 114	DISCHARGE (CFS) = 0.7
TIME (MIN) = 120	DISCHARGE (CFS) = 0.7
TIME (MIN) = 126	DISCHARGE (CFS) = 0.7
TIME (MIN) = 132	DISCHARGE (CFS) = 0.7
TIME (MIN) = 138	DISCHARGE (CFS) = 0.8
TIME (MIN) = 144	DISCHARGE (CFS) = 0.8
TIME (MIN) = 150	DISCHARGE (CFS) = 0.8
TIME (MIN) = 156	DISCHARGE (CFS) = 0.9
TIME (MIN) = 162	DISCHARGE (CFS) = 0.9
TIME (MIN) = 168	DISCHARGE (CFS) = 0.9
TIME (MIN) = 174	DISCHARGE (CFS) = 1
TIME (MIN) = 180	DISCHARGE (CFS) = 1.1
TIME (MIN) = 186	DISCHARGE (CFS) = 1.1
TIME (MIN) = 192	DISCHARGE (CFS) = 1.2
TIME (MIN) = 198	DISCHARGE (CFS) = 1.3
TIME (MIN) = 204	DISCHARGE (CFS) = 1.4
TIME (MIN) = 210	DISCHARGE (CFS) = 1.6
TIME (MIN) = 216	DISCHARGE (CFS) = 1.7
TIME (MIN) = 222	DISCHARGE (CFS) = 2.1
TIME (MIN) = 228	DISCHARGE (CFS) = 2.4
TIME (MIN) = 234	DISCHARGE (CFS) = 3.6
TIME (MIN) = 240	DISCHARGE (CFS) = 4
TIME (MIN) = 246	DISCHARGE (CFS) = 17.71
TIME (MIN) = 252	DISCHARGE (CFS) = 2.9
TIME (MIN) = 258	DISCHARGE (CFS) = 1.9
TIME (MIN) = 264	DISCHARGE (CFS) = 1.5
TIME (MIN) = 270	DISCHARGE (CFS) = 1.3
TIME (MIN) = 276	DISCHARGE (CFS) = 1.1
TIME (MIN) = 282	DISCHARGE (CFS) = 1
TIME (MIN) = 288	DISCHARGE (CFS) = 0.9
TIME (MIN) = 294	DISCHARGE (CFS) = 0.8
TIME (MIN) = 300	DISCHARGE (CFS) = 0.8
TIME (MIN) = 306	DISCHARGE (CFS) = 0.7
TIME (MIN) = 312	DISCHARGE (CFS) = 0.7
TIME (MIN) = 318	DISCHARGE (CFS) = 0.6
TIME (MIN) = 324	DISCHARGE (CFS) = 0.6
TIME (MIN) = 330	DISCHARGE (CFS) = 0.6
TIME (MIN) = 336	DISCHARGE (CFS) = 0.5
TIME (MIN) = 342	DISCHARGE (CFS) = 0.5
TIME (MIN) = 348	DISCHARGE (CFS) = 0.5
TIME (MIN) = 354	DISCHARGE (CFS) = 0.5
TIME (MIN) = 360	DISCHARGE (CFS) = 0.5
TIME (MIN) = 366	DISCHARGE (CFS) = 0

APPENDIX 8

DETENTION STORAGE HAND-CALCULATIONS

Hydraflow Storage Hand Calculation - Series 300



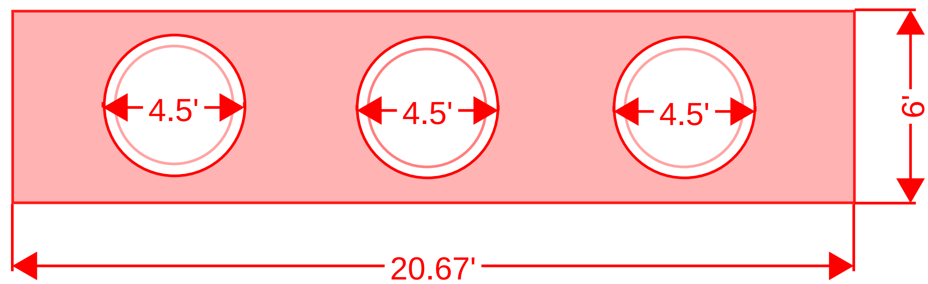
Detention Chamber Simplified Cross-Section

Area of encasement = (20.67ft*6ft)-((3)*π*(2.25ft^2))
Area of encasement = 76.3sf
Void ratio of gravel= 0.3
76.3sf*0.3 = 22.89sf
22.89sf * 340.33lf (one pipe)
Contribution of encasement to overall storage = 7787cf

This gets added to the value that Hydraflow calculates when you run the analysis with the stone encasement set to "no" (12,883cf)

Total storage = 20,670cf

Hydraflow Storage Hand Calculation - Series 400



Detention Chamber Simplified Cross-Section

Area of encasement = (20.67ft*6ft)-((3)*π*(2.25ft^2))
Area of encasement = 76.3sf
Void ratio of gravel= 0.3
76.3sf*0.3 = 22.89sf
22.89sf * 555lf (one pipe)
Contribution of encasement to overall storage = 12,704cf

This gets added to the value that Hydraflow calculates when you run the analysis with the stone encasement set to "no" (20,297cf)

Total storage = 33,625.4cf

APPENDIX 9

CCSYA BYPASS CALCULATION

CCSYA Bypass Velocity Calculation

This calculation is provided to show compliance with the CCSYA bypass criteria for the CCSYA located upstream of the project site.

Criteria from San Diego County Stormwater Manual Appendix H-3.1.

H.3.1 Bypass CCSYAs from Hillslopes Both onsite and upstream hillslopes mapped as CCSYAs must be effectively bypassed through and/or around the proposed project site. • Proposed hardened drainage systems (e.g. storm drains, drainage ditches) that convey the bed sediment from the hillslopes to the downstream waters of the state should maintain a peak velocity from the discrete 2-year, 24-hour runoff event greater than three feet per second.

- *When an 18" concrete storm drain is proposed for bypass, this velocity may typically be achieved by maintaining a storm drain slope of ≥0.5%. In instances where 2 year, 24-hour peak flow rates associated with the storm drain are less than 1.1 cfs, applicants may refer to the table below for minimum slopes needed to maintain three feet per second. Applicants may interpolate the values from the table below, or may elect to perform more detailed cleansing velocity calculations presented in Appendix H.7.1. 2-Year, 24-Hour Peak Flow (cfs) Minimum Slope for 18" Concrete Storm Drain*

2-Year, 24-Hour Peak Flow (cfs)	Minimum Slope for 18" Concrete Storm Drain
<0.25	n/a, this PCCSYA is considered de-minimis
0.25	2.0%
0.50	1.0%
1.10	0.5%

<u>Node 310 Velocity Check </u>(See Proposed Hydrology Map in Appendix 1)**:**

Q100 = 6.60 cfs, Q2 = 2.64 cfs*

Required min slope per table above = 0.5%. Minimum provided slope = 1.0%.

Minimum Velocity Criteria will be met.

<u>Node 418 Velocity Check </u>(See Proposed Hydrology Map in Appendix 1)**:**

Q100 = 6.60 cfs, Q2 = 4.55 cfs*

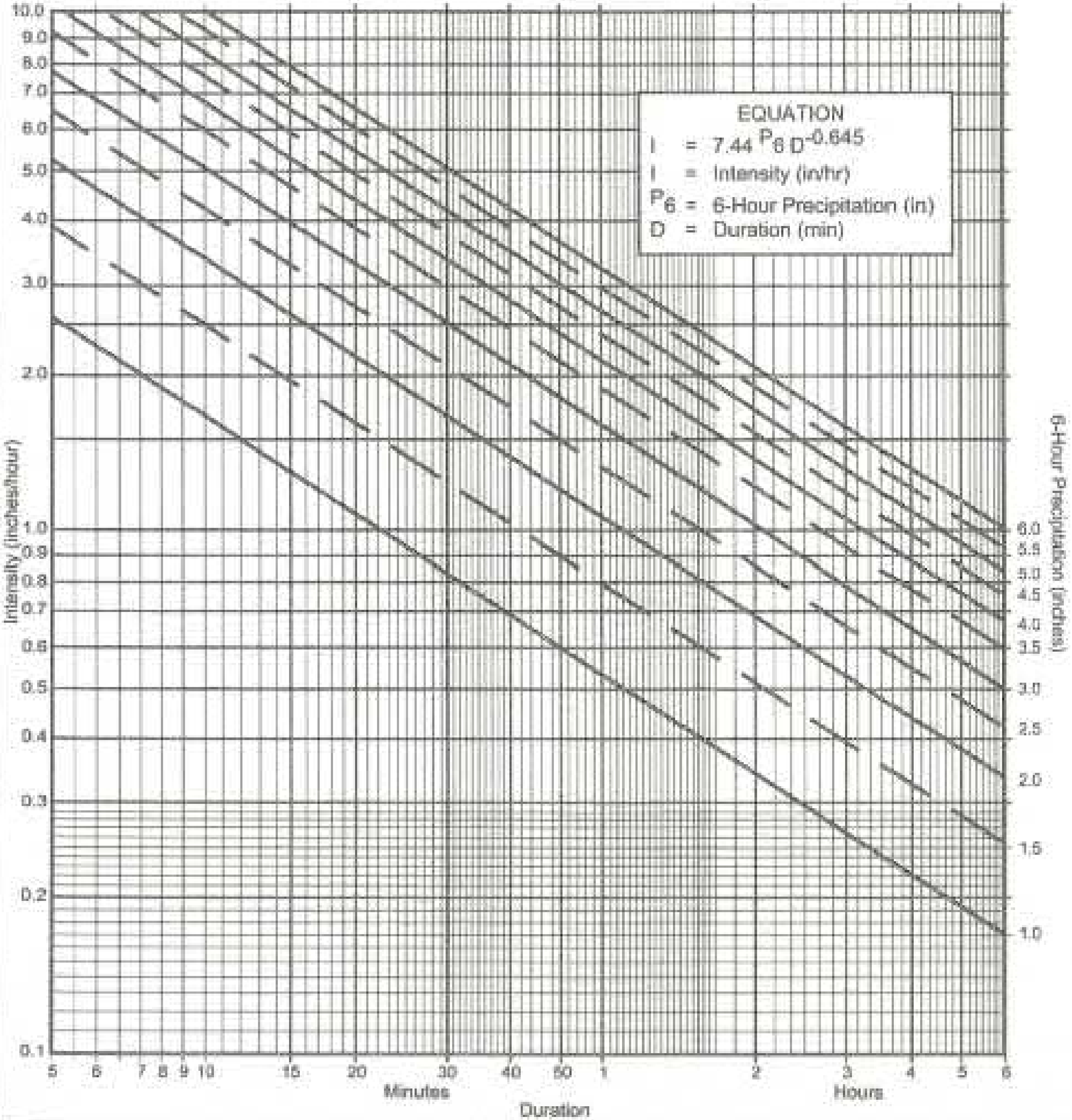
Required min slope per table above = 0.5%. Minimum provided slope = 0.6%.

Minimum Velocity Criteria will be met.

*based on calculated 100 year discharge calculated in Appendix 4, adjust to 2 year storm via ratio of 24-hour rainfall depths for 100-year storm (5") to 2-year storm (2") as shown in Appendix 10

[illegible] D[illegible] 10

SAN DIEGO COUNTY ISOPLUVIAL MAPS



Directions for Application:

(1) From precipitation maps determine 6 hr and 24 hr amounts for the selected frequency. These maps are included in the County Hydrology Manual (10, 50, and 100 yr maps included in the Design and Procedure Manual).

(2) Adjust 6 hr precipitation (if necessary) so that it is within the range of 45% to 65% of the 24 hr precipitation (not applicaple to Desert).

(3) Plot 6 hr precipitation on the right side of the chart.

(4) Draw a line through the point parallel to the plotted lines.

(5) This line is the intensity-duration curve for the location being analyzed.

Application Form:

(a) Selected frequency 100 year

(b) P_6 = 2.7 in., P_{24} = 5.0 , $\frac{P_6}{P_{24}}$ = 54 %(2)

(c) Adjusted $P_6^{(2)}$ = N/A in.

(d) t_x = ______ min.

(e) I = ______ in./hr.

Note: This chart replaces the Intensity-Duration-Frequency curves used since 1965.

P6	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6
Duration	I	I	I	I	I	I	I	I	I	I	I
5	2.63	3.95	5.27	6.59	7.90	9.22	10.54	11.86	13.17	14.49	15.81
7	2.12	3.18	4.24	5.30	6.36	7.42	8.48	9.54	10.60	11.66	12.72
10	1.68	2.53	3.37	4.21	5.05	5.90	6.74	7.58	8.42	9.27	10.11
15	1.30	1.95	2.59	3.24	3.89	4.54	5.19	5.84	6.49	7.13	7.78
20	1.08	1.62	2.15	2.69	3.23	3.77	4.31	4.85	5.39	5.93	6.46
25	0.93	1.40	1.87	2.33	2.80	3.27	3.73	4.20	4.67	5.13	5.60
30	0.83	1.24	1.66	2.07	2.49	2.90	3.32	3.73	4.15	4.56	4.98
40	0.69	1.03	1.38	1.72	2.07	2.41	2.76	3.10	3.45	3.79	4.13
50	0.60	0.90	1.19	1.49	1.79	2.09	2.39	2.69	2.98	3.28	3.58
60	0.53	0.80	1.06	1.33	1.59	1.86	2.12	2.39	2.65	2.92	3.18
90	0.41	0.61	0.82	1.02	1.23	1.43	1.63	1.84	2.04	2.25	2.45
120	0.34	0.51	0.68	0.85	1.02	1.19	1.36	1.53	1.70	1.87	2.04
150	0.29	0.44	0.59	0.73	0.88	1.03	1.18	1.32	1.47	1.62	1.76
180	0.26	0.39	0.52	0.65	0.78	0.91	1.04	1.18	1.31	1.44	1.57
240	0.22	0.33	0.43	0.54	0.65	0.76	0.87	0.98	1.08	1.19	1.30
300	0.19	0.28	0.38	0.47	0.56	0.66	0.75	0.85	0.94	1.03	1.13
360	0.17	0.25	0.33	0.42	0.50	0.58	0.67	0.75	0.84	0.92	1.00

FIGURE

3-1

Intensity-Duration Design Chart - Template

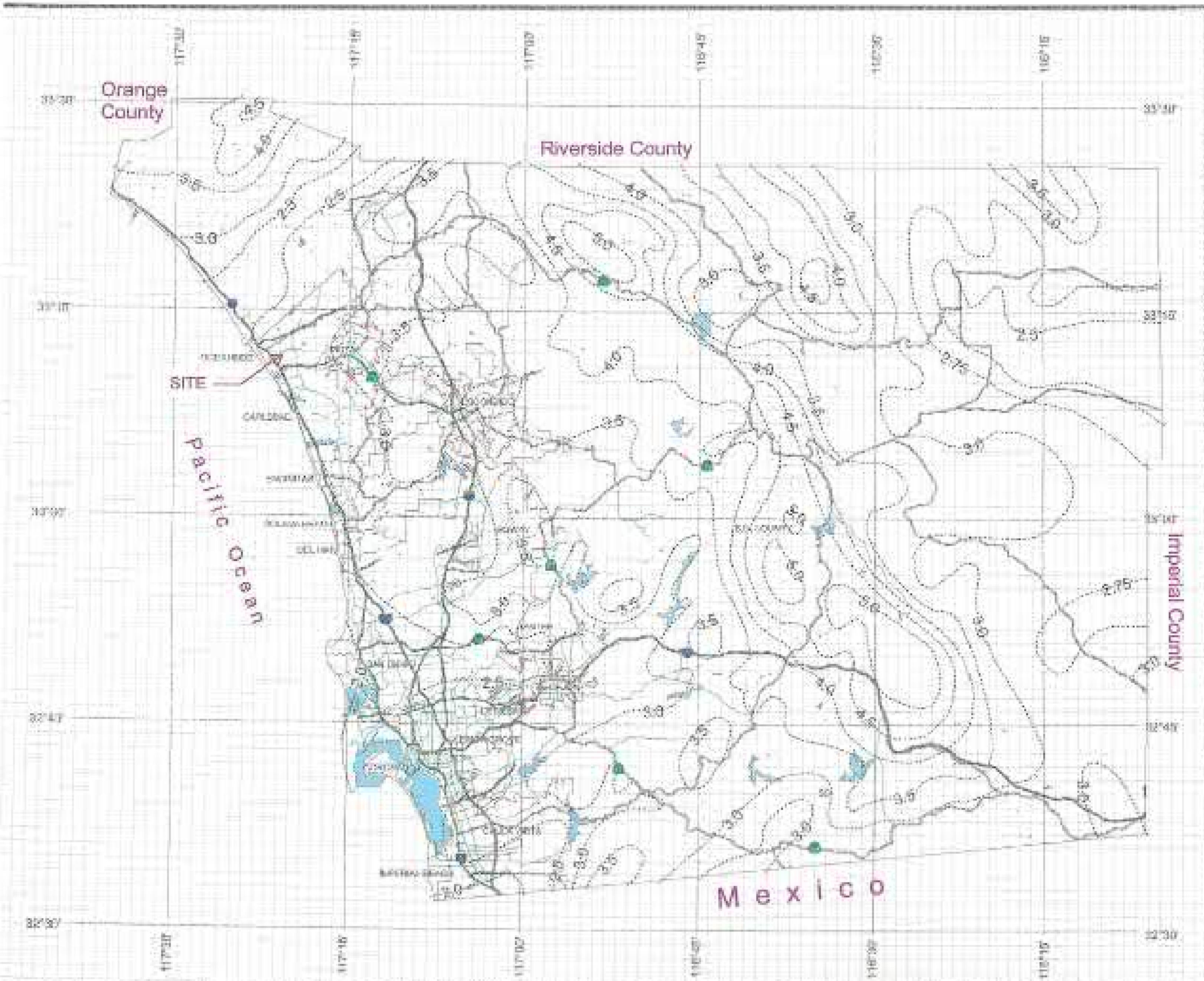
County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 6 Hours

········ Isopluvial (inches)

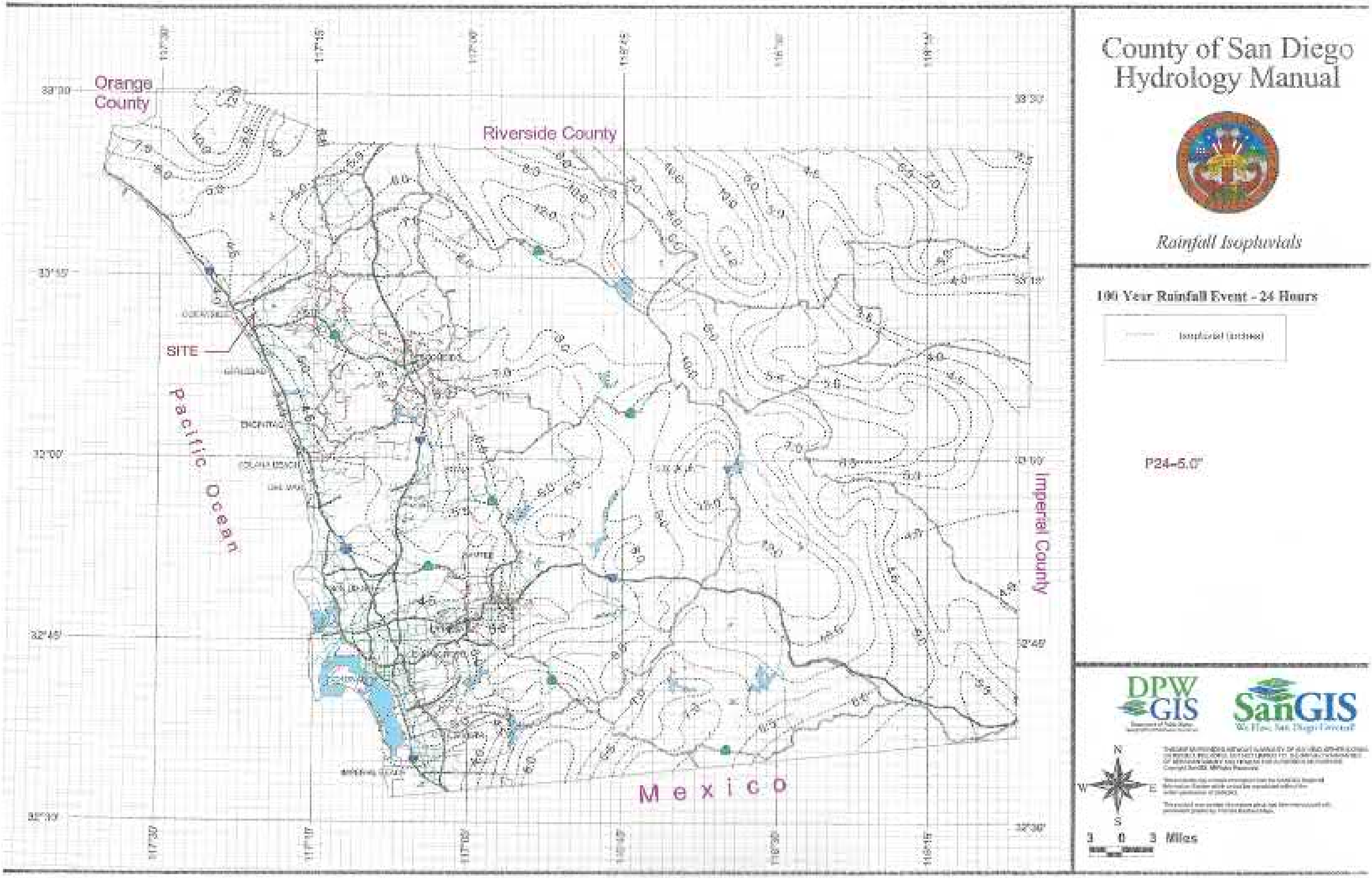
P6=2.7"



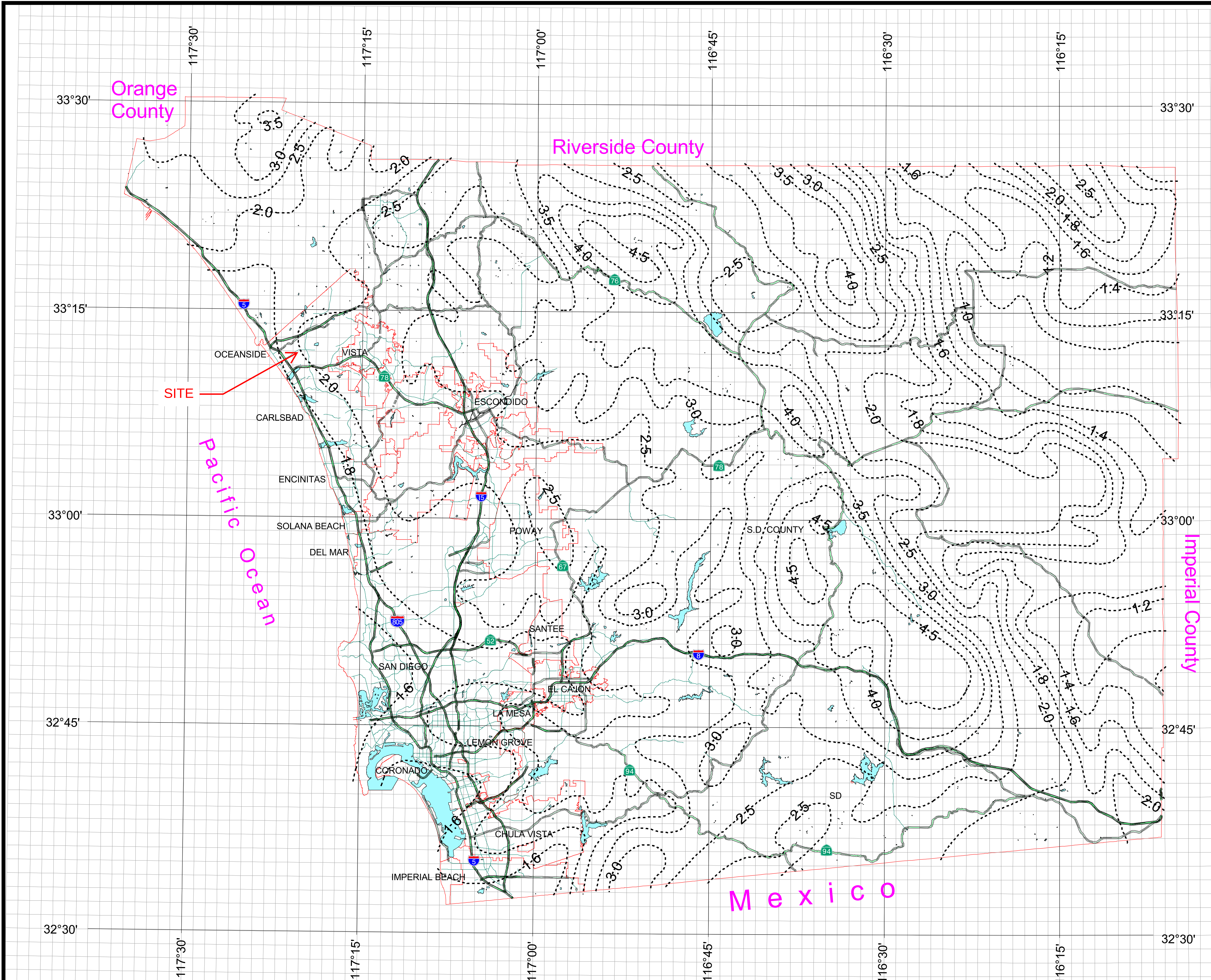
3 0 3 Miles

DPW GIS

SanGIS


County of San Diego
Hydrology Manual
Rainfall Isopluvials
100 Year Rainfall Event - 24 Hours
Isopluvial (inches)
P24=5.0"
Orange County
Riverside County
SITE
Pacific Ocean
Imperial County
Mexico
33°30'
33°15'
33°00'
32°45'
32°30'
DPW GIS
SanGIS
We Have San Diego Covered!
N
S
E
W
3 0 3 Miles

County of San Diego Hydrology Manual



Rainfall Isopluvials

2 Year Rainfall Event - 24 Hours

Isopluvial (inches)

P24= 2.0"

DPW GIS
Department of Public Works
Geographic Information Services

SanGIS
We Have San Diego Covered!

N
W E
S

3 0 3 Miles

APPENDIX 11

HYDRAULIC ANALYSES FOR JEFFERSON OCEANSIDE

HYDRAULIC ANALYSES
FOR
JEFFERSON OCEANSIDE

February 15, 2022

REGISTERED PROFESSIONAL ENGINEER
WAYNE W. CHANG
No. 46548
Exp. 6/30/23
CIVIL
STATE OF CALIFORNIA

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Rancho Santa Fe, CA 92067
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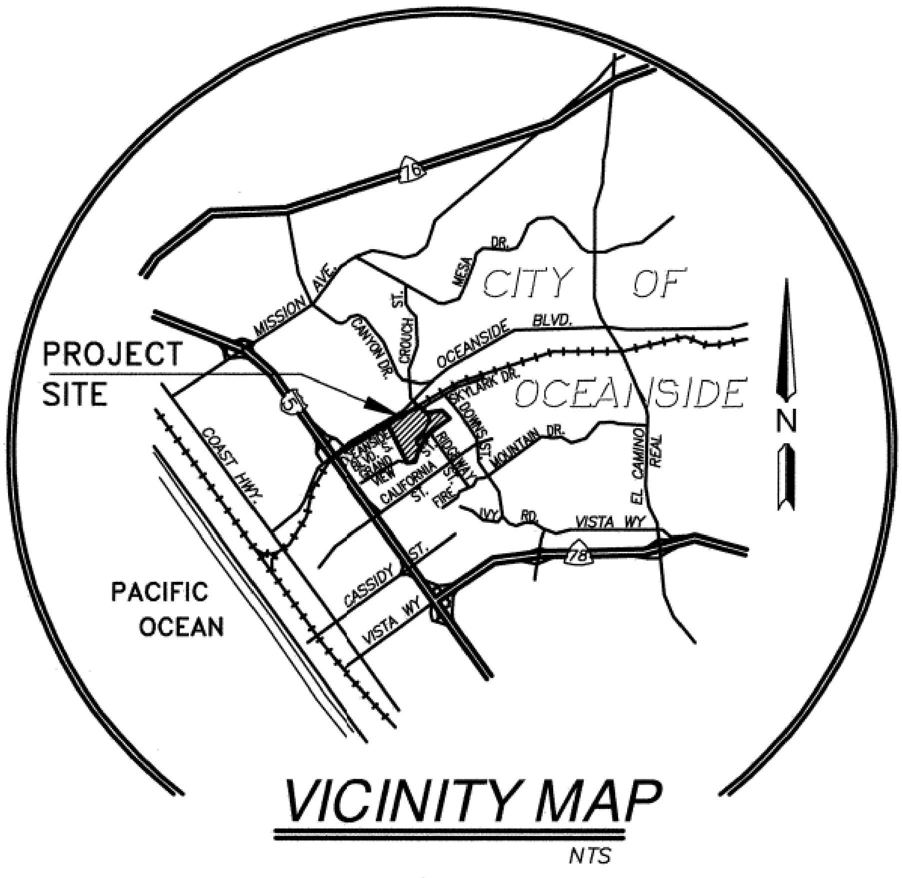
TABLE OF CONTENTS

INTRODUCTION

The Jefferson Oceanside project is pursuing entitlements for a mixed-use, transit-oriented development located southwest of the existing North County Transit District Crouch Street Sprinter Station. The site is bordered by Oceanside Boulevard to the north, Crouch Street to the east and south, and South Oceanside Boulevard to the west (see the Vicinity Map). The development proposes 295 dwelling units, approximately 3,000 square feet of commercial/office and commercial/retail space, and associated amenity spaces. The existing access road from Crouch Street will be extended and connect to South Oceanside Boulevard west of the property boundary. South Oceanside Boulevard will become a dedicated public street with right-of-way widths ranging from 56 feet wide at the eastern side of the project to 72 feet wide west of the property boundary. South Oceanside Boulevard will include added public storm drain, water, and sewer improvements. Fuscoe Engineering has prepared the conceptual grading plans.



Loma Alta Creek flows west along the northerly portion of the site. FEMA has mapped the associated Loma Alta Creek 100-year floodplain and regulatory floodway on Flood Insurance Rate Map No. 06073C0753J dated December 20, 2019. A FIRMette is included after this report text. The private development site is outside the regulatory floodway, but a portion is within the 100-year floodplain. In addition, the required public street improvements encroach into a portion of the floodplain and regulatory floodway. This report contains preliminary 100-year existing and proposed condition hydraulic analyses to determine the project impacts on Loma Alta Creek.

HYDRAULIC ANALYSES

The hydraulic analyses were performed using the US Army Corps of Engineers' HEC-RAS model. This model is approved by FEMA and used frequently for their floodplain and floodway mapping. Existing and proposed condition HEC-RAS hydraulic analyses were performed to determine the proposed grading and public street improvement impacts on the Loma Alta Creek 100-year water surface elevations. The following describes the HEC-RAS input parameters and results.

The HEC-RAS cross-sections are shown on the HEC-RAS Work Map in Appendix A. The cross-sections are at the same locations as the FIRM, where appropriate. HEC-RAS cross-sections 3, 9, and 10 correspond to FIRM cross-sections U, Z, and AA. Additional cross-sections were added to accurately model the project reach. The existing condition cross-sections were created from the project's 1-foot contour interval topographic mapping flown on December 27, 2017, where available. This was supplemented with SANGIS' 2014/2015 2-foot contour interval topographic mapping. Both mapping sources are on NAVD 88. For proposed conditions, Fuscoe Engineering's grading was modeled from cross-sections 2 to 8.

The study reach includes existing Loma Alta Creek channel improvements. Triple 12-foot-wide by 8-foot-high box culverts are located along the NCTD Crouch Street Station between cross-sections 5 and 6. Quadruple (a single 8.5-foot-wide by 5-foot-high and triple 10-foot-wide by 5-foot-high) box culverts are located under Crouch Street between cross-sections 8 and 9. A rectangular concrete channel extends between the two sets of box culverts and upstream of Crouch Street. The culverts and channel were modeled based on the topographic mapping and as-built drawings.

Additional modeling parameters are as follows. A site inspection and review of aerial photographs were used to estimate the roughness coefficients. The roughness coefficients range from n=0.020 for paved areas to n=0.075 for areas with dense vegetation. The effective 100-year flow rate of 3,800 cubic feet per second was used. The downstream starting water surface elevation at cross-section 1 was set at 30 feet NAVD 88 to match the effective water surface contour from the FIRM. HEC-RAS adjusted the downstream elevation to 31.21 feet. Blocked obstructions were used to model existing buildings. The existing and proposed condition HEC-RAS results are included in Appendix A and summarized in Table 1.

Table 1 shows that the existing condition 100-year water surface elevations are generally maintained by the proposed project. The project causes a slight decrease in water surface elevations at cross-section 4 and 5 as well as a minimal increase in water surface elevations at cross-section 6. The existing and proposed condition upstream water surface elevation at cross-section 10 are both 41.40 feet. These match the effective elevation of 41.0 feet, which satisfies FEMA's tie-in requirement of 0.5 feet.

Cross-Section	100-Year Water Surface Elevations, feet		Prop. – Exist., feet
	Existing Conditions	Proposed Conditions	
10	41.40	41.40	0.00
9	41.53	41.53	0.00
8	38.36	38.36	0.00
7	37.25	37.25	0.00
6	36.15	36.17	0.02
5	34.53	34.47	-0.06
4	35.22	35.21	-0.01
3	33.16	33.16	0.00
2	31.68	31.68	0.00
1	31.21	31.21	0.00

Table 1. HEC-RAS Hydraulic Results

CONCLUSION

Entitlement-level hydraulic analyses of Loma Alta Creek have been performed for existing and proposed conditions associated with the Jefferson Oceanside mixed-use project. The results show that the project causes minor changes in the 100-year water surface elevations at three locations. The water surface elevations are reduced slightly at a couple cross-sections. The only project increase in the 100-year water surface elevation occurs at cross-section 6 and is 0.02 feet. This minimal increase does not impact insurable structures.

Section 65.12 from Title 44 of the *Code of Federal Regulations* states that FEMA can allow a project to encroach into the regulatory floodway and increase the 100-year water surface elevations as long as seven conditions are met. The conditions are included after this report text and will be met by the project as follows:

1. A Conditional Letter of Map Revision (CLOMR) will be prepared and processed.

2. The current project is the preferred alternative.

3. Individual legal notices will be sent to impacted property owners as part of the CLOMR process.

4. The city of Oceanside will be required to sign the CLOMR prior to submittal to FEMA for their review and approval.

5. As mentioned above, no structures will be impacted by the minor increase in the 100-year water surface elevation.

6. The base flood elevations will be revised as documented in the CLOMR and LOMR.

7. The floodway will be revised as documented in the CLOMR and LOMR.

The results indicate that the project will not cause significant impacts, and it is feasible to obtain a FEMA Conditional Letter of Map Revision and Letter of Map Revision. The CLOMR and LOMR will include existing and proposed condition models similar to those included in this report. In addition, they will include the effective FEMA hydraulic model as well as a corrective effective model if corrections to the effective model are needed.

National Flood Hazard Layer FIRMette

FEMA

117°21'30"W 33°11'52"N

117°20'52"W 33°11'22"N

0 250 500 1,000 1,500 2,000 Feet

1:6,000

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- B 20.2 / 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
- 8 Coastal Transect
- 21 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 5/11/2021 at 1:15 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

sought or when the plan for a previously recognized system is revised in any manner. All maintenance activities must be under the jurisdiction of a Federal or State agency, an agency created by Federal or State law, or an agency of a community participating in the NFIP that must assume ultimate responsibility for maintenance. This plan must document the formal procedure that ensures that the stability, height, and overall integrity of the levee and its associated structures and systems are maintained. At a minimum, maintenance plans shall specify the maintenance activities to be performed, the frequency of their performance, and the person by name or title responsible for their performance.

(e) *Certification requirements.* Data submitted to support that a given levee system complies with the structural requirements set forth in paragraphs (b)(1) through (7) of this section must be certified by a registered professional engineer. Also, certified as-built plans of the levee must be submitted. Certifications are subject to the definition given at § 65.2 of this subchapter. In lieu of these structural requirements, a Federal agency with responsibility for levee design may certify that the levee has been adequately designed and constructed to provide protection against the base flood.

[51 FR 30316, Aug. 25, 1986]

§ 65.11 Evaluation of sand dunes in mapping coastal flood hazard areas.

(a) *General conditions.* For purposes of the NFIP, FEMA will consider storm-induced dune erosion potential in its determination of coastal flood hazards and risk mapping efforts. The criterion to be used in the evaluation of dune erosion will apply to primary frontal dunes as defined in § 59.1, but does not apply to artificially designed and constructed dunes that are not well-established with long-standing vegetative cover, such as the placement of sand materials in a dune-like formation.

(b) *Evaluation criterion.* Primary frontal dunes will not be considered as effective barriers to base flood storm surges and associated wave action where the cross-sectional area of the primary frontal dune, as measured perpendicular to the shoreline and above the 100-year stillwater flood elevation and seaward of the dune crest, is equal to, or less than, 540 square feet.

(c) *Exceptions.* Exceptions to the evaluation criterion may be granted where it can be demonstrated through authoritative historical documentation that the primary frontal dunes at a specific site withstood previous base flood storm surges and associated wave action.

[53 FR 16279, May 6, 1988]

§ 65.12 Revision of flood insurance rate maps to reflect base flood elevations caused by proposed encroachments.

(a) When a community proposes to permit encroachments upon the flood plain when a regulatory floodway has not been adopted or to permit encroachments upon an adopted regulatory floodway which will cause base flood elevation increases in excess of those permitted under paragraphs (c)(10) or (d)(3) of § 60.3 of this subchapter, the community shall apply to the Federal Insurance Administrator for conditional approval of such action prior to permitting the encroachments to occur and shall submit the following as part of its application:

(1) A request for conditional approval of map change and the appropriate initial fee as specified by § 72.3 of this subchapter or a request for exemption from fees as specified by § 72.5 of this subchapter, whichever is appropriate;

(2) An evaluation of alternatives which would not result in a base flood elevation increase above that permitted under paragraphs (c)(10) or (d)(3) of § 60.3 of this subchapter demonstrating why these alternatives are not feasible;

(3) Documentation of individual legal notice to all impacted property owners within and outside of the community, explaining the impact of the proposed action on their property.

(4) Concurrence of the Chief Executive Officer of any other communities impacted by the proposed actions;

(5) Certification that no structures are located in areas which would be impacted by the increased base flood elevation;

(6) A request for revision of base flood elevation determination according to the provisions of § 65.6 of this part;

(7) A request for floodway revision in accordance with the provisions of § 65.7 of this part;

(b) Upon receipt of the Federal Insurance Administrator's conditional approval of map change and prior to approving the proposed encroachments, a community shall provide evidence to the Federal Insurance Administrator of the adoption of flood plain management ordinances incorporating the increased base flood elevations and/or revised floodway reflecting the post-project condition.

(c) Upon completion of the proposed encroachments, a community shall provide as-built certifications in accordance with the provisions of § 65.3 of this part. The Federal Insurance Administrator will initiate a final map revision upon receipt of such certifications in accordance with part 67 of this subchapter.

[53 FR 16279, May 6, 1988]

§ 65.13 Mapping and map revisions for areas subject to alluvial fan flooding.

This section describes the procedures to be followed and the types of information FEMA needs to recognize on a NFIP map that a structural flood control measure provides protection from the base flood in an area subject to alluvial fan flooding. This information must be supplied to FEMA by the community or other party seeking recognition of such a flood control measure at the time a flood risk study or restudy is conducted, when a map revision under the provisions of part 65 of this subchapter is sought, and upon request by the Federal Insurance Administrator during the review of previously recognized flood control measures. The FEMA review will be for the sole purpose of establishing appropriate risk zone determinations for NFIP maps and shall not constitute a determination by FEMA as to how the flood control measure will perform in a flood event.

(a) The applicable provisions of §§ 65.2, 65.3, 65.4, 65.6, 65.8 and 65.10 shall also apply to FIRM revisions involving alluvial fan flooding.

(b) The provisions of § 65.5 regarding map revisions based on fill and the provisions of part 70 of this chapter shall not apply to FIRM revisions involving alluvial fan flooding. In general, elevations of a parcel of land or a structure by fill or other means, will not serve as a basis for removing areas subject to alluvial fan flooding from an area of special food hazards.

(c) FEMA will credit on NFIP maps only major structural flood control measures whose design and construction are supported by sound engineering analyses which demonstrate that the measures will effectively eliminate alluvial fan flood hazards from the area protected by such measures. The provided analyses must include, but are not necessarily limited to, the following:

(1) Engineering analyses that quantify the discharges and volumes of water, debris, and sediment movement associated with the flood that has a one-percent probability of being exceeded in any year at the apex under current watershed conditions and under potential adverse conditions (e.g., deforestation of the watershed by fire). The potential for debris flow and sediment movement must be assessed using an engineering method acceptable to FEMA. The assessment should consider the characteristics and availability of sediment in the drainage basin above the apex and on the alluvial fan.

(2) Engineering analyses showing that the measures will accommodate the estimated peak discharges and volumes of water, debris, and sediment, as determined in accordance with paragraph (c)(1) of this section, and will withstand the associated hydrodynamic and hydrostatic forces.

(3) Engineering analyses showing that the measures have been designed to withstand the potential erosion and scour associated with estimated discharges.

(4) Engineering analyses or evidence showing that the measures will provide protection from hazards associated with the possible relocation of flow paths from other parts of the fan.

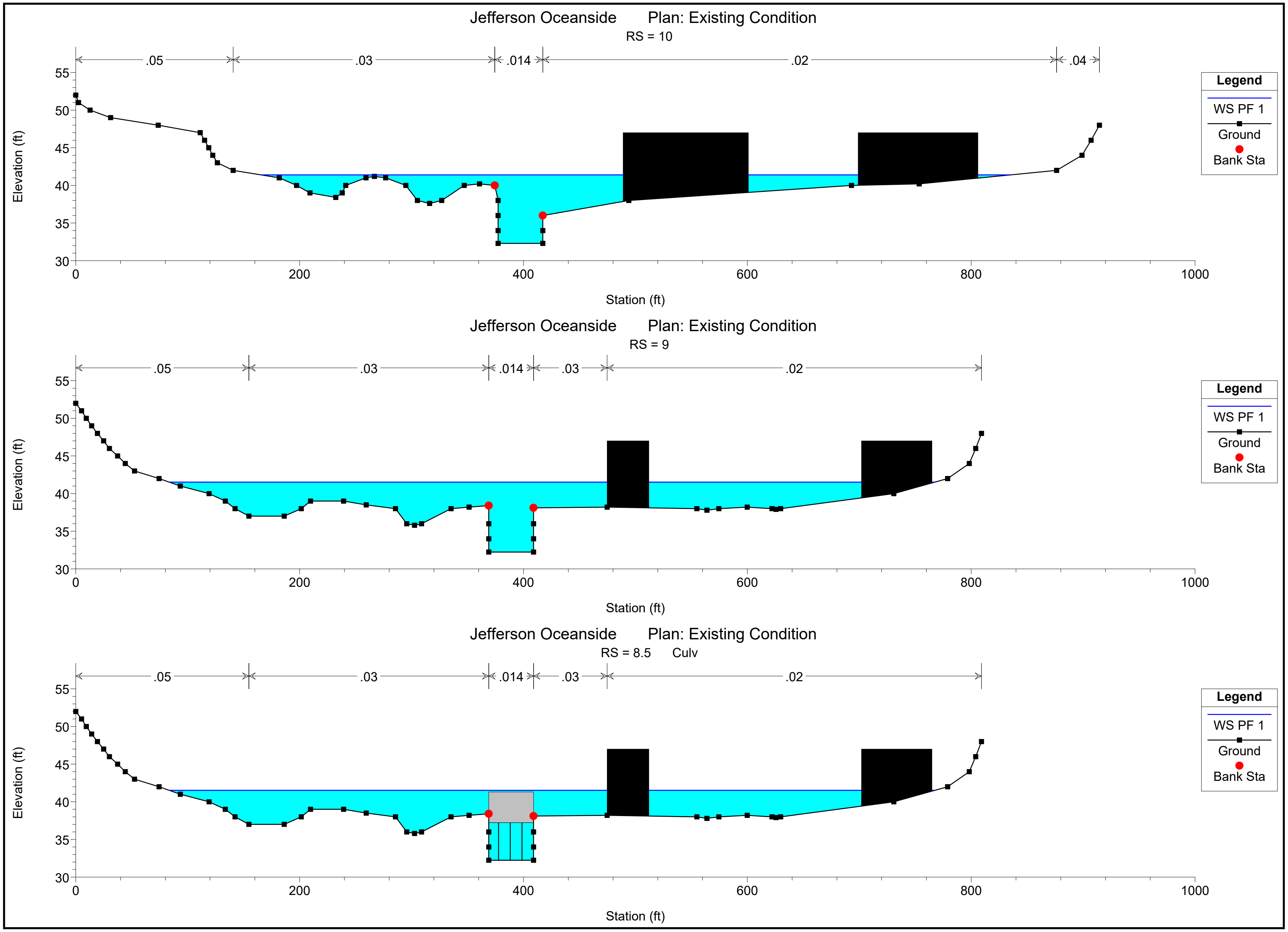
APPENDIX A

HEC-RAS RESULTS
AND WORK MAP

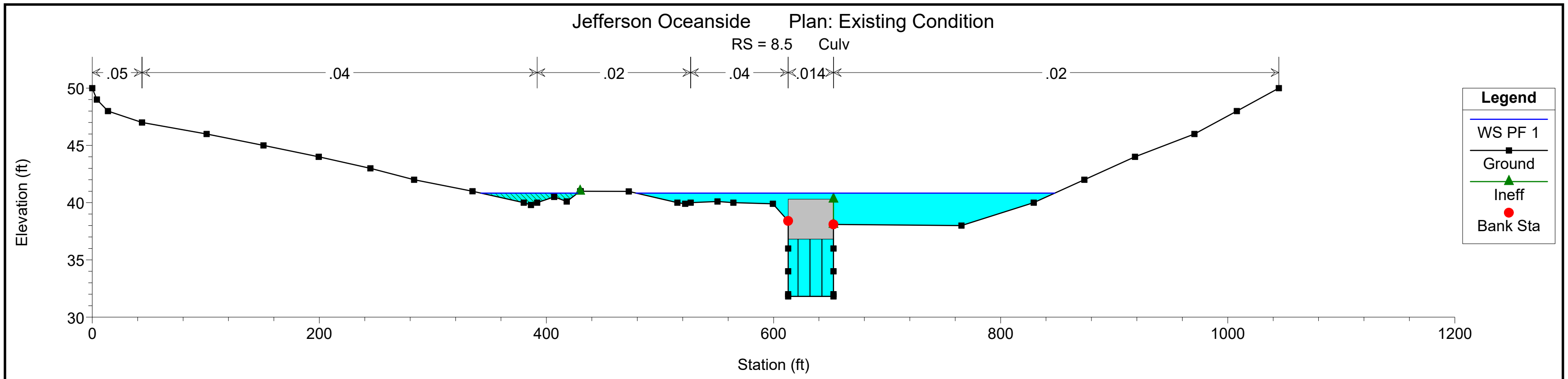
Existing Conditions

HEC-RAS Plan: Exist Cond River: RIVER-1 Reach: Reach-1 Profile: PF 1

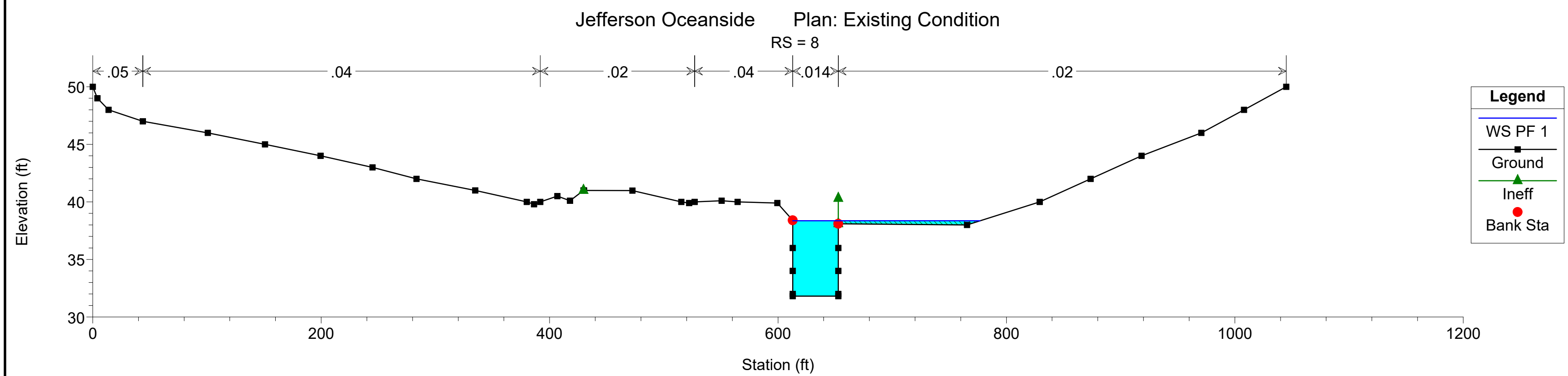
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	10	PF 1	3800.0	32.30	41.40		41.74	0.000231	5.90	1223.74	450.62	0.35
Reach-1	9	PF 1	3800.0	32.23	41.53	39.41	41.64	0.000106	4.06	2138.62	583.83	0.23
Reach-1	8.5		Culvert									
Reach-1	8	PF 1	3800.0	31.81	38.36	38.36	41.63	0.002210	14.51	261.95	164.00	1.00
Reach-1	7	PF 1	3800.0	30.70	37.25	37.25	40.52	0.002153	14.50	262.02	48.71	1.00
Reach-1	6	PF 1	3800.0	29.57	36.15	36.15	39.39	0.002179	14.44	263.77	49.46	0.99
Reach-1	5.5		Culvert									
Reach-1	5	PF 1	3800.0	27.55	34.53	34.11	37.39	0.001804	13.58	280.63	43.84	0.91
Reach-1	4	PF 1	3800.0	28.00	35.22		35.98	0.006438	6.23	578.27	255.96	0.46
Reach-1	3	PF 1	3800.0	26.00	33.16	32.79	34.13	0.008138	6.60	531.33	236.96	0.50
Reach-1	2	PF 1	3800.0	24.86	31.68	31.68	32.89	0.011124	9.03	431.12	175.42	0.78
Reach-1	1	PF 1	3800.0	24.50	31.21	31.21	32.17	0.001147	9.45	577.15	263.67	0.79



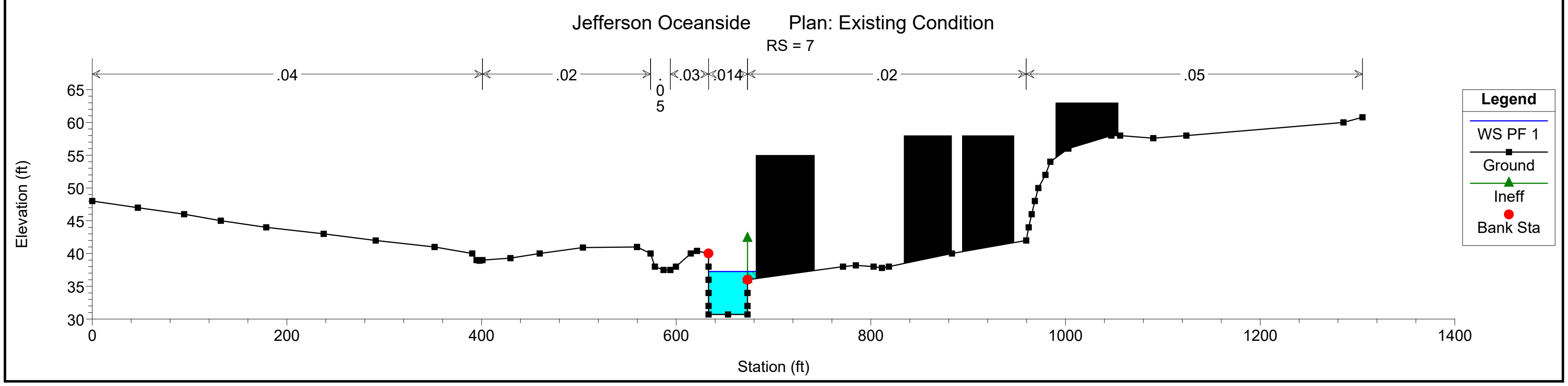
Jefferson Oceanside Plan: Existing Condition
RS = 10
.05
.03
.014
.02
.04
Elevation (ft)
Station (ft)
Legend
WS PF 1
Ground
Bank Sta
Jefferson Oceanside Plan: Existing Condition
RS = 9
.05
.03
.014
.03
.02
Elevation (ft)
Station (ft)
Legend
WS PF 1
Ground
Bank Sta
Jefferson Oceanside Plan: Existing Condition
RS = 8.5 Culv
.05
.03
.014
.03
.02
Elevation (ft)
Station (ft)
Legend
WS PF 1
Ground
Bank Sta



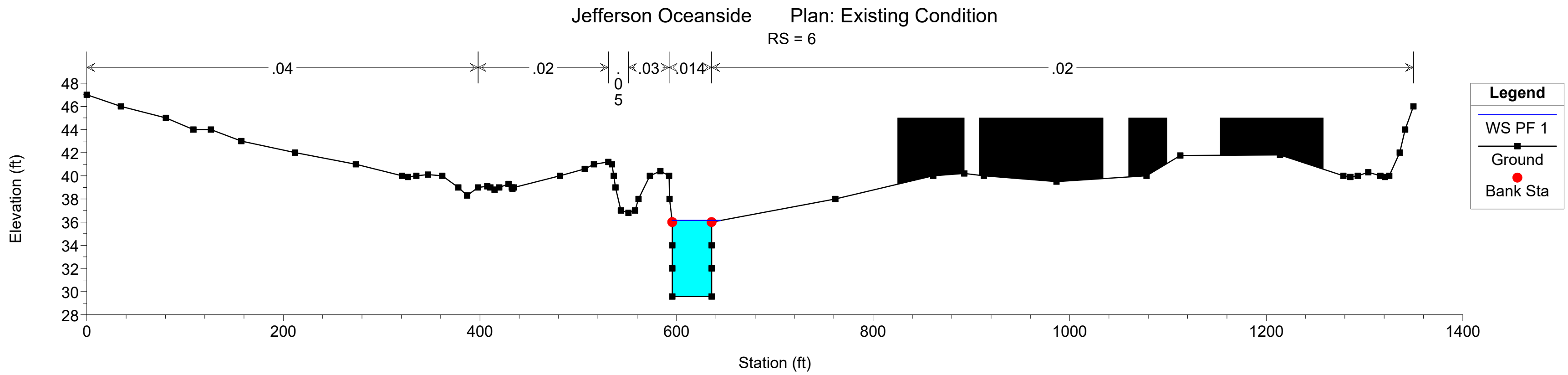
Jefferson Oceanside Plan: Existing Condition
RS = 8.5 Culv
.05
.04
.02
.04
.014
.02
Elevation (ft)
Station (ft)
Legend
WS PF 1
Ground
Ineff
Bank Sta

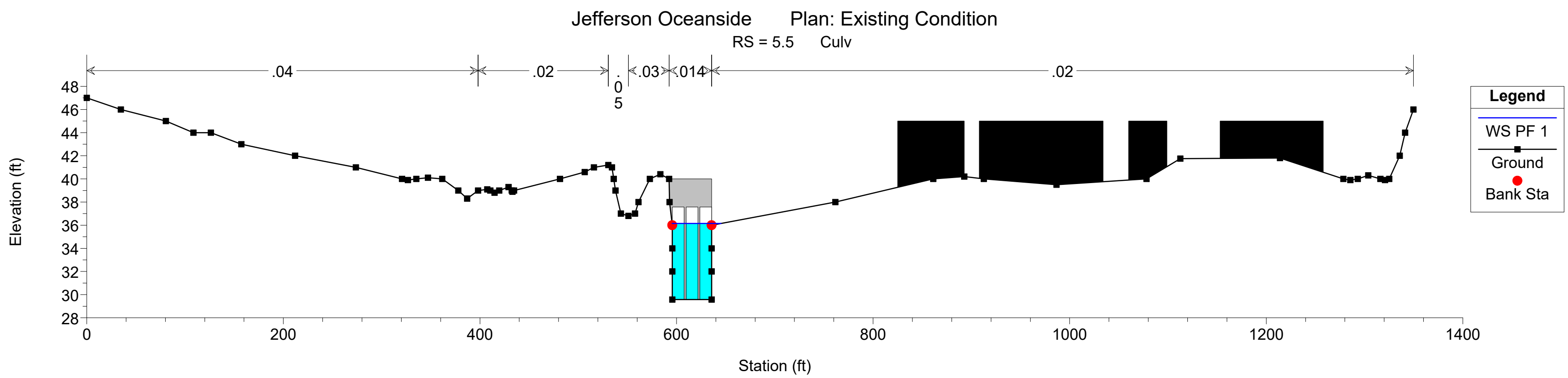


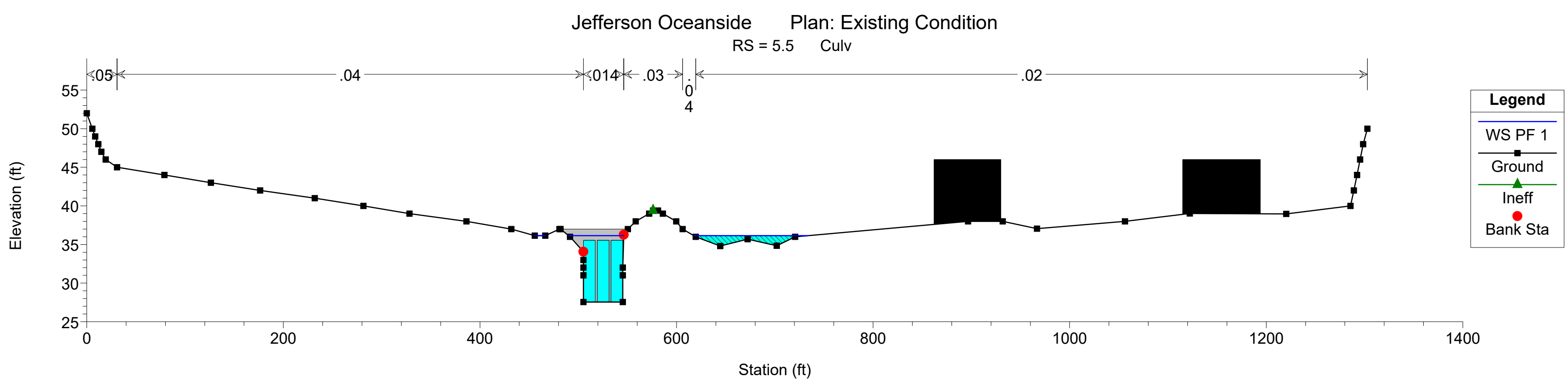
Jefferson Oceanside Plan: Existing Condition
RS = 8
.05
.04
.02
.04
.014
.02
Elevation (ft)
Station (ft)
Legend
WS PF 1
Ground
Ineff
Bank Sta



Jefferson Oceanside Plan: Existing Condition
RS = 7
.04
.02
.03
.014
.02
.05
Elevation (ft)
Station (ft)
Legend
WS PF 1
Ground
Ineff
Bank Sta


Jefferson Oceanside Plan: Existing Condition
RS = 6
.04
.02
.0 5
.03
.014
.02
Elevation (ft)
Station (ft)
Legend
WS PF 1
Ground
Bank Sta


Jefferson Oceanside Plan: Existing Condition
RS = 5.5 Culv
.04
.02
.0 5
.03
.014
.02
Elevation (ft)
Station (ft)
Legend
WS PF 1
Ground
Bank Sta


Jefferson Oceanside Plan: Existing Condition
RS = 5.5 Culv
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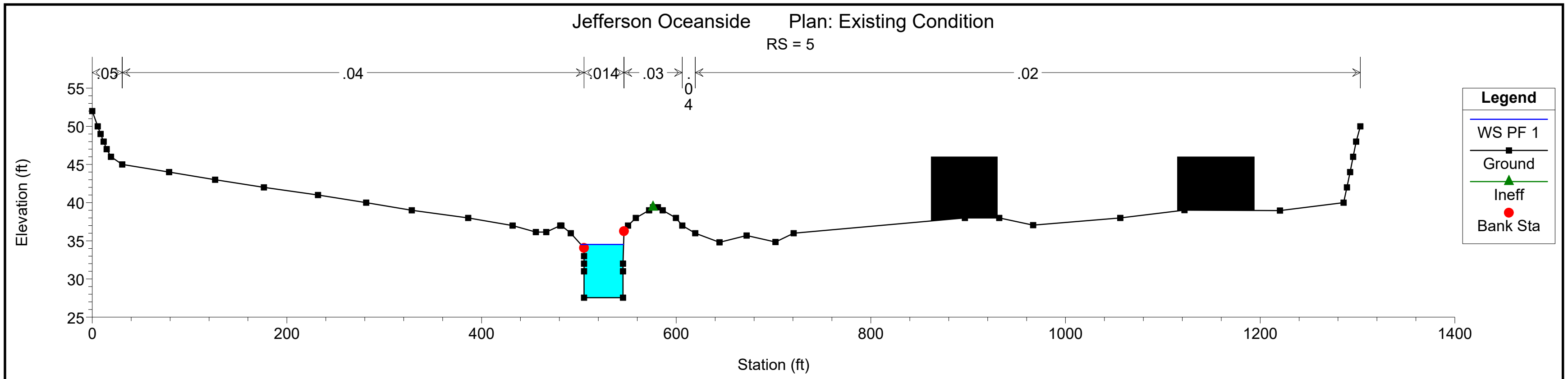
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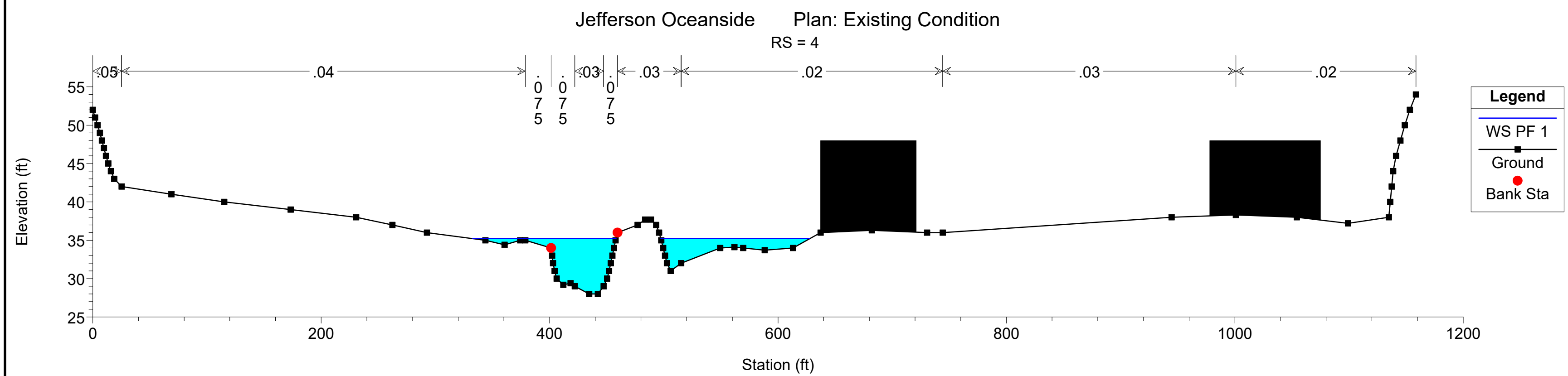
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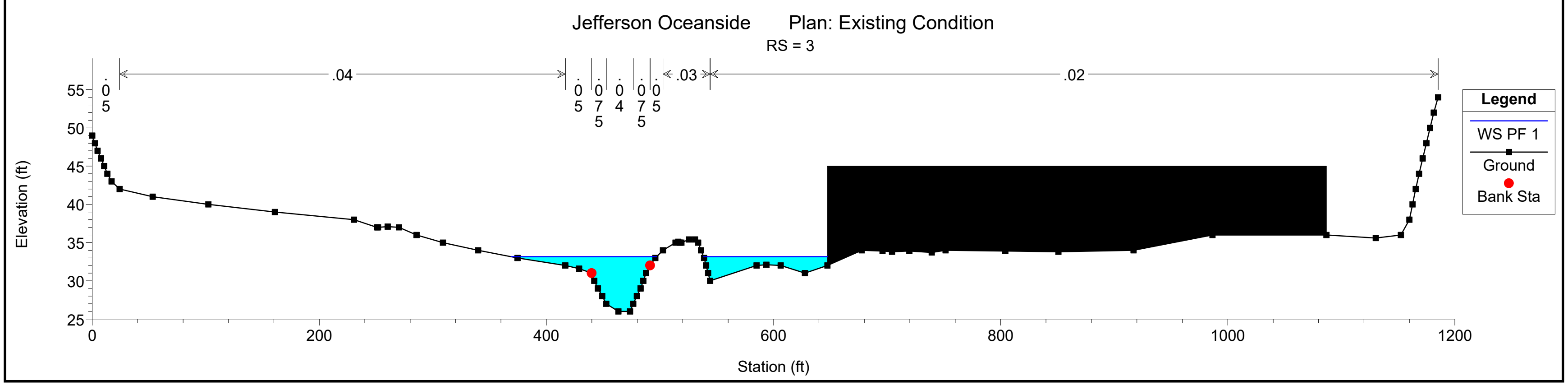
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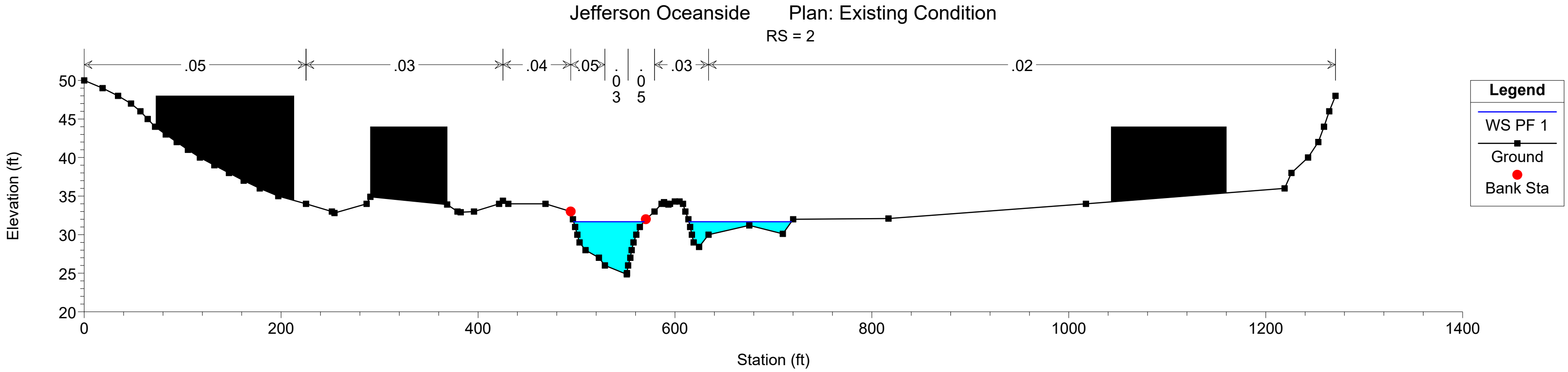
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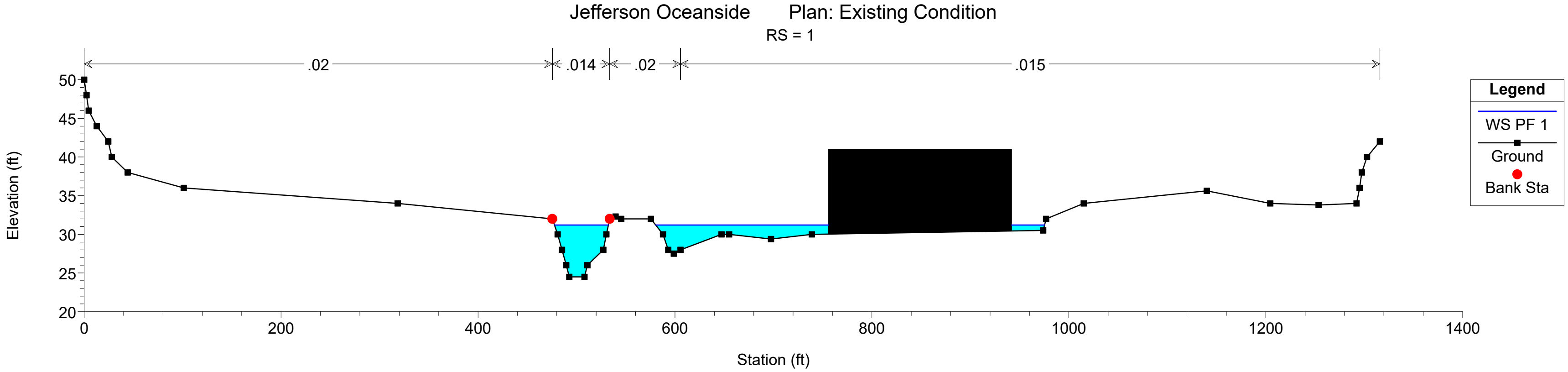
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Elevation (ft)
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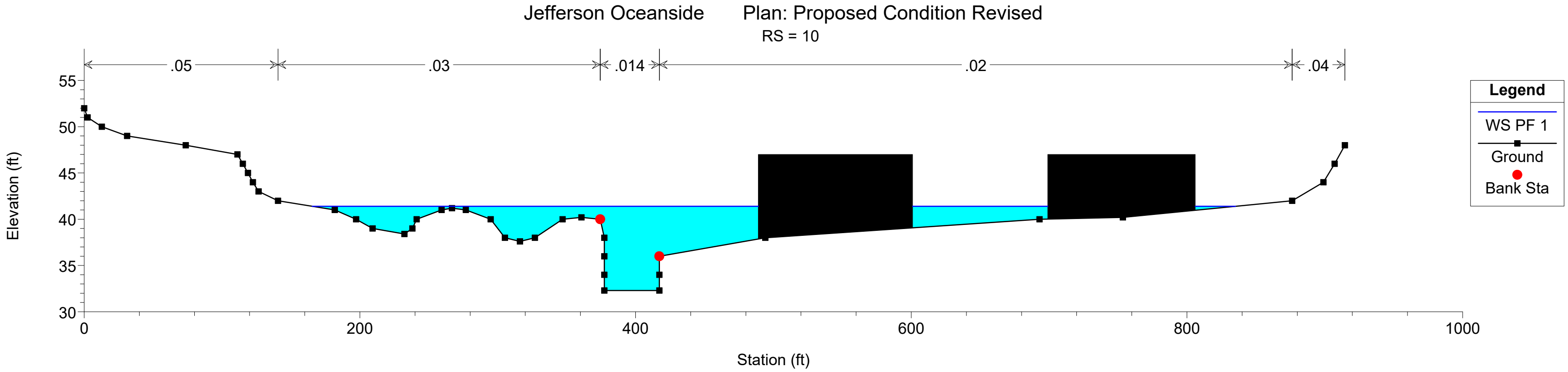
Ground
Bank Sta

Proposed Conditions

HEC-RAS Plan: Prop Cond Rev River: RIVER-1 Reach: Reach-1 Profile: PF 1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	10	PF 1	3800.0	32.30	41.40		41.74	0.000231	5.90	1223.74	450.62	0.35
Reach-1	9	PF 1	3800.0	32.23	41.53	39.41	41.64	0.000106	4.06	2138.62	583.83	0.23
Reach-1	8.5		Culvert									
Reach-1	8	PF 1	3800.0	31.81	38.36	38.36	41.63	0.002210	14.51	261.95	164.00	1.00
Reach-1	7	PF 1	3800.0	30.70	37.25	37.25	40.52	0.002153	14.50	262.02	48.71	1.00
Reach-1	6	PF 1	3800.0	29.57	36.17	36.17	39.39	0.002158	14.40	264.72	50.68	0.99
Reach-1	5.5		Culvert									
Reach-1	5	PF 1	3800.0	27.55	34.47	34.11	37.38	0.001857	13.70	277.90	43.38	0.92
Reach-1	4	PF 1	3800.0	28.00	35.21		35.93	0.006223	6.12	586.12	261.54	0.45
Reach-1	3	PF 1	3800.0	26.00	33.16	32.92	34.12	0.008064	6.57	522.34	239.10	0.50
Reach-1	2	PF 1	3800.0	24.86	31.68	31.68	32.89	0.011124	9.03	431.12	175.42	0.78
Reach-1	1	PF 1	3800.0	24.50	31.21	31.21	32.17	0.001147	9.45	577.15	263.67	0.79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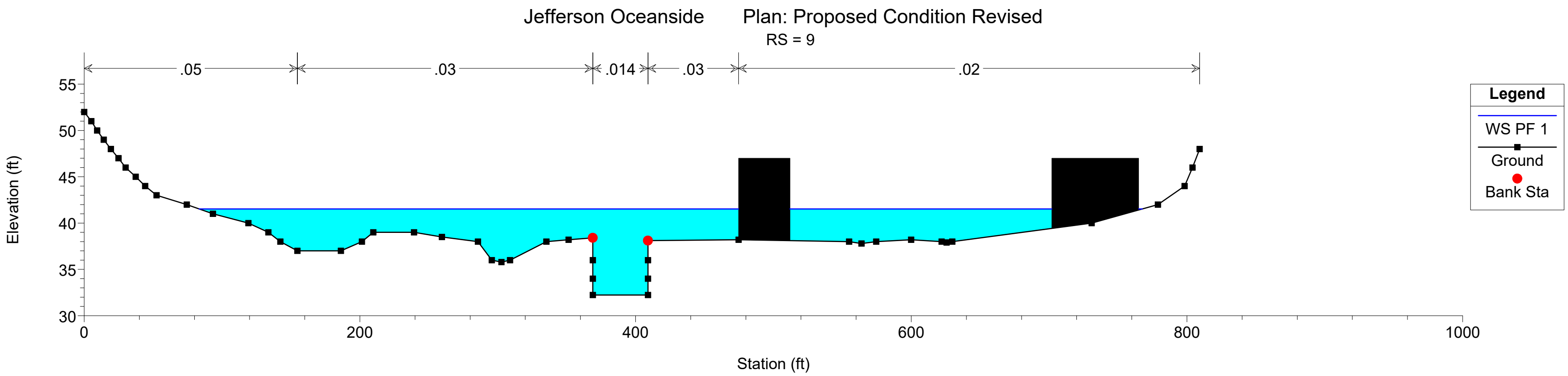
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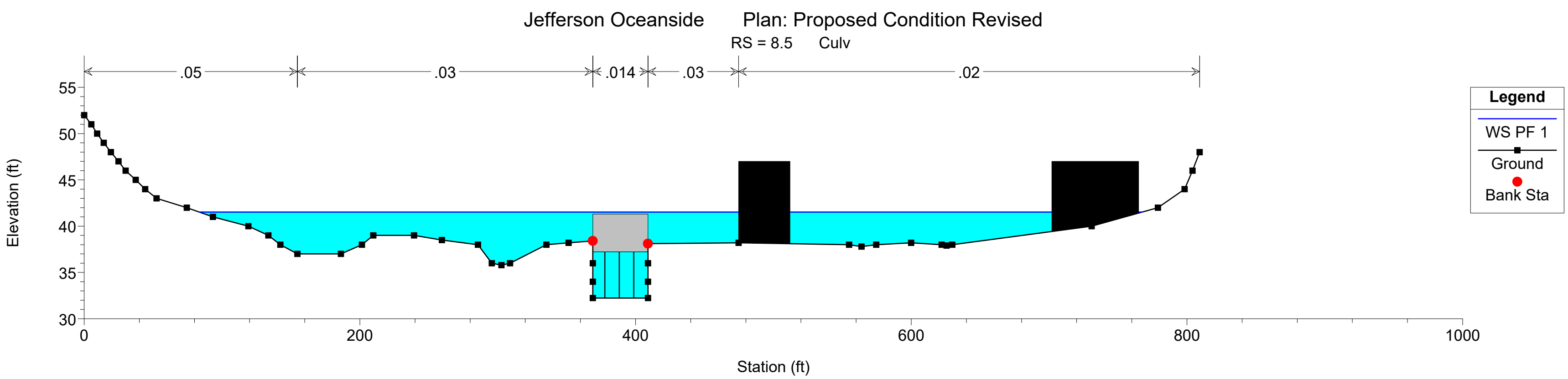
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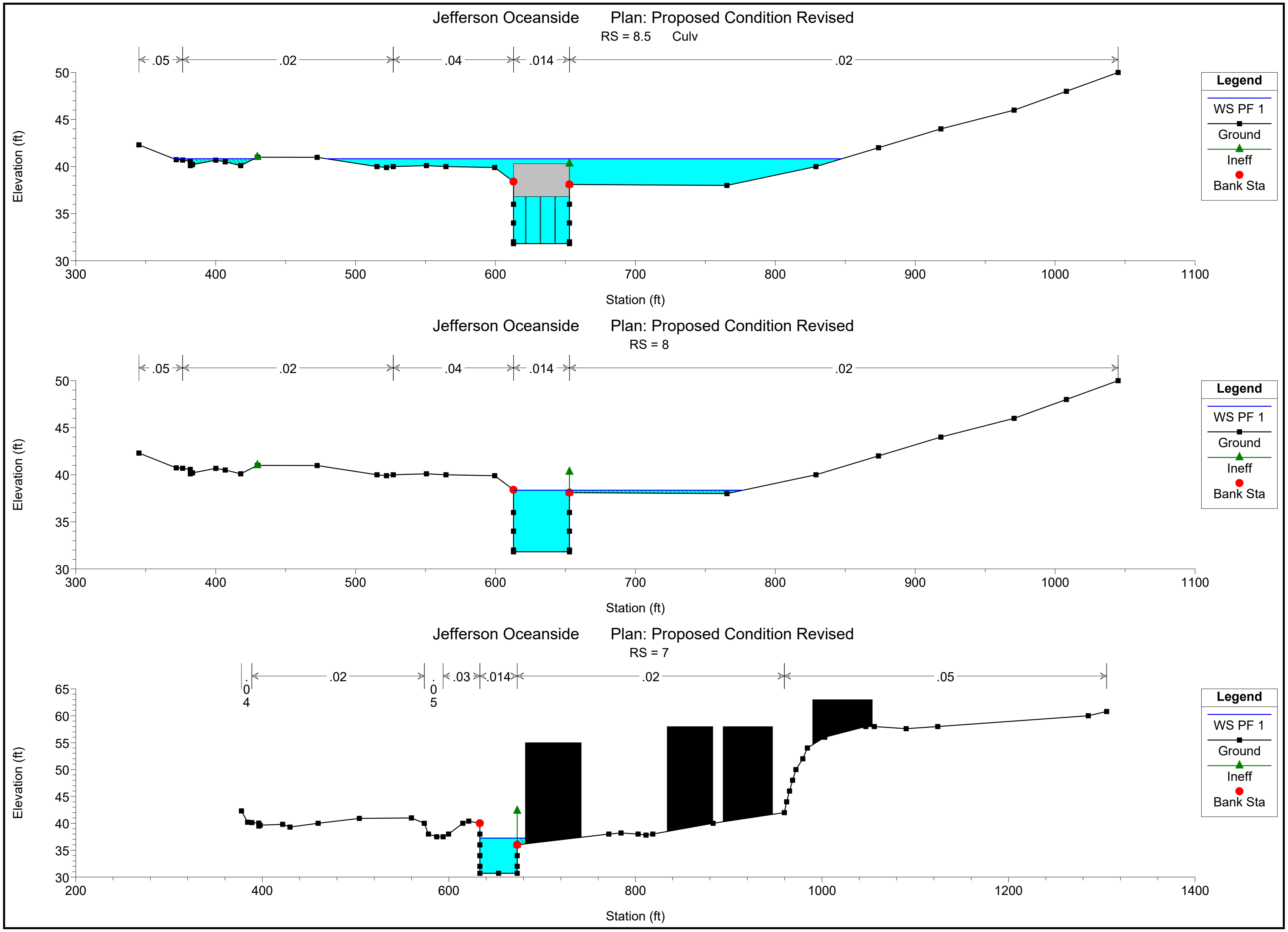

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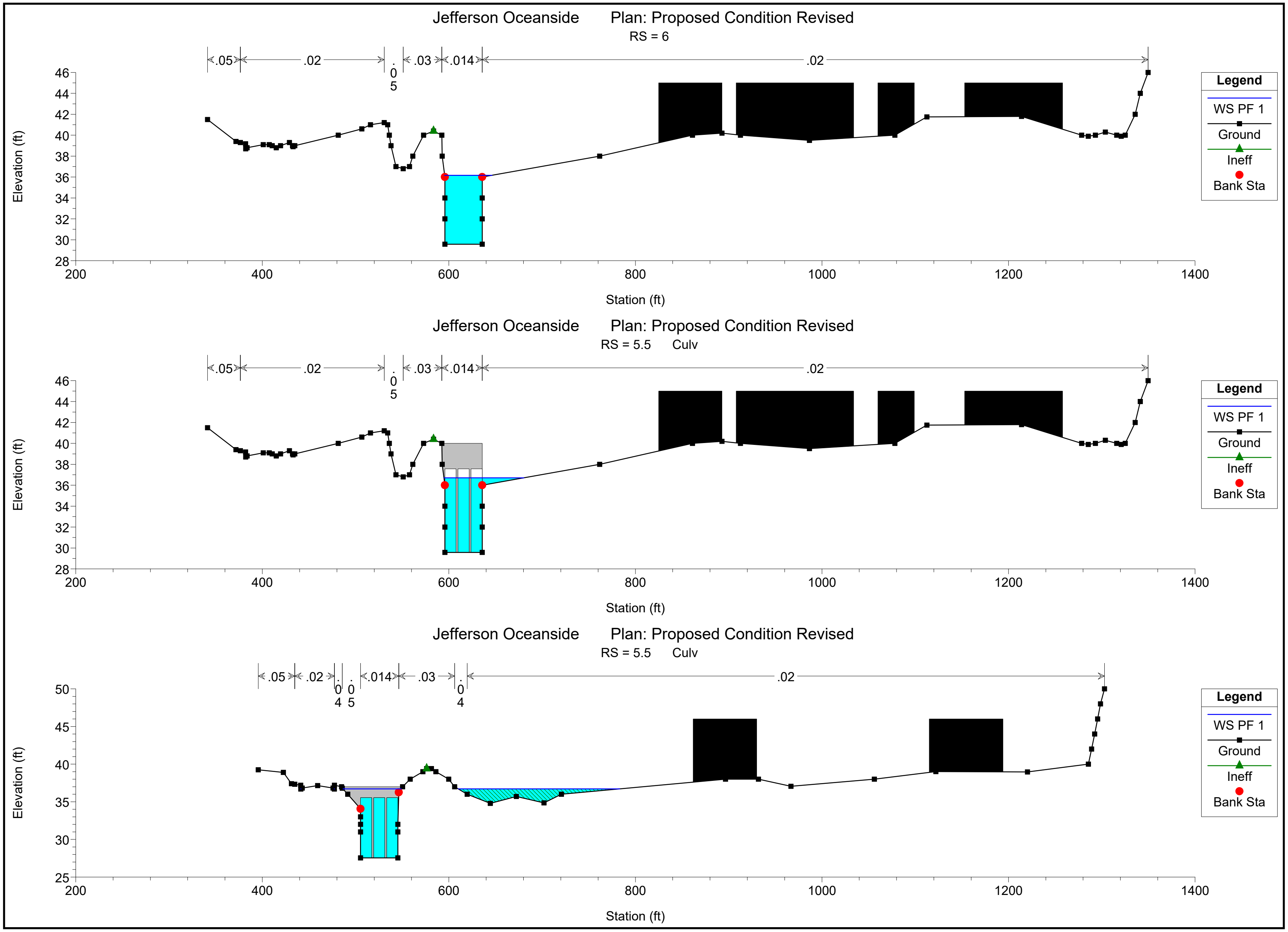
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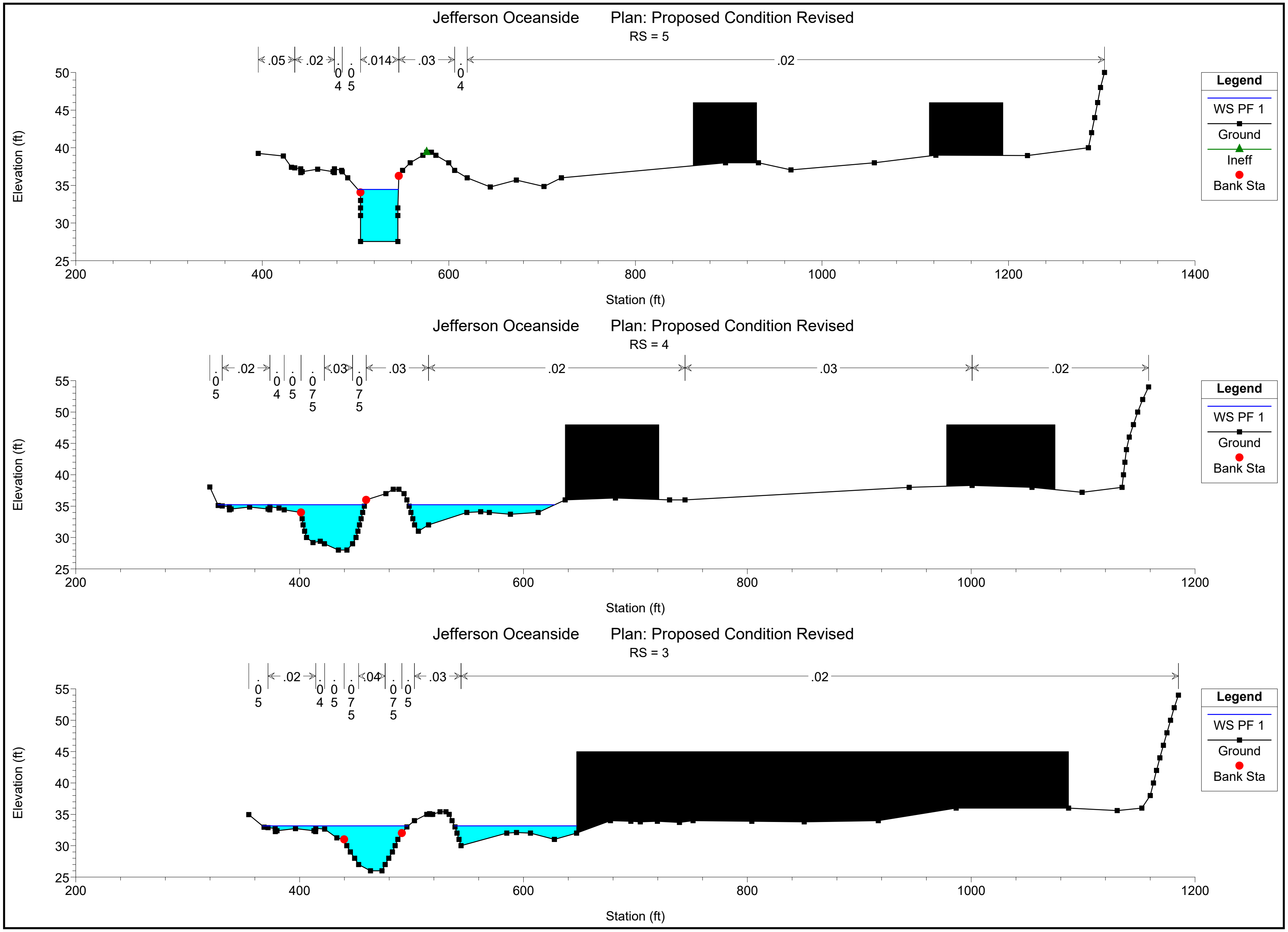
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Station (ft)
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Jefferson Oceanside Plan: Proposed Condition Revised

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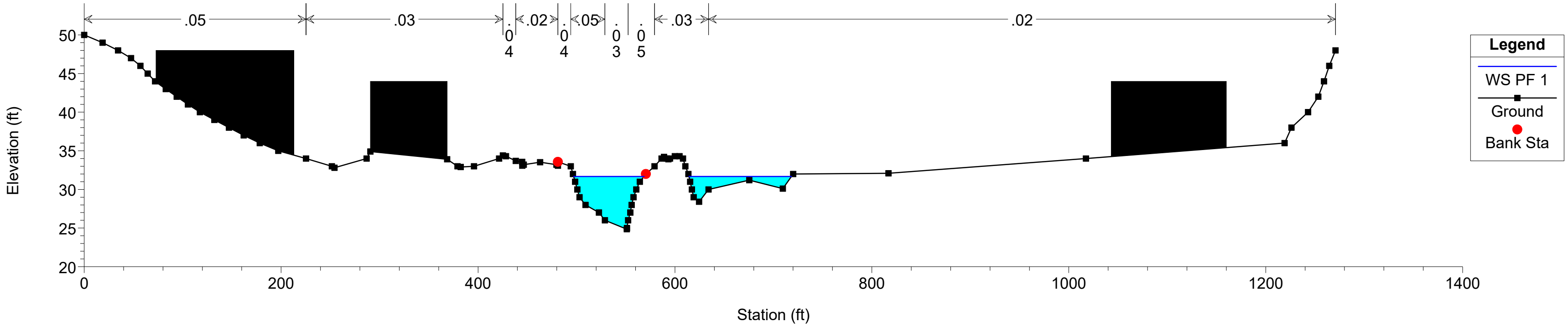

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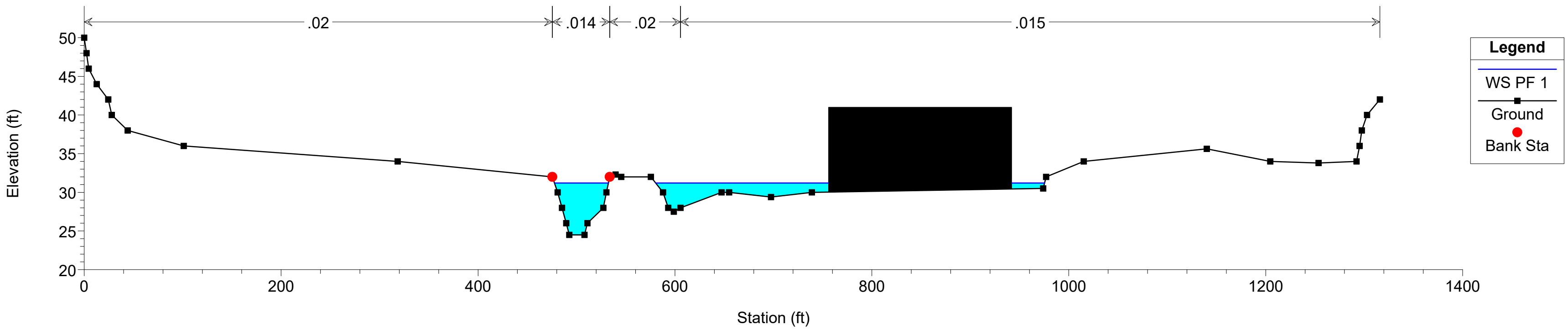

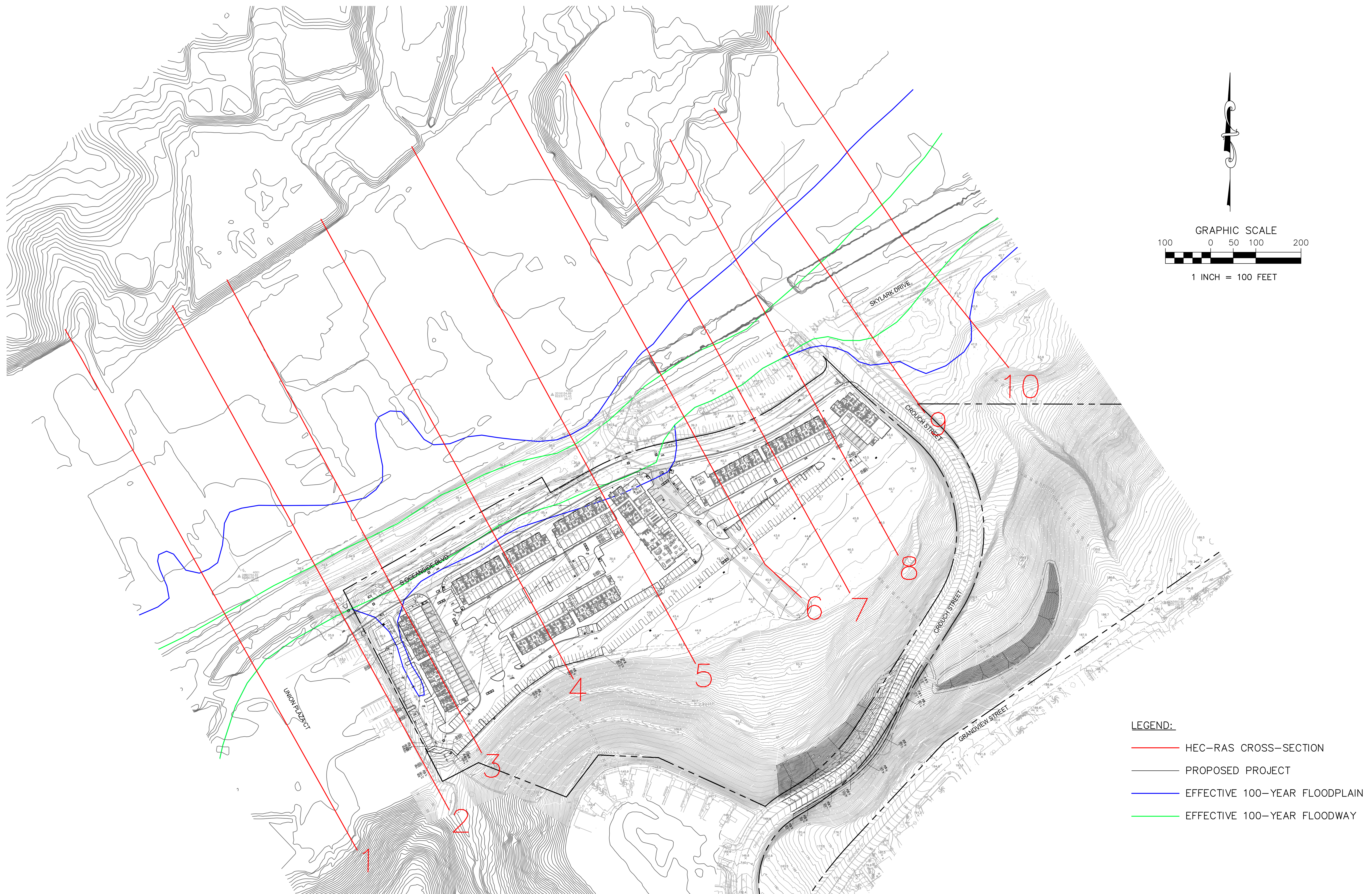

HEC-RAS WORK MAP

ATTACHMENT 6
Geotechnical and Groundwater Investigation Report

This is the cover sheet for Attachment 6.

PRELIMINARY GEOTECHNICAL INVESTIGATION, PROPOSED OCEAN CREEK TOWN CENTER OCEANSIDE, CALIFORNIA 92054

Prepared For:

JPI REAL ESTATE ACQUISITION, LLC

12250 El Camino Real, Suite 380
San Diego, California 92130

Project No. 12085.002

September 20, 2019

Leighton and Associates, Inc.

A LEIGHTON GROUP COMPANY

Leighton and Associates, Inc.
A LEIGHTON GROUP COMPANY

September 20, 2019

Project No. 12085.002

JPI Real Estate Acquisition, LLC
12250 El Camino Real, Suite 380
San Diego, California 92130

Attention: Mr. Joel Warsh

Subject: Preliminary Geotechnical Investigation, Proposed Ocean Creek Town Center Oceanside, California 92054

In accordance with the request and authorization of representatives of JPI, we have conducted a preliminary investigation of the proposed development of Ocean Creek Town Center in Oceanside, California (Figure 1). The purpose of this geotechnical study was to evaluate the pertinent geotechnical conditions of the site and to provide preliminary conclusions and recommendations relative to the grading and design of the proposed project. The accompanying report presents a summary of our evaluation and provides geotechnical findings, conclusions, and recommendations relative to the proposed development.

Based on the results of our preliminary geotechnical investigation of the site, it is our professional opinion that the proposed development is feasible from a geotechnical standpoint, provided the conclusions and recommendations presented in this report are incorporated into the project plans and specifications and utilized during the grading and construction phases of site development.

If you have any questions regarding our report, please do not hesitate to contact this office. We appreciate this opportunity to be of service.

Respectfully submitted

LEIGHTON AND ASSOCIATES, INC.

PROFESSIONAL GEOLOGIST MICHAEL D. JENSEN NO. 2457 CERTIFIED ENGINEERING GEOLOGIST Exp. 7/31/20 STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER WILLIAM D. OLSON No. 45283 Exp. 9/30/20 CIVIL STATE OF CALIFORNIA

William D. Olson, RCE 45283
Associate Engineer

Mike D. Jensen, CEG 2457
Associate Geologist

Distribution: (1) Digital Copy by E-mail

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1.0 INTRODUCTION

1.1 Introduction and Purpose

This report presents the results of our preliminary geotechnical investigation for the proposed development of Ocean Creek Residential Community in Oceanside, California (Figure 1). The purpose of this preliminary geotechnical investigation was to evaluate the existing geotechnical conditions of the site and to provide preliminary conclusions and recommendations relative to the proposed development of the property. This report presents a summary of the findings, conclusions, and recommendations of our preliminary geotechnical investigation for the site. Previous topographic plans prepared by O'Day Consultants were utilized as our base map for the geotechnical investigation (Plate 1).

1.2 Scope of Services

Our scope of services performed during this geotechnical investigation included the following:

- Review of available pertinent, published, and unpublished geologic literature and maps and aerial photographs applicable to the site (Appendix A).

- Review of available geotechnical reports applicable to the site (Appendix A).

- Coordination with an Underground Service Alert for identification of existing underground utilities.

- Geologic field reconnaissance of the property and general vicinity.

- An additional subsurface investigation consisting of the excavation of three additional large- diameter borings (Borings B-1 through B-3) and three additional Cone Penetration Test (CPT) soundings (CPT-1 through CPT-3). Logs of the borings and soundings from our current field investigation are provided in Appendix B. The approximate locations of the borings and soundings are presented on the Geotechnical Map (Plate 1).

- Analysis of the findings, conclusions, and recommendations of the previous geotechnical investigations by Leighton and Associates and others (Action

Geotechnical Consultants, 1984a and 1984b; G.A. Nicoll and Associates, 1992; and Leighton, 1985a and 1986a, 2005, 2018). The previous excavated borings and trenches (including excavations performed by others) are presented in Appendix B and shown on the Geotechnical Map (Plate 1). Appropriate laboratory testing applicable to the project is included as Appendix D.

- Update of seven geologic cross-sections (Cross-Sections A-A' through G-G'): The geologic cross-sections are presented as Plates 2 through 5. The approximate locations of the cross-sections are presented on the Geotechnical Map (Plate 1).

- Previous laboratory testing of representative soil samples obtained from the subsurface exploration. Results of these tests are presented in Appendix C, with the exception of moisture/density determinations, which are provided on the boring logs (included in Appendix B).

- Geotechnical analysis of the data accumulated during our supplemental investigation including slope and landslide stability analysis (Appendix E) and liquefaction analysis (Appendix F).

- Preparation of this report presenting our findings, conclusions, and geotechnical recommendations relative to the proposed project. The recommendations include our General Earthwork and Grading Specifications for Rough Grading presented in Appendix G.

1.3 Site Description

The irregular-shaped property encompasses approximate 26 acres in the western portion of Oceanside, California (Figure 1). The property is located southwest of the intersection of Oceanside Boulevard and Crouch Street and is bisected by Crouch Street. The site is bounded on the west and southwest by existing commercial and residential developments, on the south by Grandview Street, on the east and northeast by open space, and on the north by the AT&SF railroad right-of-way, Alta Loma Creek, and Oceanside Boulevard.

Topographically, the site generally consists of a northwest-facing hillside with a relatively level ridgeline on the southeastern portion of the site and a relatively flat area at the base of the hillside on the north side of the property. Elevations on the site range from approximately 187 feet mean sea level (msl) at the southeast corner of the site to approximately 24 feet msl at the northwest comer of the property. Site drainage is generally to the north or northwest to the northern property boundary then west along Loma Alta Creek.

Natural vegetation on the site is generally restricted to the northwest-facing hillside (including the manufactured fill slope on the western side of the site) and the lowlands along the northwestern property boundary. The vegetation generally consists of native and non-native grasses, shrubs, and trees. The relatively level areas of the mesa and at the base of the hill (including areas that were previously graded) generally consist of disturbed habitat and grasses and weeds.

1.4 Prior Site Grading and Improvements

Prior grading activities has modified portions of the site. The first of the grading activities included the placement of fill soils creating the relatively level area at the base of the hillside in 1964 (Benton, 1964). Prior grading and development also included the construction of Crouch Street and the placement of the City of Oceanside water main (which is present in the southwest portion of Crouch Street and crosses the lower hillside and the relatively level area at the base of the hillside north of Crouch Street).

The relatively level area graded in 1964 was re-graded in the mid 1980's under the observation of Leighton (Leighton, 1986b). The grading operations included: 1) the removal of the previously placed fill soils; 2) limited removals of the alluvial soils; 3) excavation of a buttress for the proposed cut slope on the western side of the property, installation of buttress subdrains and fill placement creating the buttress; and 4) the placement of compacted fill creating the relatively level sheet-graded pad. Additional grading operations included the excavation of fill (creating a borrow site in the northern portion of the sheet- graded pad) that was used to complete the buttress fill.

Since the existing landslides present on the north-facing hillside were not stabilized as part of the grading operations, a building setback line was provided, inside of which, construction of buildings or other improvements were not recommended (Leighton, 1985c). The previously placed fill soils were removed across the entire site except for the fill soils over the existing City of Oceanside water main (crossing the site in a northwest/southeast direction). In general, the alluvial soils were removed to within 2 feet of the existing ground water elevation prior to the fill placement operations.

At the same time that the buttress was being constructed, the proposed residential development southwest of the property was graded (Action, 1985). The grading operations included the placement of the offsite upper portion of the buttress, partial removal and stabilization of the landslide along the southwestern side of the property, placement of a fill slope key, and placement of fill.

In 1989, the borrow site was filled in with compacted fill and a fill area was placed along the northern property boundary just west of Crouch Street under the observation of GA Nicoll (Nicoll, 1989).

1.5 Proposed Development

The proposed development of the property will include multi-story mixed residential and commercial buildings, parking areas (including car ports), and associated improvements on the relatively level portion of the site at the base of the hillside. The multi- story buildings are anticipated to be 3 to 4 stories in height and constructed with slab-on- grade foundations. These residential structures are anticipated to have with conventional slab-on- grade foundations and wood-frame and stucco construction. Other site improvements anticipated include streets and/or driveways, underground utilities, landscaping, etc. Cut and fill slopes with inclinations of 2:I (horizontal to vertical) or flatter are also anticipated.

1.6 Subsurface Investigation

Our subsurface investigation was performed between July 29, 2019 and August 3, 2019 consisting of the excavation, logging, and sampling three large diameter borings (B-1 through B-3), and three CPT soundings (CPT-1 through CPT-3). Excavation depths ranging from of approximately 26 feet to 80 feet below the existing ground surface (bgs). Logs of the explorations are presented in Appendix B. The approximate location of the explorations are shown on the Geotechnical Map (Plate 1). Subsequent to the subsurface investigation, the borings and test pits were backfilled with tamped soils and/or bentonite.

Laboratory testing performed on representative samples included direct shear tests on drive samples. A discussion of the laboratory tests performed, and a summary of the laboratory test results are presented in Appendix C.

1.7 Previous Subsurface Investigation and Laboratory Testing

Previous subsurface investigations within the property included small-diameter and large- diameter borings and exploratory trenches by Leighton and Associates (Leighton, 1985a and 2003); Action Geotechnical Consultants, (Action Geotechnical, 1984a and 1984b); and GA Nicoll (Nicoll, 1992). The approximate location of the borings and trenches are presented on the Geotechnical Map (Plate 1) and the appropriate Geologic Cross-Sections (Plates 2 through 5). The borings and trench logs are presented in Appendix B.

Previous laboratory testing was performed on representative soil samples to evaluate their pertinent engineering properties (Leighton, 1985a, 1986b, and 2003; and Nicoll, 1992). Previous laboratory tests applicable to the proposed development included in-place moisture and density, maximum dry density, expansion potential, grain size distribution (i.e. sieve analysis), direct shear and consolidation potential tests. The laboratory test results are presented in Appendix C. The density/moisture determinations of the undisturbed samples obtained from the borings are shown on the boring logs (Appendix B).

2.0 SUMMARY OF GEOTECHNICAL CONDITIONS

2.1 Regional Geology

The subject site is located in the coastal section of the Peninsular Range Province, a geomorphic province with a long and active geologic history throughout Southern California. During the last 54 million years, the area known as the "San Diego Embayment" has undergone several episodes of marine inundation and subsequent marine regression, resulting in the deposition of a thick sequence of marine and nonmarine sedimentary rocks on the basement rock of the Southern California batholith.

Gradual emergence of the region from the sea occurred in Pleistocene time, and numerous wave-cut platforms, most of which were covered by relatively thin marine and nonmarine terrace deposits, formed as the sea receded from the land. Accelerated fluvial erosion during periods of heavy rainfall, coupled with the lowering of the base sea level during Quaternary times, resulted in the rolling hills, mesas, and deeply incised canyons which characterize the landforms we see in the general vicinity of the site today.

2.2 Site-Specific Geology

Based on our current subsurface explorations, aerial photographic analysis, and review of pertinent geologic literature and maps (Appendix A), the geologic units underlying the site and the general area consist of artificial fill, topsoil, Alluvium and Colluvium, Quaternary Terrace Deposits, Quaternary Landslide Deposits, and the Tertiary-aged Santiago Formation.

A brief description of the geologic units encountered on the site and general area is presented below. The approximate extent of these materials is presented on the Geotechnical Map (Plate 1).

2.2.1 Topsoil (Unmapped

The ungraded portions of the hillside on the site are generally mantled by topsoil, composed of soil formed in place. The topsoil consists primarily of brown to dark brown, clayey sand to sandy clay. The topsoil was generally encountered to depths of approximately 2 to 5 feet. Due to the potentially compressible nature of the topsoil, these soils should be removed to competent material within the limits of the proposed grading. Provided the topsoil is relatively free of organics and debris, it may be reused as fill.

2.2.2 Artificial Fill (Af and Afo)

There are several areas of artificial fill within the site. These include both documented fills placed under the observations of Leighton (map symbol - Af) and documented and undocumented fill placed by others (map symbol Afo). The documented fills are associated with the grading of the sheet-graded pad in the northern portion of the site, grading of the buttress and residential development in the southwestern portion of the site, and fill soils placed during the construction of Crouch Street. The fill soils placed in 1964, any undocumented fill, and/or desiccated documented fills that are encountered during the anticipated future grading operations are considered potentially compressible in their present condition and will require remedial treatment, such as removal and recompaction during site grading.

2.2.3 Alluvium/Colluvium, Undifferentiated (Map Symbol Qal)

Saturated alluvium/colluvium (undifferentiated) is present beneath the fill soils of the sheet-graded pad on the north side of the property. Based on the project geotechnical documents and results of our current CPT soundings, the alluvial soils predominately consist of sandy to silty clays and clayey silts with minor interbedded zones of clayey to silty sands. In general, the alluvium/colluvium is estimated to be up to 60+ feet in depth. A relatively shallow ground water elevation (generally less than 10 to 15 feet below the existing ground surface) was observed in the alluvial soils. Due to the shallow ground water elevation, potential liquefaction of the saturated alluvial soils is possible. Our liquefaction analysis is summarized in Section 3.5 and Appendix F.

In addition, the laboratory test methods utilized to determine the maximum dry density and relative compaction of the soils at the time of the fill placement operations (i.e. 1960's) have changed somewhat relative to the current standards used today. As a result, we drilled borings and performed laboratory tests on the existing fill soils to analyze competency and to verify the fill was compacted to meet relative compaction of today's standard.

2.2.4 Landslide Deposits (Map Symbol -Qls)

A relatively large landslide complex consisting of 3 to 4 landslides is present on the north-facing hillside on the property. The cause of the landslides appears to be the slightly dipping (i.e. 8 to 12 degrees) out-of-slope interbedded claystone and sandstone units of the Santiago Formation. The approximate limits of these landslides are shown on the Geotechnical Map (Plate 1) and the appropriate Geologic Cross Sections (Plates 2 through 5). It should be noted that most of these landslides are located above and outside the limits of grading. The eastern most landslide also extends beyond the northeastern property boundary.

The landslide deposits include graben material (and associated slope wash/colluvial soils) in the upper portion of the landslide complex, relatively undisturbed blocks of formational material and weathered formational material within the center of the slide mass, and highly weathered, jumbled and disturbed material in the toe (or lower portion) of the landslide complex. The landslide material is generally massive to moderately fractured and jointed at depth and highly weathered and jumbled near the surface and at the toe of the landslides. The landslide basal rupture surfaces, as observed in the borings, typically consisted of a paper-thin to 1/8-inch to 1/2-inch thick remolded clay seams. In general, the landslide basal rupture surfaces appear to correspond to an existing clay seam, bedding plane shear zone or a weak zone in the formational siltstone or claystone.

Due to potentially instability concerns and compressible nature, the landslide deposits within the limits of the planned grading are considered unsuitable for structural support in their present condition and remedial measures (i.e. shear pins, buttressing with fill and/or removals of the unstable and potentially compressible portions) will be required. Recommendations for the stabilization of the landslides are presented in Section 5.2.

2.2.5 Quaternary Terrace Deposits (Map Symbol Qt)

Pleistocene-aged Terrace Deposits exist on the ridgeline in the southern portion of the property unconformably overlying the Santiago Formation. Based on our geologic logging of the borings excavated along the ridgeline, the terrace deposits range from approximately 6.5 to 29 feet in depth below the existing ground surface. The base of the terrace deposits ranges from an approximate elevation of 165 feet (msl) on the eastern side of the property to an approximate elevation of 145 feet (msl) on the western side. The soil comprising the Terrace Deposits is generally composed of fine to medium grained silty sand with minor sandy silt and clayey sand zones and occasional rounded gravel and fine cobble.

2.2.6 Tertiary Santiago Formation (Map Symbol - Tsa

The Tertiary-aged Santiago Formation, as encountered on the site, consists primarily of massively bedded clayey to silty sandstones with interbedded silty claystone. The siltstones and claystones generally are olive green to gray (unweathered), damp to moist, stiff to hard, moderately weathered, fractured and sheared. The sandstone generally consists of orange brown (iron oxidized staining) to light brown, damp to moist, dense to very dense, silty fine to medium grained sandstone.

2.3 Geologic Structure

The general structure of the bedrock appears to be near horizontal to slightly dipping to the west. Based on the subsurface data, bedding within the Santiago Formation generally exhibits variable bedding with strikes ranging from northwest to northeast and dips typically 8 to 12 degrees to the northwest. Locally, cross bedding was observed with dips steeper than 10 to 15 degrees. Clay seams and/or landslide rupture surfaces encountered in the borings generally trend parallel to the bedding. Geologic mapping also indicates that the Terrace Deposits present on the site are generally massive to thickly bedded (with bedding dipping 3 to 8 degrees to the west to northwest). Folding or faulting of the onsite sedimentary units is not known or expected.

Jointing on-site is very variable, but predominantly trends subparallel to the ex1stmg hillside. Jointing dips were found to be generally moderately to steeply dipping. Jointing is anticipated to be mainly encountered in the upper portion of the bedrock becoming less pronounced with depth.

Randomly oriented shears were encountered mainly in the Santiago Formation claystone and siltstone. Numerous wide, diffuse zones of shearing, as well as more well-defined zones, were encountered in the bedrock, and are thought to be the result of regional tectonic shearing of the relatively stiff and unyielding siltstone and claystone.

2.4 Ground Water

The static ground water elevation was encountered below the sheet-graded pad in the northern portion of the site. The ground water elevation is assumed to be perched ground water within the alluvial soils. Based on the recent and previous explorations, the ground water elevation was encountered approximately 7 to 16 feet below the existing ground surface. The corresponding elevation of the ground water ranged from approximately 23 to 29 feet (msl).

Ground water seepage zones were also encountered in a number of the exploratory borings excavated across the site. The seepage zones were generally encountered within permeable sand beds present above a relatively impermeable claystone unit and/or clayseam. Some of the seepage zones were encountered at higher elevations relative to the static ground water elevation present in the alluvial soils. The ground water seepage is assumed to be the result of irrigation infiltration from properties upslope (and to the south) of the project. The approximate depths of the ground water elevation and seepage zones are depicted on the boring logs (presented in Appendix B). Seasonal fluctuations of surface water and the ground water elevation and seepage zones should be expected.

2.5 Engineering Characteristics of On-site Soils

Based on the results of our geotechnical investigation of the site laboratory testing of representative on-site soils (Appendix C), and our professional experience on near-by sites with similar soils, the engineering characteristics of the on-site soils are discussed below.

2.5.1 Expansion Potential

The expansion potential of the on-site soils ranges from very low to very high. The terrace deposits, sandy fills, and the sandstone within the Santiago Formation are anticipated to be in the very low to low expansion range. The siltstone and claystone of the Santiago Formation, as well as the clayey topsoil, alluvium/colluvium and clayey fill soils are anticipated to have a medium to very high expansion potential. Geotechnical observation and/or laboratory testing upon completion of the graded pads are recommended to determine the actual expansion potential of finish grade soils. To reduce the possibility of having expansion soils at or near finish pad grades, the clayey soils should be placed in deeper fill areas or outside the limits of the building pads.

2.5.2 Soil Corrosivity

Based on our professional experience on nearby sites, the on-site soils should possess a negligible to moderate soluble sulfate content. However, some of the soils may possess a high sulfate content. Laboratory testing should be performed on the soils placed at or near finish grade after completion of site grading.

2.5.3 Settlement and Collapse Potential

Based on the results of our current and previous subsurface exploration and laboratory testing for the subject site, the settlement and potential for collapse of the underlying materials is considered low for the anticipated loading conditions. In summary, the consolidation testing performed on the existing fill soil samples indicated relatively low compressible characteristics and a low collapse potential (i.e., values less than 1.7 percent). Our opinion is also supported by our observation of in-place drive samples, which indicated generally a medium dense to dense, very fine to medium grained sand, and damp to moist for the underlying fill soils.

2.6 Slope Stability

As part of our study, we evaluated and analyzed for gross stability and surficial stability using the computer program Slide 6.0 (RocScience, 2018). The parameters utilized in our slope stability analysis are presented on Table 1 and were based on our geotechnical investigation, our experience with similar soil types, and our professional judgment. A discussion of the results of the slope stability analyses is presented below.

Table 1 Slope Stability Soil Parameters			
Material	Unit Weight (pcf)	Friction Angle (degrees)	Cohesion (psf)
Artificial Fill Soils	120	25	400
Quaternary Alluvium	120	10	100
Landslide Material	120	13	200
Terrace Deposits	120	35	800
Santiago Formation	130	35	800

Cut Slopes: Engineering analysis of the proposed 2:1 (horizontal to vertical) cut slopes up to a maximum height of approximately 10 to 15 feet indicates the deep-seated stability of the slopes, in general, are stable from a geotechnical standpoint provided adverse geologic conditions are not present. The results of our stability analysis indicate that cut slopes have a static factor of safety in excess of 1.5 for gross stability after remedial grading is performed and our geotechnical recommendations are adhered to.

However, if cut slopes are planned consisting of Santiago Formation claystones and siltstones may be surficially unstable and may require the construction of stability or replacement fills on the slopes. The stability fill key should be constructed a minimum of 15 feet wide, at least 5 feet below the toe- of-slope grade, and have a minimum 2 percent into- the-slope inclination. The approximate location of the stability fill key is presented on the Geotechnical Map (Plate 1). A typical detail for stability fill construction is provided in the attached General Earthwork and Grading Specifications (Appendix F).

Landslides: A relatively large landslide complex consisting of 3 to 4 landslides is present on the north-facing hillside on the property. The cause of the landslides appears to be the slightly dipping (i.e. 8 to 12 degrees) out-of-slope interbedded claystone and sandstone units of the

Santiago Formation. It should be noted that the majority of these landslides are located outside the limits of the proposed multi-family development; however, if the landslides are not mitigated and stabilized by slope grading it will affect the of the proposed development. The eastern most landslide also extends beyond the northeastern property boundary. The aerial limits of landslide deposits are depicted on the Geotechnical Map, Plate 1.

Geologic Cross-Sections A-A' through G-G' (Plates 2 through 5) were prepared in areas of natural hillsides and/or landslide areas to further evaluate slope stability and to provide shear pins and buttress designs, where appropriate, to increase the overall slope static factor-of-safety to at least a 1.5. Where shear pins, landslide removal, and buttresses are recommended, the preliminary dimensions are presented on the appropriate cross-section. Prior to construction of the recommended buttresses and shear pins presented herein, the provisional stability recommendations should be reviewed, and additional design analysis performed based on the final grading plans and desired development area.

Due to the potential instability concerns, the landslide deposits within the limits of the planned grading are considered unsuitable for structural support in their present condition, and remedial measures (i.e. buttressing with fill, shear pins, and/or removals of the unstable and potentially compressible portions) will be required.

Slope stability analyses indicates that due to the presence of the existing landslide in the southeastern hillside, as defined by Cross-Sections A-A’, C-C’, D-D’, and E-E’, will have an acceptable static factor-of-safety greater than 1.5; after remedial measures have been performed, however, it will not possess an acceptable pseudo-static factor-of-safety greater than 1.15 (i.e., analysis indicates a factor-of-safety on the order of 0.8 to 1.0). Therefore, in order to achieve an acceptable pseudo-static factor-of-safety of approximately 1.15 or greater, portions of the landslide will need to be removed and stabilized by construction of an earthen buttress and shear pins. Even with these remedial measures landslide setbacks may be required. The recommended preliminary buttress and shearing pins locations are presented on the Geotechnical Map (Plate 1) and on the applicable Geologic Cross-Sections A-A’, C-C’, D-D’, and E-E’ (Plates 2 through 5). The computer program Slide calculation plots for the analyses are presented in Appendix D, Slope Stability Analyses.

In addition, an analysis of seismic slope stability was performed using pseudo-static methods using a seismic coefficient, Kh, of 0.15. The analysis indicates the existing slope with a landslide do not possess a factor of safety greater than 1.15. The analysis is included in Appendix D.

It should be noted that buttressing, landslide removal, and the use of shear pins of the natural slope north of Crouch Street (i.e., below) can obtain a static minimum factor-of-safety of 1.5 or greater; however, the natural slope above Crouch Street (south) will still have a factor-of-safety on the order of 1.1 (Leighton, 2003). Preliminary buttress and shear pin recommendations have been recommended. However, additional slope stability analyses (static and seismic) will be required after more detailed grading plans are developed.

In addition, the City of Oceanside may require re-alignment of Crouch Street in order to straighten the road and possibly even stabilize the slope above the hill. As indicated above, the factor-of-safety of the slope above Crouch Street is on the order of 1.1. If the development is conditioned to increase the stability of the overall slope to an acceptable level (i.e. a factor-of-safety of at least 1.5), additional buttressing, landslide removal, and shear pins of the landslide and slope above the street will be required. To date, there has been a limited analysis or buttress design for the slope above Crouch Street.

Due to the significant perched seepage conditions within the landslides and natural hillside, ground water conditions will be encountered that will have to be mitigated. Installation of subdrains will help to mitigate the ground water conditions; however, additional dewatering may also need to be performed to increase the stability of the hillside. One method to dewater the area upslope of recommended buttress would be to install hydro-augers along potential seepage zones. The recommended location of possible hydro-augers is presented on the Geotechnical Map (Plate 1). Design of the hydro-augers (i.e., location, spacing and lengths) should be determined during excavation of the buttress fill and the hydro-augers installed after the slope grading is completed. For planning purposes, a spacing of 10 feet and a length of 300 feet can be used as preliminary design for the hydro-augers.

We recommend the geotechnical consultant document and geologically map all excavations including cut slopes during grading. The purpose of this mapping is to substantiate the geologic conditions assumed in our analyses. Additional investigation and stability analysis may be required if unanticipated or adverse conditions are encountered during site development.

Fill Slopes: The materials anticipated for use in proposed fill slope grading will predominantly consist of sandy and silty to clayey soils. Our analysis, assuming 2:1 slopes and homogeneous slope conditions, indicates the anticipated fill slopes up to the maximum proposed heights of 10 to 15 feet and the buttress slope will have a calculated factor of safety of 1.5 or greater with respect to potential, deep-seated failure. The proposed slopes should be constructed in accordance with the recommendations of this report, the attached General Earthwork and Grading Specifications for Rough-Grading (Appendix G), and City of Oceanside grading code requirements.

1) Slope Face Compaction and Finishing

Due to the high expansion potential of the claystones and siltstones within the Santiago Formation, special compaction procedures will be necessary in order for the specified compaction to be achieved out to the slope face. Soils placed within 15 feet of the face of slope should consist of a mixture of clay and sand. The slope 1.1se of highly expansive clayey or clean sandy material within 15 feet of the face of slope should be avoided. Overbuilding the slope faces a minimum of 5 feet and trimming them back or frequent back-rolling with sheepsfoot compactors (at 1-foot to 3-foot vertical intervals) and back-rolling the completed slope with a short-shank sheepsfoot may be utilized to achieve the specified compaction of the slope face.

2) Stability for Temporary Backcut Slopes During Grading

The temporary backcut slopes that will be created during removal of unsuitable materials or construction of the buttress and/or stabilization fills should have acceptable temporary factors of safety during grading. However, since there is a moderate risk of slope instability and to minimize impacting the Crouch Street improvements, the possibility of temporary cut slopes failures may be reduced by: 1) keeping the time between cutting and filling operations to a minimum; 2) excavating the recommended buttress in sections no greater than *50* feet in length· 3) limiting the maximum length of back cut slopes exposed at any one time; and 4) cutting the temporary slopes at slope inclinations no steeper than 1-1/2:1 (horizontal to vertical) in locations of adverse geologic conditions and 1:1 (horizontal to vertical) inclinations in other locations.

In critical areas, we may recommend that slope inclinometers be installed to detect and monitor potential movements, and that a contractor's representative observes the backcut for signs of instability during buttress construction. Backcut safety is the responsibility of the contractor.

It is of utmost importance to schedule the earthwork sequence such that the time between removal and recompaction is reduced to a minimum. Full-time geologic inspection should be performed during backcut excavation, not only to

2.7 Earthwork Shrinkage and Bulking

The volume change of excavated on-site materials upon recompaction as fill is expected to vary with materials and location. Typically, the surficial soils and bedrock materials vary significantly in natural and compacted density, and therefore, accurate earthwork shrinkage/bulking estimate cannot be determined. However, the following factors (based on evaluation of our previous subsurface investigation, laboratory testing, geotechnical analysis and professional experience on adjacent sites) are provided on Table 2 as guideline estimates. If possible, we suggest an area where site grades can be adjusted be provided as a balance area.

Table 2 Earthwork Shrinkage and Bulking Estimates	
Geologic Unit	Estimated Shrinkage/bulking
Artificial Fill	0 to 2 percent bulking
Topsoil/Undocumented fill	5 to 15 percent shrinkage
Alluvium/Colluvium	5 to 15 percent shrinkage
Landslide Debris	4 to 8 percent shrinkage
Landslide Block Material	2 to 5 percent bulking
Santiago Formation	2 to 10 percent bulking

3.0 FAULTING AND SEISMICITY

3.1 Regional Tectonic Setting

The California Mining and Geology Board in 1972 (now referred to as the California Geologic Survey or CGS) defines an active fault as a fault which has "had surface displacement within Holocene time (about the last 11,700 years)." The City of San Diego (1999) further defines a Pre-Holocene fault, as a fault that has had activity within the last 1.6 million years (Quaternary Period) and can be demonstrated to be inactive during the last 11,700 years (Holocene Epoch).

The site is located within the Peninsular Ranges Geomorphic Province, which is traversed by several major active faults. The Whittier-Elsinore, San Jacinto, and the San Andreas faults are major active fault systems located east of the site, and the Rose Canyon, Newport-Inglewood (offshore), and Coronado Bank are active faults located west to southwest of the site (Jennings, 2010). The primary seismic risk to the site area is the Rose Canyon/Newport Inglewood fault zone located approximately 5.2 miles west of the site.

The Rose Canyon fault zone consists predominantly of right-lateral strike-slip faults that extend south-southeast bisecting the San Diego metropolitan area. Various fault strands display strike-slip, normal, oblique, or reverse components of displacement. The Rose Canyon fault zone extends offshore at La Jolla and continues north-northwest subparallel to the coastline. The offshore segments are poorly constrained regarding location and character. South of downtown, the fault zone splits into several splays that underlie San Diego Bay, Coronado, and the ocean floor south of Coronado (Treiman, 1993 and 2000; Kennedy and Clarke, 1999). Portions of the fault zone in the Mount Soledad, Rose Canyon, and downtown San Diego areas have been designated by the State of California (CGS, 2007) as being Earthquake Fault Zones.

3.2 Local Faulting

Our review of available geologic literature (Appendix A) indicates that there are no known Active or Potentially Active faults transecting the site. The subject site is also not located within any State Mapped Earthquake Fault Zones or County of San Diego mapped fault zones. The nearest active fault is the Rose

Canyon/Newport Inglewood fault zone located approximately 5.2 miles west of the site.

3.3 Seismicity

The site is considered to lie within a seismically active region, as is all of Southern California. As previously mentioned above, the Rose Canyon/ Newport Inglewood fault zone located approximately 5.2 miles west of the site is considered the ‘active’ fault having the most significant effect at the site from a design standpoint.

3.4 Seismic Hazards

Severe ground shaking is most likely to occur during an earthquake on one of the regional active faults in Southern California. The effect of seismic shaking may be mitigated by adhering to the California Building Code or state-of-the-art seismic design parameters of the Structural Engineers Association of California.

3.4.1 Shallow Ground Rupture

As previously discussed, no active faults are mapped transecting or projecting toward the site. Therefore, surface rupture hazard due to faulting is considered very low. Ground cracking due to shaking from a seismic event is not considered a significant hazard either, since the site is not located near slopes.

3.4.2 Mapped Fault Zones

The site is not located within a State mapped Earthquake Fault Zone (EFZ). As previously discussed, the subject site is not underlain by known active or potentially active faults.

3.4.3 Site Class

Utilizing 2016 California Building Code (CBC) procedures, we have characterized the site soil profile to be Site Class D based on our experience with similar sites in the project area and the results of our subsurface evaluation.

3.4.4 Building Code Mapped Spectral Acceleration Parameters

The effect of seismic shaking may be mitigated by adhering to the California Building Code and state-of-the-art seismic design practices of the Structural Engineers Association of California. Provided below in Table 3 are the spectral acceleration parameters for the project determined in accordance with the 2016 CBC (CBSC, 2016) and the ATC Hazard by Location.

Table 3
2016 CBC Mapped Spectral Acceleration Parameters

Site Class	D
Site Coefficients	F_a = 1.048 F_v = 1.566
Mapped MCE Spectral Accelerations	S_S = 1.129g S_1 = 0.434g
Site Modified MCE Spectral Accelerations	S_{MS} = 1.184g S_{M1} = 0.679g
Design Spectral Accelerations	S_{DS} = 0.789g S_{D1-} = 0.453g

Utilizing ASCE Standard 7-10, in accordance with Section 11.8.3, the following additional parameters for the peak horizontal ground acceleration are associated with the Geometric Mean Maximum Considered Earthquake (MCE_G). The mapped MCE_G peak ground acceleration (PGA) is 0.441g for the site. For a Site Class D, the F_{PGA} is 1.059 and the mapped peak ground acceleration adjusted for Site Class effects (PGA_M) is 0.467g for the site.

3.5 Secondary Seismic Hazards

In general, secondary seismic hazards can include soil liquefaction, seismically-induced settlement, lateral displacement, surface manifestations of liquefaction, land sliding, seiches, and tsunamis. The potential for secondary seismic hazards at the subject site is discussed below.

3.5.1 Liquefaction and Dynamic Settlement

Liquefaction and dynamic settlement of soils can be caused by strong vibratory motion due to earthquakes. Both research and historical data indicate that loose, saturated, granular soils are susceptible to liquefaction and dynamic settlement. Liquefaction is typified by a loss of shear strength in the affected soil layer, thereby causing the soil to behave as a viscous liquid. This effect may be manifested by excessive settlements and sand boils at the ground surface.

Our preliminary liquefaction analysis utilizing the computer program CLiq Version 2.1.6.11, used the Maximum Considered Earthquake event with a mean magnitude M6.8 (i.e., associated with the Design Earthquake Ground Motion). The peak horizontal ground acceleration associated with the Maximum Considered Earthquake Ground Motion is 0.48g. Based on the results of the liquefaction analysis, several discontinuous and variable thickness liquefiable layers of saturated alluvial materials are located between a depth of approximately 12 to 65 feet. As encountered in the CPT explorations, the saturated layers located above 65 feet are considered susceptible to liquefaction at the design earthquake ground motion.

Total dynamic settlement at the site as a result of the Design Earthquake Ground Motion is roughly estimated at between approximately 0.5 to 4.0 inches. Differential dynamic settlement at the site is anticipated to be on the order of 1.5 inches over 125 feet considering the depth and nature of the liquefied zones. A summary plot showing idealized profile, relevant CPT data, calculated cyclic stress and resistance ratio, factor of safety, and liquefaction-induced settlement is provided in Appendix E.

3.5.2 Lateral Spread

Empirical relationships have been derived (Youd et al., 1999) to estimate the magnitude of lateral spread due to liquefaction. These relationships include parameters such as earthquake magnitude, distance of the earthquake from the site, slope height and angle, the thickness of liquefiable soil, and gradation characteristics of the soil.

The susceptibility to earthquake-induced lateral spread is considered to be low to high for the site because of the nature of the underlying liquefiable layers, topography, and proximity to the Alta Loma Creek channel. It is anticipated that lateral spreading can be mitigated through a ground improvement program or with the use of deep foundations. At this time, we understand the proposed residential structure will be setback 100 feet from away Alta Loma Creek. If these setbacks are altered during design additional subsurface characterization and analysis will be required to further evaluate and quantify lateral spreading potential.

3.5.3 Tsunamis and Seiches

Based upon the California Emergency Management Agency Tsunami Inundation Map (CalEMA, 2009), the site is not located within a tsunami inundation area. In addition, based on the distance between the site and large, open bodies of water, and the elevation of the site with respect to sea level, the possibility of seiches and/or tsunamis is considered to be nil.

4.0 CONCLUSIONS

Based on the results of our preliminary geotechnical investigation of the site, it is our professional opinion that the proposed Ocean Creek development is feasible from a geotechnical standpoint, provided the following conclusions and recommendations are incorporated into the project plans and specifications and utilized during the grading and construction phases of site development.

The following is a summary of the significant geotechnical factors that we expect may affect development of the site.

- Based on our subsurface exploration and review of pertinent geotechnical reports, the site is underlain Tertiary Santiago Formation, Quaternary Terrace Deposits, landslide deposits, undifferentiated alluvium/colluvium, topsoil and documented and undocumented fill soils.

- The undocumented fill, topsoil, alluvium, compressible landslide deposits, and weathered formational materials are considered unsuitable in their present state and will require removal and recompaction in areas of proposed development or future fill.

- Clayey soils of the Santiago Formation, surficial units or the existing fill soils may be moderately to highly expansive. These expansive soils should not be placed within 5 feet of finish pad grades (unless a special foundation design [i.e. a post-tensioned foundation] is planned.

- The upper 2 to 3 feet older documented artificial fill, if present, are unsuitable and will require removal within the limits of settlement sensitive improvements. In order to mitigate potential differential settlement of the proposed structures, remedial grading will need to be implemented. Recommendations concerning the remedial grading are presented in Section 5.1.2.

- Due to potentially instability concerns and compressible nature, the landslide deposits within the limits of the planned grading and immediately to the south are considered unsuitable for structural support in their present condition and remedial measures (i.e. shear pins, buttressing with fill and/or removals of the unstable and potentially compressible portions) will be required. Preliminary recommendations for the stabilization of the landslide are presented in Section 5.2 and indicated on the Geotechnical Map (Plate 1) and the appropriate Geologic Cross- Sections (Plates 2 through 5).

- The static ground water elevation and ground water seepage conditions have been encountered on the site. With the exception of anticipated ground water conditions during the remedial grading operations for the stabilization of the landslides ground water conditions on the site are not anticipated to be a significant factor during site grading and subsequent development. If ground water seepage conditions are encountered during site development recommendations to mitigate the conditions can be made on a case-by-case basis at that time. Recommendations concerning ground water conditions during the landslide remedial grading operations are presented in Section 5.2.

- Laboratory testing of representative soil samples in the vicinity of the site indicate a very low to low expansion potential. Moderate to highly expansive soils should not be placed within the upper 5 feet of the finish grade and/or within 3 feet of the bottom of the proposed foundations.

- Laboratory test results also indicate the soils have a negligible potential for sulfate attack on concrete, a moderate to severe potential for corrosion to buried uncoated metal conduits.

- The existing on-site soils appear to be suitable material for use as fill provided they are relatively free of organic material and debris.

- Active faults are not known to exist on or in the immediate vicinity of the site. The main seismic hazard that may affect the site is from ground shaking from one of the active regional faults.

- In general, the recompaction of fill soils is anticipated to shrink while the formational materials are likely to bulk.

5.0 RECOMMENDATIONS

5.1 Earthwork

We anticipate that earthwork at the site will consist of site preparation, remedial grading and placement of compacted fill. We recommend that earthwork on the site be performed in accordance with the following recommendations and the General Earthwork and Grading Specifications for Rough Grading included in Appendix E. In case of conflict, the following recommendations shall supersede those in Appendix E.

5.1.1 Site Preparation

Prior to grading, all areas to receive structural fill, engineered structures, or surface improvements should be cleared of surface and subsurface obstructions, including any existing debris; asphalt; concrete; abandoned underground utility lines; loose, desiccated, or disturbed fill soils; and stripped of vegetation. Removed vegetation and debris should be properly disposed off-site. Areas to receive fill and/or other surface improvements should be scarified to a minimum depth of 8 inches, brought to 2 percent above-optimum moisture condition, and recompacted to at least 90 percent relative compaction (based on American Standard of Testing and Materials [ASTM] Test Method D1557).

5.1.2 Removal of Unsuitable Soils

As previously discussed, the site is underlain by unsuitable soils including topsoil, compressible landslide material, undocumented fill, and weathered formational material that may settle under the surcharge of fill and/or foundation loads. Unsuitable soil within the limits of the proposed structures or other settlement sensitive improvements not removed by the planned grading should be excavated to competent formational material or older fill. The material may be re-used provided it is moisture conditioned or dried back (as needed) to 2 percent above-optimum moisture condition and recompacted prior to additional fill placement or construction of improvements. The actual depth and extent of the required removals should be determined during grading operations by the geotechnical consultant; however, anticipated removal depths are summarized below.

Existing Documented Fill

The desiccated upper portion of the existing documented fills located in the northern portion of the site should be removed to competent fill prior to placement of additional fill. These materials can be utilized as fill materials provided, they are moisture conditioned and free of deleterious materials. The estimated removal depths of the desiccated documented fills are anticipated to be on the order of 1 to 5 feet. However, deeper removals may be required along the edges of the fill where left-in-place unsuitable soils may be present along the edges of the previously excavated removal areas.

Existing Undocumented Fill/Topsoil

The existing fill soils placed during 1964 (present above the existing water main in the northern portion of the site) and any undocumented fills (if encountered) should be completely removed prior to placement of additional fill. These materials can be utilized as fill materials provided, they are moisture conditioned and free of deleterious materials. All trash, construction debris, and decomposable material should be removed and disposed of off-site.

Alluvium/Colluvium

The alluvium/colluvium if encountered above the static ground water elevation should be removed to within 2 feet of the ground water. In areas without groundwater, the alluvium/colluvium should be completely removed to competent formational material.

Landslide Deposits

The landslide deposits within the limits of grading should be removed to competent material during site grading in order to remove the highly disturbed and compressible material. Compressible landslide deposits are expected to be 10 to 20 feet thick at depths up to 30 feet bgs. The actual depth of stripping or overexcavation should be determined during grading based on field observations by the geotechnical consultant. Note that compressible landslide deposits should be removed prior to construction of the proposed earthen buttress. Additional and/or specific recommendations may be made during the grading operations or as part of the grading plan review should be performed after more detailed grading plans are developed.

5.1.3 Excavations and Oversize Material

Excavations of the on-site fill and sedimentary materials may generally be accomplished with conventional heavy-duty earthwork equipment. All oversized rock that is encountered should be placed as fill in accordance with the recommendations presented Appendix E, or hauled off site for disposal.

5.1.4 Fill Placement and Compaction

The on-site soils are generally suitable for reuse as compacted fill, provided they are free of organic materials and debris. Areas to receive structural fill and/or other surface improvements should be scarified to a minimum depth of 8 inches; brought to at least 2 percent above optimum moisture content; and recompacted to at least 90 percent relative compaction (based on ASTM Test Method D1557). The optimum lift thickness to produce a uniformly compacted fill will depend on the type and size of compaction equipment used. In general, fill should be placed in uniform lifts not exceeding 8 inches in thickness. Placement and compaction of fill should be performed in general accordance with the current City of Oceanside grading ordinances under the observation and testing of the geotechnical consultant, sound construction practices, and the General Earthwork and Grading Specifications for Rough Grading presented in Appendix E.

In vehicular pavement areas, the upper 12 inches of subgrade soils should be scarified then moisture conditioned to a moisture content at or above optimum content and compacted to 95 percent or more of the maximum laboratory dry density, as evaluated by ASTM D1557.

Proposed fills placed on existing slopes steeper than 5 to 1 (horizontal to vertical) and repairs of the existing fill slopes should be keyed and benched into dense formational or competent fill soils maintaining a fill width of at least 15 feet or half of the slope height (see Appendix E for benching and replacement fill details).

Fills placed within 5 feet of finish pad grades should consist of granular soils of very low to medium expansion potential and contain no materials over 8 inches in maximum dimension. Oversize material, if encountered, may be incorporated into structural fills if placed in accordance with the recommendation of Appendix E.

5.1.5 Expansive Soils and Selective Grading

Laboratory testing and our experience with similar materials on nearby sites indicate that the on-site soils possess a low to medium expansion potential. In order to provide the proposed buildings with suitable bearing material and to reduce the negative impacts of expansive soils at finish grade, we recommend that grading be performed to ensure that material within 3 feet of the bottom of proposed foundations and within 5 feet of finish grade be of very low to low expansive material. Expansion potential testing of the soils within 5 feet of finish grade should be tested where proposed building is located upon completion of the grading operations. The presence of expansive soils close to finish grade may require special foundation and slab design. The allowable bearing capacity included in the following sections assumes that the foundation is underlain by granular fill or formation material.

5.1.6 Transition Lots and Overexcavation in Building Pads

In order to reduce the potential for differential settlement in areas of cut/fill transition conditions, we recommend that the entire cut portion of building pads containing cut/fill transition conditions be overexcavated and replaced with properly compacted fill of very low to low expansion potential. The cut/fill transition overexcavations should be made to a minimum depth of 5 feet below finished grade or 3 feet below the proposed footing bottoms, whichever is lower. In order to mitigate effects of differential settlements in areas of deep fills at steep-buttress backcuts, an overexcavation should be performed during site grading once final building pad locations are known. The actual location and depth of overexcavation should be determined in the field based upon exposed conditions. The overexcavated area should be graded with a 1 percent gradient toward deep fill areas or the street.

5.2 Landslide Stabilization and Fill Slope Grading

Geologic Cross-Sections A-A', C-C', D-D', E-E', and G-G' (Plates 2 through 5) were prepared in areas of natural hillsides and/or landslide areas to further evaluate slope stability and to provide shear pin and buttress designs, where appropriate, to increase the overall pseudo-static factor-of-safety to approximately 1.15 and static factor-of-safety to a 1.5. In summary, we recommend that the landslide material within the northeastern portion of the site (i.e. near the toe of landslide) be completely removed and replaced with a buttress fill in accordance with the recommendations of this report. The approximate location of the buttresses and shear pins for the landslide are shown on the Geotechnical Map (Plate 1) and the Geologic Cross-Sections A-A', C-C', D-D', and G-G' (Plates 2 through 5).

- Landslide Building Setback: If no stabilization measures are to be taken of the north-facing natural slope landslide, it is recommended that a building setback line be established. The structural setback is limit provided on the Geotechnical Map (Plate 1). This line is recommended to be located approximately of 50 feet from where the failure surface of where the landslide would daylight. The previous structural setback from the 1985 Leighton report was analyzed during our analysis review and was found to not meet pseudostatic failure surfaces and was updated in this report. No structures should be constructed south of this setback line, unless appropriate landslide stabilization measures are taken. However, this area may be suitable for nonstructural uses such as a park or open space.

- Compressible Landslide Deposits: The landslide deposits within the limits of the planned grading should be excavated to competent material during site grading to remove the highly disturbed and weathered material. The actual depth of stripping or overexcavation should be determined during grading based on field observations. Additional and/or specific recommendations may be made during the grading operations or as part of the anticipated grading plan review that should be performed after more detailed grading plans are developed. Removal of landslide material will require dewatering and special grading such as top loading of over-wet material.

- Landslide Stabilization: Construction of buttresses, landslide removals, and/or shear pins are recommended for stabilization. Slope grading for buttress grading would most likely impact the entire north facing slope that contains sensitive habitat. In addition, the following recommendations should be considered for the landslide stabilization:

- Groundwater Seepage Control: Recommendations to mitigate the seepage conditions such as: 1) installing a toe-of-slope subdrain system; and 2) installing a subdrain system at or slightly below the contact between the permeable and impermeable materials. For potential seepage zones within the landslides and natural hillside, hydro-augers are recommended. For planning purposes, preliminary design of the hydro-augers (i.e., location, spacing, and lengths) can be at a spacing of 10 feet on center and a length of 300 feet.

- Temporary Backcut Slope Stability: Temporary backcut slopes should be analyzed after more detailed grading are developed and stabilization measures have been selected. The temporary backcut slopes that will be created during removal of unsuitable materials or construction of the buttress and/or stabilization fills are anticipated to have marginal temporary factors of safety during grading. Since there is a moderate risk of slope instability and to minimize impacting the Crouch Street improvements, the possibility of temporary backcut slope failures may be reduced by: 1) keeping the time between the cutting and filling operations to a minimum; 2) excavating the recommended buttress in sections no greater than 50 feet in length; 3) limiting the maximum length of backcut slopes exposed at any one time; and 4) cutting the temporary backcuts at slope inclinations no steeper than 1-1/2:1 (horizontal to vertical) in locations of adverse geologic conditions and 1:1 (horizontal to vertical) inclinations in other locations. It is of utmost importance to schedule the earthwork sequence such that the time between removal and recompaction is reduced to a minimum. Full-time geologic inspection should be performed during backcut excavation, not only to confirm the geologic conditions but also to provide early warning of incipient failure of the temporary excavations and to allow in-construction reaction to accommodate such failures and keep their occurrence to a minimum.

- Slope Inclinometers: Based on our previous study, we understand that installation of slope inclinometers along Crouch Street may be required as a condition of approval of the project by the City of Oceanside. During the anticipated grading plan review, we will evaluate the existing and proposed conditions to determine the number and locations of the proposed slope inclinometers. If the City requires that Crouch Street be regraded, the slope inclinometers will not be needed. However, additional grading and buttressing of the landslides uphill of the street may be necessary.

We recommend the geotechnical consultant document and geologically map all excavations including cut slopes during grading. The purpose of this mapping is to substantiate the geologic conditions assumed in our analyses. Additional investigation and stability analysis may be required if unanticipated or adverse conditions are encountered during site development.

As previously discussed, we anticipate the proposed fill slopes placement over existing slopes will create sliver fills at the site (i.e. northcentral, northeastern, east, southeastern slopes). We recommend these slopes maintain a minimum fill width of 15 feet or half the slope height by constructing stability/replacement fills slope. A 15-foot wide key should also be constructed at the toe of slope with a subdrain system (see Appendix E for subdrain details).

5.3 Surface Drainage and Erosion

The control of ground water in a hillside development is essential in order to reduce the potential for undesirable surface flow, hydrostatic pressure and the adverse effects of ground water on slope stability.

The static ground water elevation was encountered below the sheet-graded pad in the northern portion of the site. The ground water elevation is assumed to be perched ground water within the alluvial soils. Base on the previous and recent explorations, the ground water elevation was encountered approximately 7 to 16 feet below the existing ground surface. The corresponding elevation of the ground water ranged from approximately 23 to 29 feet (msl). The control of ground water in a hillside development is essential in order to reduce the potential for undesirable surface flow hydrostatic pressure and the adverse effects of ground water on slope stability.

The static ground water elevation was encountered at a depth generally below the anticipated finish grade elevations. It is our opinion that ground water related problems should be minimal provided the recommendations presented in this report are incorporated into the design and construction of the project. However, it should be noted that the static ground water elevation and seepage zones will likely be encountered during the remedial grading measures required to stabilize the lands li des on the site. Dewatering, top-loading wet material, or other methods should be anticipated during the landslide remedial grading operations. We recommend that geotechnical observations be made by either our soil engineer or engineering geologist during the grading operations and/or construction for the presence of groundwater. Remedial measures, if any, can be recommended on a case-by- case basis during the grading and construction operations.

Surface drainage should be controlled at all times. The proposed structure should have appropriate drainage systems to collect roof runoff. Positive surface drainage should also be provided to direct surface water away from proposed structures or the top of slopes toward the parking area, driveway, or other suitable drainage facilities. Positive drainage may be accomplished by providing a minimum 2 percent gradient from the structure or slope for a distance of at least 5 feet. Below grade planters should not be situated adjacent to structures or pavements unless lined, and provisions for drainage such as catch basins and drains are made. In general, ponding of water must be avoided adjacent to structures, tops of slopes, or pavements. The control of ground water in a hillside development is essential in order to reduce the potential for undesirable surface flow, hydrostatic pressure and the adverse effects of ground water on slope stability. To that end all buttress and stability fill keys should be provided with subdrains as recommended in Appendix E.

In order to help reduce the potential for excessive erosion of graded slopes, we recommend berms and/or swales be provided along the top of the slopes and drainage directed such that surface runoff on the slope faces is minimized. Protective measures to mitigate excessive site erosion during construction should also be implemented in accordance with the latest pertinent grading ordinances.

Regarding Low Impact Development (LID) measures, we are of the opinion that bioswales, infiltration basins, and other onsite retention and infiltration systems can potentially create adverse perched ground water conditions both on-site and off-site. In particular, this site is underlain by fill or formations that are known to contain both permeable and impermeable layers which can transmit and perch ground water in unpredictable ways. Therefore, given the site geologic conditions and project type, some types of LID measures may not be appropriate for this site and project.

5.3.1 Buttress and Stability Fill Subdrains

Subdrains should be provided in the buttress and stability fill constructed on the site in order to minimize slope instability or seepage zones. The subdrains should be placed along the heel of the buttress or stability fill key (across the entire length of the key) and along the backcut at approximately 30-foot vertical intervals. The subdrains should be placed and constructed in accordance with the recommendations presented in Appendix E.

Cut Slope Seepage Conditions and Toe-of-Slope Subdrains

In accordance with City of Oceanside Engineers Design and Processing Manual (Oceanside 1992) , toe-of-slope subdrains are required at the toe of all slopes where the slope equals or exceeds 30 feet in height or when the slope equals or exceeds 8 feet in height and 300 feet in length." As a result, a number proposed slopes on the site will require toe-of-slope subdrains. The actual location of the toe-of-slope subdrains should be determined after the final grading plans are completed.

Recommendations to mitigate the seepage conditions include installing a toe-of·- slope subdrain system installing a subdrain system at or slightly below the contact between the permeable and impermeable materials or by replacing the slope with a stability fill can be made as needed based on the actual conditions.

5.4 Temporary Excavations

Sloped excavations may be utilized when adequate space allows. Based on findings, we provide the following recommendations for sloped excavations in fill soils or competent formational materials without seepage conditions.

Table 4
Temporary Excavation Recommendations

Excavation Depth Below Adjacent Surface (feet)	Maximum Slope Ratio In Landslide and Fill Soils	Maximum Slope Ratio In Competent Formational Material
0 to 5	¾:1 (H : V)	Vertical
5 to 45	1.5:1 or 1:1	1:1

Excavations greater than 20 feet in height will require an alternative sloping plan or shoring plan prepared by a California registered civil engineer. The above values are based on the assumption that no surcharge loading, or equipment will be placed within 10 feet of the top of slope. All excavations should comply with OSHA requirements. Care should be taken during excavation adjacent to the existing structures so that undermining does not occur. The contractor's "competent person" should review all excavations on a daily basis for signs of instability.

5.5 Foundation and Slab Considerations

The foundation and slab should be designed in accordance with structural considerations and the following recommendations. These recommendations assume that the soils encountered within 5 feet of the finish grade or within 3 feet of building foundation are granular with a very low to medium potential for expansion. If soils other than very low to medium expansive soils are encountered during site grading, additional foundation design will be necessary. These recommendations should be confirmed after the completion of grading based on the actual as-graded geotechnical conditions.

5.5.1 Preliminary Foundation Design

The proposed structures may be designed by the structural engineer utilizing the following geotechnical parameters. Note that it is assumed that entire building will be underlain by uniform layer of compacted fill at least 5 feet thick. For isolated square and continuous foundations, an allowable bearing capacity of 2,500 psf on compacted fill may be utilized for footings with a minimum width of 18 inches at a depth of at least 24 inches below the adjacent grade. The allowable pressure may be increased by one-third when considering loads of short duration such as wind or seismic forces.

5.5.2 Preliminary Floor Slab Design

The slab-on-grade should be at least 5 inches thick and be reinforced with No. 3 rebars 18 inches on center each way. All reinforcing should be placed at mid-height in the slab. Slabs should be underlain by a 2-inch layer of clean sand over a 10-mil plastic sheeting moisture barrier and an additional 2 inches of sand below the moisture barrier. We recommend control joints be provided across the slab at appropriate intervals as designed by the project architect/structural engineer.