BLUE PEAK ENGINEERING

Preliminary
DRAINAGE STUDY

For:
Extra Space Self Storage – New Buildings
1705 S. STATE COLLEGE BLVD, ANAHEIM, CA

Prepared by:
Blue Peak Engineering, Inc.
18543 Yorba Linda Blvd., #235
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Date: May 24, 2018

This study was prepared under my responsible charge:

5/24/18

Thomas Hawksworth, RCE 68771 **Date**

Section I Project Description

INTRODUCTION

This report has been prepared to analyze the hydrological effects of the proposed development Extra Space Self Storage project site development at 1705 S State College Blvd in Anaheim, CA.

IMPROVEMENTS

The site is located at 1705 S State College Blvd. The site is currently developed as a self-storage facility. There are railroad tracks to the north, warehouse and office space to the south, residential to south and State College Blvd to the east. Also to the west and south is a material warehouse.

The project includes construction of four (4) new storage buildings at the back of the property. The buildings will be located along the north and south property lines and will replace parking stalls for stored vehicles.

DRAINAGE PATTERNS

Runoff from the existing site sheet flows to curb and gutter or v-gutters from the west side of the site to the east side of the site. Runoff is conveyed to an inlet at approximately the middle of the site on the southern property line. From the inlet, runoff is piped to the front of the site along State College Blvd where it is pumped to grade and discharges into the curb and gutter in State College Blvd.

With the proposed development, the drainage pattern will remain the same except for the mitigated treatment runoff volume that will be diverted to an underground system to infiltrate into the soil. Runoff from the new buildings will discharge at grade and will be conveyed by new v-gutters along the fronts of the building, maintaining the existing drainage paths.

HYDROMODIFICATION

The project drainage is conveyed via public storm drain system where it discharges into Haster Retarding Basin. From this basin, the downstream conveyances are hard lined or stabilized earthen channels, therefore HCOC (hydromodification) is not a concern for the project.

Catch Basin Tributary Area Area (189,790sf)	Pervious		Impervious	
	Area (sf)	Percentage (%)	Area (sf)	Percentage (%)
Existing Conditions	0	0	189,790	100
Proposed Conditions	0	0	189,790	100

RUN-ON

The site does not include any run-on

FLOOD ZONE

This project is not in a flood zone.

Section II Methodology

RUNOFF DETERMINATION METHODS

The two primary methods used in the Orange County area to determine design discharges are the Rational Method and the Unit Hydrograph method. The Rational method is generally intended for use on small watersheds of less than 300 to 500-acres while the Synthetic Unit Hydrograph method is intended for use on watersheds in excess of these limits. For the purposes of this report, we will be using the Rational Method for the 10-year storm event.

RATIONAL METHOD

The Rational method is commonly used for determining peak discharge from relatively small drainage areas. The Rational method is based on the following equation:

$Q = C\ I\ A$

Where:
Q = peak discharge, in cubic feet per second (cfs)

C = runoff coefficient, proportion of the rainfall that runs off the surface (no units)

I = average rainfall intensity for a duration equal to the Tc for the area, in inches per hour (Note: If the computed Tc is less than 5 minutes, use 5 minutes for computing the peak discharge, Q)

$I = A * (t)^B$ (in/hr)

t = Time of Concentration (min.)

A&B = factors in the Intensity regression equation from the Orange County Hydrology Manual

A = 10.209 for 10-year storm

B = -0.573 for 10-year storm

a_i = Impervious area percentage

a_p = Pervious area percentage

F_p = Loss rate for Soils Group D (in/hr) from O.C. Hydrology Manual (0.20 for soil group D)

$F_m = a_p * F_p$

A = drainage area contributing to the design location, in acres

Section III Hydrology Calculations

Runoff Calculations

Using the Orange County Hydrology Manual, the existing and proposed runoff for the project was calculated for the 10-Year Storm Event. The runoff calculations are shown below:

Existing Conditions:

A = 4.357 acres
Impervious % = 100%
a_i = 1.0

T_c = 14 min (see appendix for nomograph)

$I = A * (t)^B$ (in/hr)

t = Time of Concentration (min.)

A&B = factors in the Intensity regression equation from the Orange County Hydrology Manual

A = 10.209 for 10-year storm

B = -0.573 for 10-year storm

I = 2.25 in/hr

$C = 0.9 * (a_i + (((I-F_p) * a_p) / I)) = 0.90$

Q_{10} = C * I * A = 0.90 * (2.25) * 4.357 = 8.82 cfs

Proposed Conditions:

A = 4.357 acres
Impervious % = 100%
a_i = 1.0

T_c = 14 min (see appendix for nomograph)

$I = A * (t)^B$ (in/hr)

I = 2.25 in/hr

$C = 0.9 * (a_i + (((I-F_p) * a_p) / I)) = 0.90$

Q_{10} = C * I * A = 0.90 * (2.25) * 4.357 = 8.82 cfs

Since post-developed runoff flow rates are equal to the pre-developed rates for the existing catch basin, no further mitigation is required.

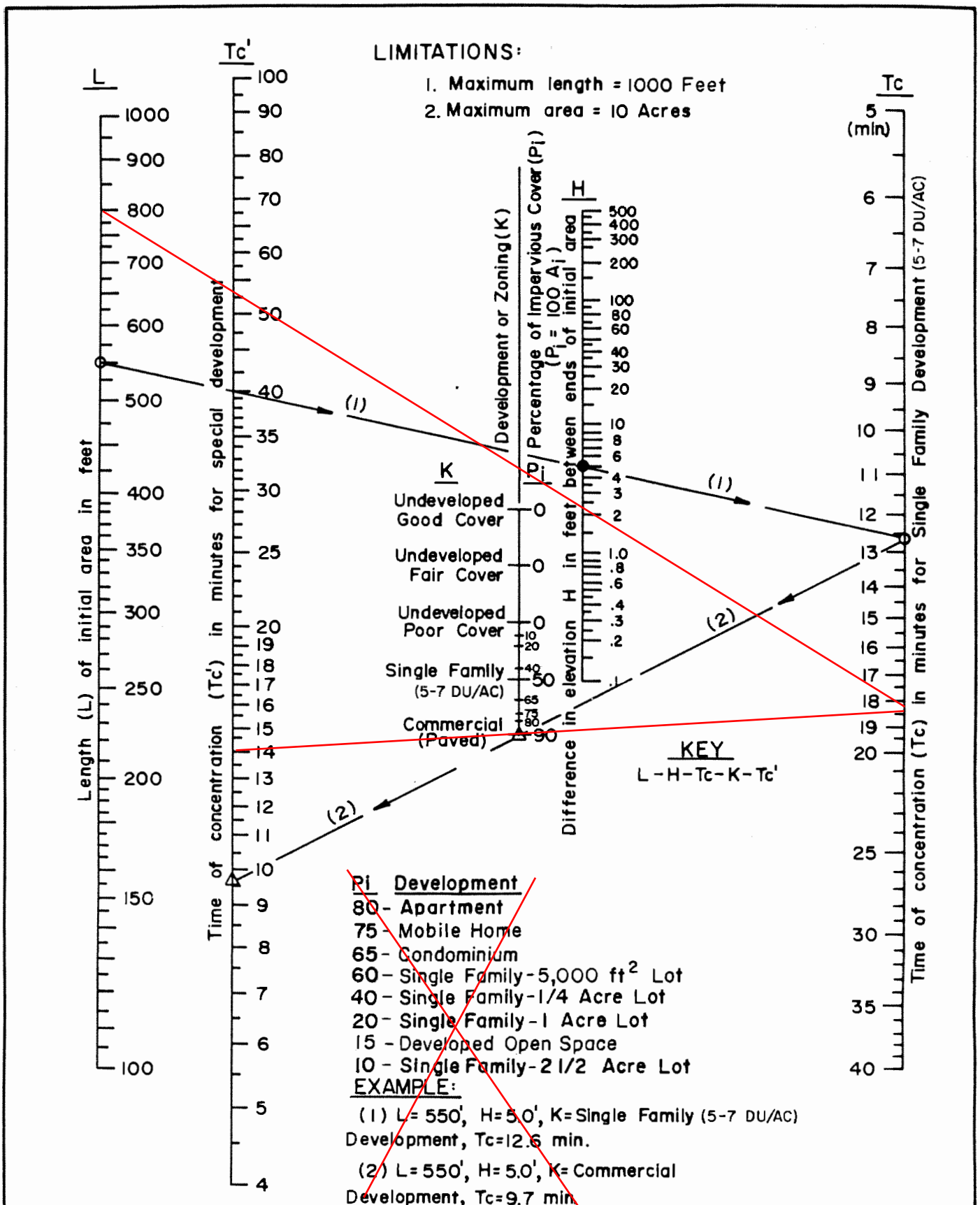
Section IV Conclusion

As shown in the calculations, runoff from the project will be decreased with the development of the project. Since the project is able to maintain a runoff less than that of the pre-developed conditions, no adverse effects will occur to the downstream conveyance system.

	10-yr (cfs)
Existing Condition	8.82
Proposed Condition	8.82
Difference	0 (0%)

In addition, BMP's will be installed that satisfy the City's water quality requirements, which will reduce the post-developed flow rates further as well as significantly reduce the pollutants generated from the project.

Appendix



ORANGE COUNTY

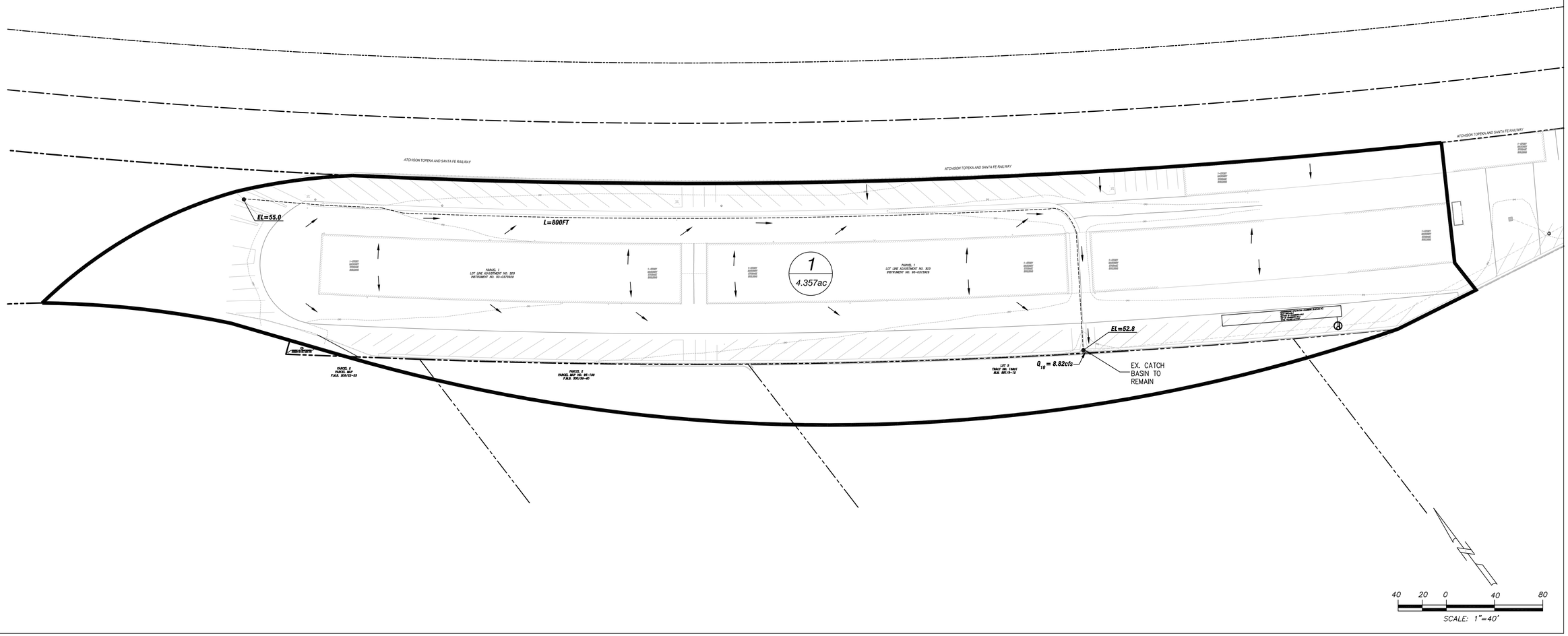
HYDROLOGY MANUAL

TIME OF CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA

Figure D-1

LEGEND

PL	PROPERTY LINE
FF	FINISHED FLOOR
TC	TOP OF CURB
FS	FINISHED SURFACE
FL	FLOW LINE
FG	FINISHED GRADE
GB	GRADE BREAK
℄	CENTERLINE
R	RIDGE LINE
R/W	RIGHT OF WAY
WV	WATER VALVE
WM	WATER METER
BW	BACK OF WALK
FG	FINISHED GROUND
INV	INVERT ELEVATION
—— 56 ——	PROPOSED CONTOUR
—(56)—	EXISTING CONTOUR
56.10	PROPOSED ELEVATION
(56.10)	EXISTING ELEVATION
	FIRE HYDRANT
	POWER POLE



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714.749.3077
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DRAWING ISSUE RECORD

DATE	DESCRIPTION
–	–

REVISION RECORD

NO.	DATE	DESCRIPTION
1	–	–

PROJECT NAME

EXTRA SPACE STORE
1705 S. STATE COLLEGE BLVD
ANAHEIM, CA 92806

PROFESSIONAL SEAL

REGISTERED PROFESSIONAL ENGINEER
TRANS. & TRAFFIC ENGINEERING
CIVIL
STATE OF CALIFORNIA

SHEET TITLE

EXISTING DRAINAGE MAP

SHEET NUMBER

1 of 2

DATE: 5/24/18

LEGEND

PL	PROPERTY LINE
FF	FINISHED FLOOR
TC	TOP OF CURB
FS	FINISHED SURFACE
FL	FLOW LINE
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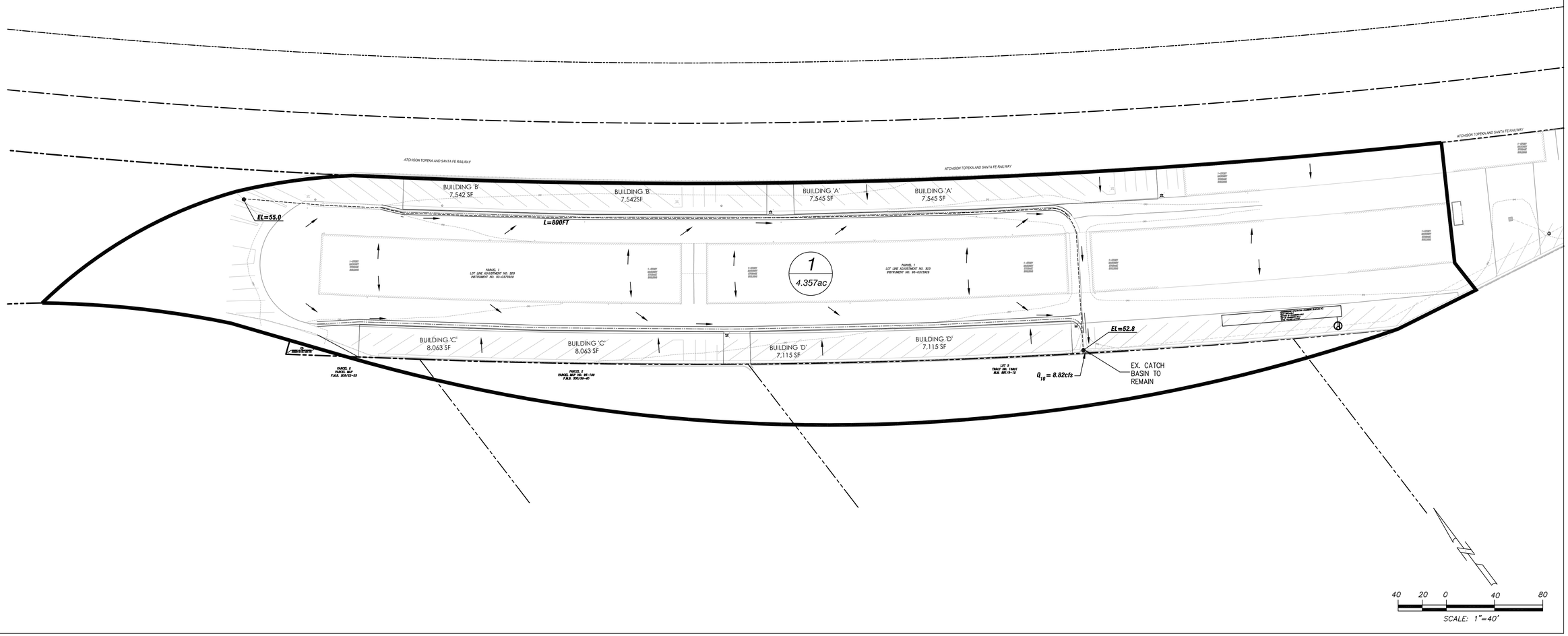

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REGISTERED PROFESSIONAL ENGINEER
TRANS. & HWY. IMPROVEMENTS
CIVIL
STATE OF CALIFORNIA

SHEET TITLE

PROPOSED DRAINAGE MAP

SHEET NUMBER

2 of 2

DATE: 5/24/18