Appendix F-2

Preliminary Hydrology-Hydraulics Study For Iron Lofts Apartments, 3093 Mission Inn Avenue, Riverside, California

KHR Associates

December 6, 2024

Preliminary Hydrology-Hydraulics Study
For
Iron Lofts Apartments
3093 Mission Inn Avenue
Riverside, California

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Date: 08/31/2023
Revised Dates: 11/27/2023; 08/09/2024; 12/06/2024

PREPARER'S CERTIFICATION

This report has been prepared under the direction of a duly Registered Civil Engineer in the State of California. The civil engineer signing below approves of the technical information included within this report along with recommendations and conclusions made.

James H. Kawamura, P.E.
Registered Civil Engineer No. C30560
Exp. 3/31/26

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EXHIBIT

APPENDIX

1.0 Introduction

1.1 Project Description

The proposed *Iron Lofts* multi-family residential project will consist of 300 residential dwelling units within a 4-story apartment building and 2-story townhome building with a 390-space parking lot on a 6.94 acres site, including a portion of a public street (6th Street) to be vacated, in the City of Riverside, California. As part of the proposed project, public street improvements, including new curb, gutter, sidewalks, and landscaping will be constructed along Commerce Street, Mission Inn Avenue, and 5th Street frontages.

1.2 Project Location

The project site is bounded by 5th Street to the north; Commerce Street to the west; Mission Inn Avenue to the south; and a residential neighborhood to the east. The project site currently consists of vacant land, large asphalt covered parking fields, several industrial buildings, and two historic Riverside Recycling buildings.

Figure 1 shows an aerial perspective of the project site and its environs, while Figure 2 illustrates the most current site plan for the proposed project.

Figure 1 – Aerial View of Project Site

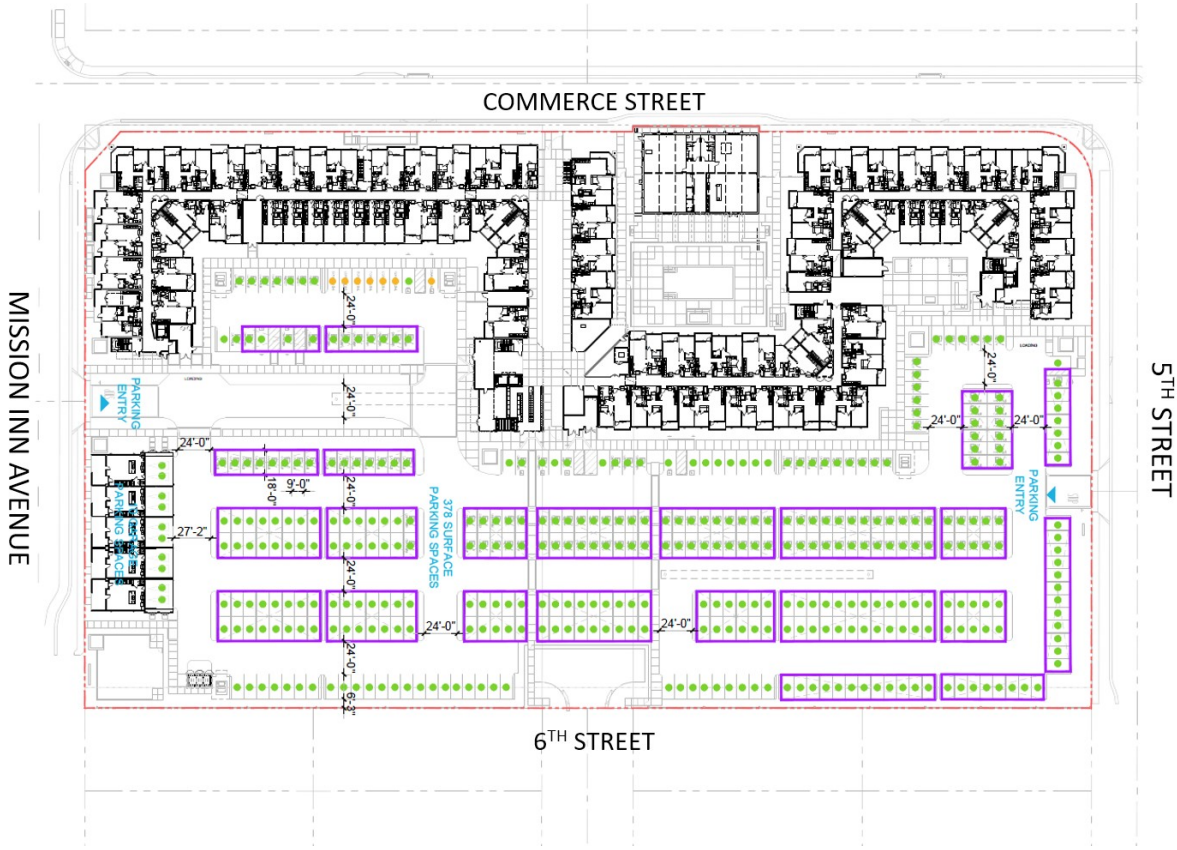


Figure 2 – Site Plan

1.3 Purpose of the Study

This drainage study presents an analysis of the hydrologic effects that may be associated with the proposed *Iron Lofts* multi-family residential project. The study details the general project characteristics, the design, criteria, and methodology applied to the analysis of the area in terms of drainage and associated conveyance facilities.

The plans and specifications in the drainage study are not for construction purposes; the contractor shall refer to final approved construction documents for plans and specifications.

2.0 Pre-Development Condition

2.1 Pre-Development Conditions

2.1.1 Hydrologic Setting

This section summarizes the project's size and location in the context of the larger watershed perspective, topography, soil and vegetation conditions, percent impervious area, natural and infrastructure drainage features, and other relevant hydrologic and environmental factors to be

protected specific to the project area's watershed.

2.1.2 Watershed

The proposed project is located within the 2,650 square miles Santa Ana watershed and drains to the Santa Ana River. The watershed includes portions of Lost Angeles, Riverside Counties, and San Bernardino County.

2.1.3 Existing Topography, Drainage Patterns, and Facilities (Narrative)

Adjacent to the subject property, 5th Street slopes from east to west and Commerce Street slopes from north to east.

The existing site currently comprises vacant land, expansive parking areas, several industrial buildings, and two historic Riverside Recycling structures. Stormwater runoff from the property flows out to all adjacent streets, where it eventually gets collected by existing curb and gutter systems. These discharges flowing out to the street occur without stormwater treatment and are collected by existing catch basins connected to the existing storm drain system.

2.1.4 Flood Zone

The subject property is located within Zone X (unshaded), considered to be a minimal risk area outside the 1% and 0.2% annual chance floodplains, as shown on the Federal Emergency Management's (FEMA) Flood Insurance Rate Map (FIRM) No. 06065C0726G, effective date August 28, 2008.

2.1.5 Adjacent Land Use

The project site is bounded by 5th Street to the north, existing residential uses to the east (within 6th street), Commerce Street to the west and Mission Inn Avenue to the south.

2.1.6 Soil Conditions

According to the geotechnical report prepared by Geotechnical Professionals Inc. (dated May 19, 2021), the site is underlain with predominantly of interbedded layers of sandy silts, silty sands, silts, and sands and is to be medium dense from depths of 20 to 50 feet. The site's soil is considered hydrologic soil group "C" according to the USDA Natural Resources Conservation Service. (See Exhibit A for Soils Group Map.)

2.2 Methodology of Hydrology Study

This section summarizes the design criteria and methodology applied for the drainage study. The design criteria and methodology follows the Riverside County Flood Control and Water Conservation District (RCFC & WCD) Hydrology Manual (April 1978) noted as "Riverside County Hydrology Manual or RCHM."

2.2.1 Design Criteria

Local storm drain facilities have been designed to conform to standards found in the RCHM. Storm drain facilities have been designed to accommodate both the 10-year and 100-year storm events.

2.2.2 Rational Method

Runoff calculations for this study were accomplished using Hydrowin / AES 2016 software, which incorporates the RCFC & WCD Hydrology Manual. This manual uses a method where runoff is assumed to be directly proportional to rainfall and area, less losses for infiltration and depression storage.

$$Q=CIA$$

Where... Q = Peak discharge (cfs);
C = runoff coefficient, based on land use and soil type;
i = Rainfall intensity (in/hr);
A = watershed area (acre)

The runoff coefficient represents the ratio of rainfall that runs off the watershed versus the portion that infiltrates to the soil or is held in depression storage. The runoff coefficient is dependent on the land use coverage and soil type. The RCFC & WCD Hydrology Manual methodology assumes hydrologic Soil Type C" (Exhibit A) for all soils near the project site.

The watershed time of concentration at any given point is defined as the time it would theoretically take runoff to travel from the most upstream point in the watershed to a concentration point, as estimated by the Time of Concentration Nomograph for Initial Subarea.

Intensity for this site was determined by the intensity-duration curves from the RCHM (See Exhibit B). The runoff coefficient represents the ratio of rainfall that runs off the watershed versus the portion that infiltrates to the soil or is held in depression storage. The runoff coefficient (C) is dependent on rainfall intensity (I), and acreage area (A).

A set of peak discharge rates were computed for both the existing and proposed conditions respectively for the project site to facilitate a comparative analysis between the two scenarios.

Rational Method calculations were accomplished using AES Software. Peak discharges for 10-year, and 100-year hypothetical storm return frequencies were computed and can be seen in the hydrology and drainage analysis section of this report.

2.3 Hydrology Calculations

This section summarizes the quantitative hydrologic analysis of the existing conditions of the site.

2.3.1 Summary of Drainage Delineation

Pre-development Analysis:

To analyze the pre-development conditions, the site was broken into two subareas: A and B (See Exhibit C).

Runoff from subarea A sheet flows southwesterly within an existing curb and gutter on 6th Street. Similarly, runoff from subarea B flows northerly and then westerly, discharging onto Commerce Street. The total runoff from Subareas A and B combine which drains into an existing inlet. The runoff eventually enters an existing storm drain culvert on Commerce Street.

In its current state, the project site also receives 13.21 acres of stormwater runoff from 6th street, designated as Subarea O-1. The flow rate for Subarea O-1 is 14.65cfs for the 10-year storm and 22.71cfs for the 100-year storm. (Refer to **Appendix 1**, Subarea O-1 for drainage area and spot elevations & **Appendix 1.2** for pre-development off-site calculations).

2.4 Results of Pre-Development Hydrology Calculations

Pre-development Calculations:

For the 10-year storm event, the existing site contributes 15.23 cfs of runoff on-site. The existing conditions results for the project site are summarized in **Table 1**. (See **Appendix 1.1** for pre-development calculations).

Table 1: Existing Conditions Hydrology

Storm Event	Subareas	Area (acres)	Q (cfs)
10-Year	A-B	6.94	15.23
	O-1	13.21	14.65
Total	-	**20.15**	**29.88**
100-Year	A-B	6.94	22.74
	O-1	13.21	22.71
Total	-	**20.15**	**45.45**

3.0 Post Development Condition

3.1 Post-Development Conditions

The proposed project will have a net increase in total impervious area compared to the existing condition of the site, increasing the site's overall total imperviousness percentage to 79% and decreases perviousness to 21%.

3.2 Methodology of Hydrology Study

This section summarizes the design criteria and methodology applied for the drainage study. The design criteria and methodology follows the RCFC & WCD Hydrology Manual (April 1978) noted as "Riverside County Hydrology Manual or RCHM."

3.2.1 Design Criteria

Local storm drain facilities have been designed to conform to standards found in the RCFC & WCD Hydrology Manual (April 1978). Storm drain facilities have been designed to accommodate both the 10-year and 100-year storm events.

3.2.2 Rational Method

Runoff calculations for this study were accomplished using AES 2016 software, which incorporates the RCFC & WCD Hydrology Manual. This manual uses a method where runoff is assumed to be directly proportional to rainfall and area, less losses for infiltration and depression storage. See section 2.2 for more information.

3.3 Hydrology Calculations

This section summarizes the quantitative hydrologic analysis of the proposed conditions of the site.

3.3.1 Summary of Drainage Delineation

Post-development Analysis:

The proposed site is broken into two main drainage areas: A and B (see **Appendix 2**). Each drainage area is further subdivided into multiple smaller subareas.

Stormwater runoff from the buildings in Subareas A and B will be collected by multiple inlets and roof drains, where it will then be collected by the proposed catch basins which will channel the stormwater into the proposed storm drain system. Runoff from the surface areas will flow along the curb and gutter, where it will be collected by multiple catch basins distributed throughout the site. All runoff will be routed for pre-treatment, prior to a solid walled CMP for detention and infiltration by drywells. Stormwater flows exceeding the treatment volume

capacity will bypass the treatment system and continue through the private storm drain system, where it will confluence with the existing stormwater runoff from 6th Street.

A proposed 24" storm drain pipe will be provided to collect and redirect all of the existing runoff on 6th Street. Once the flows combine, the on-site storm drain system will connect to the County's existing 72" storm drain pipe located on Mission Inn Avenue via a proposed 36" storm drain pipe. Additionally, there is expected to be on-site runoff coming from the proposed planters, specifically subareas B11 and B12. As water flows through these planters, the natural vegetation and soil will help to capture, treat, and manage runoff from the surrounding areas. This treated runoff will then be directed towards its respective street via the proposed catch basin. (Refer to **Appendix 2.2** for map and **Appendix 2.3** for calculations). For catch basins and storm pipes in the public right of way, sizing will be provided during the final design phase.

The project site in its post-development condition will intercept stormwater from 6th street and adjacent properties towards the east (Refer to Subarea O-1 from **Appendix 2**; and Section 3.4 for flow rates). This stormwater will not negatively impact the new development as it will be directed in a City-owned catch basin and storm drain pipe (with a maintenance easement), discharging south towards Mission Avenue through a new RCP pipe, which will connect to the existing 72-inch storm pipe (See **Appendix 2.1** for the addition of subarea O-1 to the development).

3.4 Results of Post-Development Hydrology Calculations

Post-development Calculations:

Under post-development conditions, the site will produce 23.64 cfs of stormwater runoff, which will be collected by the private storm drain system and will be routed to the proposed tanks for detention prior to infiltration by means of drywells. The proposed conditions results for the project site are summarized in **Table 2.** (See **Appendices 2.1** and **2.3** for post-development calculations).

Table 2: Proposed Conditions Hydrology

Storm Event	Subareas	Area (acres)	Q (cfs)
10-Year	A1-A12, B1-B10, O-1	19.6	23.64
	B11, B12	0.6	1.16
Total	-	**20.2**	**24.08**
100-Year	A1-A11, B1-B10, O-1	19.6	36.04
	B11, B12	0.6	1.75
Total	-	**20.2**	**37.79**

4.0 Comparison of Post-Development and Pre-Development Hydrologic Conditions

4.1 Conclusion

Site Analysis Results:

Table 3: Hydrology Comparative Analysis

Storm Event	Pre-development Condition (Q)	Post-development Condition (Q)
10-Year	29.88 cfs	23.64 cfs
100-Year	45.45 cfs	36.04 cfs

The results from the AES calculations show that the post-development condition will generate a lower peak flow rate compared to the pre-development condition (See Table 1 above). This reduction in runoff is attributed to the extended drainage flow path and the utilization of underground storm drain piping. Furthermore, the existing site land-use is industrial/commercial; whereas, the proposed development is for multi-family residential use.

The post-development condition results do not account the additional reduction in runoff volume due to the infiltration of the required stormwater quality design volume. Therefore, the proposed development will not negatively impact the downstream storm drain system or receiving waters.

4.2 Proposed Runoff Management Facilities

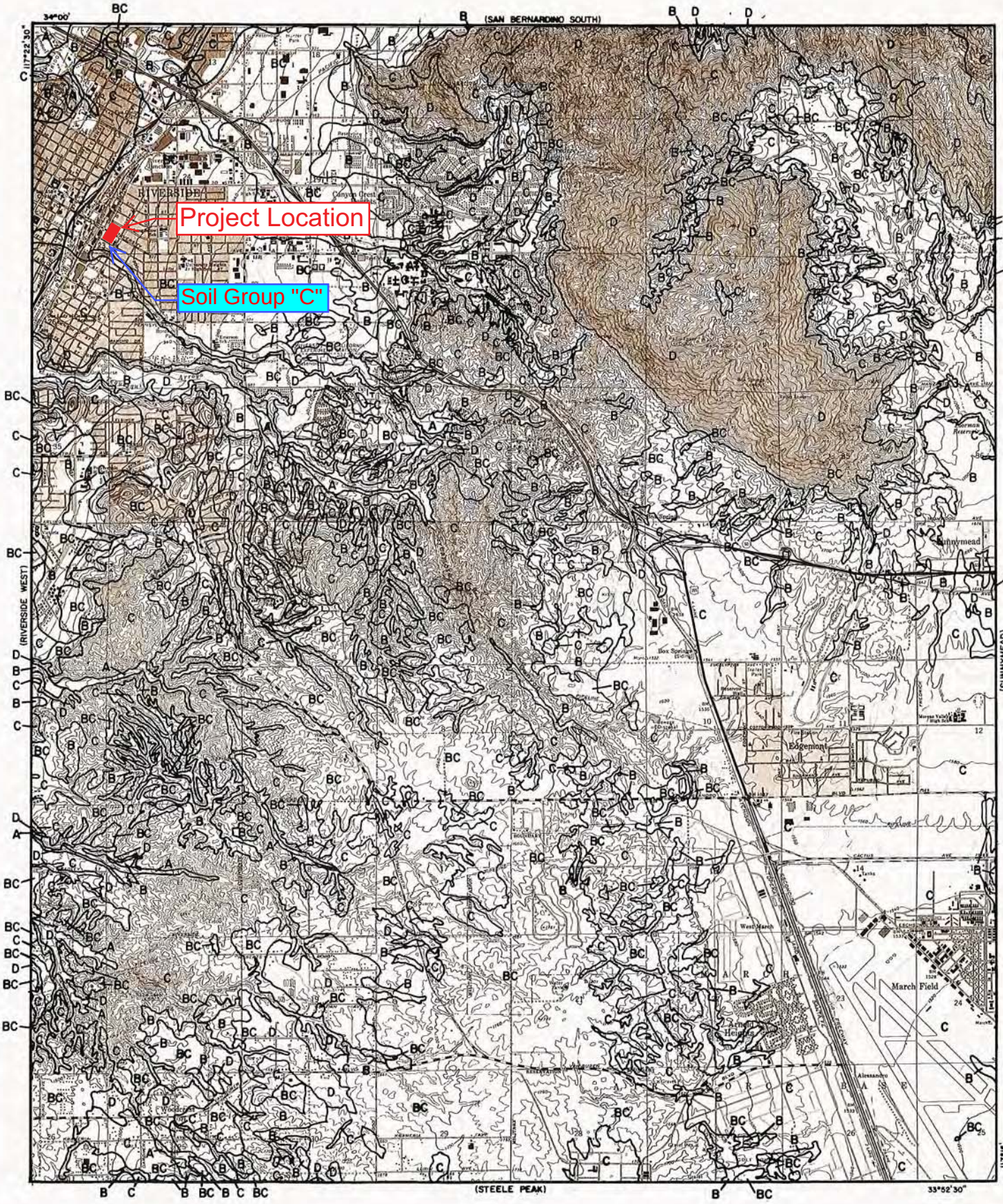
The proposed facilities managing runoff from the area include:

- ❑ Water quality treatment control Best Management Practices (BMPs); specifically, Aqua Swirl Hydrodynamic Separator Treatment device and Drywell Systems.
- ❑ Proposed perforated corrugated steel infiltration tanks will be placed on the project site.

EXHIBITS

EXHIBIT A

Hydrologic Soils Group Map



LEGEND

—— SOILS GROUP BOUNDARY

A SOILS GROUP DESIGNATION

RCFC & WCD

HYDROLOGY MANUAL

N

0 FEET 5000

HYDROLOGIC SOILS GROUP MAP FOR RIVERSIDE–EAST

PLATE C–1.16

EXHIBIT B

Precipitation Maps

RAINFALL INTENSITY–INCHES PER HOUR

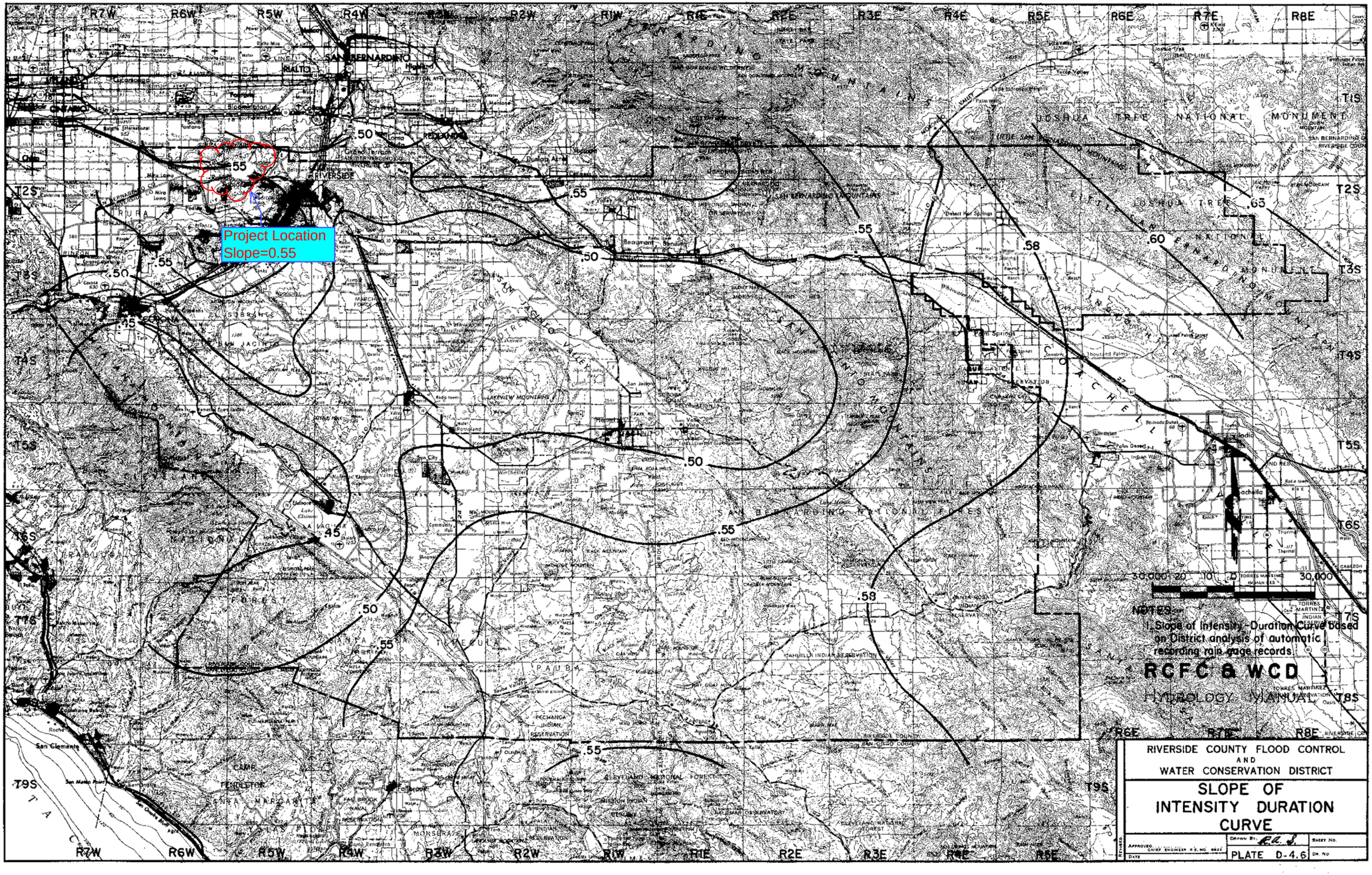
RIVERSIDE			RIVERSIDE (FOOTHILL AREAS)			RUBIDOUX			SAN JACINTO			SUN CITY		
DURATION MINUTES	FREQUENCY 10 YEAR	100 YEAR	DURATION MINUTES	FREQUENCY 10 YEAR	100 YEAR	DURATION MINUTES	FREQUENCY 10 YEAR	100 YEAR	DURATION MINUTES	FREQUENCY 10 YEAR	100 YEAR	DURATION MINUTES	FREQUENCY 10 YEAR	100 YEAR
5	2.75	3.92	5	3.14	4.71	5	3.18	4.71	5	2.81	4.16	5	3.25	4.85
6	2.48	3.55	6	2.84	4.26	6	2.87	4.26	6	2.56	3.79	6	2.95	4.40
7	2.28	3.26	7	2.61	3.91	7	2.64	3.91	7	2.37	3.51	7	2.72	4.06
8	2.12	3.03	8	2.42	3.63	8	2.45	3.63	8	2.22	3.29	8	2.53	3.78
9	1.99	2.84	9	2.27	3.41	9	2.30	3.41	9	2.09	3.10	9	2.38	3.55
10	1.88	2.68	10	2.14	3.21	10	2.17	3.21	10	1.98	2.94	10	2.25	3.36
11	1.78	2.54	11	2.03	3.05	11	2.06	3.05	11	1.89	2.80	11	2.14	3.19
12	1.70	2.42	12	1.94	2.91	12	1.96	2.91	12	1.81	2.68	12	2.04	3.05
13	1.62	2.32	13	1.86	2.78	13	1.88	2.78	13	1.74	2.58	13	1.96	2.92
14	1.56	2.23	14	1.78	2.67	14	1.80	2.67	14	1.68	2.48	14	1.88	2.81
15	1.50	2.14	15	1.71	2.57	15	1.74	2.57	15	1.62	2.40	15	1.81	2.71
16	1.45	2.07	16	1.66	2.48	16	1.68	2.48	16	1.57	2.32	16	1.75	2.62
17	1.40	2.00	17	1.60	2.40	17	1.62	2.40	17	1.52	2.25	17	1.70	2.54
18	1.36	1.94	18	1.55	2.33	18	1.57	2.33	18	1.48	2.19	18	1.65	2.46
19	1.32	1.88	19	1.51	2.26	19	1.52	2.26	19	1.44	2.13	19	1.60	2.39
20	1.28	1.83	20	1.46	2.20	20	1.48	2.20	20	1.40	2.08	20	1.56	2.33
22	1.22	1.74	22	1.39	2.08	22	1.41	2.08	22	1.34	1.98	22	1.48	2.21
24	1.16	1.66	24	1.32	1.99	24	1.34	1.99	24	1.28	1.90	24	1.41	2.11
26	1.11	1.58	26	1.27	1.90	26	1.28	1.90	26	1.23	1.82	26	1.36	2.03
28	1.06	1.52	28	1.22	1.82	28	1.23	1.82	28	1.19	1.76	28	1.30	1.95
30	1.02	1.46	30	1.17	1.76	30	1.19	1.76	30	1.15	1.70	30	1.26	1.88
32	.99	1.41	32	1.13	1.70	32	1.14	1.70	32	1.11	1.64	32	1.21	1.81
34	.96	1.37	34	1.09	1.64	34	1.11	1.64	34	1.08	1.59	34	1.18	1.76
36	.93	1.32	36	1.06	1.59	36	1.07	1.59	36	1.05	1.55	36	1.14	1.70
38	.90	1.29	38	1.03	1.54	38	1.04	1.54	38	1.02	1.51	38	1.11	1.66
40	.87	1.25	40	1.00	1.50	40	1.01	1.50	40	.99	1.47	40	1.08	1.61
45	.82	1.17	45	.94	1.41	45	.95	1.41	45	.94	1.39	45	1.01	1.51
50	.77	1.11	50	.88	1.33	50	.90	1.33	50	.89	1.31	50	.96	1.43
55	.73	1.05	55	.84	1.26	55	.85	1.26	55	.85	1.25	55	.91	1.36
60	.70	1.00	60	.80	1.20	60	.81	1.20	60	.81	1.20	60	.87	1.30
65	.67	.96	65	.77	1.15	65	.78	1.15	65	.78	1.15	65	.83	1.25
70	.64	.92	70	.73	1.10	70	.74	1.10	70	.75	1.11	70	.80	1.20
75	.62	.88	75	.71	1.06	75	.72	1.06	75	.72	1.07	75	.77	1.15
80	.60	.85	80	.68	1.02	80	.69	1.02	80	.70	1.04	80	.75	1.12
85	.58	.83	85	.66	.99	85	.67	.99	85	.68	1.01	85	.72	1.08
SLOPE = .550			SLOPE = .550			SLOPE = .550			SLOPE = .500			SLOPE = .530		

RCFC & WCD

HYDROLOGY MANUAL

STANDARD INTENSITY–DURATION CURVES DATA

PLATE D-4.1(5 of 6)


Project Location
Slope=0.55
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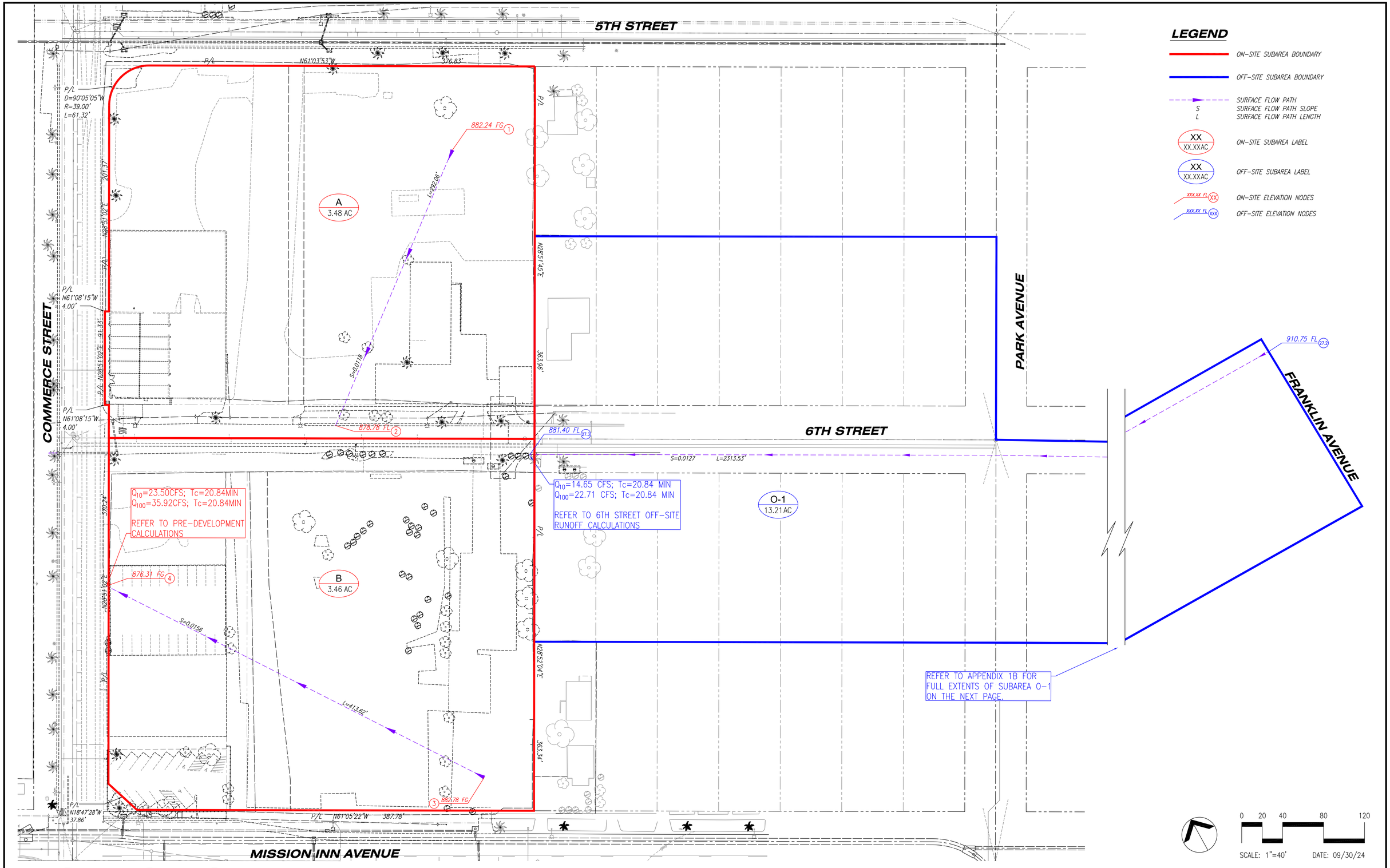
.50
.45
.58
.60
.63
SAN BERNARDINO MOUNTAINS
SAN JACINTO MOUNTAINS
JOSHUA TREE NATIONAL MONUMENT
SAN BERNARDINO NATIONAL FOREST
CLEVELAND NATIONAL FOREST
SANTA ANA MOUNTAINS
SANTA ROSA MOUNTAINS
SAN JACINTO VALLEY
SANTA MARGARITA
SAN JACINTO FAULT ZONE
SAN ANDREAS FAULT ZONE
SAN JACINTO WILDERNESS
SAN GORGONIO WILDERNESS
SAN GABRIEL MOUNTAINS
SAN BERNARDINO
RIVERSIDE
RIALTO
CORONA
NORCO
PERRIS
HEMET
SAN JACINTO
TEMECULA
MURRIETA
MENIFEE
BEAUMONT
BANNING
PALM SPRINGS
INDIO
COACHELLA
SAN CLEMENTE
FALLBROOK
CAMP PENDLETON
MARCH AFB
NORTON AFB
DUNLAP AIRSTRIP
MARCH AIR FORCE BASE
PECHANGA INDIAN RESERVATION
AGUA CALIENTE INDIAN RESERVATION
MORONGO INDIAN RESERVATION
SANTA ROSA INDIAN RESERVATION
TORRES MARTINEZ INDIAN RESERVATION
R7W R6W R5W R4W R3W R2W R1W R1E R2E R3E R4E R5E R6E R7E R8E
T2S T3S T4S T5S T6S T7S T8S T9S
30,000 20 10 0 30,000
NOTES
1. Slope of Intensity-Duration Curve based on District analysis of automatic recording rain gage records
RCFC & WCD
HYDROLOGY MANUAL
RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
SLOPE OF INTENSITY DURATION CURVE
PLATE D-4.6

APPENDICES

Appendix 1

Pre-Development Hydrology Map



IRON LOFTS

IRON LOFTS, LLC

PRE-DEVELOPMENT HYDROLOGY MAP

RIVERSIDE, CALIFORNIA

KHR ASSOCIATES
CONSULTING ENGINEERS/SURVEYORS/PLANNERS
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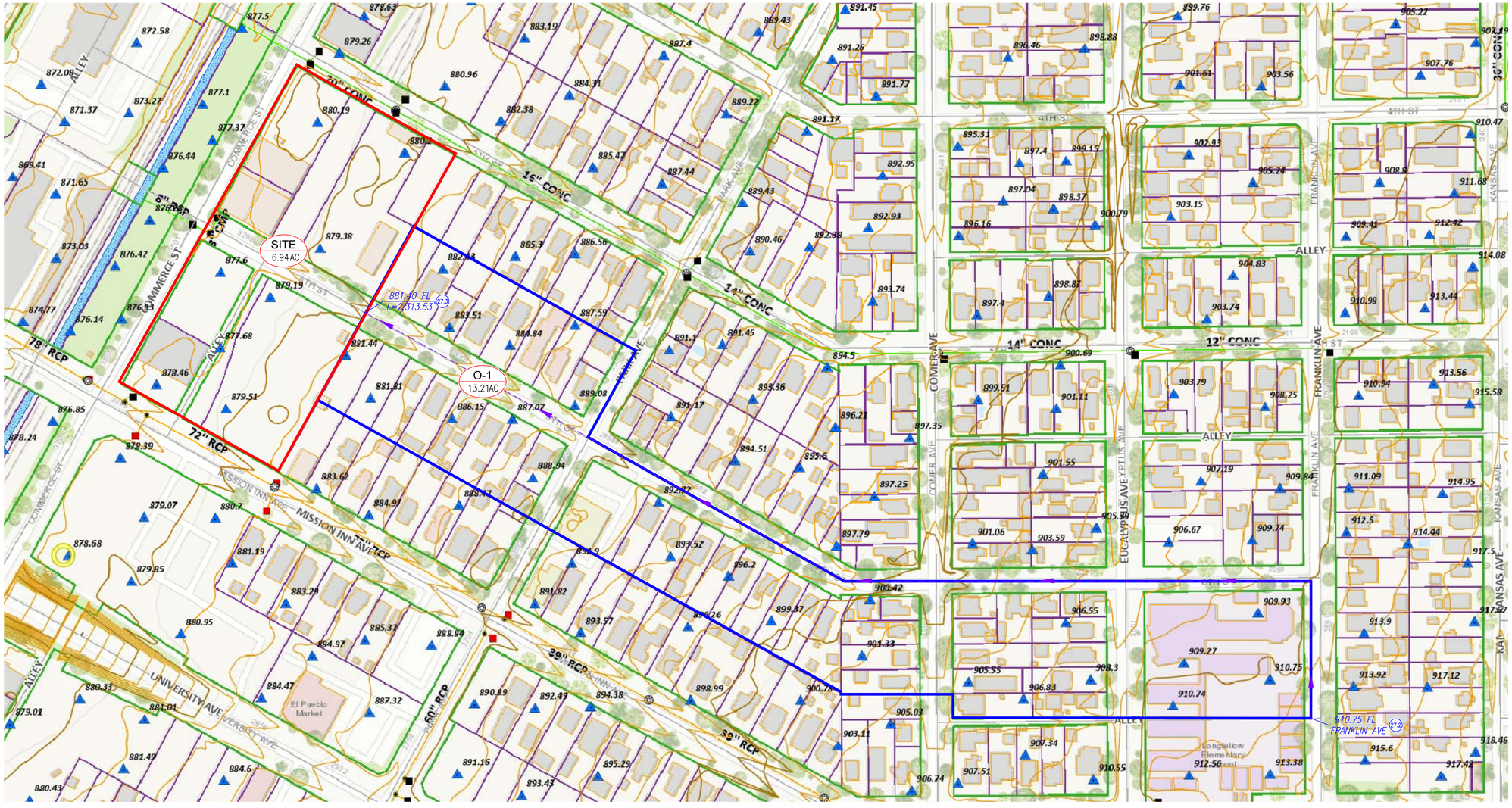
Irvine, California 92614

R:\Realm\Realm-Riverside-Iron Lofts\Documents\Hydrology\Final\Site 1\CAD\RL1-HYDRO-EXST.dwg Sep 30, 2024 - 1:13pm

NOTE: STUDY CONDUCTED FOR THE OFF-SITE DRAINAGE AREA IS BASED ON THE CITY OF RIVERSIDE GIS MAP DATA INCLUDING SPOT ELEVATIONS AND THE CITY DRAINAGE SYSTEM.

LEGEND

- ON-SITE SUBAREA BOUNDARY
- OFF-SITE SUBAREA BOUNDARY
- SURFACE FLOW PATH ON-SITE
- X / X.XXAC — SUBAREA LABEL



0 40 80 120 200

SCALE: 1:2,257 DATE: 08/05/24

IRON LOFTS

IRON LOFTS, LLC

PRE-DEVELOPMENT HYDROLOGY MAP-OFFSTE DRAINAGE AREA

RIVERSIDE, CALIFORNIA

KHR ASSOCIATES
CONSULTING ENGINEERS/SURVEYORS/PLANNERS
17530 Von Karman Ave. - Suite 200 Tel (949) 756-6440
Irvine, California 92614

R:\Realm\Realm-Riverside-Iron Lofts\Documents\Hydrology\Final\Site 1\CAD\Rl.1-HYDRO-EXST-OSTE.dwg Aug 09, 2024 - 9:59am

Appendix 1.1

Pre-Development Hydrology Calculations: On-Site plus Off-Site Runoff

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**************************************************************************
          RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM BASED ON
        RIVERSIDE COUNTY FLOOD CONTROL & WATER CONSERVATION DISTRICT
                    (RCFC&WCD)  1978 HYDROLOGY MANUAL
         (c) Copyright 1982-2016 Advanced Engineering Software (aes)
                    (Rational Tabling Version 23.0)
                Release Date: 07/01/2016  License ID 1681

                           Analysis prepared by:

                               KHR Associates
                            17530 Von Karman Avenue
                                Irvine, CA 92626


 ************************* DESCRIPTION OF STUDY *************************
* IRON LOFTS                                                            *
* PRE-DEVELOPMENT HYDROLOGY - INCLUDING OFF-SITE AREA                   *
* 10-YEAR STORM EVENT                                                   *
 ************************************************************************

  FILE NAME: RIL1-E10.DAT
  TIME/DATE OF STUDY: 09:30 08/05/2024
--------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
--------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) =   10.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   4.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  10-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  2.140
  10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  0.800
  100-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  3.210
  100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.200
  SLOPE OF 10-YEAR INTENSITY-DURATION CURVE =  0.5491525
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  STORM EVENT =   10.00   1-HOUR INTENSITY(INCH/HOUR) =   0.808
  SLOPE OF INTENSITY DURATION CURVE = 0.5492
  RCFC&WCD HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: CONSIDER ALL CONFLUENCE STREAM COMBINATIONS
        FOR ALL DOWNSTREAM ANALYSES
  *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

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
```

```
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

****************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      2.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   292.06
  UPSTREAM ELEVATION(FEET) =    882.24
  DOWNSTREAM ELEVATION(FEET) =    878.78
  ELEVATION DIFFERENCE(FEET) =      3.46
  TC = 0.303*[(  292.06**3)/(     3.46)]**.2 =    7.129
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.603
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8832
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =      8.00
  TOTAL AREA(ACRES) =      3.48   TOTAL RUNOFF(CFS) =      8.00

****************************************************************************
  FLOW PROCESS FROM NODE      2.00 TO NODE      2.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE      2.00 TO NODE      2.00 IS CODE =  13
----------------------------------------------------------------------------
  >>>>>CLEAR THE MAIN-STREAM MEMORY<<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     27.20 TO NODE     27.30 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS SINGLE FAMILY (1/4 ACRE)
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =  2313.53
  UPSTREAM ELEVATION(FEET) =    910.75
  DOWNSTREAM ELEVATION(FEET) =    881.40
  ELEVATION DIFFERENCE(FEET) =     29.35
  TC = 0.393*[( 2313.53**3)/(    29.35)]**.2 =   20.845
```

```
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.444
  SINGLE-FAMILY(1/4 ACRE LOT) RUNOFF COEFFICIENT = .7681
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =     14.65
  TOTAL AREA(ACRES) =     13.21   TOTAL RUNOFF(CFS) =     14.65

+---------------------------------------------------------------------------+
| SUBAREA O-1                                                               |
|                                                                           |
|                                                                           |
+---------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE     27.30 TO NODE     27.30 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 2 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     27.30 TO NODE     27.30 IS CODE =  13
----------------------------------------------------------------------------
  >>>>>CLEAR THE MAIN-STREAM MEMORY<<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE      3.00 TO NODE      4.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   413.62
  UPSTREAM ELEVATION(FEET) =    882.78
  DOWNSTREAM ELEVATION(FEET) =    876.31
  ELEVATION DIFFERENCE(FEET) =      6.47
  TC = 0.303*[(  413.62**3)/(     6.47)]**.2 =    7.751
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.486
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8825
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =      7.59
  TOTAL AREA(ACRES) =      3.46   TOTAL RUNOFF(CFS) =      7.59

****************************************************************************
  FLOW PROCESS FROM NODE      4.00 TO NODE      4.00 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        7.59     7.75       2.486        3.46
  LONGEST FLOWPATH FROM NODE      3.00 TO NODE      4.00 =     413.62 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF       Tc       INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1        8.00     7.13       2.603        3.48
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      4.00 =     292.06 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc       INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1      14.98       7.13        2.603
      2      15.23       7.75        2.486

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      15.23   Tc(MIN.) =    7.75
  TOTAL AREA(ACRES) =        6.9

****************************************************************************
  FLOW PROCESS FROM NODE      4.00 TO NODE      4.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 2 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF       Tc       INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1       14.98     7.13       2.603        6.94
      2       15.23     7.75       2.486        6.94
  LONGEST FLOWPATH FROM NODE      3.00 TO NODE      4.00 =     413.62 FEET.

  ** MEMORY BANK #  2 CONFLUENCE DATA **
  STREAM     RUNOFF       Tc       INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1       14.65    20.84       1.444       13.21
  LONGEST FLOWPATH FROM NODE     27.20 TO NODE      4.00 =    2313.53 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc       INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1      19.99       7.13        2.603
      2      20.68       7.75        2.486
      3      23.50      20.84        1.444

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      23.50   Tc(MIN.) =   20.84
  TOTAL AREA(ACRES) =       20.1
```

```
==========================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =       20.1  TC(MIN.) =     20.84
  PEAK FLOW RATE(CFS)   =      23.50
  *** PEAK FLOW RATE TABLE ***
         Q(CFS)   Tc(MIN.)
  1       19.99       7.13
  2       20.68       7.75
  3       23.50      20.84
==========================================================================
==========================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
**************************************************************************
          RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM BASED ON
        RIVERSIDE COUNTY FLOOD CONTROL & WATER CONSERVATION DISTRICT
                    (RCFC&WCD)  1978 HYDROLOGY MANUAL
         (c) Copyright 1982-2016 Advanced Engineering Software (aes)
                    (Rational Tabling Version 23.0)
                Release Date: 07/01/2016  License ID 1681

                          Analysis prepared by:

                              KHR Associates
                            17530 Von Karman Avenue
                               Irvine, CA 92626


 ************************* DESCRIPTION OF STUDY *************************
* IRON LOFTS                                                            *
* PRE-DEVELOPMENT HYDROLOGY - INCLUDING OFF-SITE AREA                   *
* 100-YEAR STORM EVENT                                                  *
 ************************************************************************

  FILE NAME: RIL1-E10.DAT
  TIME/DATE OF STUDY: 09:30 08/05/2024
--------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
--------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   4.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  10-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  2.140
  10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  0.800
  100-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  3.210
  100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.200
  SLOPE OF 10-YEAR INTENSITY-DURATION CURVE =  0.5491525
  SLOPE OF 100-YEAR INTENSITY-DURATION CURVE =  0.5491524
  COMPUTED RAINFALL INTENSITY DATA:
  STORM EVENT =  100.00   1-HOUR INTENSITY(INCH/HOUR) =   1.200
  SLOPE OF INTENSITY DURATION CURVE = 0.5492
  RCFC&WCD HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: CONSIDER ALL CONFLUENCE STREAM COMBINATIONS
        FOR ALL DOWNSTREAM ANALYSES
  *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

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
```

```
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

****************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      2.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   292.06
  UPSTREAM ELEVATION(FEET) =    882.24
  DOWNSTREAM ELEVATION(FEET) =    878.78
  ELEVATION DIFFERENCE(FEET) =      3.46
  TC = 0.303*[(  292.06**3)/(     3.46)]**.2 =    7.129
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.865
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8879
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =     11.94
  TOTAL AREA(ACRES) =      3.48   TOTAL RUNOFF(CFS) =     11.94

****************************************************************************
  FLOW PROCESS FROM NODE      2.00 TO NODE      2.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE      2.00 TO NODE      2.00 IS CODE =  13
----------------------------------------------------------------------------
  >>>>>CLEAR THE MAIN-STREAM MEMORY<<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     27.20 TO NODE     27.30 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS SINGLE FAMILY (1/4 ACRE)
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =  2313.53
  UPSTREAM ELEVATION(FEET) =    910.75
  DOWNSTREAM ELEVATION(FEET) =    881.40
  ELEVATION DIFFERENCE(FEET) =     29.35
  TC = 0.393*[( 2313.53**3)/(    29.35)]**.2 =   20.845
```

```
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.145
  SINGLE-FAMILY(1/4 ACRE LOT) RUNOFF COEFFICIENT = .8017
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =     22.71
  TOTAL AREA(ACRES) =     13.21   TOTAL RUNOFF(CFS) =     22.71

+---------------------------------------------------------------------------+
| SUBAREA O-1                                                               |
|                                                                           |
|                                                                           |
+---------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE     27.30 TO NODE     27.30 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 2 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     27.30 TO NODE     27.30 IS CODE =  13
----------------------------------------------------------------------------
  >>>>>CLEAR THE MAIN-STREAM MEMORY<<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE      3.00 TO NODE      4.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   413.62
  UPSTREAM ELEVATION(FEET) =    882.78
  DOWNSTREAM ELEVATION(FEET) =    876.31
  ELEVATION DIFFERENCE(FEET) =      6.47
  TC = 0.303*[(  413.62**3)/(     6.47)]**.2 =    7.751
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.692
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8874
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =     11.34
  TOTAL AREA(ACRES) =      3.46   TOTAL RUNOFF(CFS) =     11.34

****************************************************************************
  FLOW PROCESS FROM NODE      4.00 TO NODE      4.00 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       11.34     7.75       3.692        3.46
  LONGEST FLOWPATH FROM NODE      3.00 TO NODE      4.00 =     413.62 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF       Tc       INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1       11.94     7.13       3.865        3.48
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      4.00 =     292.06 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc       INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1      22.37       7.13        3.865
      2      22.74       7.75        3.692

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      22.74   Tc(MIN.) =    7.75
  TOTAL AREA(ACRES) =        6.9

****************************************************************************
  FLOW PROCESS FROM NODE      4.00 TO NODE      4.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 2 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF       Tc       INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1       22.37     7.13       3.865        6.94
      2       22.74     7.75       3.692        6.94
  LONGEST FLOWPATH FROM NODE      3.00 TO NODE      4.00 =     413.62 FEET.

  ** MEMORY BANK #  2 CONFLUENCE DATA **
  STREAM     RUNOFF       Tc       INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1       22.71    20.84       2.145       13.21
  LONGEST FLOWPATH FROM NODE     27.20 TO NODE      4.00 =    2313.53 FEET.

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc       INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1      30.14       7.13        3.865
      2      31.19       7.75        3.692
      3      35.92      20.84        2.145

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      35.92   Tc(MIN.) =   20.84
  TOTAL AREA(ACRES) =       20.1
```

```
================================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =       20.1  TC(MIN.) =     20.84
  PEAK FLOW RATE(CFS)   =      35.92
  *** PEAK FLOW RATE TABLE ***
         Q(CFS)   Tc(MIN.)
  1       30.14       7.13
  2       31.19       7.75
  3       35.92      20.84
================================================================================
================================================================================
  END OF RATIONAL METHOD ANALYSIS
```

Appendix 1.2

Pre-Development Hydrology Calculations:

6th Street Off-Site Runoff

```
**************************************************************************
          RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM BASED ON
        RIVERSIDE COUNTY FLOOD CONTROL & WATER CONSERVATION DISTRICT
                    (RCFC&WCD)  1978 HYDROLOGY MANUAL
         (c) Copyright 1982-2016 Advanced Engineering Software (aes)
                    (Rational Tabling Version 23.0)
                Release Date: 07/01/2016  License ID 1681

                          Analysis prepared by:

                              KHR Associates
                            17530 Von Karman Avenue
                               Irvine, CA 92626


 ************************* DESCRIPTION OF STUDY *************************
* IRON LOFTS                                                            *
* PRE-DEVELOPMENT HYDROLOGY - 6TH STREET OFF-SITE RUNOFF                *
* 10-YEAR STORM EVENT                                                   *
 ************************************************************************

  FILE NAME: 6TH-FR.DAT
  TIME/DATE OF STUDY: 17:26 08/02/2024
--------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
--------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) =   10.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   4.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  10-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  2.140
  10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  0.800
  100-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  3.210
  100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.200
  SLOPE OF 10-YEAR INTENSITY-DURATION CURVE =  0.5491525
  SLOPE OF 100-YEAR INTENSITY-DURATION CURVE =  0.5491524
  COMPUTED RAINFALL INTENSITY DATA:
  STORM EVENT =   10.00   1-HOUR INTENSITY(INCH/HOUR) =   0.808
  SLOPE OF INTENSITY DURATION CURVE = 0.5492
  RCFC&WCD HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: CONSIDER ALL CONFLUENCE STREAM COMBINATIONS
        FOR ALL DOWNSTREAM ANALYSES
  *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

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
```

```
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

****************************************************************************
  FLOW PROCESS FROM NODE     26.10 TO NODE     26.20 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS SINGLE FAMILY (1/4 ACRE)
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =  2313.53
  UPSTREAM ELEVATION(FEET) =    910.75
  DOWNSTREAM ELEVATION(FEET) =    881.40
  ELEVATION DIFFERENCE(FEET) =     29.35
  TC = 0.393*[( 2313.53**3)/(    29.35)]**.2 =   20.845
    10 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.444
  SINGLE-FAMILY(1/4 ACRE LOT) RUNOFF COEFFICIENT = .7681
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =     14.65
  TOTAL AREA(ACRES) =     13.21   TOTAL RUNOFF(CFS) =     14.65

+----------------------------------------------------------------------------+
| SUBAREA O-1 TO PROPOSED CITY CATCH BASIN                                   |
|                                                                            |
|                                                                            |
+----------------------------------------------------------------------------+
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =       13.2  TC(MIN.) =     20.84
  PEAK FLOW RATE(CFS)   =      14.65
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
**************************************************************************
          RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM BASED ON
        RIVERSIDE COUNTY FLOOD CONTROL & WATER CONSERVATION DISTRICT
                    (RCFC&WCD)  1978 HYDROLOGY MANUAL
         (c) Copyright 1982-2016 Advanced Engineering Software (aes)
                    (Rational Tabling Version 23.0)
                Release Date: 07/01/2016  License ID 1681

                          Analysis prepared by:

                              KHR Associates
                            17530 Von Karman Avenue
                               Irvine, CA 92626


 ************************* DESCRIPTION OF STUDY *************************
* IRON LOFTS                                                            *
* PRE-DEVELOPMENT HYDROLOGY - 6TH STREET OFF-SITE RUNOFF                *
* 100-YEAR STORM EVENT                                                  *
 ************************************************************************

  FILE NAME: 6TH-FR.DAT
  TIME/DATE OF STUDY: 17:26 08/02/2024
--------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
--------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   4.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  10-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  2.140
  10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  0.800
  100-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  3.210
  100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.200
  SLOPE OF 10-YEAR INTENSITY-DURATION CURVE =  0.5491525
  SLOPE OF 100-YEAR INTENSITY-DURATION CURVE =  0.5491524
  COMPUTED RAINFALL INTENSITY DATA:
  STORM EVENT =  100.00   1-HOUR INTENSITY(INCH/HOUR) =   1.200
  SLOPE OF INTENSITY DURATION CURVE = 0.5492
  RCFC&WCD HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: CONSIDER ALL CONFLUENCE STREAM COMBINATIONS
        FOR ALL DOWNSTREAM ANALYSES
  *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

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
```

```
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

****************************************************************************
  FLOW PROCESS FROM NODE     26.10 TO NODE     26.20 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS SINGLE FAMILY (1/4 ACRE)
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =  2313.53
  UPSTREAM ELEVATION(FEET) =    910.75
  DOWNSTREAM ELEVATION(FEET) =    881.40
  ELEVATION DIFFERENCE(FEET) =     29.35
  TC = 0.393*[( 2313.53**3)/(    29.35)]**.2 =   20.845
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.145
  SINGLE-FAMILY(1/4 ACRE LOT) RUNOFF COEFFICIENT = .8017
  SOIL CLASSIFICATION IS "C"
  SUBAREA RUNOFF(CFS) =     22.71
  TOTAL AREA(ACRES) =     13.21   TOTAL RUNOFF(CFS) =     22.71

+--------------------------------------------------------------------------+
| SUBAREA O-1 TO PROPOSED CITY CATCH BASIN                                 |
|                                                                          |
|                                                                          |
+--------------------------------------------------------------------------+
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =       13.2  TC(MIN.) =     20.84
  PEAK FLOW RATE(CFS)   =      22.71
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

Appendix 2

Post-Development Hydrology Map