FUSCOE ENGINEERING

# PRELIMINARY DRAINAGE STUDY FOR
# SOUTHWEST PARK

FUSCOE ENGINEERING, INC
6390 GREENWICH DR. STE 170
SAN DIEGO, CA 92122

PROJECT MANAGER:
BRYAN D. SMITH , P.E.

DATE PREPARED: JUNE 25, 2020
FEI# 1440-009

full circle thinking®

# PRELIMINARY DRAINAGE STUDY

# SOUTHWEST PARK

SAN DIEGO, CA 92154
APN: 634-120-12,15,17
June 25, 2020

Prepared Under the Responsible Charge of:


Bryan D. Smith, P.E. RCE 75822 EXP: 06-30-22

Fuscoe Engineering, San Diego, Inc.
6390 Greenwich Dr., Ste 170
San Diego, CA 92122

Prepared For:
Schmidt Design Group
1111 6th Avenue, Suite 500
San Diego, CA 92101

# TABLE OF CONTENTS

1. INTRODUCTION ..... 1
1.1 Project Description ..... 1
1.2 Existing Conditions ..... 2
1.3 Proposed Conditions ..... 2
1.4 Proposed Green Street Improvements for 25th St, 27th St, and Grove St. ..... 3
2. METHODOLOGY ..... 3
2.1 Rational Method ..... 3
2.2 Runoff Coefficient ..... 4
2.3 Rainfall Intensity ..... 4
2.4 Tributary Areas ..... 5
2.5 Hydraulic Calculations ..... 5
3. CALCULATIONS/RESULTS ..... 5
3.1 Peak Flow Comparison ..... 5
3.2 Public Storm Drain ..... 5
4. CONCLUSION ..... 6

**Appendix 1**.....**Existing & Proposed Conditions Hydrology Maps**
**Appendix 2**.....**Grading and Cross Sections**
**Appendix 3**.....**Runoff Coefficient Calculations**
**Appendix 4**.....**Existing Hydrology Calculations**
**Appendix 5**.....**Proposed Hydrology Calculations**
**Appendix 6**.....**Hydraulic Calculations**
**Appendix 7**.....**As Builts Plans**
**Appendix 8**.....**FEMA Firm**

# 1. INTRODUCTION

The purpose of this preliminary drainage study is to present the preliminary drainage design for the Southwest Park and to demonstrate that the project will comply with the City of San Diego Drainage Design Manual (SDDDM) 2017 Criteria.

## 1.1 Project Description

The project consists of development of approximately 11.5 acres into a public neighborhood park. The site is located between 25th and 27th Streets and south of Grove Avenue in the City of San Diego, CA. The proposed park may include features such as multi-sport fields, multi-purpose courts, dog park, children's play areas, picnic shelters, parking lots, comfort station, security lighting, storm water facilities. The project also proposes street widening on Grove and 27th as well as the construction of new curb, gutter, and pedestrian sidewalk on all frontage streets.

A separate Hydraulic Study prepared by Fuscoe Inc., will show that the project will meet the City of San Diego and FEMA requirements for development within the floodplain.

The project does not propose to dredge or fill any waters of the U.S.; therefore, the project is not required to obtain approval from the Regional Water Quality Board under Federal Clean Water Act Section 401 or 404.

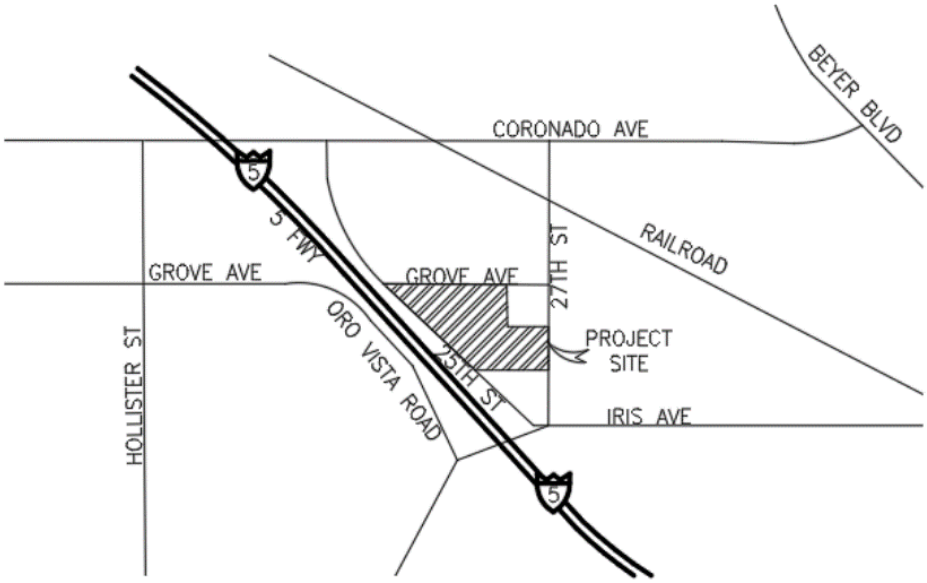



Figure 1. Vicinity Map

## 1.2 Existing Conditions

The existing project site is a vacant rural triangular lot bordered by Grove Street on the north, 25th street on the west and 27th street on the east. The site is mostly pervious and is covered by light vegetation with mild to moderate slopes ranging from 1% to 10% and in some isolated areas up to 20% along Grove St. Refer to the Existing Conditions Drainage Map in Appendix 1.

The project site (identified by onsite Basin Areas A1 & A2) drain to the north west corner and into an existing 24" culvert (identified as Node 100) that crosses I-5 and ultimately discharges into Nestor Creek. Portions of 25th St and Grove St flow into the site (identified as Basin A3) because there are no existing public sidewalks, curbs or gutters.

The drainage runoff from the south neighboring property and portions of 25th St down to Iris Ave (labeled as Basin Area B) effectively drains northwest along 25th and into an existing 18" RCP (identified as Node 200). The pipe also crosses I-5 and ultimately discharges into Nestor Creek.

## 1.3 Proposed Conditions

The project proposes to grade the site into three major oval fields consisting of 1) on the north a multi-use soccer field with adjacent basketball courts, 2) on the southwest a dog park with adjacent parking lot along 25th street, and 3) a children's play field with restrooms and parking lot adjacent to 27th street. The play field will overlook the park being set about 20 feet higher than the other two. Access will be provided from 27th street and 25th street to connect both parking lots.

The Project will maintain existing drainage patterns to the maximum extend practical. Onsite basin Areas A-1 through A-4 which include all three fields will be collected and conveyed northwest to biofiltration basins for water quality treatment and hydromodification management before discharging into to the existing 24" RCP on 25th Street (Node 100).

For approximately 1 acre of the site consisting of the parking lot adjacent to 25th street (Area B3) and the south boundary landscape slope (Area B2) it is infeasible to gravity drain towards the existing 24"RCP. Instead, drainage will be routed to the closer existing 18"RCP storm drain (Node 200) on 25th street. The runoff from the parking lot (Area B3) will be mitigated with a biofiltration basin and its discharge will combine with runoff of the south landscape slope (Area B2) to be conveyed to the existing 18" RCP (Node 200). The street widening and public improvements on 25th will also serve to convey the south offsite basin (Area B1) into the existing 18" RCP (node 200).

On Grove Street with the new construction of curb and gutter to maintain public drainage within the street, the existing grades at the intersection of 25th street will not be sufficient to gravity flow drainage around the curb return and into the existing 24" RCP (Node 100) on 25th. Therefore a new curb inlet on Grove Street will be constructed and tied into the existing curb inlet north across the street. This existing inlet directly discharges into the Nestor Creek channel along Grove Street.

The project is located within the FEMA Floodplain and will fill the site to raise the fields above the 100-year flood base elevations per City of San Diego Municipal Code requirements. A CLOMR or CLOMR-F may be required to be processed with FEMA.

### 1.4 Proposed Green Street Improvements for 25th St, 27th St, and Grove St.

The improvements to 25th, 27th, and Grove Streets will implement Green Street BMP's to meet the PDP Exemption Category 2 for redevelopment of existing paved streets under The City of San Diego Storm Water Standards BMP Design Manual, October 2018 Edition. The structural BMP's selected will be standard curb extensions to provide impervious area dispersion along the frontage streets to mitigate the construction of sidewalk, curb and gutter, and the street widening of Grove & 25th streets. See the separate preliminary SQWMP report for this project.

# 2. METHODOLOGY

## 2.1 Rational Method

The site is inundated for the 100-year storm event of Nestor Creek, however for the period before Nestor Creek's peak time of concentration, this report analyses the proposed developed storm runoff for the site's relatively smaller time of concentration. Runoff was calculated using the Modified Rational Method equation below:

$Q = C \times I \times A$

Where:
Q = Flow rate in cubic feet per second (cfs)
C = Runoff coefficient
I = Rainfall Intensity in inches per hour (in/hr)
A = Drainage basin area in acres, (ac)

Modified Rational Method calculations were performed using the Advanced Engineering Software AES 2014) computer program. To perform the hydrology routing, the total watershed area was divided into sub-areas which discharge at designated nodes. The procedure for the sub-area summation model is as follows:

(1) Subdivide the watershed into an initial sub-area (generally 1 lot) and subsequent sub-areas, which are generally less than 10 acres in size. Assign upstream and downstream node numbers to each sub-area.

(2) Estimate an initial $T_c$ by using the appropriate nomograph or overland flow velocity estimation. The minimum $T_c$ considered is 5.0 minutes.

(3) Using the initial $T_c$, determine the corresponding values of I. Then Q = CIA.

(4) Using Q, estimate the travel time between this node and the next by Manning's equation as applied to particular channel or conduit linking the two nodes. Then, repeat the calculation for Q based on the revised intensity (which is a function of the revised time of concentration)

The nodes are joined together by links, which may be street gutter flows, drainage swales, drainage ditches, pipe flow, or various channel flows. The AES 2014 computer software sub-area menu is as follows:

SUBAREA HYDROLOGIC PROCESS

1. Confluence analysis at node.
2. Initial sub-area analysis (including time of concentration calculation).
3. Pipe flow travel time (computer estimated).
4. Pipe flow travel time (user specified).
5. Trapezoidal channel travel time.
6. Street flow analysis through sub-area.
7. User-specified information at node.
8. Addition of sub-area runoff to main line.
9. V-gutter flow through area.
10. Copy main stream data to memory bank
11. Confluence main stream data with a memory bank
12. Clear a memory bank

At the confluence point of two or more basins, the following procedure is used to combine peak flow rates to account for differences in the basin's times of concentration. This adjustment is based on the assumption that each basin's hydrographs are triangular in shape.

(1). If the collection streams have the same times of concentration, then the Q values are directly summed,

$$Q_p = Q_a + Q_b; \; T_p = T_a = T_b$$

(2). If the collection streams have different times of concentration, the smaller of the tributary Q values may be adjusted as follows:

(i). The most frequent case is where the collection stream with the longer time of concentration has the larger Q. The smaller Q value is adjusted by a ratio of rainfall intensities.

$$Q_p = Q_b + Q_a (I_b/I_a); \; T_p = T_a$$

(ii). In some cases, the collection stream with the shorter time of concentration has the larger Q. Then the smaller Q is adjusted by a ratio of the T values.

$$Q_p = Q_b + Q_a (T_b/T_a); \; T_p = T_b$$

## 2.2 Runoff Coefficient

For the onsite existing and proposed areas the lowest default coefficient of C=0.45 was selected to reflect the existing empty rural lot and the proposed park without requiring special city approval. Actual impervious percentages in both conditions are much lower than the low limit default however the conservative use of the coefficient results in peak discharges that are within acceptable conveyance capacity of existing storm drain facilities.

For the offsite areas of Grove Street, 25th Street and south neighboring properties in existing and proposed conditions, a weighted runoff coefficient of C=0.56 was used and calculated was based on actual impervious percentages and the methods presented in the Table A-1 in the SDDDM.

## 2.3 Rainfall Intensity

Rainfall intensity was determined by AES using the Intensity-Duration Chart per Figure A-1 of the SDDDM.

## 2.4 Tributary Areas

Drainage basins are delineated on the Existing and Proposed Hydrology Condition Maps in Appendix 1. Bold lines graphically portray the tributary area for the drainage basin.

## 2.5 Hydraulic Calculations

Bently Systems Inc. FLowmaster V8i was used to analyze the flow depth and full capacity of the existing public 24" RCP & 18" RCP storm drains in 25th street. For the analysis results see section 3.2.

# 3. CALCULATIONS/RESULTS

## 3.1 Peak Flow Comparison

Tables 1 summarize the existing and proposed peak flow rates at each Node of interest.

Table 1. EXISTING VS PROPOSED HYDROLOGY CONDITIONS SUMMARY (100-YR STORM EVENT)

| NODE Description | NODE | BASIN (Description) | EXISTING AREA (ac) | PROPOSED AREA (ac) | EXISTING Q100 (cfs) | Proposed Q100 (cfs) |
|---|---|---|---|---|---|---|
| Existing 24" RCP on 25th Street | 100 | Area A | 12.77 | 11.29 | 20.61 | 13.90 |
| Existing 18" RCP on 25th Street | 200 | Area B | 4.87 | 5.87 | 7.35 | 8.56 |
| New curb inlet on Grove Street | 300 | Area C | 0.0 | 0.48 | 0.0 | 0.81 |
| Totals | - | - | 17.64 | 17.64 | 27.96 | 23.27 |
| DIFFERENCE FROM EXISTING | | | | 0.0 (Same) | | 4.69 (Less) |

The project results in a decrease of the total 100-year storm runoff by 4.69 cfs by grading the existing sloped empty lots into large flat recreational parks and play fields. The result is a decrease in the effective slope of the terrain and longer time of concentration and reduced storm intensity. The public street improvements will also serve to eliminate the uncontrolled public drainage entering the park property.

In actual conditions, the four onsite biofiltration detention basins will provide measurable attenuation for the 100year storm event, however the unmitigated flowrates of the hydrologic analysis are within acceptable capacities for existing and proposed public storm drain facilities.

## 3.2 Public Storm Drain

A hydraulic analysis using FlowMaster was performed to check the capacity of the proposed public storm drains in 25th street. At a slope of 0.6% the existing 24" RCP (Node 100) pipe is 84% full with the project's proposed flow rates. See Appendix 7 for the results.

During the 100-year storm event under existing condition, the 24" RCP (Node 100) will experience

flowrates over its capacity for gravity flow. Its existing capacity is calculated to be 17.52cfs and under current conditions the analysis shows that it will experience flows of about 20.61cfs, or about 118% of its capacity. The proposed development will result in a flowrate of 13.90cfs or 79% of its capacity therefore allowing the existing pipe to function under gravity flow versus existing flows that force it under pressure.

For the existing 18"RCP (Node 200), the current capacity is calculated to be 8.3cfs and in existing conditions the pipe will be 88% full. The proposed development will contribute an additional flowrate of 1.21cfs to a total of 8.56cfs or about 102% of its capacity.

The new curb inlet on Grove Street will experience only about 0.81cfs or about 10% full at minimal pipe slope.

# 4. CONCLUSION

The project will match existing drainage patterns to the maximum extent feasible. The project will result in a total net decrease of 4.69 cfs or 17% in the 100-year peak runoff from the studied area of 17.64 acres by developing the city-owned lot into a usable public park and installing storm drain facilities to convey and mitigate site runoff.

The park fields will be elevated above the FEMA 100-year water surface elevation. A CLOMR or CLOMR-F may be required to document the fill within the flood plain.

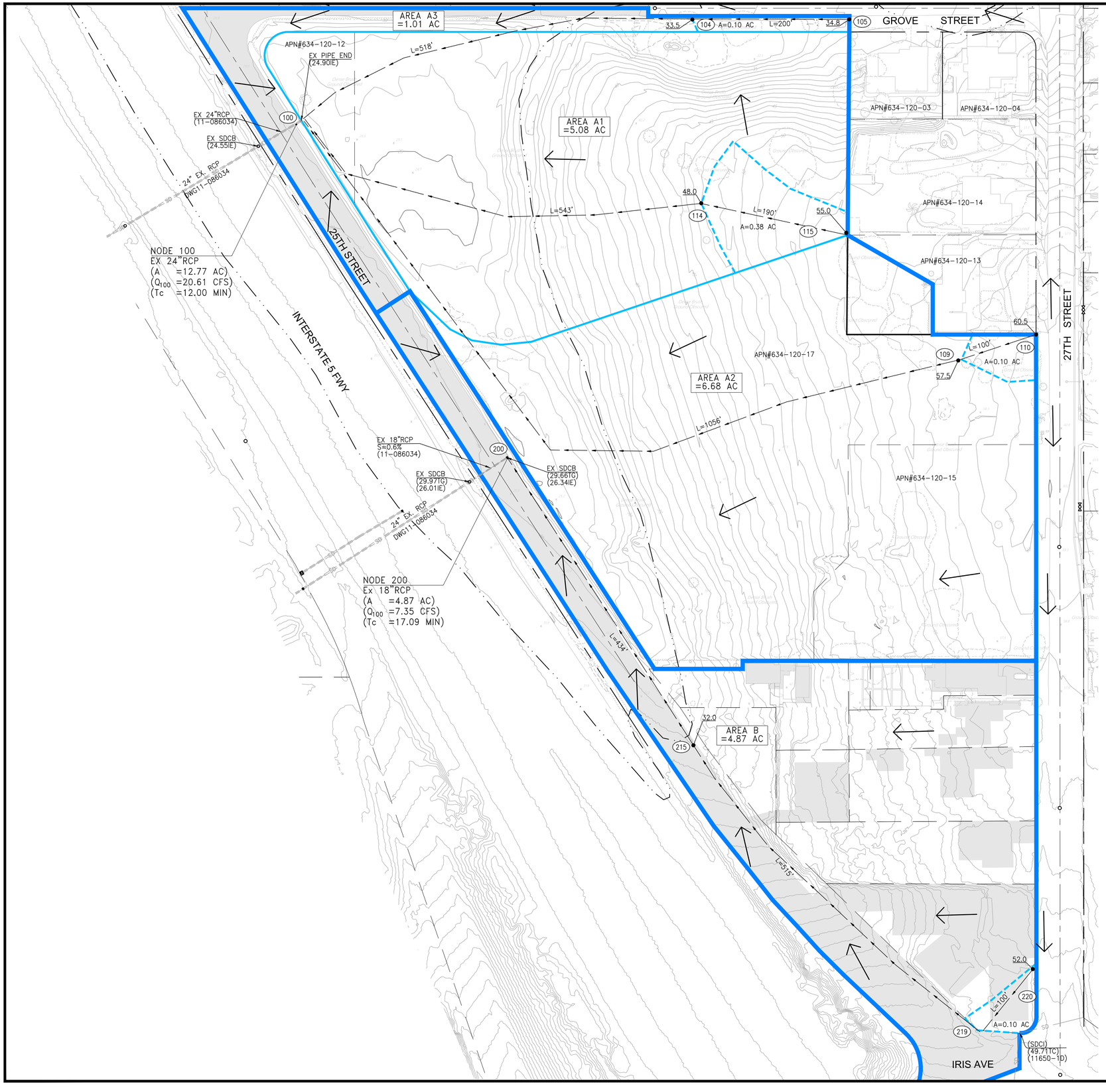
The project is anticipated to improve the drainage conditions of the existing frontage streets by construction basic sidewalk, curb and gutter and provide treatment by implementing green street bmps. The public improvements in combinations with onsite storm drain facilities will eliminate the uncontrolled public drainage flowing through property.

# APPENDIX 1

# EXISTING HYDROLOGY MAP

# &

# PROPOSED HYDROLOGY MAP




## LEGEND

- BOUNDARY
- RIGHT OF WAY
- LOT LINE
- CENTER LINE
- EX FLOOD PLAIN LIMITS
- BASIN LIMITS
- SUB-BASIN LIMITS
- INITIAL SUB-AREA
- FLOW PATH
- DIRECTION OF FLOW
- HYDROLOGY NODE (200)
- EXISTING CONTOUR (60)
- IMPERVIOUS AREA

60' 0' 30' 60'

SCALE: 1" = 60'

| NO. | DATE | REVISION |
|---|---|---|
| | | |

# SOUTHWEST PARK

## EXISTING CONDITIONS HYDROLOGY MAP

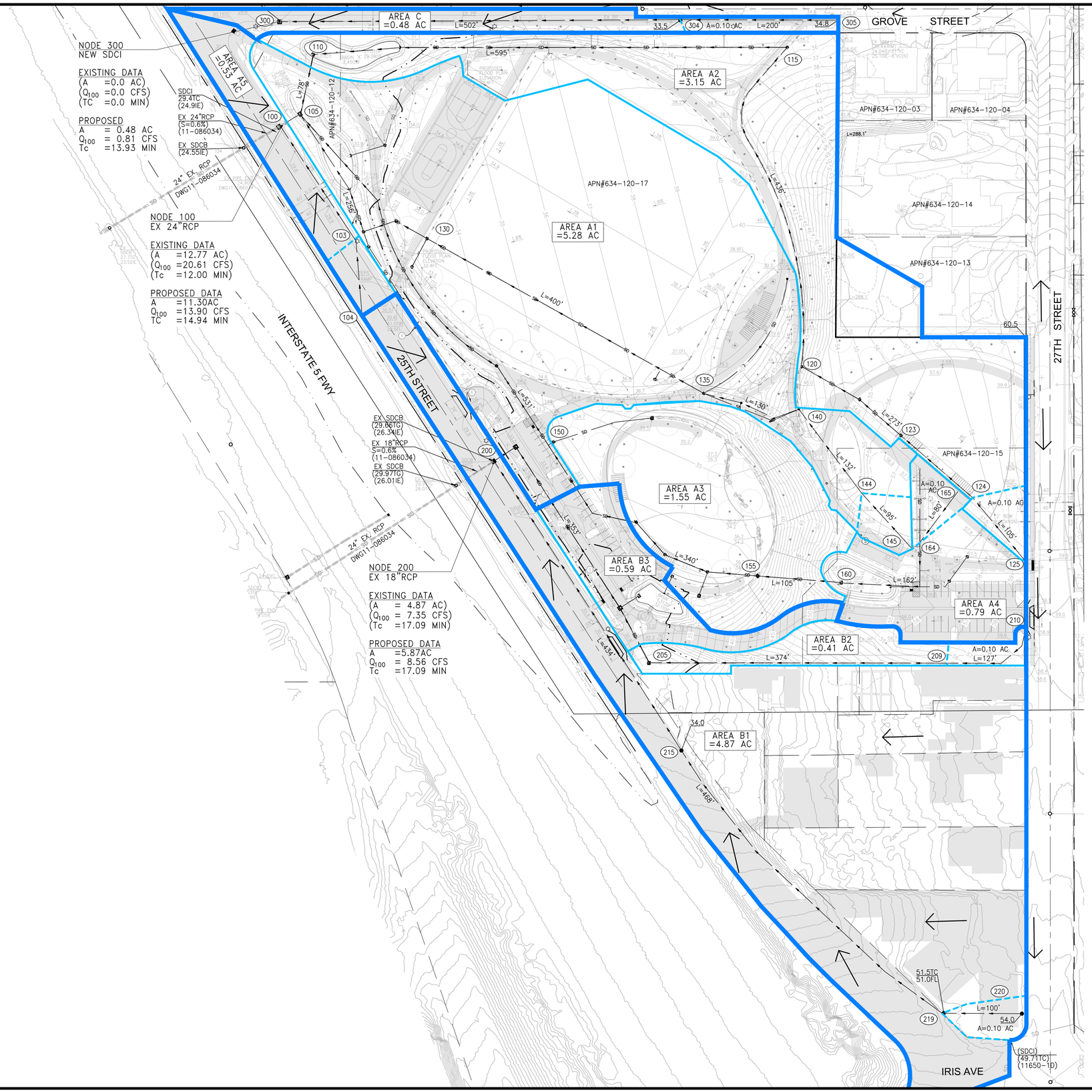
FUSCOE ENGINEERING
6390 Greenwich Dr., Suite 170
San Diego, California 92122
tel 858.554.1500 ◦ fax 858.597.0335
www.fuscoe.com

JOB NO. 1440-009

DRAWN BY: J.G.

SHEET 1 of 1

F:\Projects\1440\009_Support Files\Reports\Hydrology\Exhibits\1440-009-HYD-EX.dwg (11/9/2019 4:59 PM) Plotted by: Jesus Garcia




## LEGEND

- BOUNDARY
- RIGHT OF WAY
- LOT LINE
- CENTER LINE
- EX FLOOD PLAIN LIMITS
- PROPOSED FLOOD PLAIN LIMITS
- BASIN LIMITS
- SUB-BASIN LIMITS
- INITIAL SUB-AREA
- FLOW PATH
- DIRECTION OF FLOW
- HYDROLOGY NODE (200)
- EXISTING CONTOUR (60)
- IMPERVIOUS AREA

| NO. | DATE | REVISION |
|---|---|---|
| | | |

SOUTHWEST PARK

PROPOSED CONDITIONS
HYDROLOGY MAP

SCALE: 1" = 60'

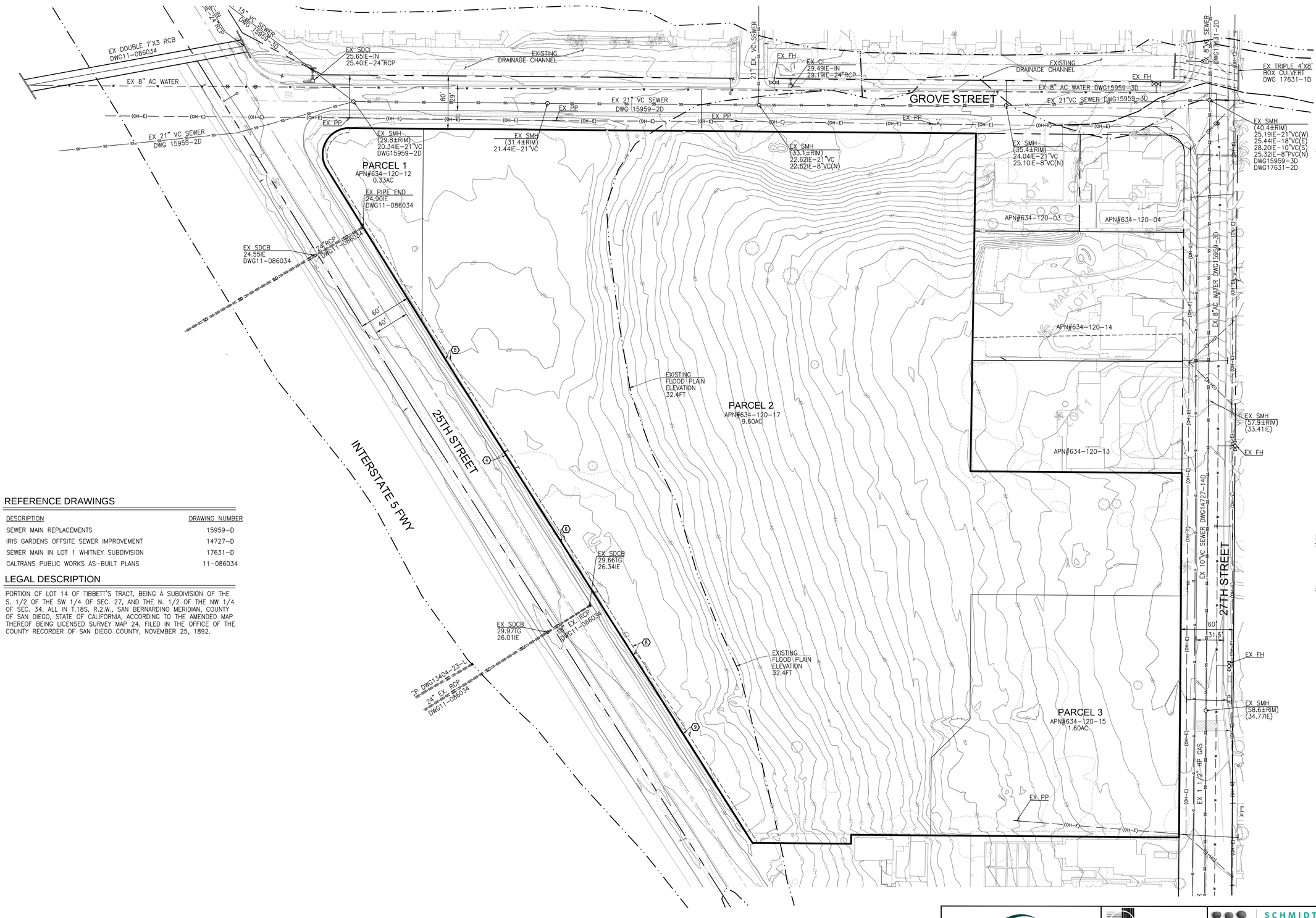
FUSCOE ENGINEERING
6390 Greenwich Dr., Suite 170
San Diego, California 92122
tel 858.554.1500 ◦ fax 858.597.0335
www.fuscoe.com

JOB NO. 1440-009
DRAWN BY: J.G.
SHEET 1 of 1

F:\Projects\1440\009_Support Files\Reports\Hydrology\Exhibits\1440-009-HYD-PR.dwg (6/26/2020 11:23 AM) Plotted by: Brittany Cloud

# APPENDIX 2

# GRADING & SITE CROSS SECTIONS




## REFERENCE DRAWINGS

| DESCRIPTION | DRAWING NUMBER |
|---|---|
| SEWER MAIN REPLACEMENTS | 15959-D |
| IRIS GARDENS OFFSITE SEWER IMPROVEMENT | 14727-D |
| SEWER MAIN IN LOT 1 WHITNEY SUBDIVISION | 17631-D |
| CALTRANS PUBLIC WORKS AS-BUILT PLANS | 11-086034 |

## LEGAL DESCRIPTION

PORTION OF LOT 14 OF TIBBETT'S TRACT, BEING A SUBDIVISION OF THE S. 1/2 OF THE SW 1/4 OF SEC. 27, AND THE N. 1/2 OF THE NW 1/4 OF SEC. 34, ALL IN T.18S, R.2.W., SAN BERNARDINO MERIDIAN, COUNTY OF SAN DIEGO, STATE OF CALIFORNIA, ACCORDING TO THE AMENDED MAP THEREOF BEING LICENSED SURVEY MAP 24, FILED IN THE OFFICE OF THE COUNTY RECORDER OF SAN DIEGO COUNTY, NOVEMBER 25, 1892.

## LEGEND

| ITEM | SYMBOL |
|---|---|
| EXISTING CONTOUR | 24 |
| FIRE HYDRANT | |
| FENCE | x x x |
| SEWER MAIN | ss ss |
| STORM DRAIN | sd |
| WATER MAIN | w w |
| OVERHEAD UTILITIES | (OH-E) |
| UTILITY POLE | |
| EXISTING LIMIT OF FLOOD WAY | |

## SITE ADDRESS

SITE IS LOCATED ON GROVE STREET BETWEEN 25TH STREET AND 27TH STREET.

## EASEMENT NOTES:

(4) 5' WIDE EASEMENT FOR HIGHWAY SLOPES AND RIGHTS INCIDENTAL THERETO, AND DOES NOT INCLUDE RIGHTS OF ACCESS TO OR FROM A PUBLIC STREET OR HIGHWAY ABUTTING SAID LAND, IN FAVOR OF STATE OF CALIFORNIA. REC. AUGUST 7, 1958 AS INSTRUMENT NO. 133928

(6) 5' WIDE EASEMENT FOR HIGHWAY SLOPES AND RIGHTS INCIDENTAL THERETO, AND DOES NOT INCLUDE RIGHTS OF ACCESS TO OR FROM A PUBLIC STREET OR HIGHWAY ABUTTING SAID LAND, IN FAVOR OF STATE OF CALIFORNIA. REC. AUGUST 13, 1968 AS INSTRUMENT NO. 137716

(8) 5' WIDE EASEMENT FOR HIGHWAY SLOPES AND RIGHTS INCIDENTAL THERETO, IN FAVOR OF STATE OF CALIFORNIA. REC. JULY 10, 1969 AS INSTRUMENT NO. 5078

(9) 5' WIDE EASEMENT FOR HIGHWAY SLOPS AND RIGHTS INCIDENTAL THERETO, IN FAVOR OF STATE OF CALIFORNIA. REC. JULY 31, 1969 AS INSTRUMENT NO. 138332

## TOPOGRAPHY SOURCE

TOPOGRAPHY WAS COMPILED BY AEROTECH MAPPING 02/07/2019, DATUM NAD 83. ELEVATIONS ON THIS PLAN ARE REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).

## ASSESSORS PARCEL NUMBER

634-120-09, 634-120-12, & 634-120-15

## ZONING / BOUNDARY

EXISTING ZONE: RS-1-7 (RESIDENTIAL-SINGLE UNIT)

## BASIS OF BEARINGS

THE BASIS OF BEARINGS FOR THIS SURVEY IS THE CALIFORNIA COORDINATE SYSTEM, CCS83, ZONE 6, (EPOCH 1991.35) AND IS DETERMINED BY G.P.S. MEASUREMENTS TAKEN ON JANUARY 24, 2019 AT GPS STATIONS 59 AND GPS STATION 1382 PER ROS 14492. THE BEARING FROM GPS PT#1382 TO GPS PT#59 IS N33°01'24"W.

QUOTED BEARINGS FROM REFERENCE MAPS OR DEEDS MAY OR MAY NOT BE IN TERMS OF SAID SYSTEM.

## BENCHMARK

CITY OF SAN DIEGO BENCHMARK AT GROVE AVENUE SO BAY AND 27TH STREET SB, NWBP IN CB INLET
ELEVATION 38.745' M.S.L.

## FLOOD ZONE

FLOOD ZONE INFORMATION PER THE FEMA FLOOD HAZARD WEBSITE. THIS SITE IS LOCATED IN ZONE AE (BASE FLOOD ELEVATIONS DETERMINED) AS SHOWN ON THE FLOOD INSURANCE RATE MAP (F.I.R.M.), COMMUNITY-PANEL NO. 06073C 2154 H, EFFECTIVE DATE: APRIL 5, 2016.

0 25 50 100
GRAPHIC SCALE: 1"=50'-0"

NORTH

50' 0' 25' 50'
SCALE: 1" = 50'

# EXISTING CONDITIONS

# SOUTHWEST PARK
SAN DIEGO, CA

XXXX
WBS #

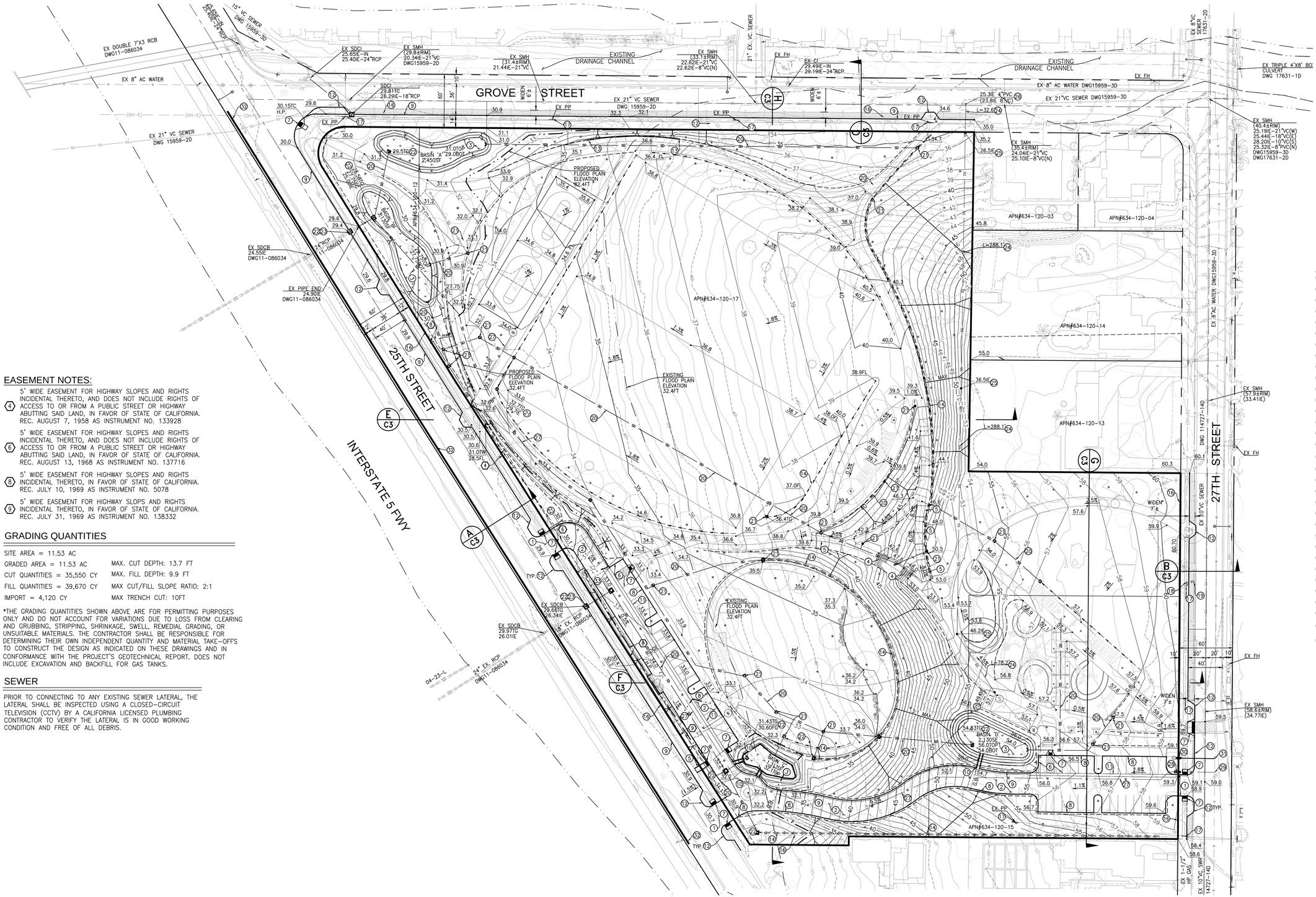
11/11/2019
DATE

SHEET C1
OF 6 SHEETS

BSE ENGINEERING

FUSCOE ENGINEERING
6390 Greenwich Drive, Suite 170
San Diego, California 92122
tel 858.554.1500 ▪ fax 858.597.0335
www.fuscoe.com

SCHMIDT DESIGN GROUP
1310 Rosecrans St., Suite G, San Diego, CA 92106
619.236.1462
LIC. CA 2138 | NV 219 | AZ 34139
SCHMIDTDESIGN.COM




## EASEMENT NOTES:

(4) 5' WIDE EASEMENT FOR HIGHWAY SLOPES AND RIGHTS INCIDENTAL THERETO, AND DOES NOT INCLUDE RIGHTS OF ACCESS TO OR FROM A PUBLIC STREET OR HIGHWAY ABUTTING SAID LAND, IN FAVOR OF STATE OF CALIFORNIA. REC. AUGUST 7, 1958 AS INSTRUMENT NO. 133928

(6) 5' WIDE EASEMENT FOR HIGHWAY SLOPES AND RIGHTS INCIDENTAL THERETO, AND DOES NOT INCLUDE RIGHTS OF ACCESS TO OR FROM A PUBLIC STREET OR HIGHWAY ABUTTING SAID LAND, IN FAVOR OF STATE OF CALIFORNIA. REC. AUGUST 13, 1968 AS INSTRUMENT NO. 137716

(8) 5' WIDE EASEMENT FOR HIGHWAY SLOPES AND RIGHTS INCIDENTAL THERETO, IN FAVOR OF STATE OF CALIFORNIA. REC. JULY 10, 1969 AS INSTRUMENT NO. 5078

(9) 5' WIDE EASEMENT FOR HIGHWAY SLOPS AND RIGHTS INCIDENTAL THERETO, IN FAVOR OF STATE OF CALIFORNIA. REC. JULY 31, 1969 AS INSTRUMENT NO. 138332

## GRADING QUANTITIES

| | |
|---|---|
| SITE AREA = 11.53 AC | |
| GRADED AREA = 11.53 AC | MAX. CUT DEPTH: 13.7 FT |
| CUT QUANTITIES = 35,550 CY | MAX. FILL DEPTH: 9.9 FT |
| FILL QUANTITIES = 39,670 CY | MAX CUT/FILL SLOPE RATIO: 2:1 |
| IMPORT = 4,120 CY | MAX TRENCH CUT: 10FT |

*THE GRADING QUANTITIES SHOWN ABOVE ARE FOR PERMITTING PURPOSES ONLY AND DO NOT ACCOUNT FOR VARIATIONS DUE TO LOSS FROM CLEARING AND GRUBBING, STRIPPING, SHRINKAGE, SWELL, REMEDIAL GRADING, OR UNSUITABLE MATERIALS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR DETERMINING THEIR OWN INDEPENDENT QUANTITY AND MATERIAL TAKE-OFFS TO CONSTRUCT THE DESIGN AS INDICATED ON THESE DRAWINGS AND IN CONFORMANCE WITH THE PROJECT'S GEOTECHNICAL REPORT. DOES NOT INCLUDE EXCAVATION AND BACKFILL FOR GAS TANKS.

## SEWER

PRIOR TO CONNECTING TO ANY EXISTING SEWER LATERAL, THE LATERAL SHALL BE INSPECTED USING A CLOSED-CIRCUIT TELEVISION (CCTV) BY A CALIFORNIA LICENSED PLUMBING CONTRACTOR TO VERIFY THE LATERAL IS IN GOOD WORKING CONDITION AND FREE OF ALL DEBRIS.

## LEGEND

| IMPROVEMENT | SYMBOL |
|---|---|
| PROPOSED RIGHT-OF-WAY | |
| EASEMENT | |
| CENTERLINE | |
| PROPOSED CONTOUR | 25 |
| 6" CURB & GUTTER | |
| 6" CURB | |
| SIDEWALK | |
| ASPHALT PAVEMENT PER SCHEDULE 'J' | |
| BIOFILTRATION BMP | |
| LIMITS OF GRADING | |
| DOMESTIC WATER MAIN | W W |
| SANITARY SEWER MAIN | SS SS |
| BACKFLOW PREVENTER | |
| WATER METER | M |
| GATE VALVE | |
| WATER SERVICE CONNECTION | W |
| IRRIGATION LINE CONNECTION | I |
| STORM DRAIN | SD |

## CONSTRUCTION NOTES:

1. 26FT WIDE DRIVEWAY ENTRY
2. VEHICULAR AC PAVEMENT
3. BIORETENTION BASIN W/ IMPERMEABLE LINER PER DETAIL 'D'
4. STAIRS WITH HANDRAILS
5. ADA RAMP WITH HANDRAILS
6. ADA PARKING – 2% MAX SLOPE IN ANY DIRECTION
7. ADA CURB RAMP WITH TRUNCATED DOMES
8. 6" CURB
9. 6" CURB & GUTTER
10. 2FT WIDE CURB OPENING WITH CONCRETE SPILLWAY
11. 3FT WIDE VALLEY GUTTER
12. CURB EXTENSION PER GREEN STREETS STANDARD GS-3.4
13. 3FT HEIGHT RETAINING WALL (2FT MAX RETAINING)
14. GRADED SWALE
15. SIDEWALK UNDERDRAIN
16. REMOVE EXISTING FENCE
17. RELOCATE EXISTING OVERHEAD UTILITIES TO UNDERGROUND ALONG FRONTAGE
18. RELOCATE EXISTING UTILITY PEDESTAL
19. RELOCATE EXISTING STREET SIGN
20. HDPE STORM DRAIN PIPE, MIN 8" @ 0.5%
21. PRECAST CONCRETE GRATE INLET CATCH BASIN
22. CAST-IN-PLACE STORM DRAIN INLET CATCH BASIN
23. TIE-IN TO EXISTING PUBLIC STORM DRAIN
24. 4" PVC SEWER SERVICE LATERAL, S=3.5%
25. SEWER PVC CLEANOUT ASSEMBLY
26. SEWER SERVICE CONNECTION TO MAIN
27. 3/4" PVC WATER SERVICE LATERAL, W/ 3.5FT COVER
28. 3/4" WATER METER & 3/4"BFP
29. 1" WATER SERVICE CONNECTION TO MAIN
30. 1" IRRIGATION METER & 1" BFP
31. 1" IRRIGATION SERVICE CONNECTION TO MAIN
32. SOUND WALL WITH 4"X8" DRAIN OPENINGS AT 3' ON CENTER
33. STORM DRAIN CLEANOUT PER SDRSD D-09

50' 0' 25' 50'

SCALE: 1" = 50'

GRAPHIC SCALE: 1"=50'-0"

0 25 50 100

# CONCEPT GRADING & UTILITY PLAN

## SOUTHWEST PARK

SAN DIEGO, CA


BSE ENGINEERING

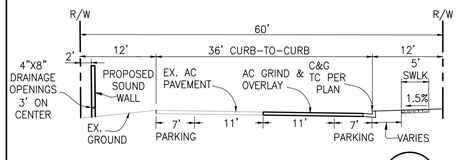
FUSCOE ENGINEERING
6390 Greenwich Drive, Suite 170
San Diego, California 92122
tel 858.554.1500 ° fax 858.597.0335
www.fuscoe.com

SCHMIDT DESIGN GROUP
1310 Rosecrans St., Suite G, San Diego, CA 92106
619.236.1462
L.C. CA 2138 | NV 219 | AZ 34139
SCHMIDTDESIGN.COM

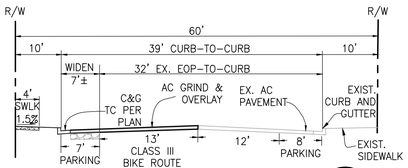

XXXX
WBS #

11/11/2019
DATE

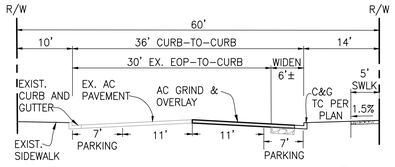
SHEET C2
OF 6 SHEETS



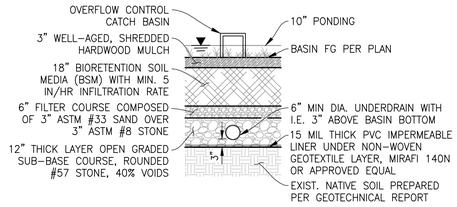

TYPICAL SECTION - 25TH STREET (A / C3)
NOT TO SCALE



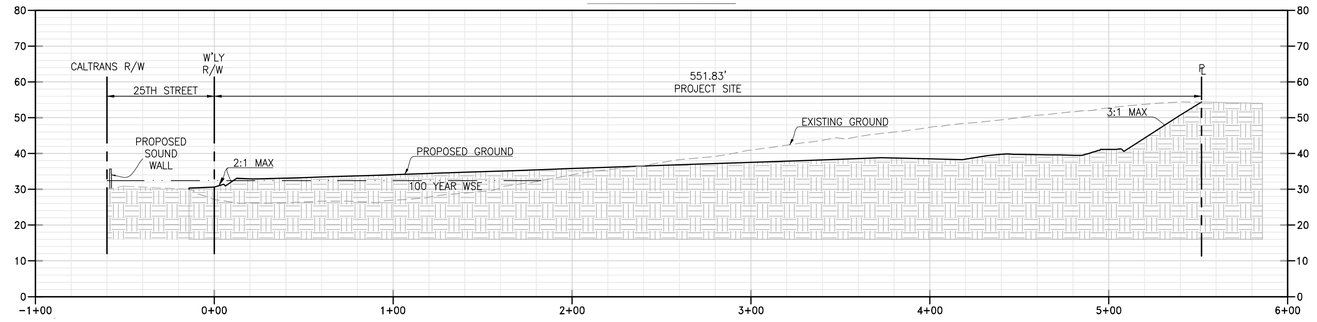

TYPICAL SECTION - 27TH STREET (B / C3)
NOT TO SCALE



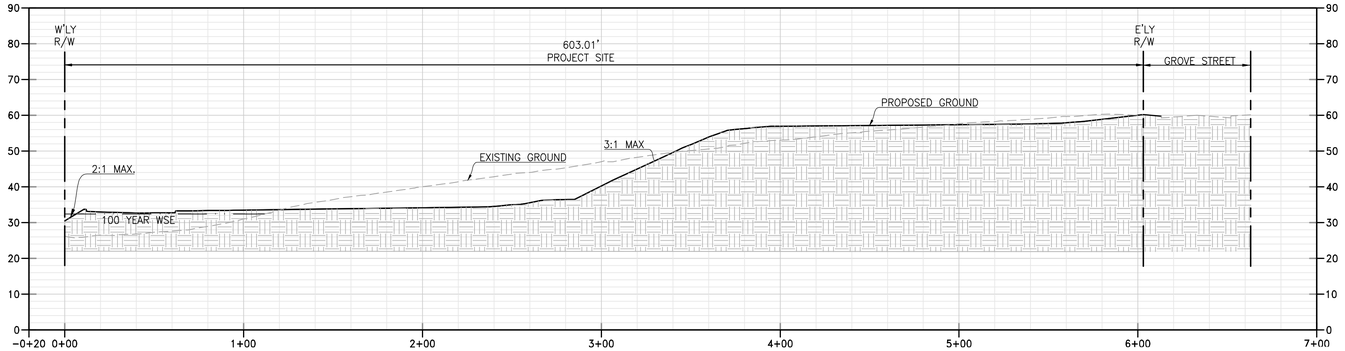

TYPICAL SECTION - GROVE STREET (C / C3)
NOT TO SCALE




DETAIL - BIOFILTRATION SECTION (D / C3)
NOT TO SCALE




SITE SECTION (E / C3)
1"=40'




SITE SECTION (F / C3)
1"=40'




SITE SECTION (G / C3)
1"=40'




SITE SECTION (H / C3)
1"=40'

0 25 50 100
GRAPHIC SCALE: 1"=50'-0"

NORTH

BSE ENGINEERING

FUSCOE ENGINEERING
6390 Greenwich Drive, Suite 170
San Diego, California 92122
tel 858.554.1500 • fax 858.597.0335
www.fuscoe.com

SCHMIDT DESIGN GROUP
1310 Rosecrans St., Suite G, San Diego, CA 92106
619.236.1462
LIC. CA 2138 | NV 219 | AZ 34139
SCHMIDTDESIGN.COM

SECTIONS & DETAILS

SOUTHWEST PARK
SAN DIEGO, CA

XXXX
WBS #

11/11/2019
DATE

SHEET C3
OF 6 SHEETS

# APPENDIX 3

# RUNOFF COEFFICIENT CALCULATIONS

FUSCOE ENGINEERING

**Job Name:** SW Neighborhood Park
**Job #:** 1440-009
**Date:** 11/8/2019

Runoff Coefficient Calculations

## Runoff Coefficent Variables Per City of San Diego Drainage Design Manual (January '17)

**Assumptions:** D soils per City Drainage Manual

### EXISTING CONDITIONS: ONSITE BASINS A1 & B1 (RURAL)

| | | | |
|---|---|---|---|
| Rural C = | 0.45 | | Per Drainage Design Manual Appendix A Table A-1 |

### EXISTING CONDITIONS: OFFSITE BASIN A2 (GROVE ST & 25th)

| | | | |
|---|---|---|---|
| Area Impervious = | 23053 | sf | 53% |
| Area Pervious = | 20725 | sf | 47% |
| Total Area = | 43778 | sf | |

| | | |
|---|---|---|
| Industrial C = | 0.85 | Per Drainage Design Manual Appendix A Table A-1 |
| Tabulated % Impervious = | 80% | |
| Acutal % Impervious = | 53% | |
| Calculated Cweighted = | 0.56 | |
| Design C = | 0.56 | |

### EXISTING CONDITIONS: OFFSITE BASIN B2 (RURAL)

| | | |
|---|---|---|
| Rural C = | 0.45 | Per Drainage Design Manual Appendix A Table A-1 |

### EXISTING CONDITIONS: OFFSITE BASIN B2 (SOUTH 25th)

| | | | |
|---|---|---|---|
| Area Impervious = | 112550 | sf | 53% |
| Area Pervious = | 99742 | sf | 47% |
| Total Area = | 212292 | sf | |

| | | |
|---|---|---|
| Industrial C = | 0.85 | Per Drainage Design Manual Appendix A Table A-1 |
| Tabulated % Impervious = | 80% | |
| Acutal % Impervious = | 53% | |
| Calculated Cweighted = | 0.56 | |
| Design C = | 0.56 | |

### PROPOSED CONDITIONS: ONSITE BASINS A1 & B1 (PUBLIC PARK)

| | | |
|---|---|---|
| Rural C = | 0.45 | Per Drainage Design Manual Appendix A Table A-1 |

### PROPOSED CONDITIONS: OFFSITE BASIN A2 (GROVE ST & 25th)

| | | | |
|---|---|---|---|
| Area Impervious = | 23053 | sf | 53% |
| Area Pervious = | 20725 | sf | 47% |
| Total Area = | 43778 | sf | |

| | | |
|---|---|---|
| Industrial C = | 0.85 | Per Drainage Design Manual Appendix A Table A-1 |
| Tabulated % Impervious = | 80% | |

| | |
|---|---|
| Acutal % Impervious = | 53% |
| Calculated Cweighted = | 0.56 |
| Design C = | 0.56 |

## PROPOSED CONDITIONS: OFFSITE BASIN B2 (RURAL)

| | | | |
|---|---|---|---|
| Area Impervious = | 112550 | sf | 53% |
| Area Pervious = | 99742 | sf | 47% |
| Total Area = | 212292 | sf | |

| | | |
|---|---|---|
| Industrial C = | 0.85 | Per Drainage Design Manual Appendix A Table A-1 |
| Tabulated % Impervious = | 80% | |
| Acutal % Impervious = | 53% | |
| Calculated Cweighted = | 0.56 | |
| Design C = | 0.56 | |

# APPENDIX 4

# EXISTING HYDROLOGY CALCULATIONS

```
**************************************************************************

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
          (c) Copyright 1982-2014 Advanced Engineering Software (aes)
              Ver. 21.0 Release Date: 06/01/2014  License ID 1355

                              Analysis prepared by:

                                Fuscoe Engineering
                               6390 Greenwich Drive
                                    Suite 170
                               San Diego, CA 92122

 ************************* DESCRIPTION OF STUDY *************************
* SW NEIGHBORHOOD PARK                                                  *
* EXISTING CONDITIONS - 100 YR                                          *
*                                                                       *
 *************************************************************************

  FILE NAME: SWPEX.DAT
  TIME/DATE OF STUDY: 14:16 11/08/2019
-------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
-------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   6.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  RAINFALL-INTENSITY ADJUSTMENT FACTOR = 1.000
  *USER SPECIFIED:
  NUMBER OF [TIME,INTENSITY] DATA PAIRS = 20
   1)   5.000;  4.400
   2)   6.000;  4.200
   3)   7.000;  3.900
   4)   8.000;  3.750
   5)   9.000;  3.600
   6)  10.000;  3.450
   7)  11.000;  3.300
   8)  12.000;  3.200
   9)  14.000;  3.000
  10)  15.000;  2.900
  11)  16.000;  2.800
  12)  17.000;  2.700
  13)  19.000;  2.600
  14)  20.000;  2.550
  15)  25.000;  2.230
```

```
  16)  30.000;  2.000
  17)  40.000;  1.700
  18)  50.000;  1.500
  19)  60.000;  1.310
  20) 120.000;  0.860
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: ONLY PEAK CONFLUENCE VALUES CONSIDERED
  *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   27.0     22.0    0.020/0.020/0.020   0.50    2.00 0.0313 0.125 0.0150
  2   40.0     35.0    0.020/0.020/0.015   0.50    2.00 0.0313 0.125 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    115.00 TO NODE    114.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   190.00
  UPSTREAM ELEVATION(FEET) =     55.00
  DOWNSTREAM ELEVATION(FEET) =     48.00
  ELEVATION DIFFERENCE(FEET) =      7.00
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    7.576
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =   100.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.814
  SUBAREA RUNOFF(CFS) =      0.65
  TOTAL AREA(ACRES) =      0.38   TOTAL RUNOFF(CFS) =      0.65

****************************************************************************
  FLOW PROCESS FROM NODE    114.00 TO NODE    100.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
```

```
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     48.00  DOWNSTREAM(FEET) =     24.90
  CHANNEL LENGTH THRU SUBAREA(FEET) =   543.00   CHANNEL SLOPE =  0.0425
  NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
  CHANNEL FLOW THRU SUBAREA(CFS) =       0.65
  FLOW VELOCITY(FEET/SEC) =   3.09 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   2.93   Tc(MIN.) =   10.50
  LONGEST FLOWPATH FROM NODE    115.00 TO NODE    100.00 =     733.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.375
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.4500
  SUBAREA AREA(ACRES) =    4.70   SUBAREA RUNOFF(CFS) =    7.14
  TOTAL AREA(ACRES) =        5.1   TOTAL RUNOFF(CFS) =       7.71
  TC(MIN.) =   10.50

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   10.50
  RAINFALL INTENSITY(INCH/HR) =   3.37
  TOTAL STREAM AREA(ACRES) =     5.08
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      7.71

****************************************************************************
  FLOW PROCESS FROM NODE    110.00 TO NODE    109.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =     60.50
  DOWNSTREAM ELEVATION(FEET) =     57.50
  ELEVATION DIFFERENCE(FEET) =      3.00
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    8.113
```

```
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.733
SUBAREA RUNOFF(CFS) =      0.17
TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.17

****************************************************************************
FLOW PROCESS FROM NODE    109.00 TO NODE    109.00 IS CODE =  81
----------------------------------------------------------------------------
>>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.733
*USER SPECIFIED(SUBAREA):
USER-SPECIFIED RUNOFF COEFFICIENT = .4500
S.C.S. CURVE NUMBER (AMC II) =   0
AREA-AVERAGE RUNOFF COEFFICIENT = 0.4500
SUBAREA AREA(ACRES) =    6.58   SUBAREA RUNOFF(CFS) =   11.05
TOTAL AREA(ACRES) =        6.7   TOTAL RUNOFF(CFS) =      11.22
TC(MIN.) =    8.11

****************************************************************************
FLOW PROCESS FROM NODE    109.00 TO NODE    100.00 IS CODE =  52
----------------------------------------------------------------------------
>>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
>>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
ELEVATION DATA: UPSTREAM(FEET) =     57.50  DOWNSTREAM(FEET) =     24.90
CHANNEL LENGTH THRU SUBAREA(FEET) =  1056.00   CHANNEL SLOPE =  0.0309
CHANNEL FLOW THRU SUBAREA(CFS) =      11.22
FLOW VELOCITY(FEET/SEC) =   4.52 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
TRAVEL TIME(MIN.) =   3.89   Tc(MIN.) =   12.00
LONGEST FLOWPATH FROM NODE    110.00 TO NODE    100.00 =    1156.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 IS CODE =   1
----------------------------------------------------------------------------
>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
TOTAL NUMBER OF STREAMS =  3
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
TIME OF CONCENTRATION(MIN.) =   12.00
RAINFALL INTENSITY(INCH/HR) =   3.20
TOTAL STREAM AREA(ACRES) =     6.68
PEAK FLOW RATE(CFS) AT CONFLUENCE =     11.22

****************************************************************************
FLOW PROCESS FROM NODE    105.00 TO NODE    104.00 IS CODE =  21
----------------------------------------------------------------------------
>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
```

```
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .5600
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   200.00
  UPSTREAM ELEVATION(FEET) =     34.80
  DOWNSTREAM ELEVATION(FEET) =     33.50
  ELEVATION DIFFERENCE(FEET) =      1.30
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    8.284
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    54.50
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.707
  SUBAREA RUNOFF(CFS) =      0.21
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.21

****************************************************************************
  FLOW PROCESS FROM NODE    104.00 TO NODE    104.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.707
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .5600
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.5600
  SUBAREA AREA(ACRES) =    0.91   SUBAREA RUNOFF(CFS) =    1.89
  TOTAL AREA(ACRES) =        1.0   TOTAL RUNOFF(CFS) =       2.10
  TC(MIN.) =    8.28

****************************************************************************
  FLOW PROCESS FROM NODE    104.00 TO NODE    100.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     33.50  DOWNSTREAM(FEET) =     24.90
  CHANNEL LENGTH THRU SUBAREA(FEET) =   518.00   CHANNEL SLOPE =  0.0166
  CHANNEL FLOW THRU SUBAREA(CFS) =       2.10
  FLOW VELOCITY(FEET/SEC) =   2.24 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   3.85   Tc(MIN.) =   12.14
  LONGEST FLOWPATH FROM NODE    105.00 TO NODE    100.00 =     718.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
```

```
==============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
  TIME OF CONCENTRATION(MIN.) =   12.14
  RAINFALL INTENSITY(INCH/HR) =   3.19
  TOTAL STREAM AREA(ACRES) =     1.01
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      2.10

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        7.71    10.50        3.375          5.08
      2       11.22    12.00        3.200          6.68
      3        2.10    12.14        3.186          1.01

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  3 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1       19.35    10.50       3.375
      2       20.61    12.00       3.200
      3       20.56    12.14       3.186

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      20.61   Tc(MIN.) =   12.00
  TOTAL AREA(ACRES) =       12.8
  LONGEST FLOWPATH FROM NODE    110.00 TO NODE    100.00 =    1156.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    220.00 TO NODE    219.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .5600
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =     52.00
  DOWNSTREAM ELEVATION(FEET) =     50.70
  ELEVATION DIFFERENCE(FEET) =      1.30
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    7.425
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    69.50
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.836
```

```
  SUBAREA RUNOFF(CFS) =      0.21
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.21

****************************************************************************
  FLOW PROCESS FROM NODE    219.00 TO NODE    215.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     50.20  DOWNSTREAM(FEET) =     32.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   515.00   CHANNEL SLOPE =  0.0353
  NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
  CHANNEL FLOW THRU SUBAREA(CFS) =       0.21
  FLOW VELOCITY(FEET/SEC) =   2.82 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   3.04   Tc(MIN.) =   10.47
  LONGEST FLOWPATH FROM NODE    220.00 TO NODE    215.00 =     615.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    215.00 TO NODE    200.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     32.00  DOWNSTREAM(FEET) =     29.70
  CHANNEL LENGTH THRU SUBAREA(FEET) =   434.00   CHANNEL SLOPE =  0.0053
  NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
  CHANNEL FLOW THRU SUBAREA(CFS) =       0.21
  FLOW VELOCITY(FEET/SEC) =   1.09 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   6.62   Tc(MIN.) =   17.09
  LONGEST FLOWPATH FROM NODE    220.00 TO NODE    200.00 =    1049.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    200.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.695
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .5600
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.5600
  SUBAREA AREA(ACRES) =    4.77   SUBAREA RUNOFF(CFS) =    7.20
  TOTAL AREA(ACRES) =        4.9   TOTAL RUNOFF(CFS) =       7.35
  TC(MIN.) =   17.09
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        4.9  TC(MIN.) =     17.09
  PEAK FLOW RATE(CFS)   =       7.35
```

==========

==========

END OF RATIONAL METHOD ANALYSIS

# APPENDIX 5

# PROPOSED HYDROLOGY CALCULATIONS

```
**************************************************************************

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
          (c) Copyright 1982-2014 Advanced Engineering Software (aes)
              Ver. 21.0 Release Date: 06/01/2014  License ID 1355

                              Analysis prepared by:

                                Fuscoe Engineering
                               6390 Greenwich Drive
                                    Suite 170
                               San Diego, CA 92122

 ************************* DESCRIPTION OF STUDY *************************
* SW NEIGHBORHOOD PARK                                                  *
* PROPOSED CONDITIONS - 100 YR                                          *
*                                                                       *
 *************************************************************************

  FILE NAME: SWPPR.DAT
  TIME/DATE OF STUDY: 13:56 11/08/2019
-------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
-------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   6.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  RAINFALL-INTENSITY ADJUSTMENT FACTOR = 1.000
  *USER SPECIFIED:
  NUMBER OF [TIME,INTENSITY] DATA PAIRS = 20
   1)   5.000;  4.400
   2)   6.000;  4.200
   3)   7.000;  3.900
   4)   8.000;  3.750
   5)   9.000;  3.600
   6)  10.000;  3.450
   7)  11.000;  3.300
   8)  12.000;  3.200
   9)  14.000;  3.000
  10)  15.000;  2.900
  11)  16.000;  2.800
  12)  17.000;  2.700
  13)  19.000;  2.600
  14)  20.000;  2.550
  15)  25.000;  2.230
```

```
  16)  30.000;  2.000
  17)  40.000;  1.700
  18)  50.000;  1.500
  19)  60.000;  1.310
  20) 120.000;  0.860
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: ONLY PEAK CONFLUENCE VALUES CONSIDERED
  *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   27.0     22.0    0.020/0.020/0.020   0.50    2.00 0.0313 0.125 0.0150
  2   40.0     35.0    0.020/0.020/0.015   0.50    2.00 0.0313 0.125 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    305.00 TO NODE    304.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .5600
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   200.00
  UPSTREAM ELEVATION(FEET) =     34.80
  DOWNSTREAM ELEVATION(FEET) =     33.50
  ELEVATION DIFFERENCE(FEET) =      1.30
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    8.284
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    54.50
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.707
  SUBAREA RUNOFF(CFS) =      0.21
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.21

****************************************************************************
  FLOW PROCESS FROM NODE    304.00 TO NODE    300.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
```

```
==============================================================================
  UPSTREAM ELEVATION(FEET) =   33.50  DOWNSTREAM ELEVATION(FEET) =   29.80
  STREET LENGTH(FEET) =   502.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 27.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  22.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.53
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.21
    HALFSTREET FLOOD WIDTH(FEET) =    4.58
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.48
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.31
  STREET FLOW TRAVEL TIME(MIN.) =   5.64   Tc(MIN.) =   13.93
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.007
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .5600
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.560
  SUBAREA AREA(ACRES) =    0.38      SUBAREA RUNOFF(CFS) =    0.64
  TOTAL AREA(ACRES) =        0.5        PEAK FLOW RATE(CFS) =       0.81

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.24   HALFSTREET FLOOD WIDTH(FEET) =   5.99
  FLOW VELOCITY(FEET/SEC.) =  1.60   DEPTH*VELOCITY(FT*FT/SEC.) =   0.38
  LONGEST FLOWPATH FROM NODE    305.00 TO NODE    300.00 =     702.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    220.00 TO NODE    219.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .5600
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =     52.00
  DOWNSTREAM ELEVATION(FEET) =     50.70
  ELEVATION DIFFERENCE(FEET) =      1.30
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    7.425
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
```

```
          THE MAXIMUM OVERLAND FLOW LENGTH =    69.50
          (Reference: Table 3-1B of Hydrology Manual)
          THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.836
  SUBAREA RUNOFF(CFS) =      0.21
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.21

****************************************************************************
  FLOW PROCESS FROM NODE    219.00 TO NODE    215.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     50.20  DOWNSTREAM(FEET) =     32.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   515.00   CHANNEL SLOPE =  0.0353
  NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
  CHANNEL FLOW THRU SUBAREA(CFS) =       0.21
  FLOW VELOCITY(FEET/SEC) =   2.82 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   3.04   Tc(MIN.) =   10.47
  LONGEST FLOWPATH FROM NODE    220.00 TO NODE    215.00 =     615.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    215.00 TO NODE    200.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     32.00  DOWNSTREAM(FEET) =     29.70
  CHANNEL LENGTH THRU SUBAREA(FEET) =   434.00   CHANNEL SLOPE =  0.0053
  NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
  CHANNEL FLOW THRU SUBAREA(CFS) =       0.21
  FLOW VELOCITY(FEET/SEC) =   1.09 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   6.62   Tc(MIN.) =   17.09
  LONGEST FLOWPATH FROM NODE    220.00 TO NODE    200.00 =    1049.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    200.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.695
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .5600
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.5600
  SUBAREA AREA(ACRES) =    4.77   SUBAREA RUNOFF(CFS) =    7.20
  TOTAL AREA(ACRES) =        4.9   TOTAL RUNOFF(CFS) =       7.35
  TC(MIN.) =   17.09
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    200.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   17.09
  RAINFALL INTENSITY(INCH/HR) =   2.70
  TOTAL STREAM AREA(ACRES) =     4.87
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      7.35

****************************************************************************
  FLOW PROCESS FROM NODE    210.00 TO NODE    209.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   127.00
  UPSTREAM ELEVATION(FEET) =     59.60
  DOWNSTREAM ELEVATION(FEET) =     55.00
  ELEVATION DIFFERENCE(FEET) =      4.60
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    7.619
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =   100.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.807
  SUBAREA RUNOFF(CFS) =      0.17
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.17

****************************************************************************
  FLOW PROCESS FROM NODE    209.00 TO NODE    205.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     55.00  DOWNSTREAM(FEET) =     30.60
  CHANNEL LENGTH THRU SUBAREA(FEET) =   374.00   CHANNEL SLOPE =  0.0652
  NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
  CHANNEL FLOW THRU SUBAREA(CFS) =       0.17
  FLOW VELOCITY(FEET/SEC) =   3.83 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   1.63   Tc(MIN.) =    9.25
  LONGEST FLOWPATH FROM NODE    210.00 TO NODE    205.00 =     501.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    205.00 TO NODE    205.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.563
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.4500
  SUBAREA AREA(ACRES) =    0.31   SUBAREA RUNOFF(CFS) =    0.50
  TOTAL AREA(ACRES) =        0.4   TOTAL RUNOFF(CFS) =       0.66
  TC(MIN.) =    9.25

****************************************************************************
  FLOW PROCESS FROM NODE    205.00 TO NODE    200.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    27.80  DOWNSTREAM(FEET) =    26.40
  FLOW LENGTH(FEET) =   353.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN   9.0 INCH PIPE IS   4.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   2.72
  ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.66
  PIPE TRAVEL TIME(MIN.) =   2.16    Tc(MIN.) =   11.41
  LONGEST FLOWPATH FROM NODE    210.00 TO NODE    200.00 =     854.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    200.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.259
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.4500
  SUBAREA AREA(ACRES) =    0.59   SUBAREA RUNOFF(CFS) =    0.87
  TOTAL AREA(ACRES) =        1.0   TOTAL RUNOFF(CFS) =       1.47
  TC(MIN.) =   11.41

****************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    200.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
```

```
==============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   11.41
  RAINFALL INTENSITY(INCH/HR) =   3.26
  TOTAL STREAM AREA(ACRES) =     1.00
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.47

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        7.35    17.09        2.695          4.87
      2        1.47    11.41        3.259          1.00

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1        6.37    11.41       3.259
      2        8.56    17.09       2.695

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       8.56   Tc(MIN.) =   17.09
  TOTAL AREA(ACRES) =        5.9
  LONGEST FLOWPATH FROM NODE    220.00 TO NODE    200.00 =    1049.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    125.00 TO NODE    124.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   105.00
  UPSTREAM ELEVATION(FEET) =     59.80
  DOWNSTREAM ELEVATION(FEET) =     57.40
  ELEVATION DIFFERENCE(FEET) =      2.40
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    8.393
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    89.29
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.691
  SUBAREA RUNOFF(CFS) =      0.17
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.17
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    124.00 TO NODE    123.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     57.40  DOWNSTREAM(FEET) =     57.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   120.00   CHANNEL SLOPE =  0.0033
  NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
  CHANNEL FLOW THRU SUBAREA(CFS) =       0.17
  FLOW VELOCITY(FEET/SEC) =   0.87 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   2.31   Tc(MIN.) =   10.70
  LONGEST FLOWPATH FROM NODE    125.00 TO NODE    123.00 =     225.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    123.00 TO NODE    120.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    54.00  DOWNSTREAM(FEET) =    46.00
  FLOW LENGTH(FEET) =   153.00   MANNING'S N =  0.011
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO  6.000
  DEPTH OF FLOW IN   6.0 INCH PIPE IS   1.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.88
  ESTIMATED PIPE DIAMETER(INCH) =   6.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.17
  PIPE TRAVEL TIME(MIN.) =   0.52    Tc(MIN.) =   11.22
  LONGEST FLOWPATH FROM NODE    125.00 TO NODE    120.00 =     378.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    120.00 TO NODE    115.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     46.00  DOWNSTREAM(FEET) =     35.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   436.00   CHANNEL SLOPE =  0.0252
  NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
  CHANNEL FLOW THRU SUBAREA(CFS) =       0.17
  FLOW VELOCITY(FEET/SEC) =   2.38 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   3.05   Tc(MIN.) =   14.27
  LONGEST FLOWPATH FROM NODE    125.00 TO NODE    115.00 =     814.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    115.00 TO NODE    110.00 IS CODE =  31
----------------------------------------------------------------------------
```

```
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    33.00  DOWNSTREAM(FEET) =    29.00
  FLOW LENGTH(FEET) =   595.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN   6.0 INCH PIPE IS   2.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   2.36
  ESTIMATED PIPE DIAMETER(INCH) =   6.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.17
  PIPE TRAVEL TIME(MIN.) =   4.20    Tc(MIN.) =   18.48
  LONGEST FLOWPATH FROM NODE    125.00 TO NODE    110.00 =    1409.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    110.00 TO NODE    110.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
================================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.626
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.4500
  SUBAREA AREA(ACRES) =    3.05   SUBAREA RUNOFF(CFS) =    3.60
  TOTAL AREA(ACRES) =        3.1   TOTAL RUNOFF(CFS) =       3.72
  TC(MIN.) =   18.48

****************************************************************************
  FLOW PROCESS FROM NODE    110.00 TO NODE    105.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    26.00  DOWNSTREAM(FEET) =    25.00
  FLOW LENGTH(FEET) =    78.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   8.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.43
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.72
  PIPE TRAVEL TIME(MIN.) =   0.20    Tc(MIN.) =   18.68
  LONGEST FLOWPATH FROM NODE    125.00 TO NODE    105.00 =    1487.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    105.00 TO NODE    105.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
================================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
```

```
  TIME OF CONCENTRATION(MIN.) =   18.68
  RAINFALL INTENSITY(INCH/HR) =   2.62
  TOTAL STREAM AREA(ACRES) =     3.15
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      3.72

****************************************************************************
  FLOW PROCESS FROM NODE    165.00 TO NODE    164.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    80.00
  UPSTREAM ELEVATION(FEET) =     57.50
  DOWNSTREAM ELEVATION(FEET) =     57.20
  ELEVATION DIFFERENCE(FEET) =      0.30
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =   10.423
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    50.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.387
  SUBAREA RUNOFF(CFS) =      0.15
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.15

****************************************************************************
  FLOW PROCESS FROM NODE    164.00 TO NODE    160.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    55.10  DOWNSTREAM(FEET) =    54.00
  FLOW LENGTH(FEET) =   162.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN   6.0 INCH PIPE IS   2.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   2.30
  ESTIMATED PIPE DIAMETER(INCH) =   6.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.15
  PIPE TRAVEL TIME(MIN.) =   1.17    Tc(MIN.) =   11.60
  LONGEST FLOWPATH FROM NODE    165.00 TO NODE    160.00 =     242.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    160.00 TO NODE    160.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.240
  *USER SPECIFIED(SUBAREA):
```

```
  USER-SPECIFIED RUNOFF COEFFICIENT = .4500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.4500
  SUBAREA AREA(ACRES) =    0.69   SUBAREA RUNOFF(CFS) =    1.01
  TOTAL AREA(ACRES) =        0.8   TOTAL RUNOFF(CFS) =       1.15
  TC(MIN.) =   11.60

****************************************************************************
  FLOW PROCESS FROM NODE    160.00 TO NODE    155.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    50.00  DOWNSTREAM(FEET) =    30.20
  FLOW LENGTH(FEET) =   105.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN   6.0 INCH PIPE IS   2.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  13.32
  ESTIMATED PIPE DIAMETER(INCH) =   6.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.15
  PIPE TRAVEL TIME(MIN.) =   0.13    Tc(MIN.) =   11.73
  LONGEST FLOWPATH FROM NODE    165.00 TO NODE    155.00 =     347.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    155.00 TO NODE    150.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    30.20  DOWNSTREAM(FEET) =    28.20
  FLOW LENGTH(FEET) =   340.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN   9.0 INCH PIPE IS   6.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.58
  ESTIMATED PIPE DIAMETER(INCH) =   9.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.15
  PIPE TRAVEL TIME(MIN.) =   1.58    Tc(MIN.) =   13.31
  LONGEST FLOWPATH FROM NODE    165.00 TO NODE    150.00 =     687.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    150.00 TO NODE    150.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.069
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.4500
  SUBAREA AREA(ACRES) =    1.55   SUBAREA RUNOFF(CFS) =    2.14
```

```
  TOTAL AREA(ACRES) =        2.3   TOTAL RUNOFF(CFS) =       3.23
  TC(MIN.) =   13.31

****************************************************************************
  FLOW PROCESS FROM NODE    150.00 TO NODE    105.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    28.20  DOWNSTREAM(FEET) =    25.00
  FLOW LENGTH(FEET) =   531.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  15.0 INCH PIPE IS   8.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.74
  ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.23
  PIPE TRAVEL TIME(MIN.) =   1.87    Tc(MIN.) =   15.18
  LONGEST FLOWPATH FROM NODE    165.00 TO NODE    105.00 =    1218.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    105.00 TO NODE    105.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   15.18
  RAINFALL INTENSITY(INCH/HR) =   2.88
  TOTAL STREAM AREA(ACRES) =     2.34
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      3.23

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        3.72    18.68        2.616          3.15
      2        3.23    15.18        2.882          2.34

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1        6.26    15.18       2.882
      2        6.66    18.68       2.616

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       6.66   Tc(MIN.) =   18.68
```

```
  TOTAL AREA(ACRES) =        5.5
  LONGEST FLOWPATH FROM NODE    125.00 TO NODE    105.00 =    1487.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    105.00 TO NODE    105.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   18.68
  RAINFALL INTENSITY(INCH/HR) =   2.62
  TOTAL STREAM AREA(ACRES) =     5.49
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      6.66

****************************************************************************
  FLOW PROCESS FROM NODE    145.00 TO NODE    144.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .4500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    95.00
  UPSTREAM ELEVATION(FEET) =     57.20
  DOWNSTREAM ELEVATION(FEET) =     56.70
  ELEVATION DIFFERENCE(FEET) =      0.50
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =   10.354
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    51.05
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.397
  SUBAREA RUNOFF(CFS) =      0.15
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.15

****************************************************************************
  FLOW PROCESS FROM NODE    144.00 TO NODE    140.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     56.70  DOWNSTREAM(FEET) =     53.60
  CHANNEL LENGTH THRU SUBAREA(FEET) =   132.00   CHANNEL SLOPE =  0.0235
  NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
  CHANNEL FLOW THRU SUBAREA(CFS) =       0.15
  FLOW VELOCITY(FEET/SEC) =   2.30 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   0.96   Tc(MIN.) =   11.31
```

```
 LONGEST FLOWPATH FROM NODE    145.00 TO NODE    140.00 =     227.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    140.00 TO NODE    135.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    47.00  DOWNSTREAM(FEET) =    34.30
 FLOW LENGTH(FEET) =   130.00   MANNING'S N =  0.011
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO  6.000
 DEPTH OF FLOW IN   6.0 INCH PIPE IS   1.1 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   5.88
 ESTIMATED PIPE DIAMETER(INCH) =   6.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       0.15
 PIPE TRAVEL TIME(MIN.) =   0.37    Tc(MIN.) =   11.68
 LONGEST FLOWPATH FROM NODE    145.00 TO NODE    135.00 =     357.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    135.00 TO NODE    130.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    34.30  DOWNSTREAM(FEET) =    30.40
 FLOW LENGTH(FEET) =   400.00   MANNING'S N =  0.011
 DEPTH OF FLOW IN   6.0 INCH PIPE IS   2.0 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   2.63
 ESTIMATED PIPE DIAMETER(INCH) =   6.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       0.15
 PIPE TRAVEL TIME(MIN.) =   2.53    Tc(MIN.) =   14.21
 LONGEST FLOWPATH FROM NODE    145.00 TO NODE    130.00 =     757.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    130.00 TO NODE    130.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.979
 *USER SPECIFIED(SUBAREA):
 USER-SPECIFIED RUNOFF COEFFICIENT = .4500
 S.C.S. CURVE NUMBER (AMC II) =   0
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.4500
 SUBAREA AREA(ACRES) =    5.18   SUBAREA RUNOFF(CFS) =    6.94
 TOTAL AREA(ACRES) =        5.3   TOTAL RUNOFF(CFS) =       7.08
 TC(MIN.) =   14.21

****************************************************************************
```

```
 FLOW PROCESS FROM NODE    130.00 TO NODE    105.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    30.40  DOWNSTREAM(FEET) =    27.80
 FLOW LENGTH(FEET) =   256.00   MANNING'S N =  0.011
 DEPTH OF FLOW IN  15.0 INCH PIPE IS  11.9 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   6.78
 ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       7.08
 PIPE TRAVEL TIME(MIN.) =   0.63    Tc(MIN.) =   14.84
 LONGEST FLOWPATH FROM NODE    145.00 TO NODE    105.00 =    1013.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    105.00 TO NODE    105.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =   14.84
 RAINFALL INTENSITY(INCH/HR) =   2.92
 TOTAL STREAM AREA(ACRES) =     5.28
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      7.08

 ** CONFLUENCE DATA **
 STREAM     RUNOFF       Tc      INTENSITY      AREA
 NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
     1        6.66    18.68        2.616          5.49
     2        7.08    14.84        2.916          5.28

 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR  2 STREAMS.

 ** PEAK FLOW RATE TABLE **
 STREAM     RUNOFF      Tc      INTENSITY
 NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
     1       13.05    14.84       2.916
     2       13.01    18.68       2.616

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      13.05   Tc(MIN.) =   14.84
 TOTAL AREA(ACRES) =       10.8
 LONGEST FLOWPATH FROM NODE    125.00 TO NODE    105.00 =    1487.00 FEET.

****************************************************************************
```

```
  FLOW PROCESS FROM NODE    105.00 TO NODE    100.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    25.00  DOWNSTREAM(FEET) =    24.90
  FLOW LENGTH(FEET) =    31.00   MANNING'S N =  0.011
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  17.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.19
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      13.05
  PIPE TRAVEL TIME(MIN.) =   0.10    Tc(MIN.) =   14.94
  LONGEST FLOWPATH FROM NODE    125.00 TO NODE    100.00 =    1518.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   14.94
  RAINFALL INTENSITY(INCH/HR) =   2.91
  TOTAL STREAM AREA(ACRES) =    10.77
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     13.05

****************************************************************************
  FLOW PROCESS FROM NODE    104.00 TO NODE    103.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  USER-SPECIFIED RUNOFF COEFFICIENT = .5600
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =     30.70
  DOWNSTREAM ELEVATION(FEET) =     30.10
  ELEVATION DIFFERENCE(FEET) =      0.60
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    8.390
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    53.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.692
  SUBAREA RUNOFF(CFS) =      0.21
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.21

****************************************************************************
```

```
 FLOW PROCESS FROM NODE    103.00 TO NODE    100.00 IS CODE =  62
----------------------------------------------------------------------------
 >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
============================================================================
 UPSTREAM ELEVATION(FEET) =   30.10  DOWNSTREAM ELEVATION(FEET) =   29.40
 STREET LENGTH(FEET) =   172.00   CURB HEIGHT(INCHES) =  6.0
 STREET HALFWIDTH(FEET) = 40.00

 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  35.00
 INSIDE STREET CROSSFALL(DECIMAL) =  0.020
 OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
 STREET PARKWAY CROSSFALL(DECIMAL)  =  0.015
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0150

   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.60
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  0.24
   HALFSTREET FLOOD WIDTH(FEET) =    5.99
   AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.18
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.28
 STREET FLOW TRAVEL TIME(MIN.) =   2.43   Tc(MIN.) =   10.82
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.328
 *USER SPECIFIED(SUBAREA):
 USER-SPECIFIED RUNOFF COEFFICIENT = .5600
 S.C.S. CURVE NUMBER (AMC II) =   0
 AREA-AVERAGE RUNOFF COEFFICIENT =  0.560
 SUBAREA AREA(ACRES) =    0.42      SUBAREA RUNOFF(CFS) =    0.78
 TOTAL AREA(ACRES) =        0.5        PEAK FLOW RATE(CFS) =       0.97

 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.27   HALFSTREET FLOOD WIDTH(FEET) =   7.77
 FLOW VELOCITY(FEET/SEC.) =  1.29   DEPTH*VELOCITY(FT*FT/SEC.) =   0.35
 LONGEST FLOWPATH FROM NODE    104.00 TO NODE    100.00 =     272.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    100.00 TO NODE    100.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =   10.82
 RAINFALL INTENSITY(INCH/HR) =   3.33
```

```
  TOTAL STREAM AREA(ACRES) =     0.52
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.97

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1       13.05    14.94        2.906         10.77
      2        0.97    10.82        3.328          0.52

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1       12.36    10.82       3.328
      2       13.90    14.94       2.906

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      13.90   Tc(MIN.) =   14.94
  TOTAL AREA(ACRES) =       11.3
  LONGEST FLOWPATH FROM NODE    125.00 TO NODE    100.00 =    1518.00 FEET.
================================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =       11.3  TC(MIN.) =     14.94
  PEAK FLOW RATE(CFS)   =      13.90
================================================================================
================================================================================
  END OF RATIONAL METHOD ANALYSIS
```

# APPENDIX 6

# HYDRAULIC CALCULATIONS

# Worksheet for Ex 18" RCP On 25th

## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Full Flow Capacity |

## Input Data

| | | |
|---|---|---|
| Roughness Coefficient | 0.013 | |
| Channel Slope | 0.00630 | ft/ft |
| Normal Depth | 1.50 | ft |
| Diameter | 1.50 | ft |
| Discharge | 8.34 | ft³/s |

## Results

| | | |
|---|---|---|
| Discharge | 8.34 | ft³/s |
| Normal Depth | 1.50 | ft |
| Flow Area | 1.77 | ft² |
| Wetted Perimeter | 4.71 | ft |
| Hydraulic Radius | 0.38 | ft |
| Top Width | 0.00 | ft |
| Critical Depth | 1.12 | ft |
| Percent Full | 100.0 | % |
| Critical Slope | 0.00768 | ft/ft |
| Velocity | 4.72 | ft/s |
| Velocity Head | 0.35 | ft |
| Specific Energy | 1.85 | ft |
| Froude Number | 0.00 | |
| Maximum Discharge | 8.97 | ft³/s |
| Discharge Full | 8.34 | ft³/s |
| Slope Full | 0.00630 | ft/ft |
| Flow Type | SubCritical | |

## GVF Input Data

| | | |
|---|---|---|
| Downstream Depth | 0.00 | ft |
| Length | 0.00 | ft |
| Number Of Steps | 0 | |

## GVF Output Data

| | | |
|---|---|---|
| Upstream Depth | 0.00 | ft |
| Profile Description | | |
| Profile Headloss | 0.00 | ft |
| Average End Depth Over Rise | 0.00 | % |

# Worksheet for Ex 18" RCP On 25th

## GVF Output Data

| | | |
|---|---|---|
| Normal Depth Over Rise | 100.00 | % |
| Downstream Velocity | Infinity | ft/s |
| Upstream Velocity | Infinity | ft/s |
| Normal Depth | 1.50 | ft |
| Critical Depth | 1.12 | ft |
| Channel Slope | 0.00630 | ft/ft |
| Critical Slope | 0.00768 | ft/ft |

# Worksheet for Ex 24" RCP On 25th

## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Full Flow Capacity |

## Input Data

| | | |
|---|---|---|
| Roughness Coefficient | 0.013 | |
| Channel Slope | 0.00600 | ft/ft |
| Normal Depth | 2.00 | ft |
| Diameter | 2.00 | ft |
| Discharge | 17.52 | ft³/s |

## Results

| | | |
|---|---|---|
| Discharge | 17.52 | ft³/s |
| Normal Depth | 2.00 | ft |
| Flow Area | 3.14 | ft² |
| Wetted Perimeter | 6.28 | ft |
| Hydraulic Radius | 0.50 | ft |
| Top Width | 0.00 | ft |
| Critical Depth | 1.51 | ft |
| Percent Full | 100.0 | % |
| Critical Slope | 0.00712 | ft/ft |
| Velocity | 5.58 | ft/s |
| Velocity Head | 0.48 | ft |
| Specific Energy | 2.48 | ft |
| Froude Number | 0.00 | |
| Maximum Discharge | 18.85 | ft³/s |
| Discharge Full | 17.52 | ft³/s |
| Slope Full | 0.00600 | ft/ft |
| Flow Type | SubCritical | |

## GVF Input Data

| | | |
|---|---|---|
| Downstream Depth | 0.00 | ft |
| Length | 0.00 | ft |
| Number Of Steps | 0 | |

## GVF Output Data

| | | |
|---|---|---|
| Upstream Depth | 0.00 | ft |
| Profile Description | | |
| Profile Headloss | 0.00 | ft |
| Average End Depth Over Rise | 0.00 | % |

# Worksheet for Ex 24" RCP On 25th

## GVF Output Data

| | | |
|---|---|---|
| Normal Depth Over Rise | 100.00 | % |
| Downstream Velocity | Infinity | ft/s |
| Upstream Velocity | Infinity | ft/s |
| Normal Depth | 2.00 | ft |
| Critical Depth | 1.51 | ft |
| Channel Slope | 0.00600 | ft/ft |
| Critical Slope | 0.00712 | ft/ft |

# APPENDIX 7

# AS-BUILT REFERENCES

I-005-1(93)I

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF HIGHWAYS

# PROJECT PLANS FOR CONSTRUCTION ON
# STATE HIGHWAY

## In San Diego County in San Diego

## between 0.3 mile north of Sycamore Street Undercrossing and 0.3 mile south of Palm Avenue

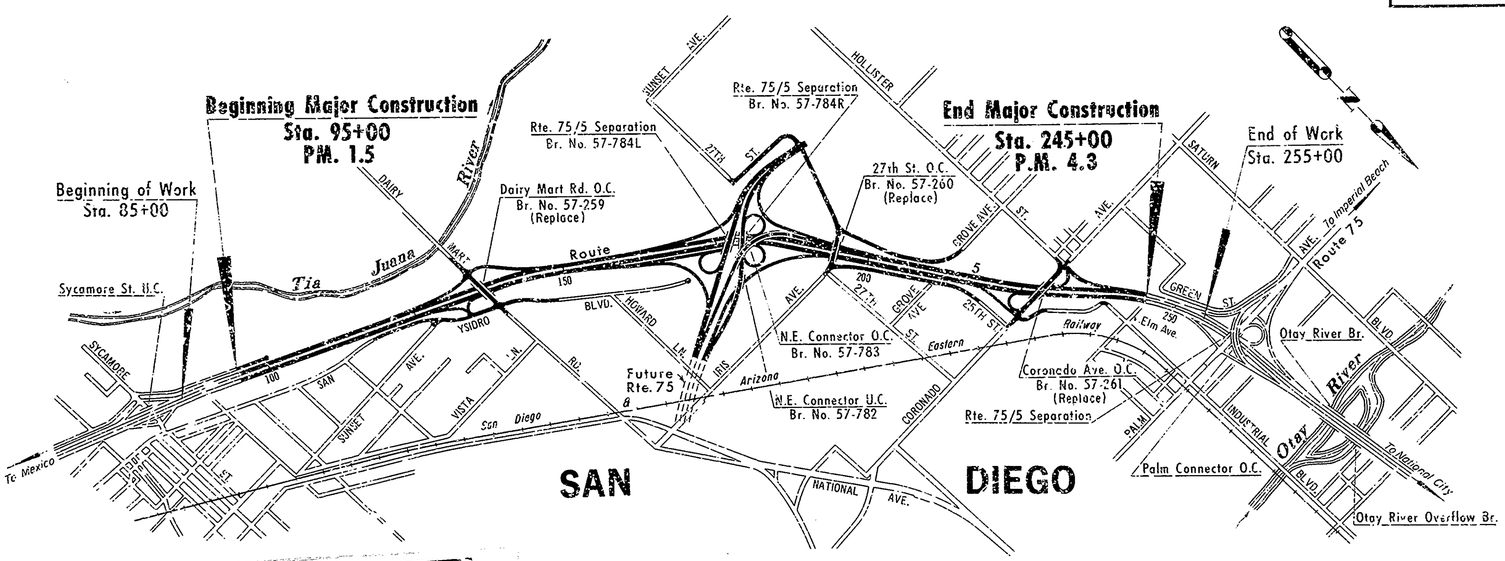
To be supplemented by Standard Plans dated January, 1971

| DIST. | COUNTY | ROUTE | POST MILE—TOTAL PROJECT | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| 11 | SD | 5 | 15 / 43 | 1 | 246 |

LOCATION MAP

INDEX OF SHEETS


| Sheet No. | | |
|---|---|---|
| " | 1 | Title Sheet |
| " | 2-4 | Typical Cross Sections |
| " | 5 | Standard Plans List |
| " | 6-33 | Plan and Profile |
| " | 34-64 | Drainage Plans |
| " | 65-75 | Drainage Details |
| " | 76-85 | Drainage List |
| " | 86-110 | Utility Plans |
| " | 111-124 | Traffic Handling, Stage Construction and Detours |
| " | 125 | Quantity Summary |
| " | 126-157 | Signs, Striping, Delineation and Barrier Details |
| " | 158-179 | Lighting and Signals |
| " | 180-188 | Dairy Mart Road Overcrossing Br No. 57-259 |
| " | 189-196 | Route 75/5 Separation Br No 57-784 L |
| " | 197-204 | Route 75/5 Separation Br No 57-784 R |
| " | 205-215 | Northeast Connector Undercrossing Br. No. 57-782 |
| " | 214-228 | Northeast Connector Overcrossing Br. No 57-783 |
| " | 229-237 | 27th Street Overcrossing Br. No. 57-260 |
| " | 238-246 | Coronado Avenue Overcrossing Br. No. 57-261 |
| " | 1-141 | Cross Sections |


AS BUILT PLANS
Contract No. 11-086034
Date Completed 8-3-71
Document No. 11 000 2576

SCALE IN FEET
1000 0 1000 2000

LEGEND
Grading & Paving
Future Construction

Length of Major Construction = 2.8 miles
Length of Work = 3.2 miles

The detailed plans are a portion of the route for the State Highway adopted by the California Highway Commission on March 27, 1952 and declared a FREEWAY by resolution of the California Highway Commission on March 27, 1952

Approved for commencement by: Date
Design Engineer: Date
Project Engineer

Drawn by: Date
Checked by: Date

District Engineer
Registered Civil Engineer No.

Approved February 22, 1971

State Highway Engineer
Registered Civil Engineer No. 5645

James A. Moe
Director of Public Works

By DEPUTY DIRECTOR FOR PLANNING AND POLICY

Bids Open
Contract No. 11-086034

11-208-086031

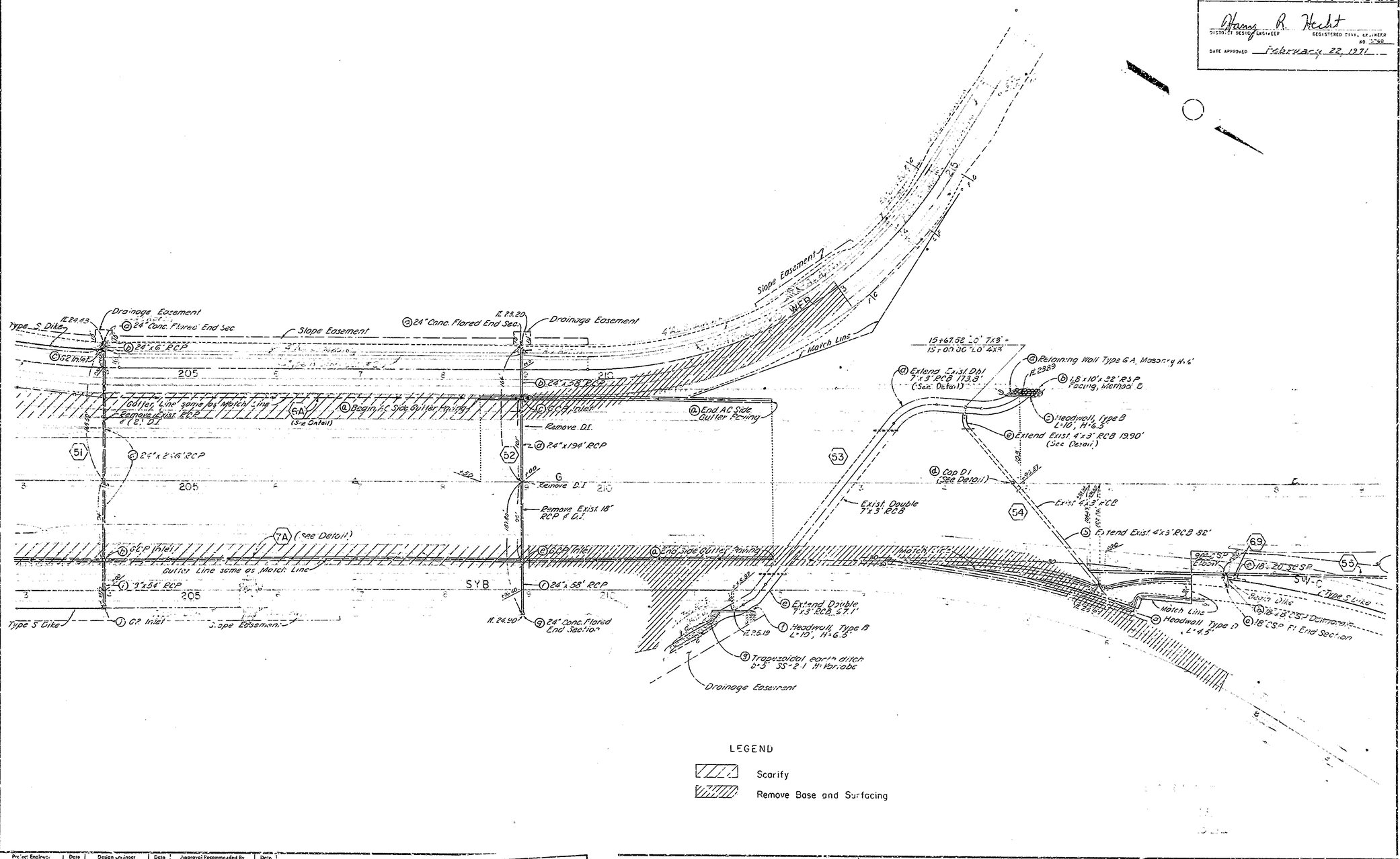
I HEREBY CERTIFY THAT THIS IS A TRUE AND ACCURATE COPY OF THE ABOVE PLANS CURRENT PLANS UNDER MY DIRECTION AND CONTROL ON THIS DATE IN SACRAMENTO, CALIFORNIA PURSUANT TO AUTHORIZATION BY THE DIRECTOR OF TRANSPORTATION

10/7/70 Dick Meadows Microfilm Supervisor

| DIST | COUNTY | ROUTE | POST MILES—TOTAL PROJECT | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|
| 11 | SD | 5 | 15.14.8 | 45 | 246 |

Thomas R. Hecht
DISTRICT DESIGN ENGINEER — REGISTERED CIVIL ENGINEER NO. 5768

DATE APPROVED February 22, 1971




LEGEND

Scarify

Remove Base and Surfacing

| Project Engineer | Date | Design Engineer | Date | Approval Recommended By | Date |
|---|---|---|---|---|---|
| | | | | | |

AS BUILT PLANS
Contract No. 11-086034
Date Completed 2-71
Document No. 11 080 2576

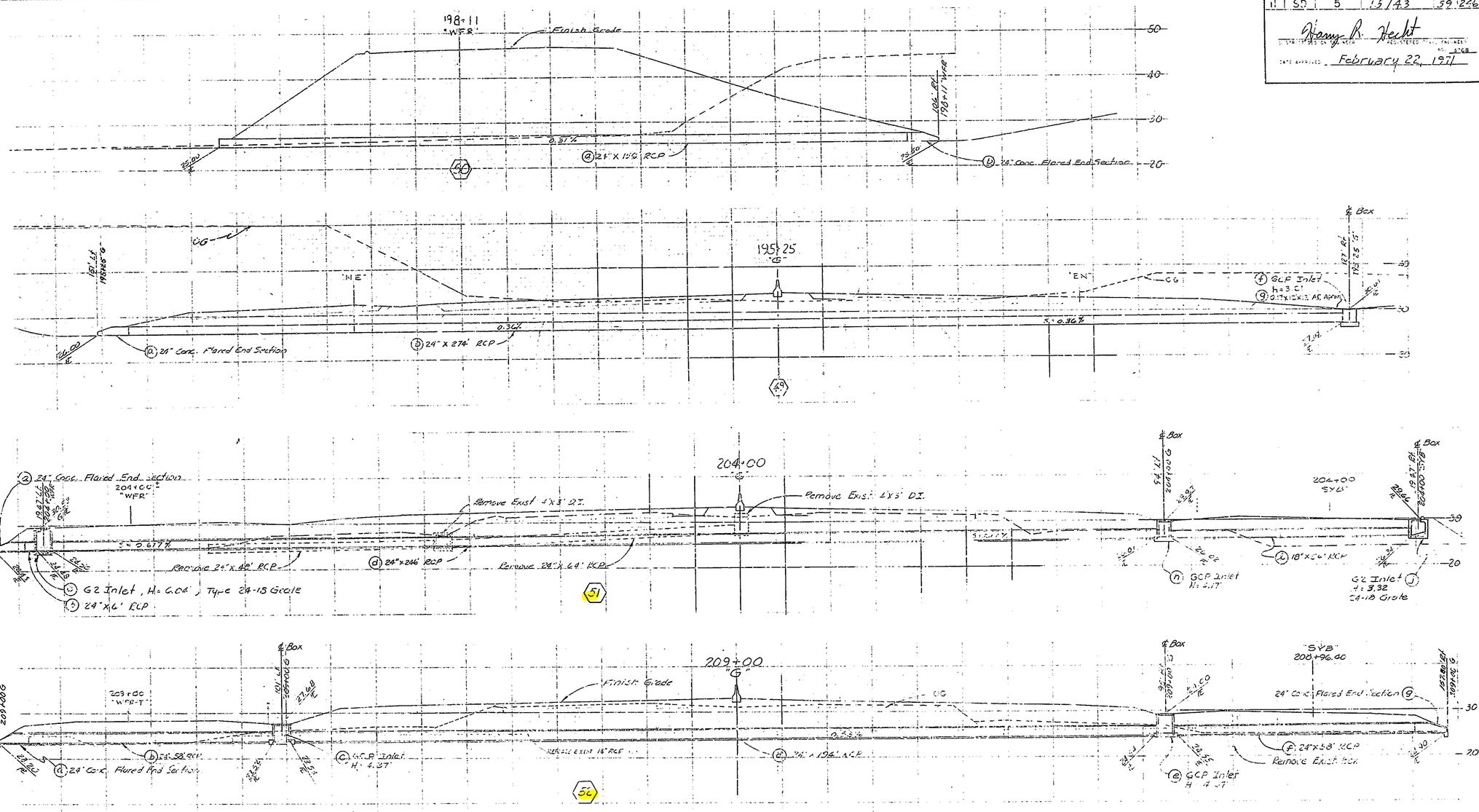
FORM WN234-PE

I HEREBY CERTIFY THAT THIS IS A TRUE AND ACCURATE COPY OF THE ABOVE DOCUMENT TAKEN UNDER MY DIRECTION AND CONTROL ON THIS DATE IN SACRAMENTO, CALIFORNIA, PURSUANT TO AUTHORIZATION BY THE DIRECTOR OF TRANSPORTATION.

DATE 10/7/70 Dick Meadows Microfilm Supervisor

| DIST | COUNTY | ROUTE | POST MILE | SHEET | TOTAL SHEETS |
|---|---|---|---|---|---|
| 11 | SD | 5 | 15/43 | 59 | 246 |

Jerry R. Heckt
REGISTERED ENGINEER
CIVIL
No. 5768
DATE APPROVED February 22, 1971




SCALE 1" = 10'

# DRAINAGE PROFILES

49 50 51 52

AS BUILT PLANS
Contract No. 11-086034
Date Completed 2-71
Document No. 11 000 25776

| Project Engineer | Date | Design Approved | Date | Approved Recommended By | Date |
|---|---|---|---|---|---|
| | | M.P. Grant | | E.R. Seitle | |

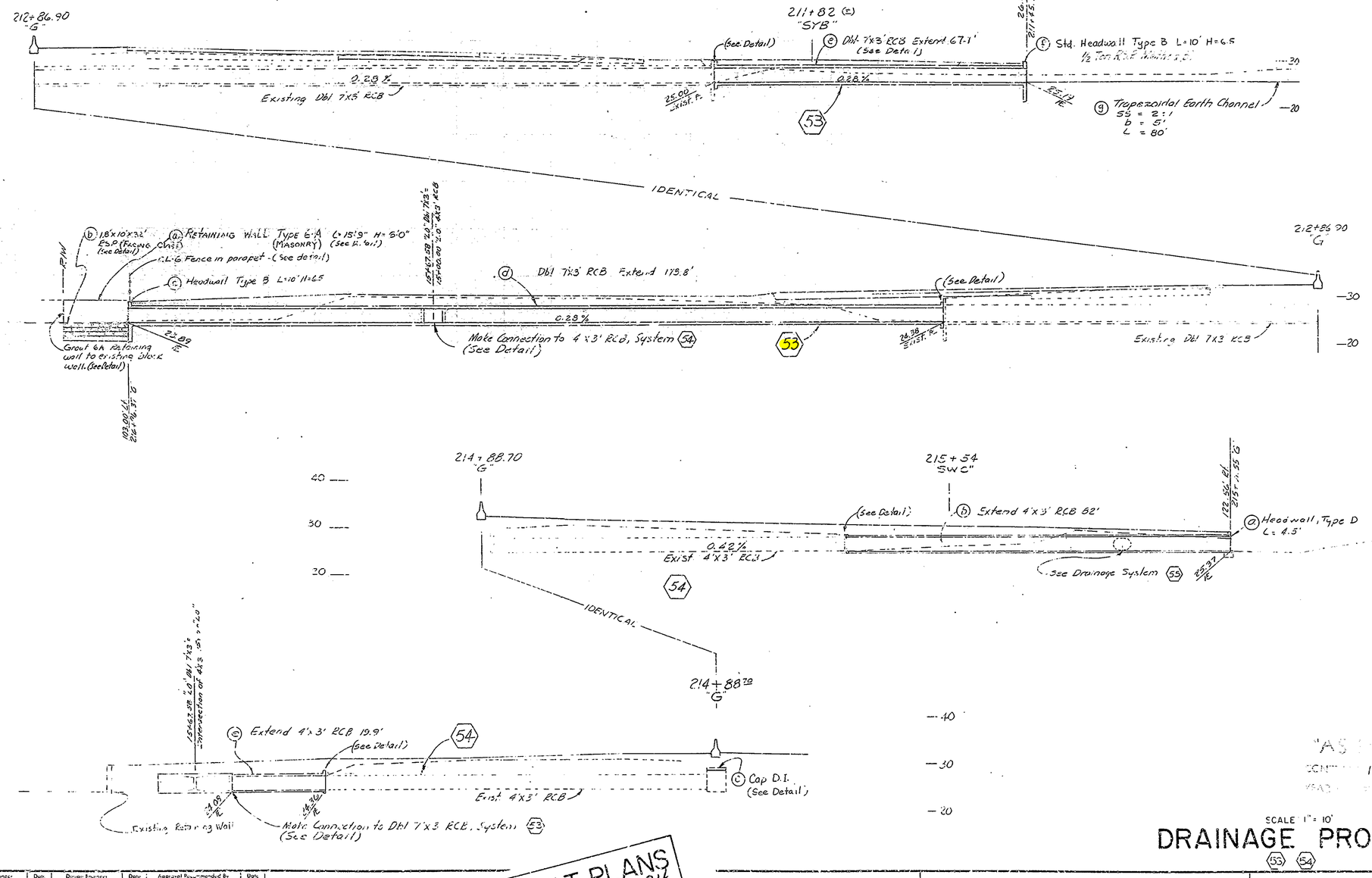
I HEREBY CERTIFY THAT THIS IS A TRUE AND ACCURATE COPY OF THE ABOVE DOCUMENT TAKEN UNDER MY DIRECTION AND CONTROL ON THIS DATE IN SACRAMENTO, CALIFORNIA PURSUANT TO AUTHORIZATION BY THE DIRECTOR OF TRANSPORTATION.

DATE 10/7/71 Dick Meadows Microfilm Supervisor

MICROFILM STATE OF CALIFORNIA - DEPARTMENT OF PUBLIC WORKS - MICROFILM

| DIST | COUNTY | ROUTE | POST MILES | TOTAL PROJECT | SHEET NO. | TOTAL SHEETS |
|---|---|---|---|---|---|---|
| 11 | SD | 5 | 1.3/4.3 | | 60 | 246 |

Harry R. Hecht
DISTRICT DESIGN ENGINEER — REGISTERED CIVIL ENGINEER
P.E. 5768
DATE APPROVED February 22, 1971




SCALE 1" = 10'

# DRAINAGE PROFILES

53 54

| Project Engineer | Date | Design Engineer | Date | Approved Recommended By | Date |
|---|---|---|---|---|---|
| | | H R Hecht | | E R Seitz | |

AS BUILT PLANS
Contract No. 11-086034
Date Completed 2-71
Document No. 11 on 25776

FORM HD 70-28

I HEREBY CERTIFY THAT THIS IS A TRUE AND ACCURATE COPY OF THE ABOVE DOCUMENT TAKEN UPON MY DIRECTION AND CONTROL ON THIS DATE IN SACRAMENTO, CALIFORNIA PURSUANT TO AUTHORIZATION BY THE DIRECTOR OF TRANSPORTATION.

10/7/70 Dick Meadows Microfilm Supervisor

# APPENDIX 9

# FEMA FIRM

## NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations (BFEs)** and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

**Coastal Base Flood Elevations (BFEs)** shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) Zone 11. The **horizontal datum** was NAD83, GRS1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov/ or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713-3242** or visit its website at http://www.ngs.noaa.gov/.

**Base map** information shown on this FIRM was provided in digital format by the USDA National Agriculture Imagery Program (NAIP). this information was photogrammetrically compiled at a scale of 1:24,000 from aerial photography dated 2009.

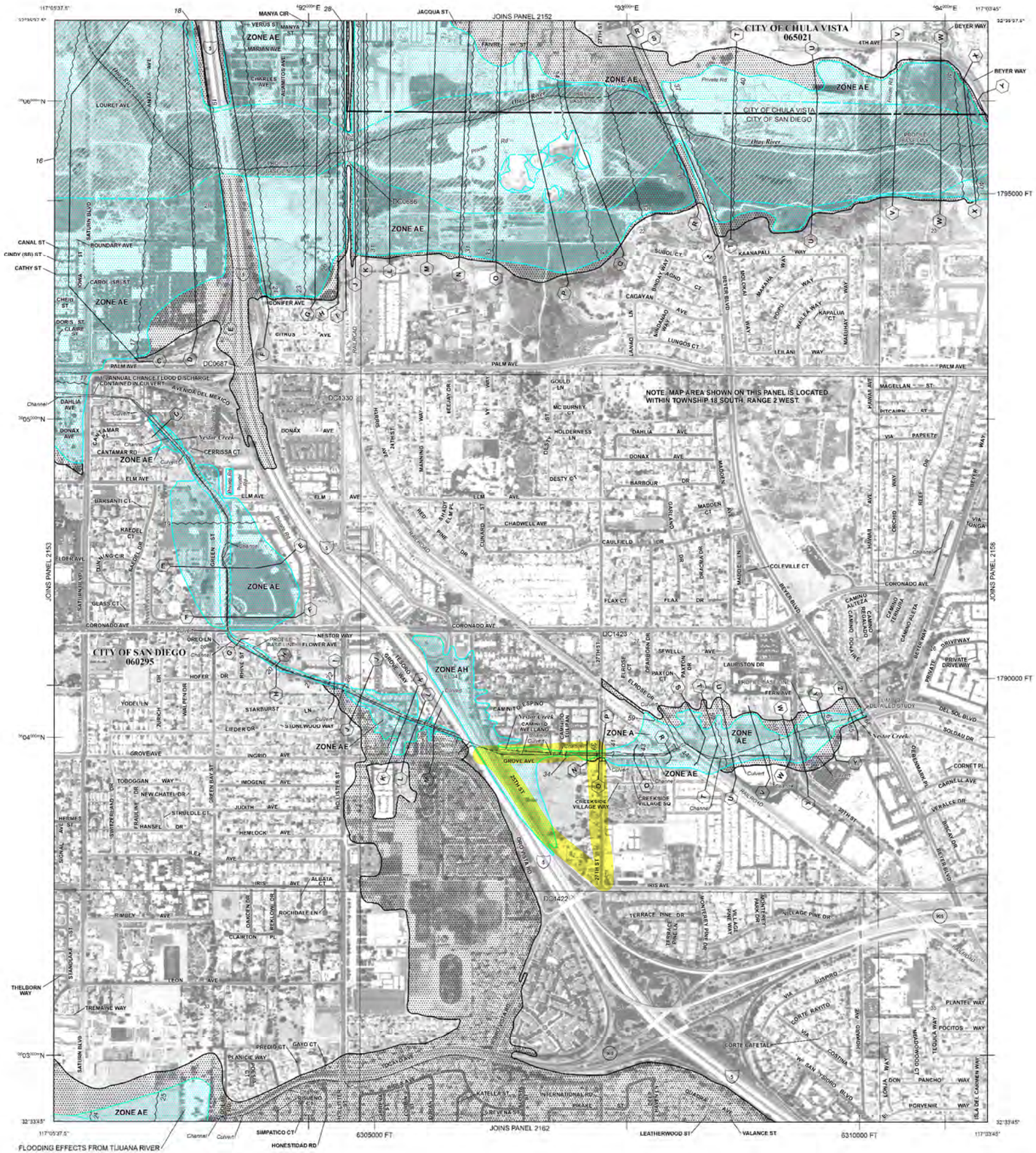
This map reflects more detailed and up-to-date **stream channel configurations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in *the Flood Insurance Study report (which contains authoritative hydraulic data)* may reflect stream channel distances that differ from what is shown on this map.

**Corporate limits** shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

For information and questions about this map, available products associated with this FIRM including historic versions of this FIRM, how to order products or the National Flood Insurance Program in general, please call the FEMA Map Information eXchange at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA Map Service Center website at http://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the website. Users may determine the current map date for each FIRM panel by visiting the FEMA Map Service Center website or by calling the FEMA Map Information eXchange.

The **"profile base lines"** depicted on this map represent the hydraulic modeling baselines that match the flood profiles in the FIS report. As a result of improved topographic data, the "profile base line", in some cases, may deviate significantly from the channel centerline or appear outside the SFHA.




## LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equalled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

| | |
|---|---|
| ZONE A | No Base Flood Elevations determined. |
| ZONE AE | Base Flood Elevations determined. |
| ZONE AH | Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined. |
| ZONE AO | Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined. |
| ZONE AR | Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood. |
| ZONE A99 | Areas to be protected from 1% annual chance flood event by a Federal flood protection system under construction; no Base Flood Elevations determined. |
| ZONE V | Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined. |
| ZONE VE | Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined. |

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

| | |
|---|---|
| ZONE X | Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood. |

OTHER AREAS

| | |
|---|---|
| ZONE X | Areas determined to be outside the 0.2% annual chance floodplain. |
| ZONE D | Areas in which flood hazards are undetermined, but possible. |

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

| | |
|---|---|
| | 1% annual chance floodplain boundary |
| | 0.2% annual chance floodplain boundary |
| | Floodway boundary |
| | Zone D boundary |
| | CBRS and OPA boundary |
| | Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities |
| 513 (EL 987) | Base Flood Elevation line and value; elevation in feet* |
| | Base Flood Elevation value where uniform within zone; elevation in feet* |
| * Referenced to the North American Vertical Datum of 1988 | |
| A A | Cross section line |
| 23 23 | Transect line |
| 97°07'30", 32°22'30" | Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere |
| 4275000mE | 1000-meter Universal Transverse Mercator grid ticks, zone 11 |
| 6000000 FT | 5000-foot grid values: California State Plane coordinate system, Zone VI (FIPSZONE = 406), Lambert projection |
| DX5510 | Bench mark (see explanation in Notes to Users section of this FIRM panel) |
| M1.5 | River Mile |

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
June 19, 1997

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
May 16, 2012 - to update corporate limits, to add roads and road names, to incorporate previously issued Letters of Map Revision, and to update map elevations to North American Vertical Datum of 1988.
April 5, 2016 - to remove Provisionally Accredited Levee note

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'

250 0 250 500 750 1,000 FEET
100 0 100 200 METERS

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 2154H

# FIRM

**FLOOD INSURANCE RATE MAP**
**SAN DIEGO COUNTY, CALIFORNIA**
**AND INCORPORATED AREAS**

**PANEL 2154 OF 2375**
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

| COMMUNITY | NUMBER | PANEL | SUFFIX |
|---|---|---|---|
| CHULA VISTA, CITY OF | 065021 | 2154 | H |
| SAN DIEGO, CITY OF | 060295 | 2154 | H |

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject communities.

**MAP NUMBER**
**06073C2154H**

**MAP REVISED**
**APRIL 5, 2016**

**Federal Emergency Management Agency**