PRELIMINARY
DRAINAGE STUDY

FOR

2005 HARMONY GROVE
ESCONDIDO, CALIFORNIA

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ENGINEER:
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BY:

_____

Bruce A. Tait, RCE 32247

PN: 15167
Date: March 10, 2016

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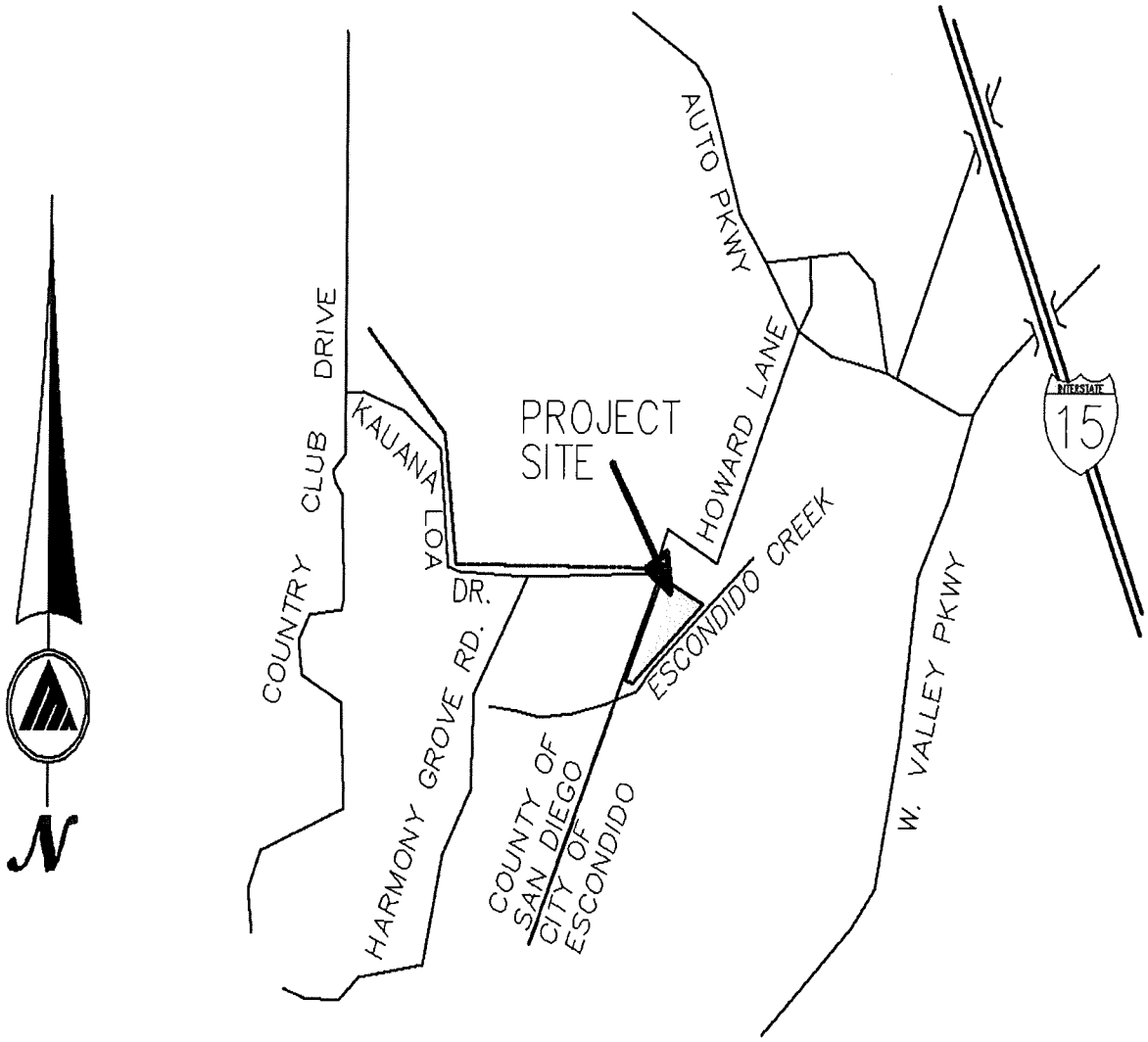
CITY OF ESCONDIDO, CALIFORNIA



VICINITY MAP

NO SCALE

CURRENT CONDITION

INTRODUCTION:

The project site is located on the south side of Harmony Grove Road, approximately 480 feet south of its intersection with Enterprise Street, within the City of Escondido, California. The Project is located on the light industrial zone (M-1) per City of Escondido General plan, on an approximately 4.8 acre site. The development project will be composed of two commercial buildings, parking lots, landscape and two bioretention basins.

According to the NRCS Websoil Survey, the site situated in hydrologic soil groups A and D. A drainage study was performed to evaluate the needs and effects of the runoff from the property. This report summarizes the findings of the study.

METHODOLOGY:

The method used herein to determine discharge quantities is the Rational Method as described in the City of Escondido Drainage Design Standards. Per the city drainage standards, for areas less than 0.5 square miles, a 50-year storm frequency event was used to determine runoff quantities.

Per the City standards, the following parameters will be used:

Intensity (I) =	3.3 in/hr (Figure 1)
Time of Concentration (Tc) =	10 minutes minimum (Figure 2)
Runoff coefficients (C):	
Undeveloped Land =	0.35 (Figure 1)
Commercial/Industrial =	0.85

Pre and post development hydrology maps are located in the back of this report as Exhibit 'A' and Exhibit 'B' respectively. The included maps outline the basins, flow paths and concentration points for runoff discharging from the site area. All applicable tables and charts referenced from the manual are included herein.

CURRENT CONDITIONS:

The triangular-sized project site currently contains one unoccupied single-family residence, detached garage, barn, and corral which they have been demolished to accommodate the proposed development. The site slopes gently from north to south on an average of 2 percent. A small depression runs northeast to southwest inside the project boundary. The immediate surrounding land uses consist of industrial parks to the north and west, vacant land to the north, and Escondido Creek to the east. The project onsite and offsite runoff currently sheet flow south westerly and ultimately drains onto Escondido Creek.

The "C" factor was used for the existing conditions is:
Undeveloped Land: 0.35
Commercial/Industrail: 0.85

Due to the short travel distance of each drainage basin, a 10 minute minimum time of concentration was used for the calculation per City of Escondido standards.

See Appendix A for calculations and exhibits.

PROPOSED CONDITIONS:

The proposed on-site development drainage will consist of 2 drainage basins with the gentle slope to the east and southwest.

Basin 1 is the smallest one of the two drainage basins and it is located on the north side of the project site. The basin will drain easterly via rooftop gutter and parking lot curb and gutter to a proposed bioretention basin located on the north east corner of the site.

Basin 2 is the largest basin of the two drainage basins. The basin will drain westerly via rooftop gutter and parking lot curb and gutter to a proposed bioretention basin located on the southwest corner of the site.

The onsite drainage basins after treatment will drain onto Escondido Creek via proposed storm drain system.

The offsite runoff will bypass along the south portion of the project site from east to west by a proposed storm drain system into the Escondido Creek.

Due to the short travel distance of each drainage basin, a 10 minute minimum time of concentration was used for all calculations per City of Escondido standards.

The following C factor was used:
Commercial/Industrail: 0.85

See Appendix B for calculations and exhibit.

CONCLUSIONS:

A comparison of the on-site runoff from the existing condition to the proposed conditions shows an increase in runoff because the proposed development adds impervious surfaces.

As previously mentioned, the runoff from the proposed development has been minimized by the use water quality treatment facilities located before the off-site discharge points and which consist of a bioretention basins. The retention of water will have the beneficial side effect of helping to reduce the peak rate of flow exiting the site.

Summary Table-Onsite

Basin	Area (Ac) Pre	Q_{50} (CFS) Pre	Area (Ac) Post	Q50 (CFS) Post
CP #1	-	-	1.9	5.4
CP#2	4.9	5.6	3.1	8.8

Summary Table-Bypass Offsite

Basin	Area (Ac)	Q50 (CFS) Post
Basin-1	5.5	15.3
Basin-2	4.7	5.5
Total	10.2	20.8

APPENDIX A
EXISTING CONDITIONS CALCULATIONS

Existing Condition Hydrology									
BASIN ID	AREA	AREA	C	CA	Change in Elevation	Longest Runoff Length	T_c	I_{50}	Q_{50}
	(ft^2)	(ac.)					(min.)	(in/hr)	(cfs)
Existing	212093	4.87	0.35	1.70	14.00	1024.0	**10.0**	**3.30**	**5.6**

Notes:

Minimum T_c used in 10 minutes.

Bypass Offsite Drainage- Hydrology									
BASIN ID	AREA	AREA	C	CA	Change in Elevation	Longest Runoff Length	T_c	I_{50}	Q_{50}
	(ft^2)	(ac.)					(min.)	(in/hr)	(cfs)
Offsite Basin 1	237826	5.46	0.85	4.64	16.00	900.0	**10.0**	**3.30**	**15.3**
Offsite Basin 2	205904	4.73	0.35	1.65	12.00	520.0	**10.0**	**3.30**	**5.5**
								Total	**20.8**

Notes:

Minimum T_c used in 10 minutes.

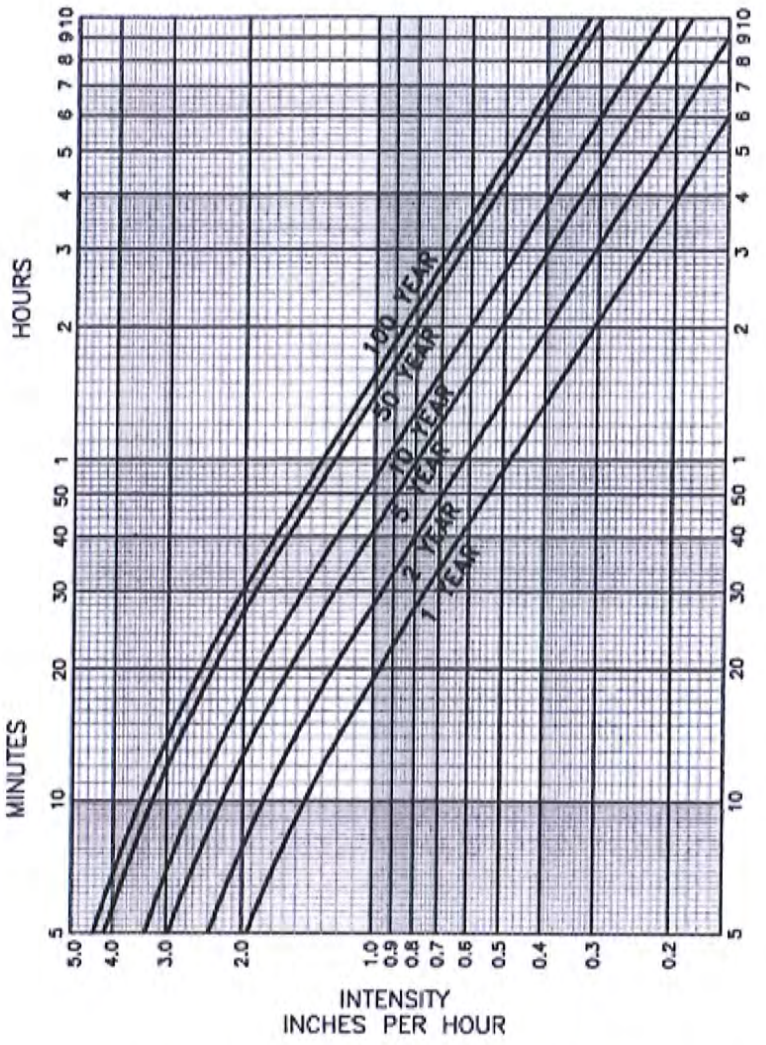
APPENDIX B
POST DEVELOPMENT CALCULATIONS

PROPOSED CONDITIONS HYDROLOGY										
BASIN ID	AREA	AREA	C	CA	Change in Elevation	Longest Runoff Length	T_c	I_{50}	Q_{50}	CUMMULATIVE Q50
	(ft^2)	(ac.)					(min.)	(in/hr)	(cfs)	(cfs)
1	84273	1.9	0.85	1.64	11.0	514.0	**10.0**	**3.30**	**5.4**	**5.4**
2	136573	3.1	0.85	2.66	12.0	530.0	**10.0**	**3.30**	**8.8**	**14.2**

Notes:

Minimum T_c used in 10 minutes.

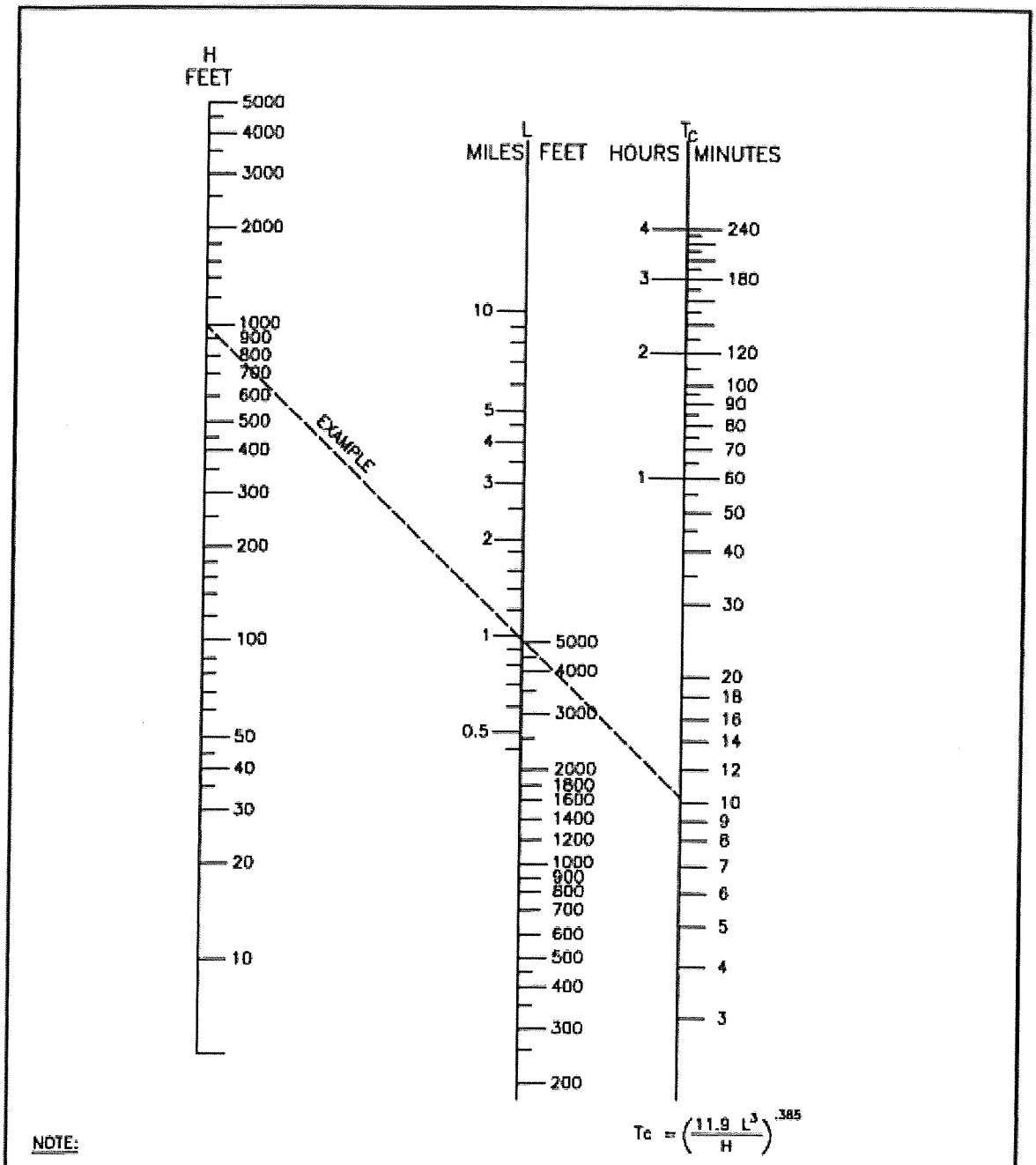
APPENDIX C
TABLES AND FIGURES FROM CITY OF ESCONDIDO DRAINAGE STANDARDS



ESCONDIDO RUNOFF COEFFICIENTS

PARKS, GOLF COURSES, CEMETERIES	0.25
UNDEVELOPED LAND, OPEN SPACE	0.35
RURAL – OVER 1/2 ACRE LOTS	0.45
SINGLE FAMILY	0.55
MOBILE HOME	0.65
MULTIPLE UNITS	0.70
COMMERCIAL	0.85
INDUSTRIAL	0.95

APPROVED: DIRECTOR OF ENGINEERING SERVICES — DATE: 5/8/09		CITY OF ESCONDIDO DEPARTMENT OF ENGINEERING SERVICES	SCALE: NOT TO SCALE
REVISED	APPROVED	RUNNOFF INTENSITY DURATION CURVE	FIGURE NO. 1



$$Tc = \left(\frac{11.9\ L^3}{H}\right)^{.385}$$

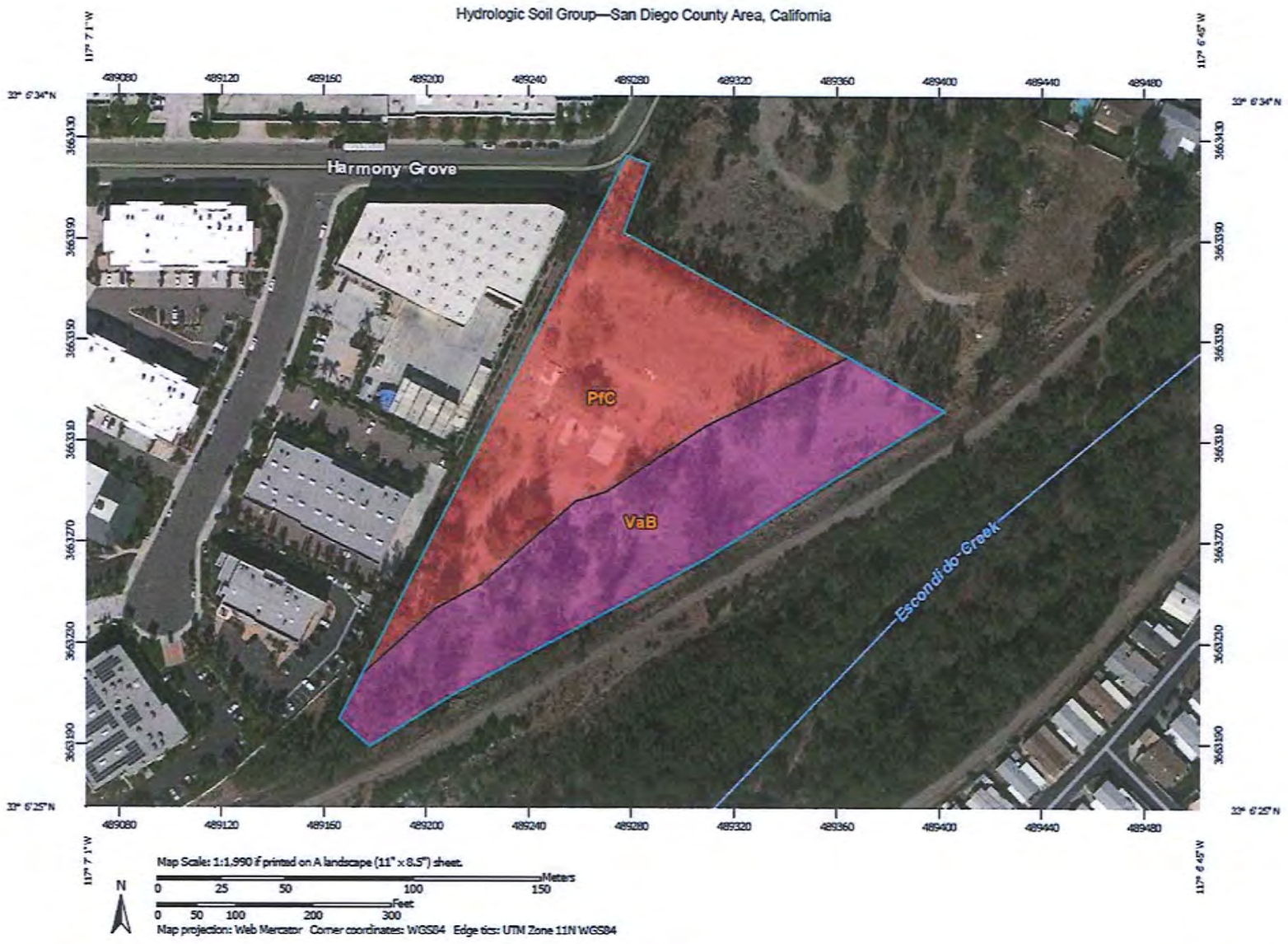
NOTE:

THIS CHART SHALL BE USED FOR ALL BASINS WITHIN THE CITY OF ESCONDIDO LESS 0.5 SQUARE MILE. THE MINIMUM Tc TO BE USED IS 10 MINUTES

Tc = TIME OF CONCENTRATION (HOURS)
L = LENGTH OF DRAINAGE COURSE (MILES)
H = DIFFERENCE IN ELEVATION FROM FURTHER MOST POINT OF DESIGN (FEET)

APPROVED: DIRECTOR OF ENGINEERING SERVICES — DATE: 5/8/09	CITY OF ESCONDIDO DEPARTMENT OF ENGINEERING SERVICES	SCALE: NOT TO SCALE
REVISED / APPROVED	RUNOFF TIME CHART	FIGURE NO. 2

APPENDIX E
NRCS HYDROLOGIC SOILS GROUP DATA


Hydrologic Soil Group—San Diego County Area, California
Harmony Grove
PfC
VaB
Escondido Creek
Map Scale: 1:1,990 if printed on A landscape (11" x 8.5") sheet.
Meters
0 25 50 100 150
Feet
0 50 100 200 300
N
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84
Natural Resources Conservation Service
Web Soil Survey
National Cooperative Soil Survey
11/12/2015
Page 1 of 4

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: San Diego County Area, California
Survey Area Data: Version 9, Sep 17, 2015

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Nov 3, 2014—Nov 22, 2014

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — San Diego County Area, California (CA638)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
PfC	Placentia sandy loam, thick surface, 2 to 9 percent slo pes	D	2.6	52.4%
VaB	Visalia sandy loam, 2 to 5 percent slopes	A	2.4	47.6%
Totals for Area of Interest			5.0	100.0%

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

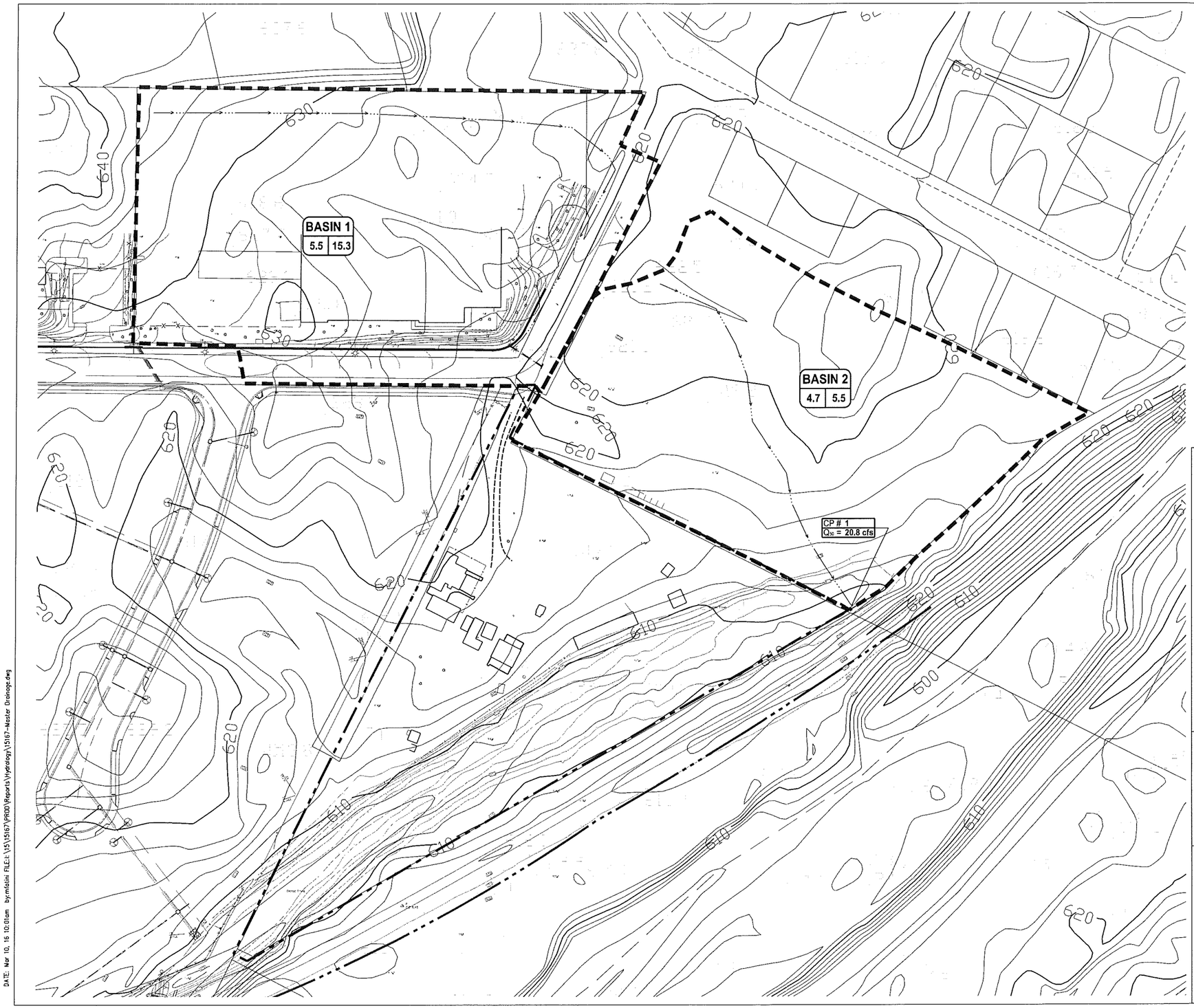
Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: *None Specified*

Tie-break Rule: Higher

EXHIBIT A



LEGEND

PROJECT BOUNDRY

DRAINAGE BOUNDARY

FLOW LINE

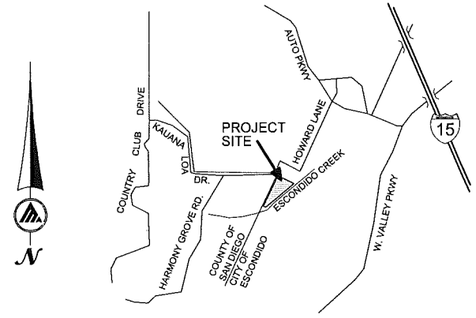
BASIN DESIGNATION — BASIN 2 | 4.7 | 5.5

N

0 30 60 120

SCALE IN FEET
GRAPHIC SCALE
1"=60'

CITY OF ESCONDIDO, CALIFORNIA



VICINITY MAP
NO SCALE

EXHIBIT 'A'
OFFSITE DRAINAGE MAP FOR:
HARMONY GROVE
CITY OF ESCONDIDO, CA

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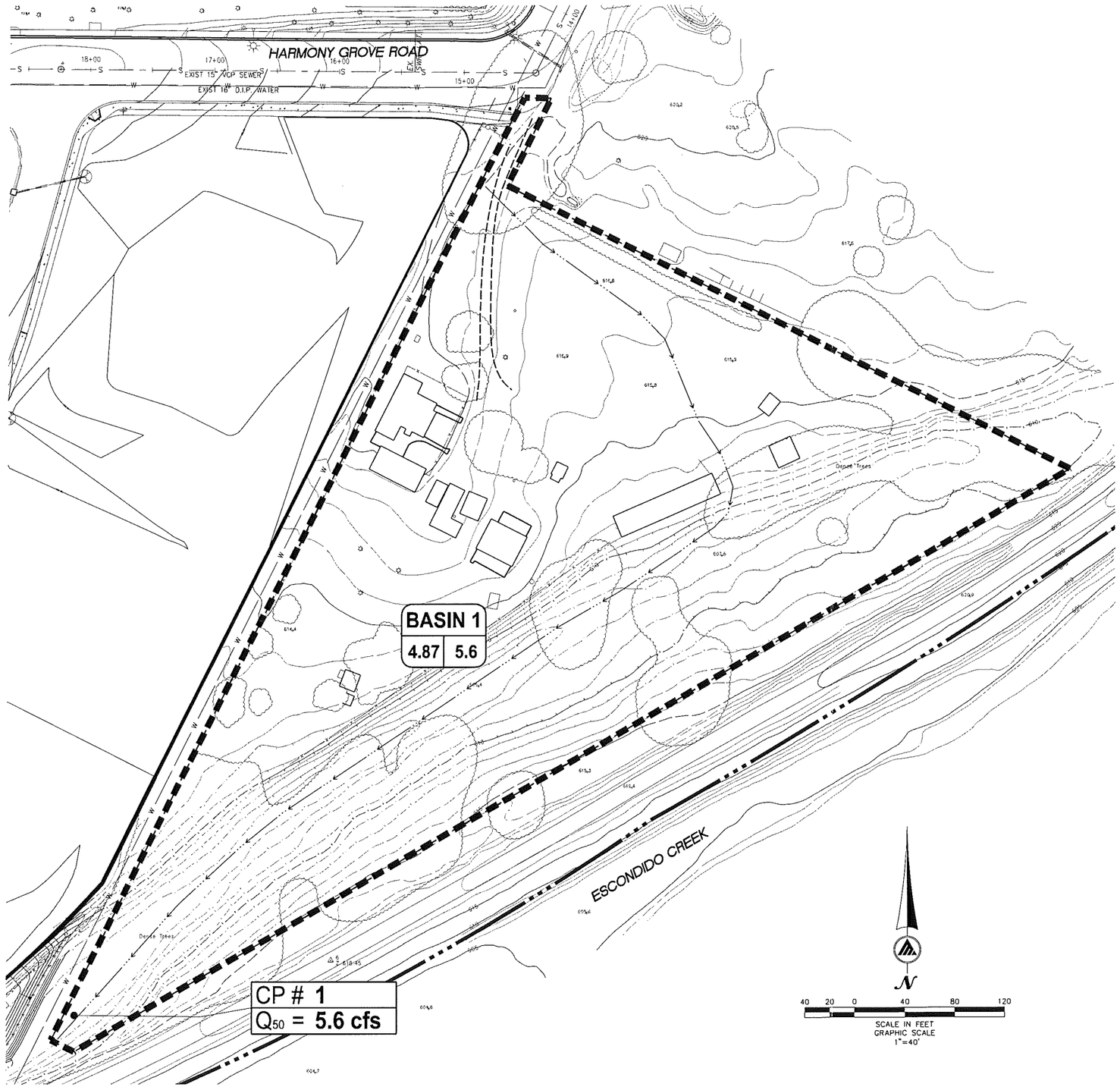
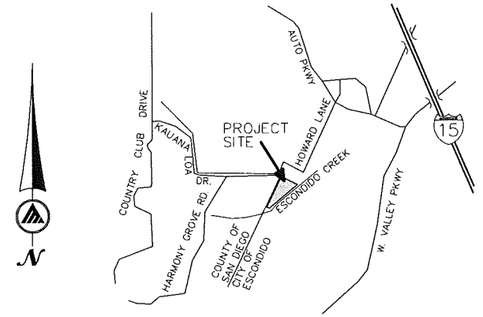
EXHIBIT B



LEGEND

SYMBOL	DESCRIPTION
BASIN 2 / A ac | Q cfs	BASIN DESIGNATION BASIN AREA (ACRES) AND RUNOFF (CFS)
CP # / Q_{50} =	CONCENTRATION POINT NUMBER 50-YEAR DISCHARGE
	BASIN BOUNDARY
	PROJECT BOUNDARY
	FLOW LINE

CITY OF ESCONDIDO, CALIFORNIA



VICINITY MAP
NO SCALE

EXHIBIT B
PRE-DEVELOPMENT HYDROLOGY MAP
HARMONY GROVE
CITY OF ESCONDIDO, CA

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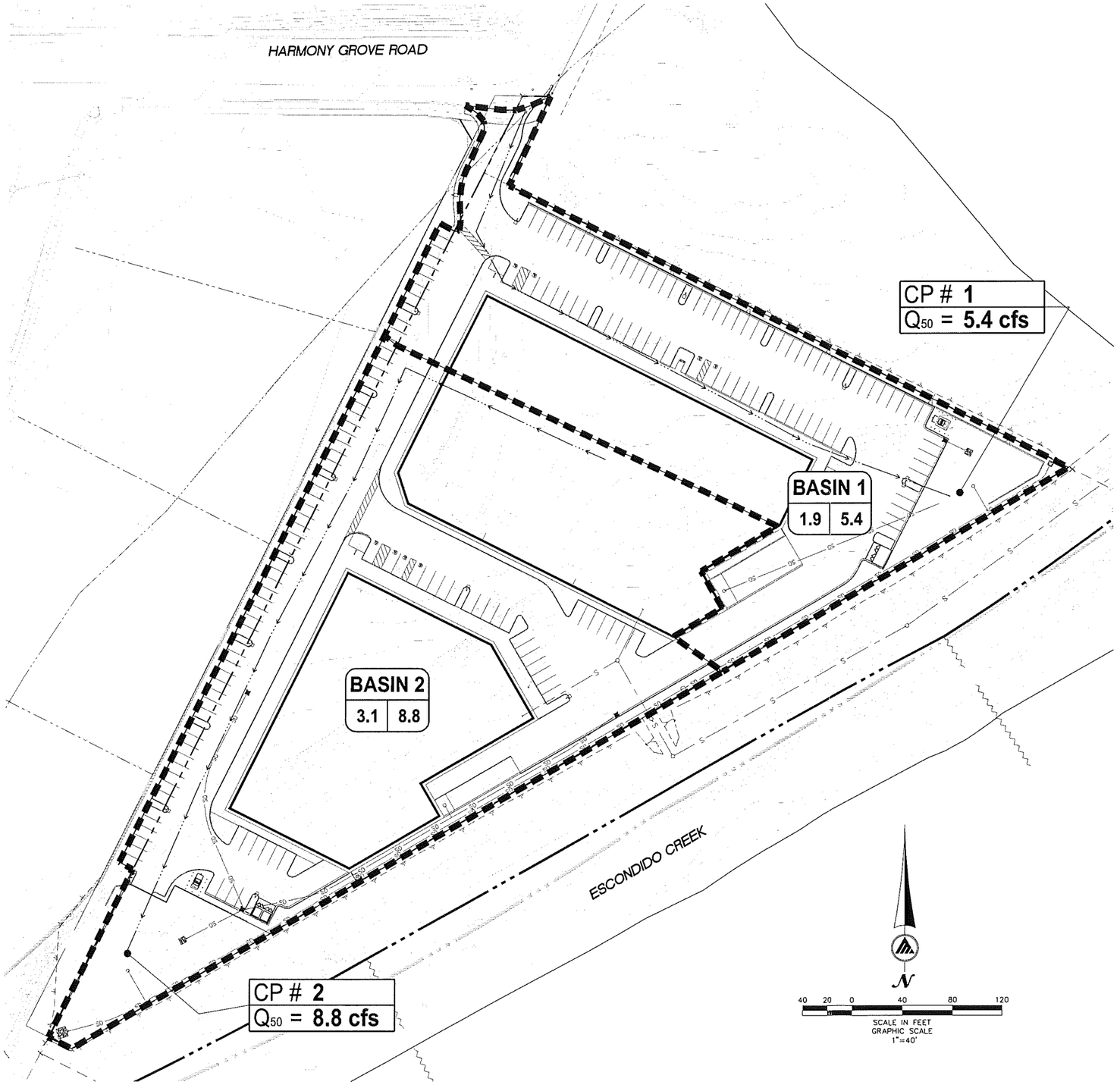
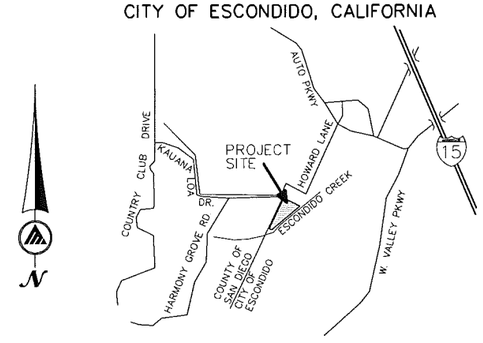
EXHIBIT C



LEGEND

SYMBOL	DESCRIPTION
BASIN 2 / A ac | Q cfs	BASIN DESIGNATION BASIN AREA (ACRES) AND RUNOFF (CFS)
CP # / Q_{50} =	CONCENTRATION POINT NUMBER 50-YEAR DISCHARGE
	BASIN BOUNDARY
	PROJECT BOUNDARY
	FLOW LINE

CITY OF ESCONDIDO, CALIFORNIA



VICINITY MAP
NO SCALE

EXHIBIT C
POST-DEVELOPMENT HYDROLOGY MAP
HARMONY GROVE
CITY OF ESCONDIDO, CA

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