

Drainage Memo for Roquet Ranch – Tentative Tract Map 19983 City of Colton

Date: November 2016

From: K&A Engineering, Inc.

Discussion:

The purpose of this memorandum is to discuss the following:

1. On-site pre- and post-development hydrology and water quality conditions.
2. Off-site hydrology impacts to Cadena Creek and the Highgrove Channel.

The Roquet Ranch community is comprised of approximately 335 acres. It is a mixed use development which will include single family homesites, attached condominium homes, a school site, commercial area, a public park, a private recreational area, and numerous open space areas. Residential development will be the primary land use with approximately 800 residential units. The new Community is located in the La Loma Hills in south Colton. The project bounded on the south by residential development and the San Bernardino/Riverside County boundary line, on the west by low lying vacant land and the Santa Ana River, on the north by vacant land within the La Loma Hills, and on the east by existing Colton residential developments and La Cadena Drive.

Refer to Figure 1 - Project Area below.

Hydrologic parameters used in our analysis follow the San Bernardino County Hydrology Manual.

On-site Existing Condition: The property contains three main drainage subareas:

1. North subarea, approximately 157.2 acres in the northern portion of the property and drains toward the Santa Ana River. The 100-year storm peak discharge for this drainage area is 312.9 cfs.
2. West subarea, approximately 110.8 acres in the central portion of the property and drains westerly across low lying property towards the Santa Ana River. The 100-year storm peak discharge for this drainage area is 262.2 cfs.
3. South subarea, approximately 79.3 acres in the southern portion of the property and drains southerly and westerly and is tributary to Cadena Creek the existing Highgrove Channel. The 100-year storm peak discharge for this drainage area is 189.3 cfs.

On-site Proposed Condition: Every effort was made to maintain the Existing Condition drainage patterns for the proposed developed condition. We have created three primary drainage subareas:

1. North subarea, approximately 100.1 acres in the northern portion of the property and drains toward the Santa Ana River. The 100-year storm peak discharge for this drainage area is 256.7 cfs.
2. West subarea, approximately 100.1 acres in the central portion of the property and drains westerly across low lying property towards the Santa Ana River. The 100-year storm peak discharge for this drainage area is 252.9 cfs.

- South subarea, approximately 87.9 acres, in the southern portion of the property and drains southerly and westerly and is tributary to Cadena Creek and the existing Highgrove Channel. The 100-year storm peak discharge for this drainage area is 240.2 cfs.

Refer to attached Figures 2.1, 2.2, and 2.3 “On-Site Comparison Pre- & Post- Condition, Hydrology Map” for each subarea.

Refer to Attachment A: Drainage Report for Roquet Ranch – TTM 19983 by K&A Engineering, Inc. for hydrology calculations.

Summary On-site Existing Condition vs. Proposed Condition Drainage Comparison

Drainage Subarea	Existing Condition Q100 (cfs)	Proposed Condition Q100 (cfs)	Delta Q100 (cfs)
North	312.9	256.7	-56.2
West	262.2	252.9	-9.3
South	189.3	240.2	+50.9 *)

*) The South subarea requires a minor detention basin to achieve no net drainage increase.

On-Site Water Quality: On-Site water quality treatment from runoff from the Roquet Ranch Community will be mitigated by incorporating applicable Low Impact Development Best Management Practices (LID BMPs) and Treatment Control BMPs per the Waste Discharge Requirements for the County of San Bernardino, Order No. R8-2010-0036, NPDES No. CAS618036, Areawide Urban Stormwater Runoff, for the Santa Ana Region of the California Regional Water Quality Control Board.

Refer to Figure 3 for the locations of the On-Site water quality control basins.

Also see Water Quality Management Plan (WQMP) for Roquet Ranch – TTM 19983 by K&A Engineering, Inc. in Attachment D for the detailed analysis.

Off-Site Drainage Tributary to Cadena Creek and the Highgrove Channel: We have identified three off-site drainage areas tributary to Cadena Creek and the Highgrove Channel. We have labeled them as Drainage Areas A, B, and C. Refer to attached exhibits “Hydrology Map Off-site Drainage Areas” for existing and proposed conditions, Figures 4.1, 4.2, and 4.3.

- Drainage Area A, approximately 2.6 square miles is the most upstream drainage area and lies mostly within the City of Grand Terrace. The drainage boundaries begin at the ridge line of Blue Mountain to the east and the I-215 Freeway corridor to the west. The southern drainage boundary runs parallel along Main Street from the I-215 Freeway corridor to the ridge line of Blue Mountain. The northern drainage boundary runs through existing residential units north of Barton Road until reaching the ridge line of Blue Mountain.

Topographically, the off-site drainage area consists of the steep hillside (+/-40% slopes) from the ridge line of Blue Mountain to the base of the mountain, where the area begins to flatten out in the developed valley area (+/-3% slopes) down to the I-215 Freeway corridor. Several storm drain facilities including a 54” RCP and a 60” RCP running along Barton Road and De Berry Street help drain the valley area east of the Freeway. This off-site drainage area consists mostly of residential areas with some commercial/industrial development. Area A ultimately drains under the I-215 Freeway through an existing Caltrans double 6’ by 6’ box

culvert located next to the railroad crossing. The Q_{100} flow rate through the box culvert is 1,200 cfs based on FEMA's analysis (see Attachment B). This box culvert acts as flow restriction to Cadena Creek downstream of the I-215 Freeway.

2. Drainage Area B, is sandwiched between the I-215 Freeway and La Cadena Drive on the east and west, and Barton Road and Main Street to the north and south. The cumulative area of Area A and B is approximately 4.1 square miles. This off-site drainage area consists mostly of commercial and industrial development. The area is generally flat (+/-3% slopes). Flows from Area A run southerly parallel to the I-215 Freeway through two CalTrans 6' x 6' RCB culverts at Iowa Avenue and at the south bound I-215 off ramp and continue to the 60" CMP culvert at the La Cadena crossing. Our preliminary design indicates the need for a double 7' x 8' RCB at this location to intercept design flows of $Q_{100} = 1,700$ cfs based on FEMA's analysis.
3. Drainage Area C, is located between ridgeline of the La Loma Hills and La Cadena Drive on the east and west, and Barton Road and the Cadena Creek Mobile Home Community to the north and south. The cumulative area of Area A, B and C is approximately 4.7 square miles. This off-site drainage area consists mostly of residential development. The area is steep (+/-40% slopes) within the La Loma hills and flatter (+/-3% to 6% slopes) within the residential areas and along La Cadena Drive. Flows from Area B will be intercepted by the proposed double 7' x 8' RCB culvert and conveyed under La Cadena Drive and through Planning Area 9 to outlet into the existing Cadena Creek at the mobile home park. Storm flows travel westerly along the natural creek bed through the mobile home park and through two existing double 12' x 7' RCB culverts to the Highgrove Channel entrance at Orange Street. The Q_{100} flow rate at this point is 2,000 cfs. The existing culverts at Orange Street are planned to be replaced with a triple 6' x 9' RCB culvert. The Q_{100} flow rate through this box culvert is 2,000 cfs based on FEMA's analysis.

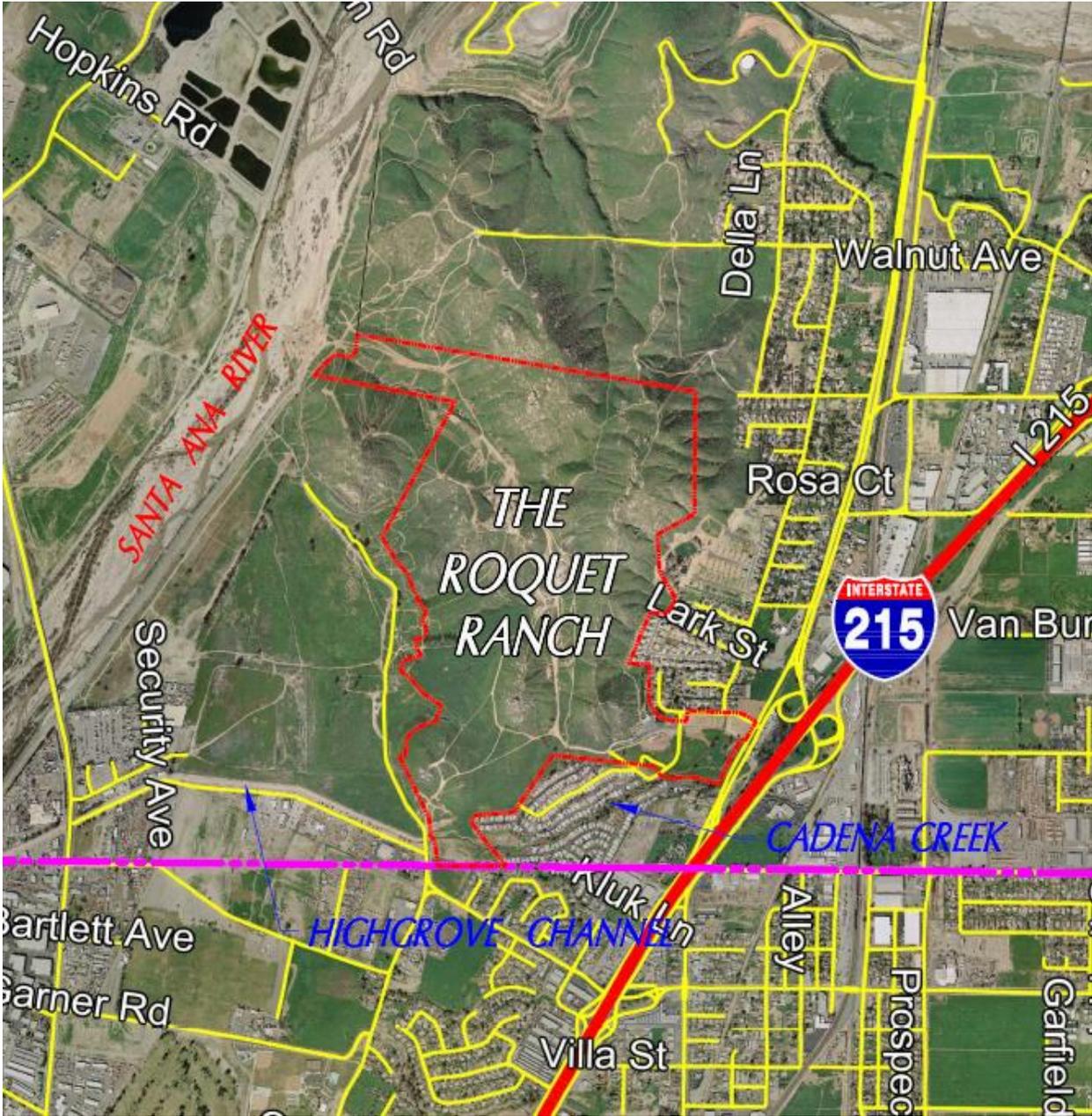
The existing Highgrove Channel, downstream of Orange Street is a trapezoidal concrete lined open channel owned and maintained by the Riverside County Flood Control & Water Conservation District. The design data from RCFCD indicates the capacity for this channel is 1,300 cfs (see Attachment C for more information).

Additionally, the existing overall total drainage area tributary to Cadena Creek and the Highgrove Channel consists of approximately 2,980 acres (4.7 square miles) and, based on FEMA's Flood Insurance Study (FIS), has a peak flow rate, $Q_{100} = 2,000$ cfs. The Time of Concentration for this peak flow to reach Cadena Creek at the mobile home park from the most upstream portion of the watershed is approximately 60 minutes. Peak flows from the Roquet Ranch Community that are tributary to Cadena Creek have a Time of Concentration of approximately 20 minutes, thereby lessening the impact of storm water runoff from the proposed project.

In conclusion:

- The development of the Roquet Ranch Community will not have any significant additional drainage impacts to Cadena Creek or the Highgrove Channel.
- The incorporation of the appropriate Low Impact Development Best Management Practices (LID BMPs) and Treatment Control BMPs to ensure water quality treatment of project runoff; the Roquet Ranch Community will not have any significant impacts to downstream water quality.

FIGURE 1 – PROJECT AREA



Attachments included on CD:

Attachment A: Drainage Report for Roquet Ranch – TTM 19983 by K&A Engineering, Inc.

Attachment B: Highgrove Channel FEMA FIRM and FIS.

Attachment C: Hydrology check on Highgrove Channel by RCFC&WCD and Highgrove Channel plans.

Attachment D: Water Quality Management Plan (WQMP) for Roquet Ranch – TTM 19983 by K&A Engineering, Inc.

ROQUET RANCH

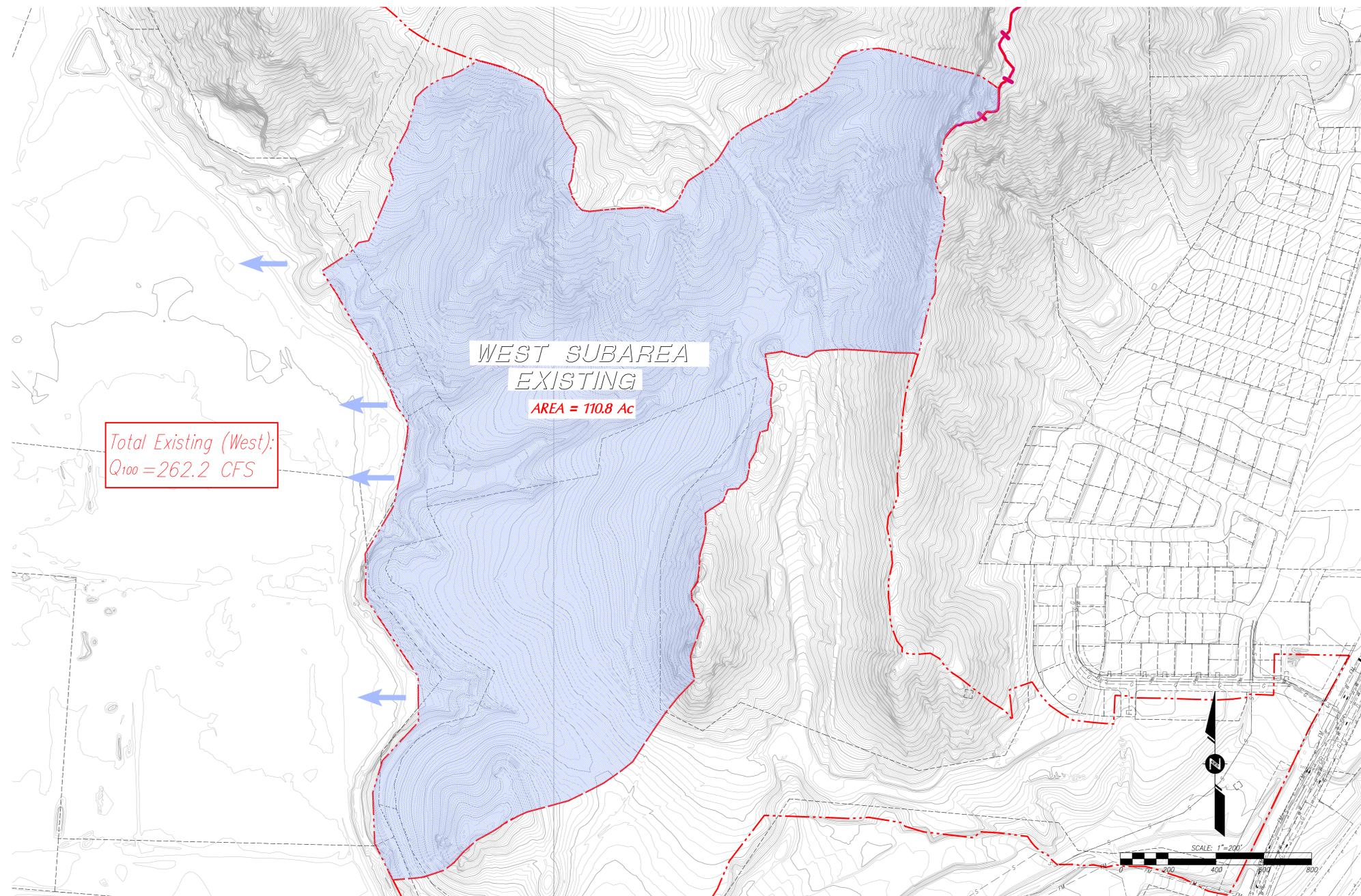
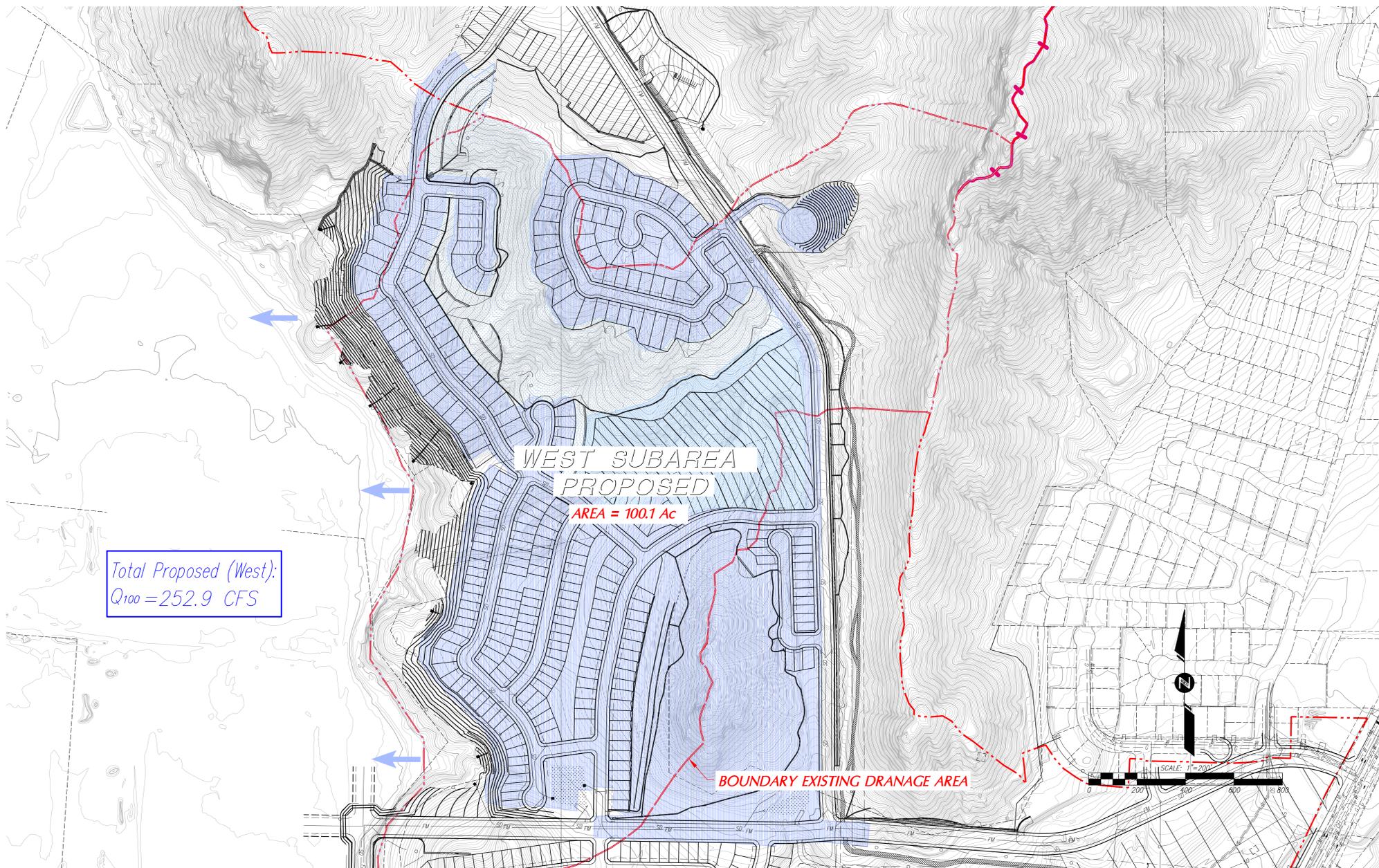
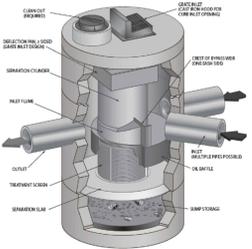
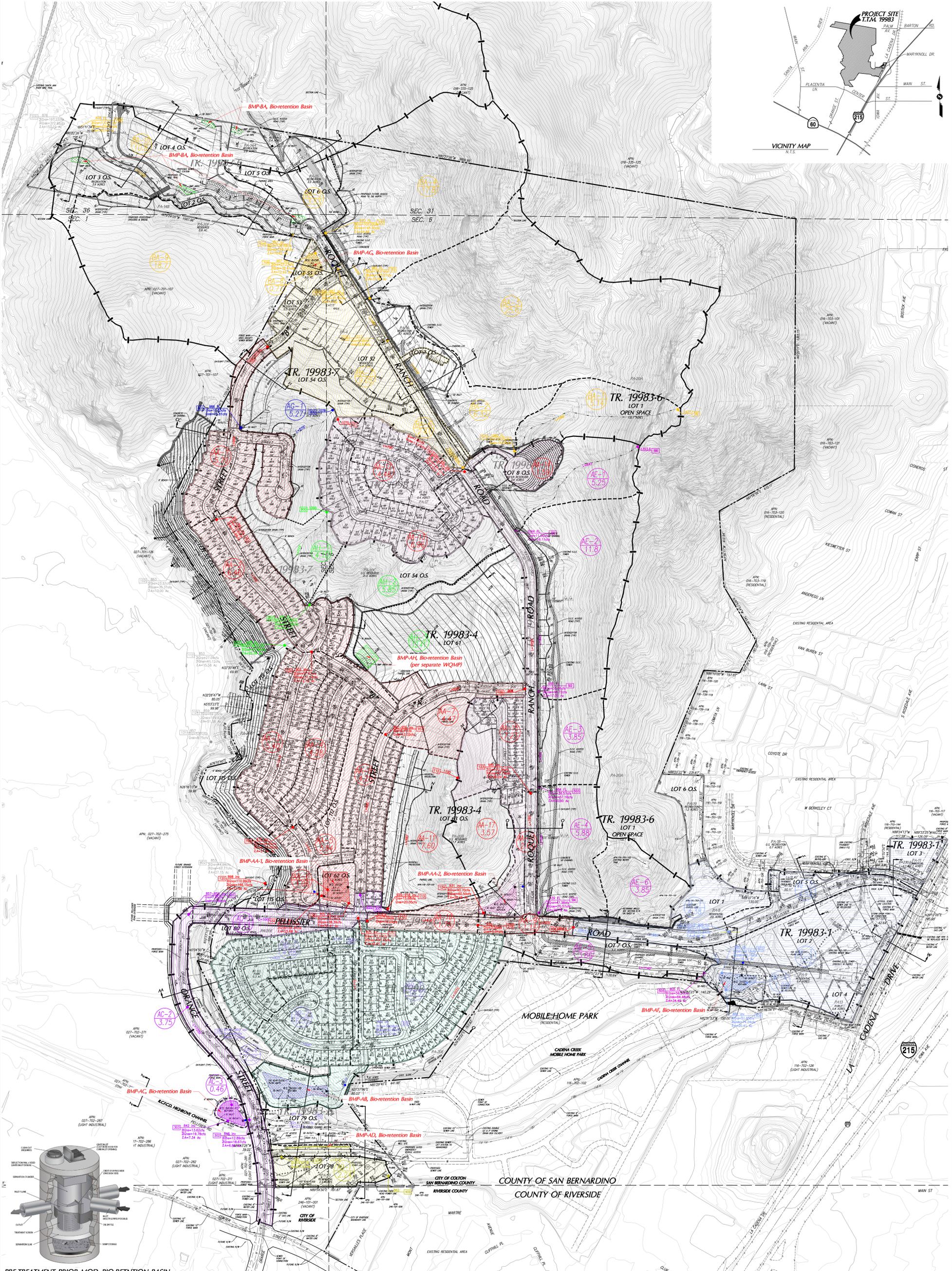
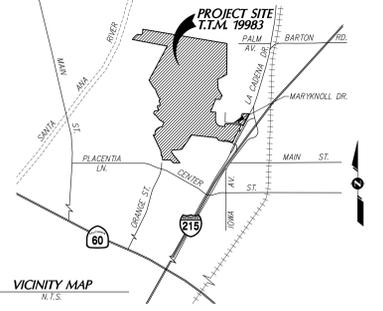
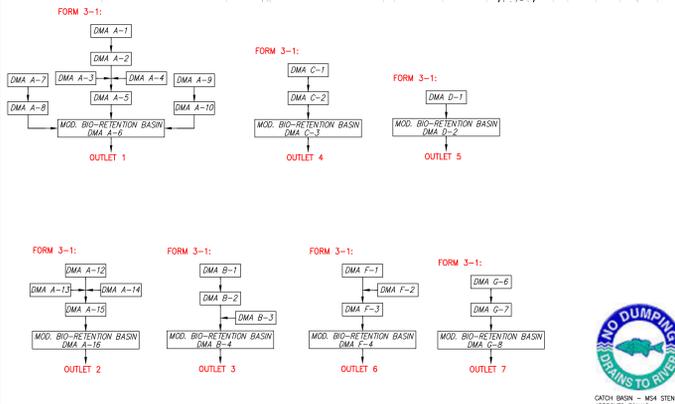


FIGURE: 2.2

ON-SITE COMPARISON: WEST SUBAREA
HYDROLOGY MAP - PRE- & POST- CONDITIONS



PRE-TREATMENT PRIOR MOD. BIO-RETENTION BASIN



AREA A:		AREA B:	
[Pattern]	DMA = AA1-AA10	[Pattern]	DMA = BA
[Pattern]	DMA = AA12-AA16	[Pattern]	BMP-AA, MOD. BIO-RETENTION BASIN
[Pattern]	DMA = AB1-AB4	[Pattern]	BMP-AA2, MOD. BIO-RETENTION BASIN
[Pattern]	DMA = AC1-AC3	[Pattern]	BMP-AB, MOD. BIO-RETENTION BASIN
[Pattern]	DMA = AD1	[Pattern]	BMP-AC, MOD. BIO-RETENTION BASIN
[Pattern]	DMA = AF1-AF4	[Pattern]	BMP-AD, MOD. BIO-RETENTION BASIN
[Pattern]	DMA = AG6-AG8	[Pattern]	BMP-AF, MOD. BIO-RETENTION BASIN
[Pattern]		[Pattern]	BMP-AG, MOD. BIO-RETENTION BASIN
[Pattern]		[Pattern]	

- PRE-TREATMENT BMP: VORTSENTRY HS
- RIPRAP OUTLET PIPE
- LID PRACTICES TO BE IMPLEMENTED FOR THIS PROJECT:
 - VEGETATION BUFFER ALONG PASEOS
 - CATCH BASIN - M54 STENCILING AND SIGNAGE
 - SLOPE LANDSCAPE AND IRRIGATION SYSTEM
 - OPEN SPACE AND PARK AREAS
 - STREET TREES AND PARKWAY
 - CONSERVATION DESIGN
 - RUNOFF CONVEYANCE
 - ROOF DOWNSPOUT DISCONNECTION
 - EFFICIENT / LOW IMPACT LANDSCAPING

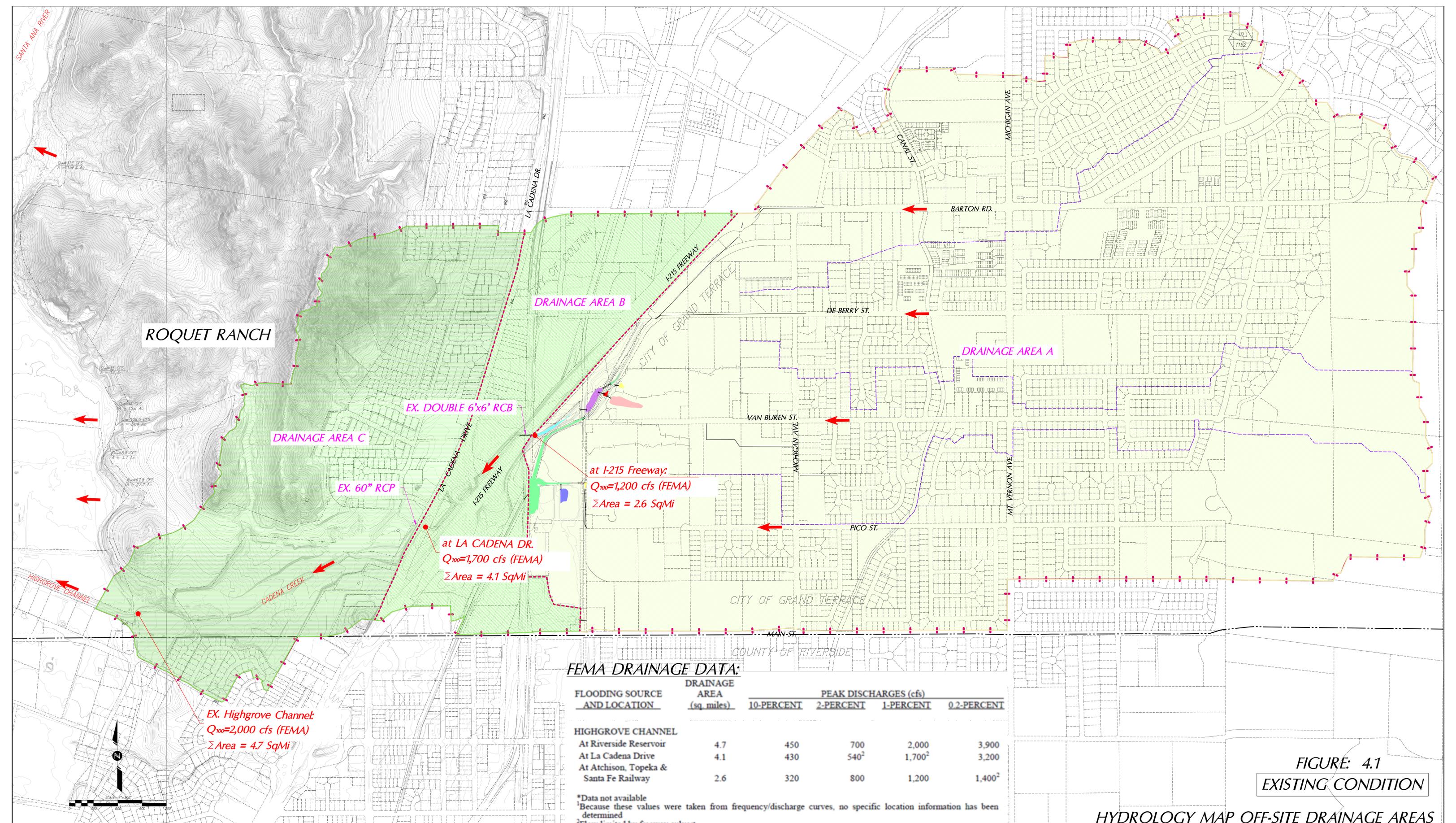


FIGURE 3

ROQUET RANCH - TTM 19983
WQMP BMPs SITE PLAN

K&A ENGINEERING
 LAND PLANNING
 SURVEYING
 357 N. SHERIDAN STREET
 SUITE 117
 CORONA, CALIFORNIA 92880
 TEL: (951) 279-1850
 FAX: (951) 279-4380

DATE: 10/20/2014 10:50 AM
 DRAWN: JLD
 CHECKED: JLD
 PROJECT: ROQUET RANCH - TTM 19983
 SHEET: 11 OF 11

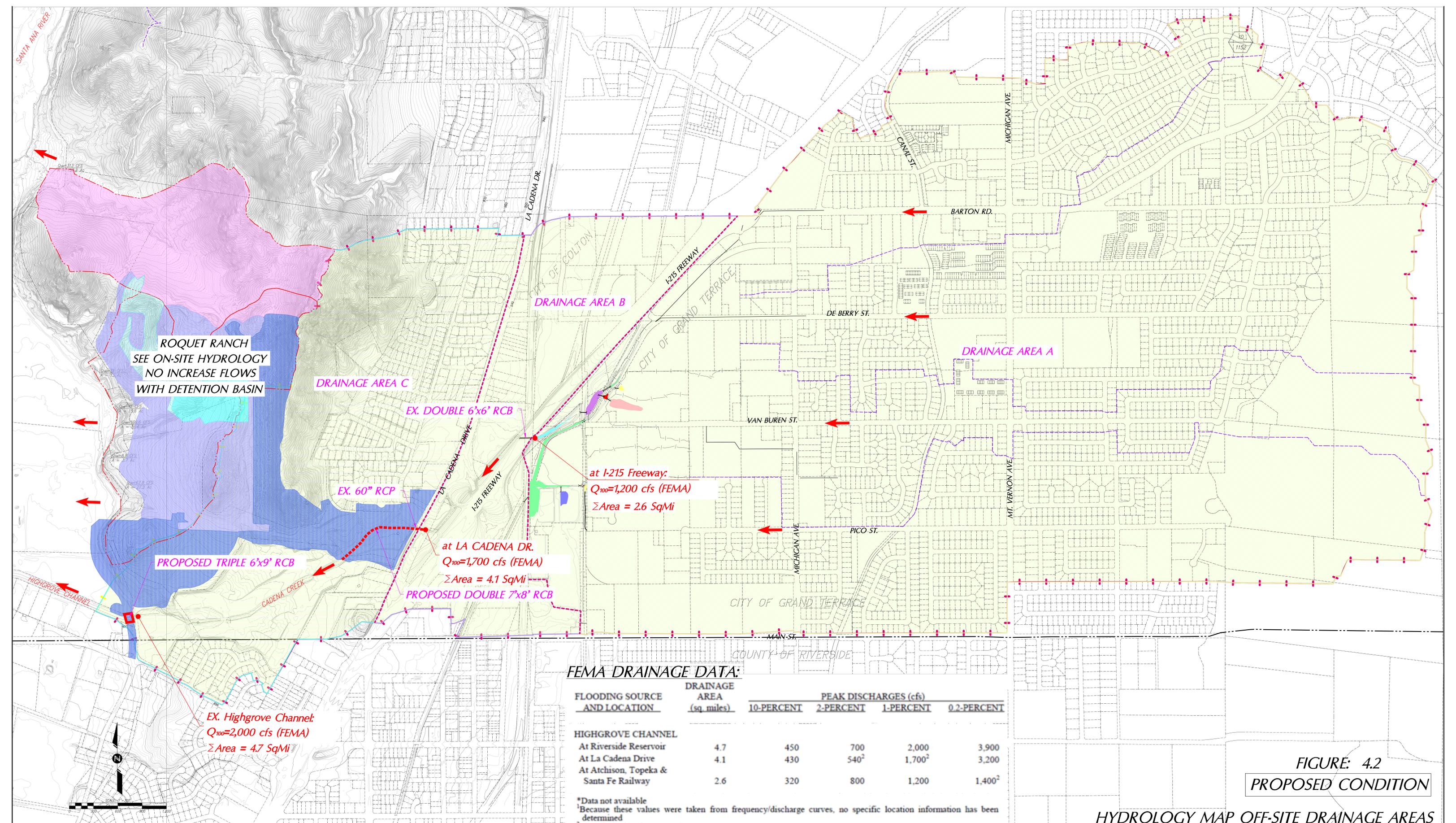


FEMA DRAINAGE DATA:

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs)			
		10-PERCENT	2-PERCENT	1-PERCENT	0.2-PERCENT
HIGHGROVE CHANNEL					
At Riverside Reservoir	4.7	450	700	2,000	3,900
At La Cadena Drive	4.1	430	540 ²	1,700 ²	3,200
At Atchison, Topeka & Santa Fe Railway	2.6	320	800	1,200	1,400 ²

²Data not available
¹Because these values were taken from frequency/discharge curves, no specific location information has been determined
²Flow limited by freeway culvert
³Drainage Area and discharge only considers contributing area downstream of confluence with Etiwanda/San Sevaire System

FIGURE: 4.1
EXISTING CONDITION

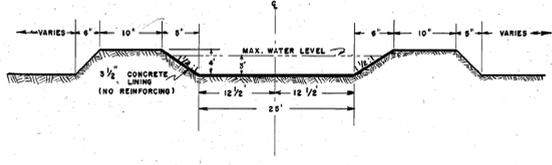


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FIGURE: 4.2
PROPOSED CONDITION



TYPICAL CHANNEL SECTION

SCALE 1" = 10'

DATA: B.L.R. P.B. 10-1-96 PAGES 44-48

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

HIGHGROVE PROJECT CHANNEL ALIGNMENT

AS BUILT

APPROVED: [Signature] DRAWN: WRA SHEET NO. 5

DATE: JANUARY 11, 1990 DATE: 1-71

PROJECT NO. 1-0-050

FEMA DRAINAGE DATA:

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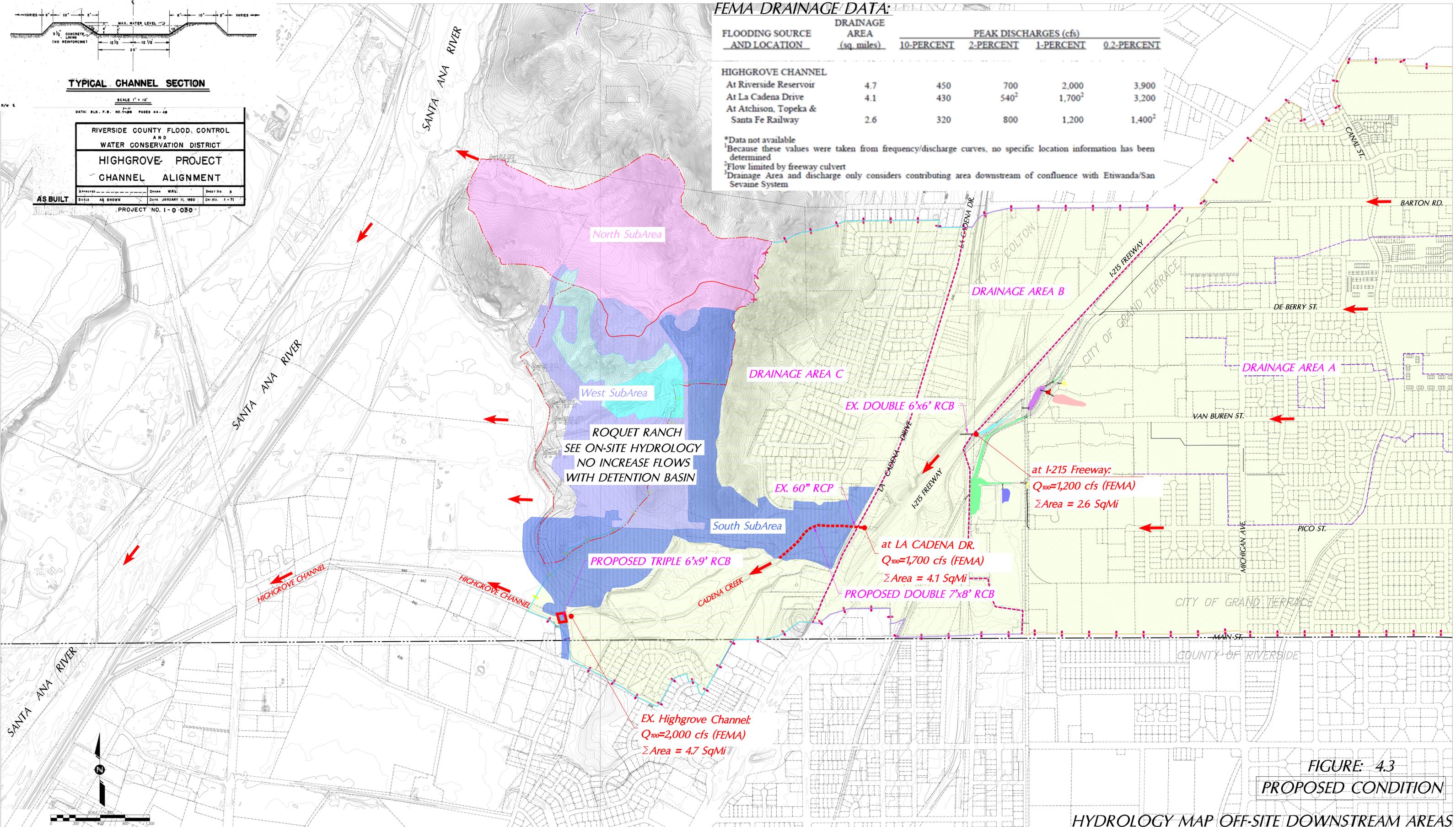


FIGURE: 4.3
PROPOSED CONDITION

HYDROLOGY MAP OFF-SITE DOWNSTREAM AREAS