
Appendix F-2

Preliminary Hydrology Report

JN 121.1965
April 7, 2022

Drainage Summary
Rialto Industrial Site



Armstrong & Brooks Consulting Engineers
Civil Engineering - Water Resources - Surveying

The site is located at the northeast corner of Willow Avenue and Valley Boulevard. It is bounded to the north and east by an improved portion of the San Bernardino County Flood Control maintained Rialto Channel. The site is approximately 6.5 acres and roughly half developed as industrial and the other half is undeveloped.

It is assumed that a commercial development will generate roughly 3 cfs per acre peak flow and an undeveloped land would generate roughly 2 cfs per acre peak flow for a 100-year storm event. With this assumption, the site currently generates approximately 16.25 cfs. Once fully developed, the site is expected to generate approximately 19.5 cfs.

The project proposes an internal storm drain system to collect runoff and route drainage into on-site basins throughout the project site. Flows would generally be conveyed from the north to the south, ultimately entering a basin along the side edge on the project site, on the north side of Valley Boulevard. From this point, flows would outflow into the existing under sidewalk drain in Valley Boulevard.

The series of upper level basins along Willow Ave, which serve a portion of the Building 1 parcel will outlet into Willow Avenue via a proposed under sidewalk drain. The remaining flows from the Building 1 parcel will be captured and conveyed via the on-site storm drain system through the basins located within the Building 2 parcel before ultimately being released into Valley Boulevard via the existing under sidewalk drain or infiltrating into the soil. All of the flow from the Building 2 parcel is captured and conveyed via the on-site storm drain system through the basins located within the Building 2 parcel before being released into Valley Blvd. via the existing under sidewalk drain or infiltrating into the soil. Flow released into the public right-of-way is conveyed via existing curb and gutter to the existing catch basin in Valley Boulevard. There is an

existing catch basin in Valley Boulevard, above the trap channel to the east of the project site.

Willow Avenue, at the northern limits of the site, has approximately 140 acres tributary to with no storm drain systems to mitigate the flow captured in the improved street with 8" curb and gutters for approximately 1 mile to the north. Approximately 60 acres are tributary to the easterly half street of Willow Avenue and the remaining 80 acres are tributary to the westerly half street. The easterly 60 acres is a mixture of development being roughly 40% 1/4 acre residential and 60% commercial development. The proposed storm drain improvements per the City of Rialto Master Plan of Drainage have not yet been constructed.

Assuming that the cross-section and slope of Willow Avenue fronting the project site is constant for the 1 mile to the north and that each 10 acres is an average of the development type with a flow path of 1,000 feet, using the rational method per the San Bernardino County Flood Control Hydrology Manual for a 100-year storm event, the easterly 60 acres tributary to the easterly half street of Willow Avenue has approximately 127 cfs tributary to the northerly limits of the site. Using the same assumptions for the flow tributary to the westerly half street of Willow Avenue, there is approximately 166 cfs tributary to the northerly limits of the site. The total flow in the full width of Willow Avenue is approximately 293 cfs.

The flow is conveyed by Willow Avenue to the intersection of Valley Boulevard. The flow in the easterly half street is conveyed to an inlet at the northwest corner of the intersection. The flow in the westerly half street is conveyed easterly along the northerly half street of Valley Boulevard to a catch basin adjacent and outlets to the Rialto Channel. If the flow, due to momentum or ponding crests the crown of Valley Boulevard, it will continue down Willow Avenue to the terminus of Willow Avenue being the San Bernardino County Flood Control maintained trap channel along the I-10 Freeway.

Willow Avenue has a half street flow capacity of approximately 23 cfs to the street crown, 50 cfs to the top of curb, and 113 cfs to the public right-of-way. With a larger tributary on the west side of Willow Avenue, and the easterly half street having insufficient capacity to convey the smaller tributary area, the total street capacity is insufficient to convey the flow. However, this capacity is exceeded before the northerly

limits of the site which is bounded to the north by the trap channel, so portions the overflow beyond the public right-of-way would be capture by the trap channel which is apparent via field inspection.

The pre-post development differential for peak flow is roughly 3.25 cfs. Not accounting for the time of concentration the additional flow from the project is about 1% of the total flow tributary to Willow Avenue and thus is not significantly contributing to the flow. The project will be designed to prevent overflow from the street from spilling over into the site.

Prepared by:

Wyatt Helms, Assistant Civil Engineer

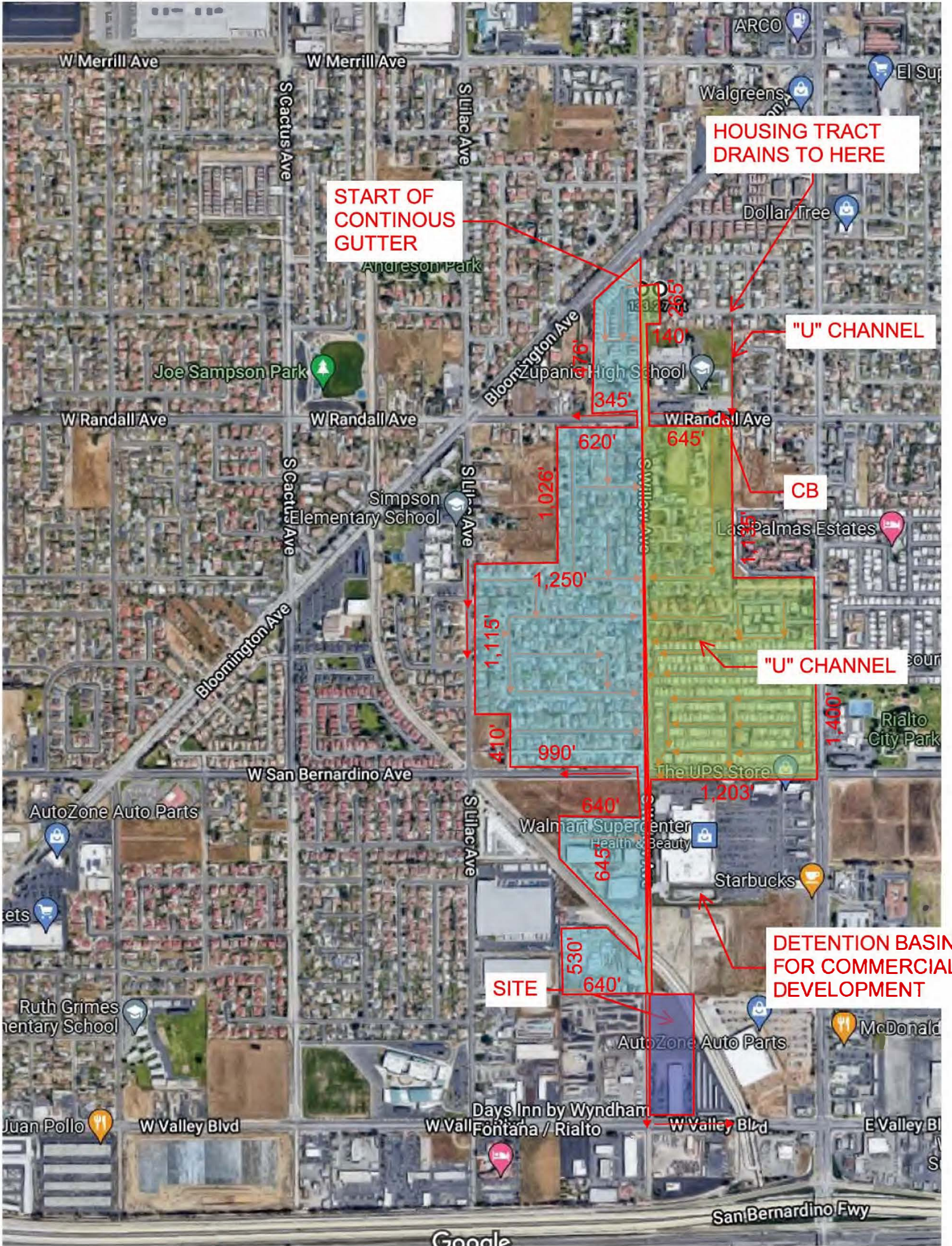
Attachments:

Tributary Area Map

Hydrology Calculations

Street Capacity Calculations

Street Cross-Section & Notes



HOUSING TRACT
DRAINS TO HERE

START OF
CONTINUOUS
GUTTER

"U" CHANNEL

CB

"U" CHANNEL

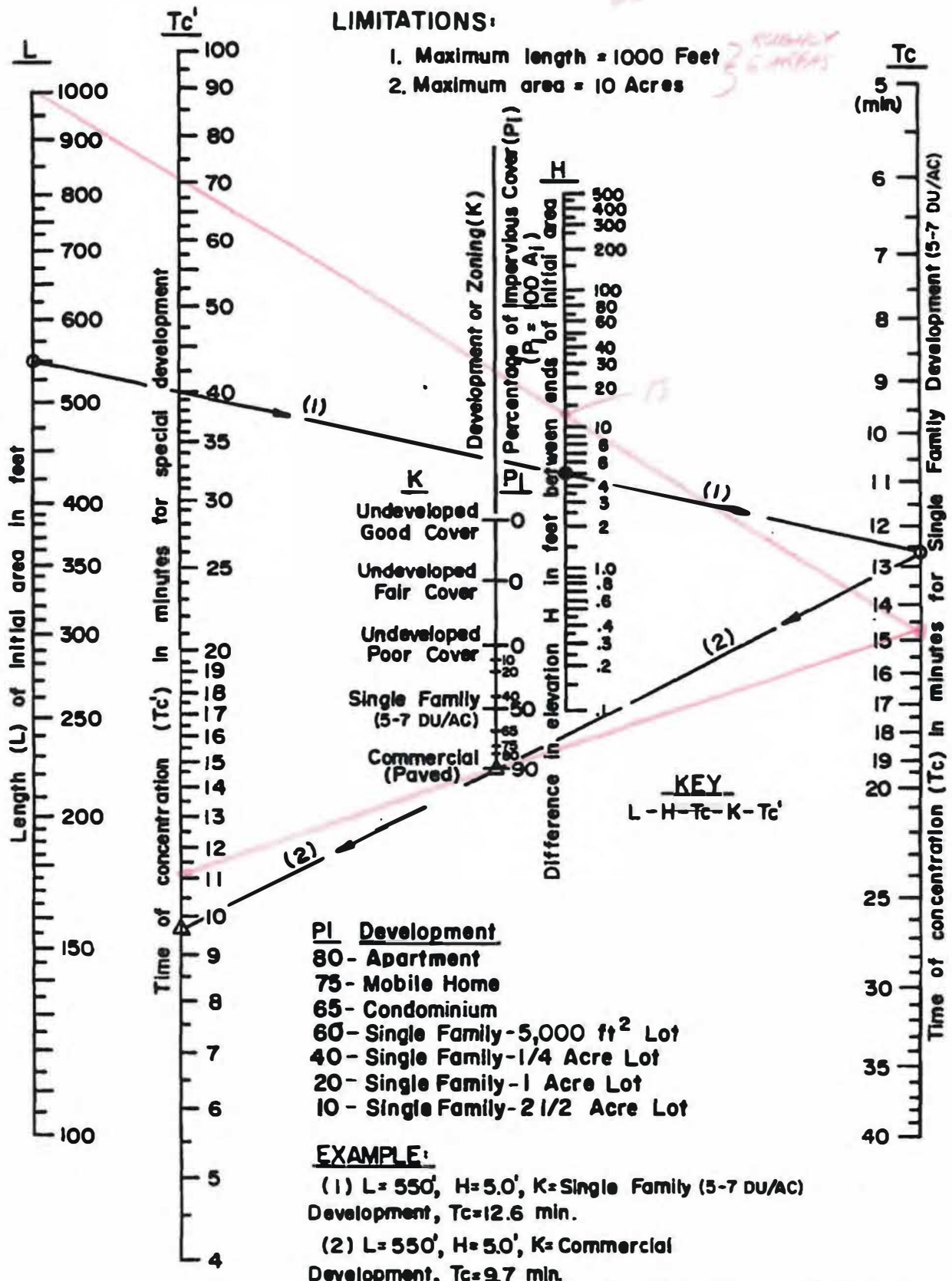
SITE

DETENTION BASIN FOR
COMMERCIAL
DEVELOPMENT

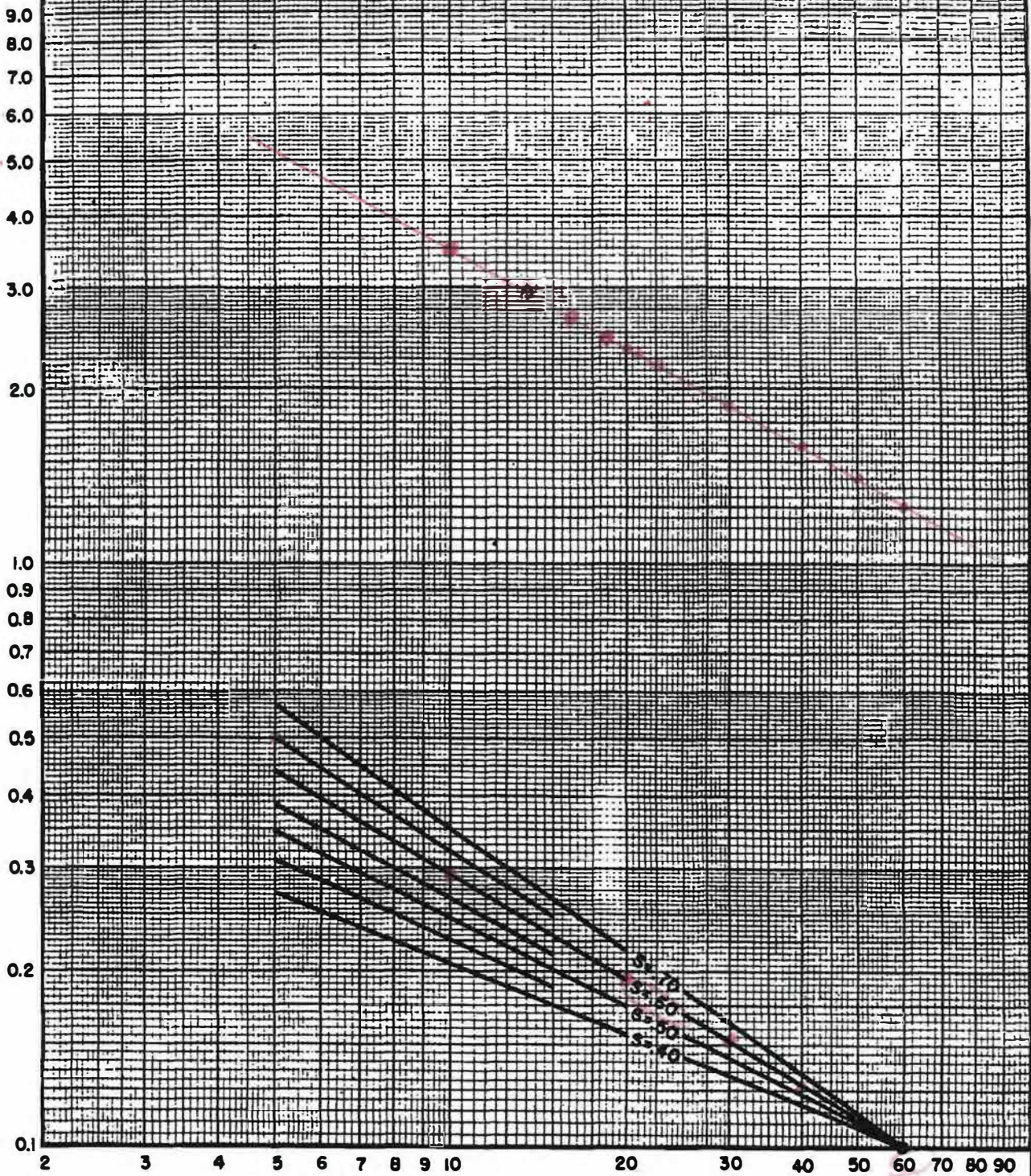
*LO max = 5,000
60 acres*

LIMITATIONS:

1. Maximum length = 1000 Feet
2. Maximum area = 10 Acres



RAINFALL INTENSITY (INCHES / HOUR)



STORM DURATION (MINUTES)

DESIGN STORM FREQUENCY = 100 YEARS
ONE HOUR POINT RAINFALL = 1.25 INCHES
LOG-LOG SLOPE = 0.60
PROJECT LOCATION = 11220

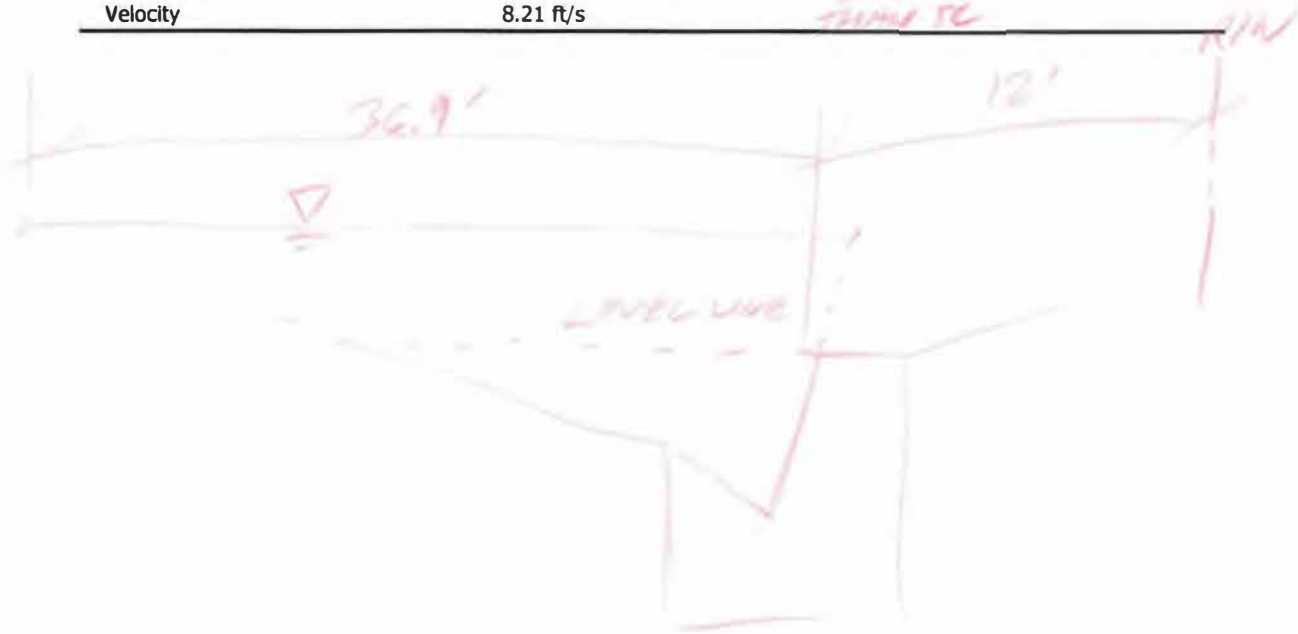
*T_c = 11 min for 12 AC @ 1.00"
1.0 miles = 5,280'
60 FEET*

SAN BERNARDINO COUNTY
HYDROLOGY MANUAL

INTENSITY - DURATION
CURVES
CALCULATION SHEET

Worksheet for Willow Gutter - To R/W w/ 2" lower crown

Project Description	
Solve For	Spread
Input Data	
Channel Slope	0.013 ft/ft
Discharge	113.00 cfs <i>x2 = 226 cfs (TOTAL STREET CAPACITY)</i>
Gutter Width	2.0 ft
Gutter Cross Slope	0.083 ft/ft
Road Cross Slope	0.020 ft/ft
Roughness Coefficient	0.013
Results	
Spread	36.9 ft
Flow Area	13.8 ft ² <i>= 10.4 ft² + 3.4 ft²</i>
Depth	10.4 in <i>TO R/W</i>
Gutter Depression	1.5 in <i>2" LOWER CROWN THAN TC</i>
Velocity	8.21 ft/s

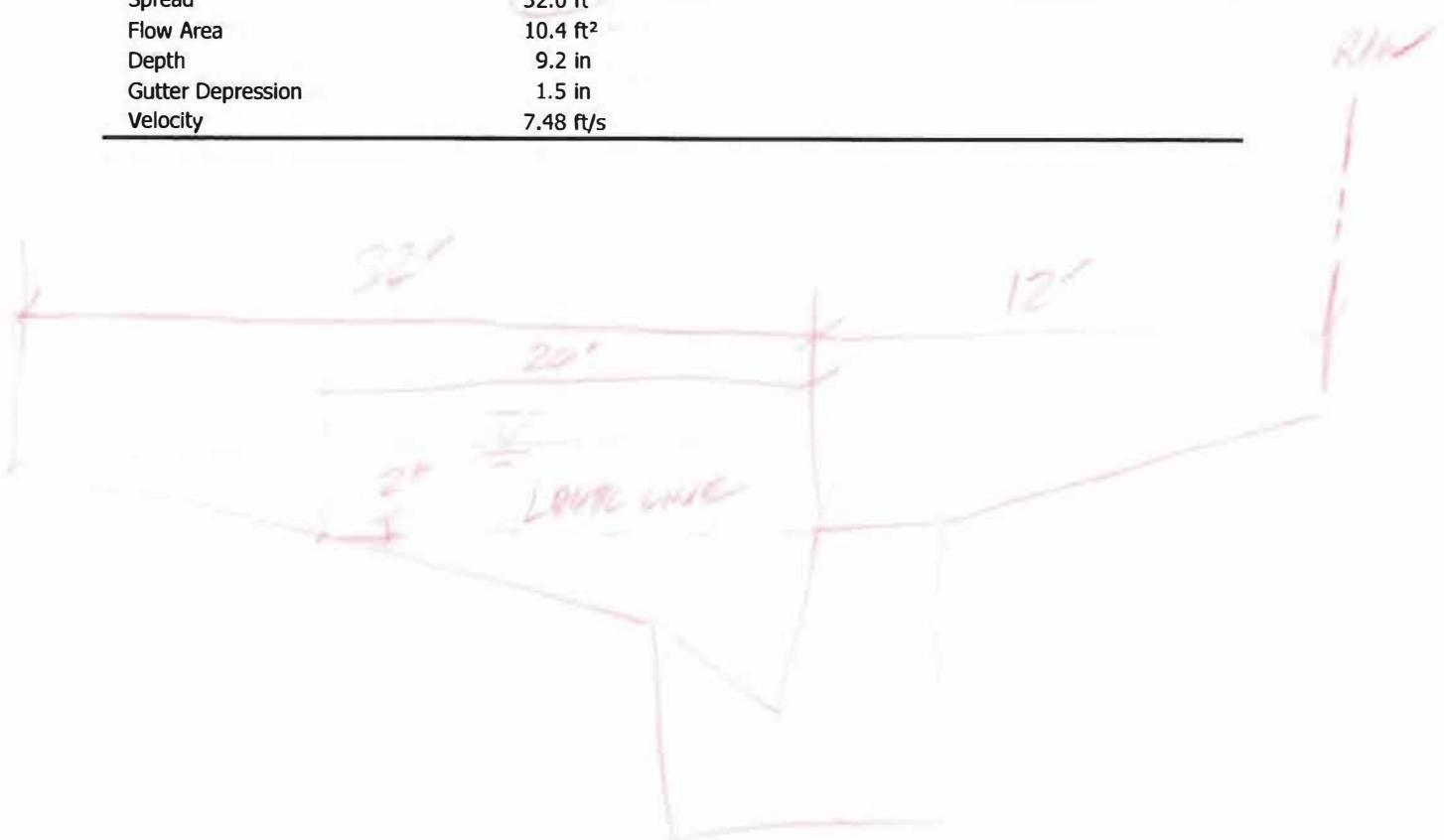


TOTAL SPREAD TO R/W

$$R = \frac{A}{P} = 0.368'$$

Worksheet for Willow Gutter - To R/W

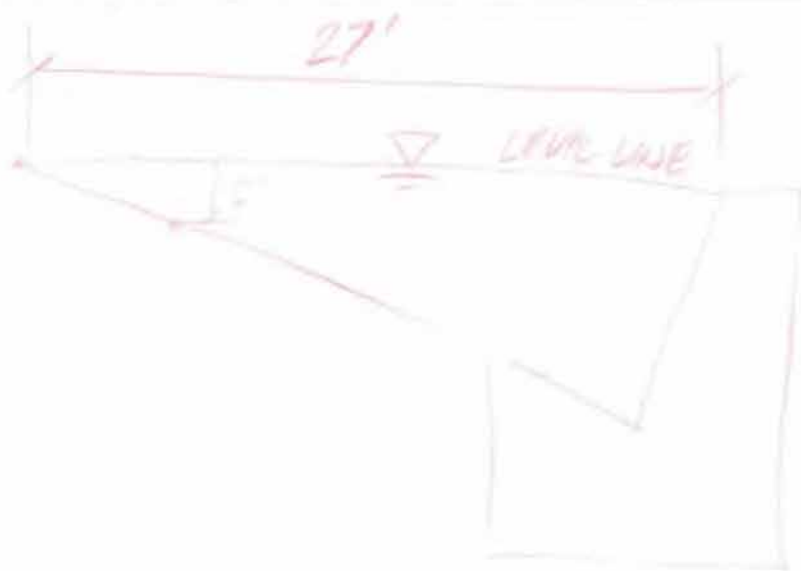
Project Description	
Solve For	Spread
Input Data	
Channel Slope	0.013 ft/ft
Discharge	77.50 cfs
Gutter Width	2.0 ft
Gutter Cross Slope	0.083 ft/ft
Road Cross Slope	0.020 ft/ft
Roughness Coefficient	0.013
Results	
Spread	32.0 ft
Flow Area	10.4 ft ²
Depth	9.2 in
Gutter Depression	1.5 in
Velocity	7.48 ft/s



*12' EXTRA SPREAD IN PARKWAY
 DOES NOT ACCOUNT FOR FLOW AREA DUE TO LOWER
 CROWN LINE*

Worksheet for Willow Gutter - To TC

Project Description	
Solve For	Spread
Input Data	
Channel Slope	0.013 ft/ft
Discharge	50.00 cfs
Gutter Width	2.0 ft
Gutter Cross Slope	0.083 ft/ft
Road Cross Slope	0.020 ft/ft
Roughness Coefficient	0.013
Results	
Spread	27.0 ft
Flow Area	7.4 ft ² ⇒ 7.54² = 4.14² + 3.44²
Depth	8.0 in (DEPTHS)
Gutter Depression	1.5 in 2nd LOWER (LOWEST) THAN X
Velocity	6.73 ft/s



$$R = \frac{A}{P} = 0.358'$$

HYDRAULIC RADIUS

Worksheet for Willow Gutter - To Crown

Project Description	
Solve For	Spread
Input Data	
Channel Slope	0.013 ft/ft
Discharge	23.00 cfs
Gutter Width	2.0 ft
Gutter Cross Slope	0.083 ft/ft
Road Cross Slope	0.020 ft/ft
Roughness Coefficient	0.013
Results	
Spread	20.0 ft
Flow Area	4.1 ft ²
Depth	6.3 in
Gutter Depression	1.5 in
Velocity	5.59 ft/s

