



# PRELIMINARY DRAINAGE STUDY FOR **SOUTHWEST PARK**

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SAN DIEGO, CA 92122

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

# PRELIMINARY DRAINAGE STUDY

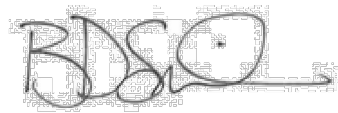
## SOUTHWEST PARK

SAN DIEGO, CA 92154

APN: 634-120-12,15,17

June 25, 2020

Prepared Under the Responsible Charge of:



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# 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 27<sup>th</sup> 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.

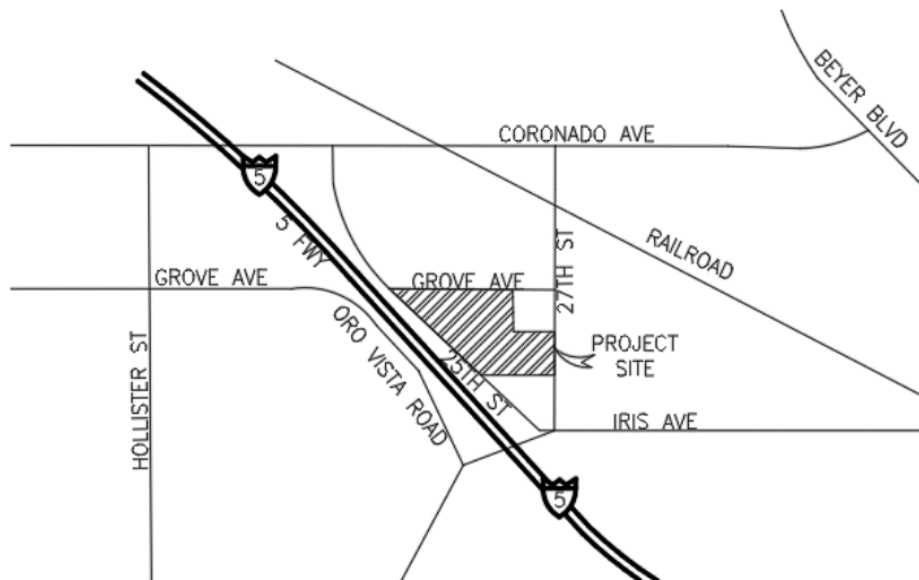


Figure 1. Vicinity Map

## 1.2 Existing Conditions

The existing project site is a vacant rural triangular lot bordered by Grove Street on the north, 25<sup>th</sup> street on the west and 27<sup>th</sup> 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 25<sup>th</sup> 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 25<sup>th</sup> St down to Iris Ave (labeled as Basin Area B) effectively drains northwest along 25<sup>th</sup> 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 25<sup>th</sup> street, and 3) a children's play field with restrooms and parking lot adjacent to 27<sup>th</sup> street. The play field will overlook the park being set about 20 feet higher than the other two. Access will be provided from 27<sup>th</sup> street and 25<sup>th</sup> 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 25<sup>th</sup> Street (Node 100).

For approximately 1 acre of the site consisting of the parking lot adjacent to 25<sup>th</sup> 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 25<sup>th</sup> 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 25<sup>th</sup> 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 25<sup>th</sup> street will not be sufficient to gravity flow drainage around the curb return and into the existing 24" RCP (Node 100) on 25<sup>th</sup>. 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.

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## 1.4 Proposed Green Street Improvements for 25<sup>th</sup> St, 27<sup>th</sup> St, and Grove St.

The improvements to 25<sup>th</sup>, 27<sup>th</sup>, 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 & 25<sup>th</sup> 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, 25<sup>th</sup> 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 25<sup>th</sup> 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)

| <b>NODE<br/>Description</b>                 | <b>NODE</b> | <b>BASIN<br/>(Description)</b> | <b>EXISTING<br/>AREA<br/>(ac)</b> | <b>PROPOSED<br/>AREA<br/>(ac)</b> | <b>EXISTING<br/>Q100<br/>(cfs)</b> | <b>Proposed<br/>Q100<br/>(cfs)</b> |
|---------------------------------------------|-------------|--------------------------------|-----------------------------------|-----------------------------------|------------------------------------|------------------------------------|
| Existing 24" RCP on 25 <sup>th</sup> Street | 100         | Area A                         | 12.77                             | 11.29                             | 20.61                              | 13.90                              |
| Existing 18" RCP on 25 <sup>th</sup> 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                               |
| <b>Totals</b>                               | -           | -                              | <b>17.64</b>                      | <b>17.64</b>                      | <b>27.96</b>                       | <b>23.27</b>                       |
| <b>DIFFERENCE<br/>FROM EXISTING</b>         |             |                                |                                   | <b>0.0 (Same)</b>                 |                                    | <b>4.69 (Less)</b>                 |

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 25<sup>th</sup> 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

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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







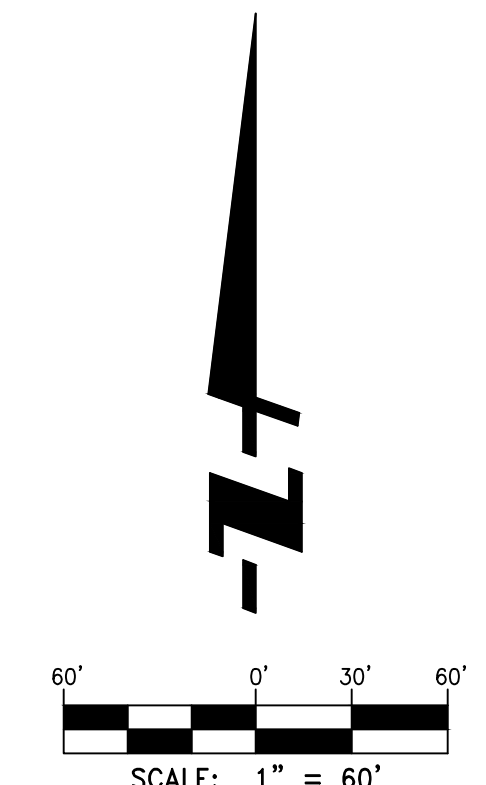
NODE 300  
NEW SDCI  
EXISTING DATA  
(A = 0.0 AC)  
(Q<sub>100</sub> = 0.0 CFS)  
(T<sub>c</sub> = 0.0 MIN)  
PROPOSED  
A = 0.48 AC  
Q<sub>100</sub> = 0.81 CFS  
T<sub>c</sub> = 13.93 MIN

NODE 100  
EX 24" RCP  
EXISTING DATA  
(A = 12.77 AC)  
(Q<sub>100</sub> = 20.61 CFS)  
(T<sub>c</sub> = 12.00 MIN)  
PROPOSED DATA  
A = 11.30 AC  
Q<sub>100</sub> = 13.90 CFS  
T<sub>c</sub> = 14.94 MIN

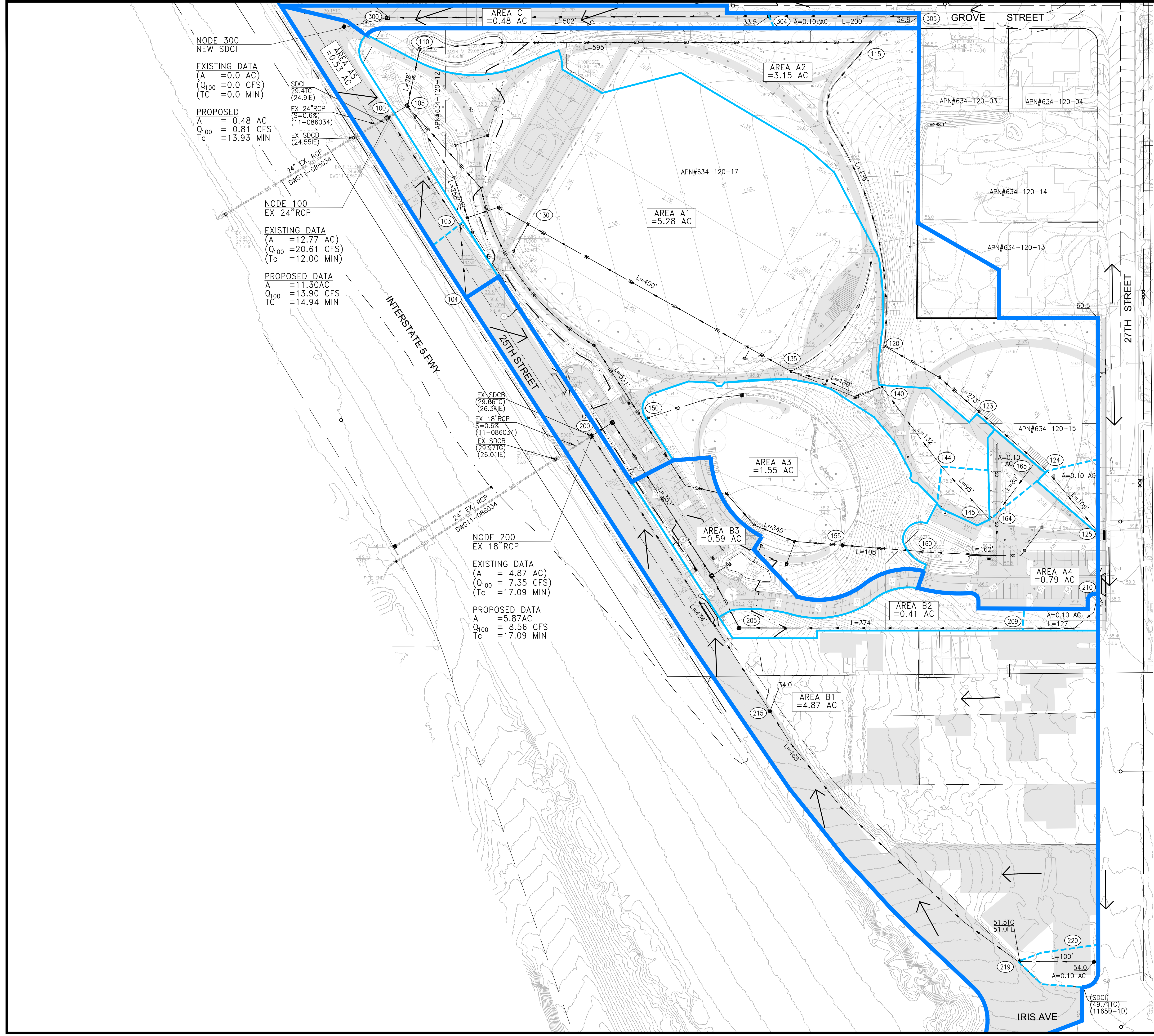
NODE 200  
EX 18" RCP  
EXISTING DATA  
(A = 4.87 AC)  
(Q<sub>100</sub> = 7.35 CFS)  
(T<sub>c</sub> = 17.09 MIN)  
PROPOSED DATA  
A = 5.87 AC  
Q<sub>100</sub> = 8.56 CFS  
T<sub>c</sub> = 17.09 MIN

# 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
- EXISTING CONTOUR
- IMPERVIOUS AREA



| NO.                                                                                                                                                                                                            | DATE | REVISION                                                    |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|-------------------------------------------------------------|
|                                                                                                                                                                                                                |      |                                                             |
|                                                                                                                                                                                                                |      |                                                             |
|                                                                                                                                                                                                                |      |                                                             |
|                                                                                                                                                                                                                |      |                                                             |
| SOUTHWEST PARK                                                                                                                                                                                                 |      |                                                             |
| PROPOSED CONDITIONS<br>HYDROLOGY MAP                                                                                                                                                                           |      |                                                             |
| <br>6390 Greenwich Dr., Suite 170<br>San Diego, California 92122<br>tel 858.554.1500 • fax 858.597.0335<br>www.fuscoe.com |      | JOB NO.<br>1440-009<br>DRAWN BY:<br>J.G.<br>SHEET<br>1 of 1 |

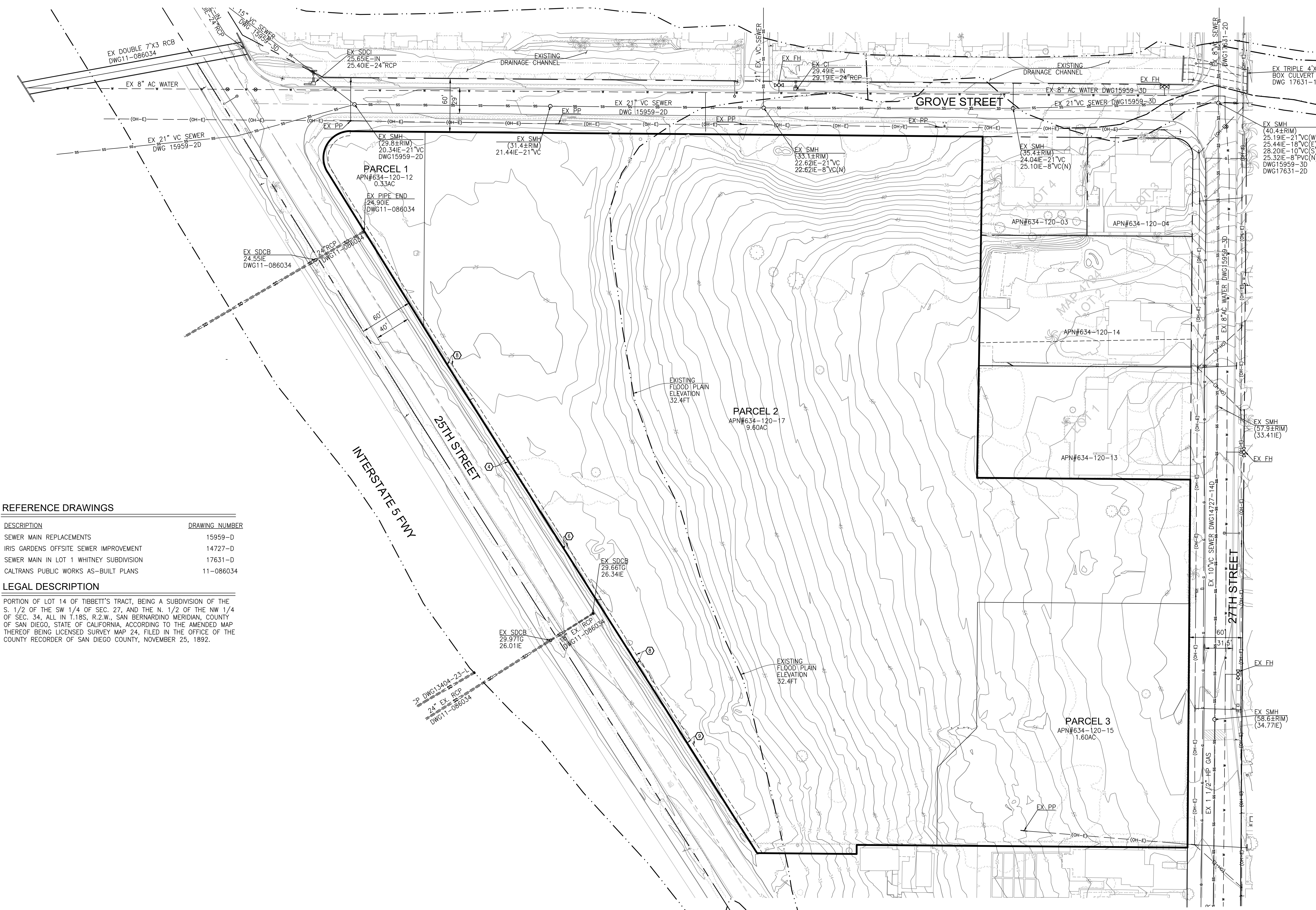




## APPENDIX 2

### 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                       |        |
| SEWER MAIN                  | SS     |
| STORM DRAIN                 | SD     |
| WATER MAIN                  | 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:

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

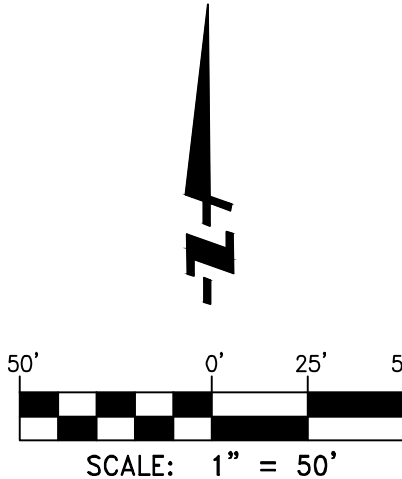
QUOTED BEARINGS FROM REFERENCE MAPS OR DEEDS MAY OR MAY NOT BE IN TERMS OF SAID SYSTEM.

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.

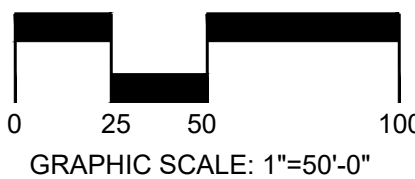


EXISTING CONDITIONS

SOUTHWEST PARK  
SAN DIEGO, CA

XXXX  
WBS #  
  
11/11/2019  
DATE

SHEET C1  
OF 6 SHEETS





EASEMENT NOTES:

- 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
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- 5' WIDE EASEMENT FOR HIGHWAY SLOPES 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  
CUT QUANTITIES = 35,550 CY  
FILL QUANTITIES = 39,670 CY  
IMPORT = 4,120 CY

MAX. CUT DEPTH: 13.7 FT  
MAX. FILL DEPTH: 9.9 FT  
MAX CUT/FILL SLOPE RATIO: 2:1  
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                       | ---     |
| GATE VALVE                        | ---     |
| WATER SERVICE CONNECTION          | ---     |
| IRRIGATION LINE CONNECTION        | ---     |
| STORM DRAIN                       | SD      |

CONSTRUCTION NOTES:

- 26FT WIDE DRIVEWAY ENTRY
- VEHICULAR AC PAVEMENT
- BIORETENTION BASIN W/ IMPERMEABLE LINER PER DETAIL 'D'
- STAIRS WITH HANDRAILS
- ADA RAMP WITH HANDRAILS
- ADA PARKING - 2% MAX SLOPE IN ANY DIRECTION
- ADA CURB RAMP WITH TRUNCATED DOMES
- 6" CURB
- 6" CURB & GUTTER
- 2FT WIDE CURB OPENING WITH CONCRETE SPILLWAY
- 3FT WIDE VALLEY GUTTER
- CURB EXTENSION PER GREEN STREETS STANDARD GS-3.4
- 3FT HEIGHT RETAINING WALL (2FT MAX RETAINING)
- GRADED SWALE
- SIDEWALK UNDERDRAIN
- REMOVE EXISTING FENCE
- RELOCATE EXISTING OVERHEAD UTILITIES TO UNDERGROUND ALONG FRONTAGE
- RELOCATE EXISTING UTILITY PEDESTAL
- RELOCATE EXISTING STREET SIGN
- HOPE STORM DRAIN PIPE, MIN 8" @ 0.5%
- PRECAST CONCRETE GRATE INLET CATCH BASIN
- CAST-IN-PLACE STORM DRAIN INLET CATCH BASIN
- TIE-IN TO EXISTING PUBLIC STORM DRAIN
- 4" PVC SEWER SERVICE LATERAL, S=3.5%
- SEWER PVC CLEANOUT ASSEMBLY
- SEWER SERVICE CONNECTION TO MAIN
- 3/4" PVC WATER SERVICE LATERAL, W/ 3.5FT COVER
- 3/4" WATER METER & 3/4"BFP
- 1" WATER SERVICE CONNECTION TO MAIN
- 1" IRRIGATION METER & 1" BFP
- 1" IRRIGATION SERVICE CONNECTION TO MAIN
- SOUND WALL WITH 4"x8" DRAIN OPENINGS AT 3' ON CENTER
- STORM DRAIN CLEANOUT PER SDRSD D-09

CONCEPT GRADING & UTILITY PLAN

SOUTHWEST PARK  
SAN DIEGO, CA

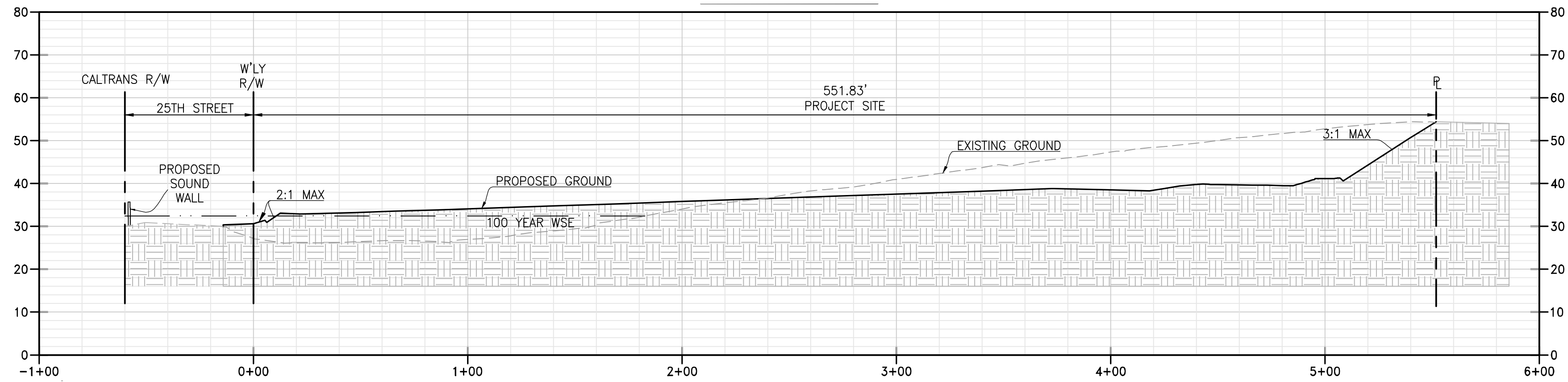
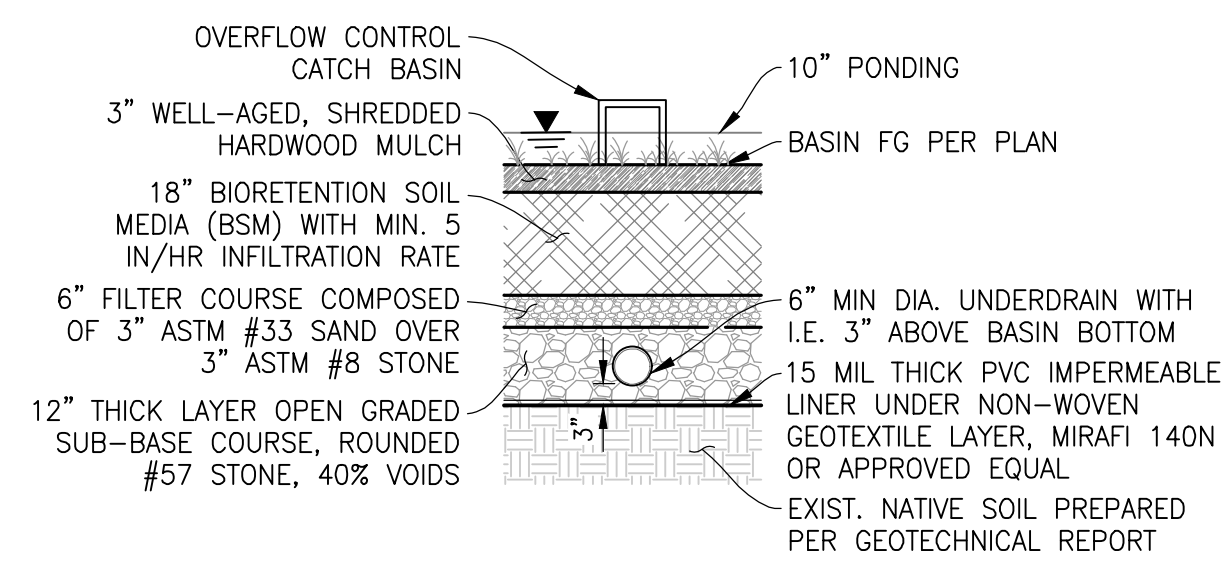
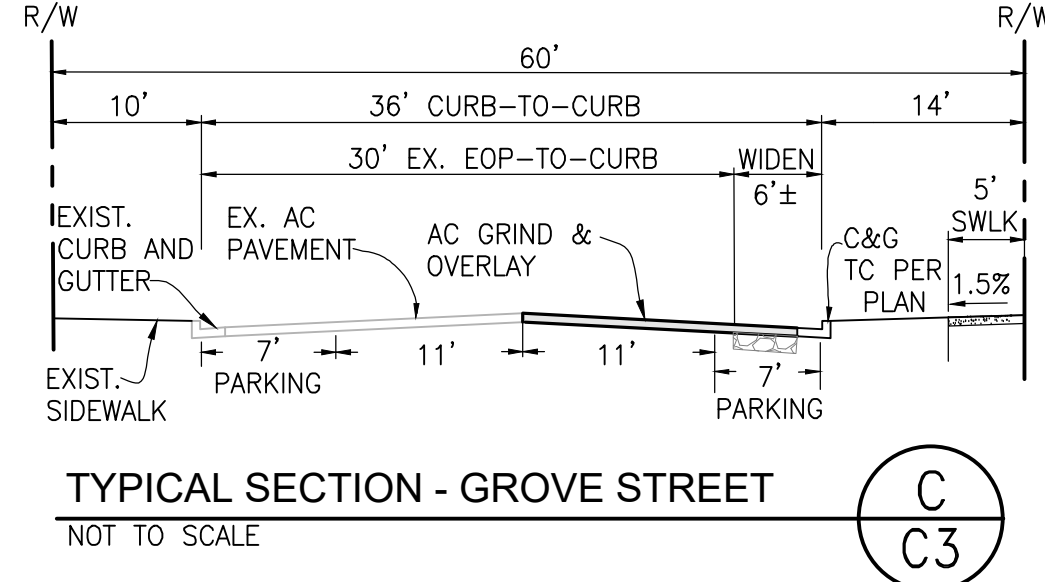
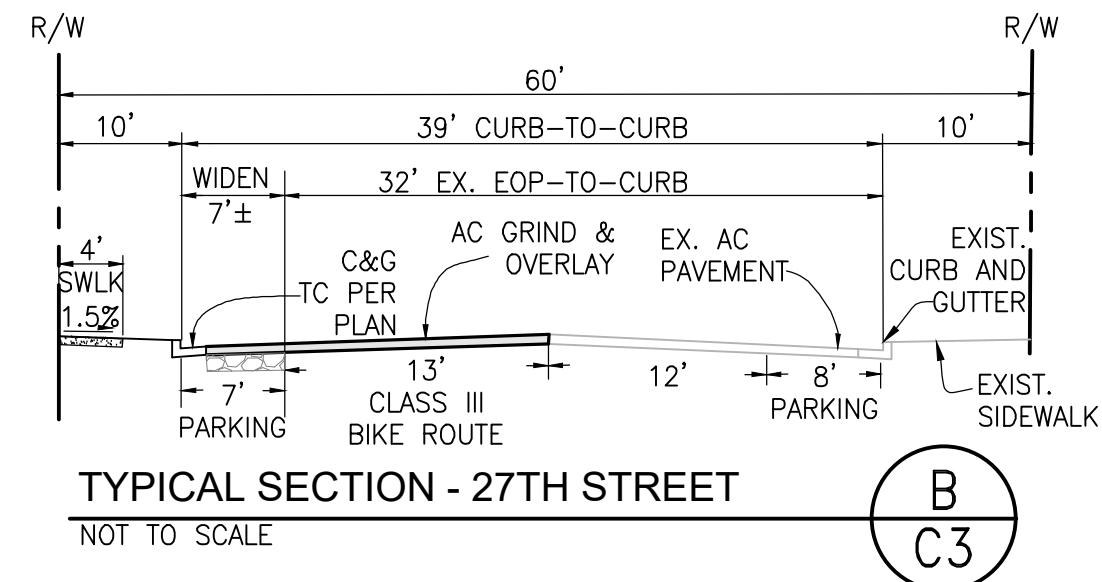
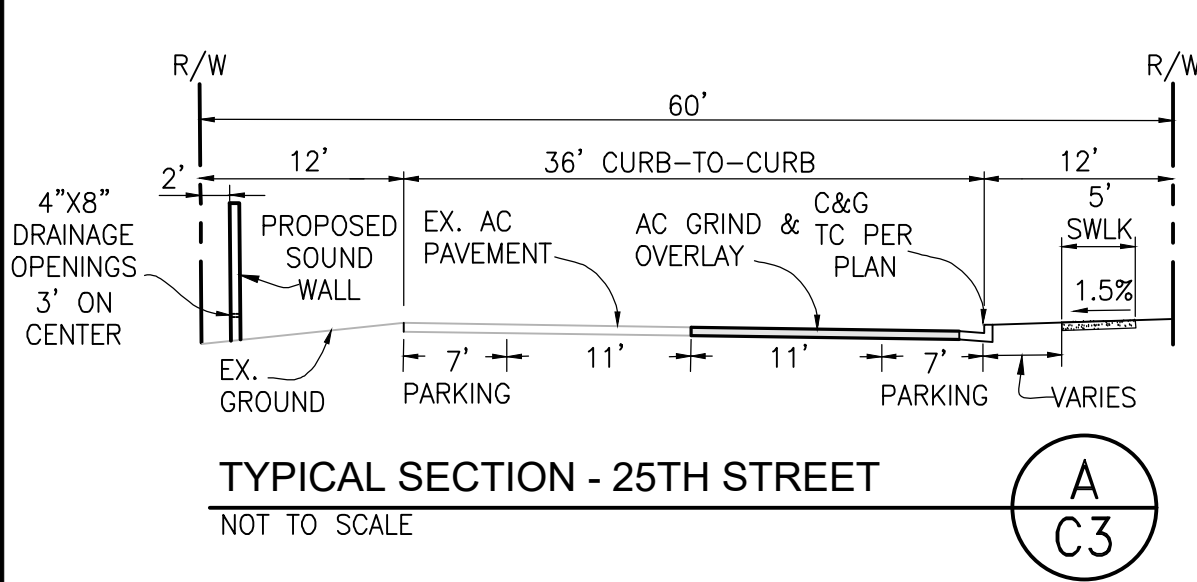
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WBS #  
11/11/2019  
DATE

SHEET C2  
OF 6 SHEETS

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

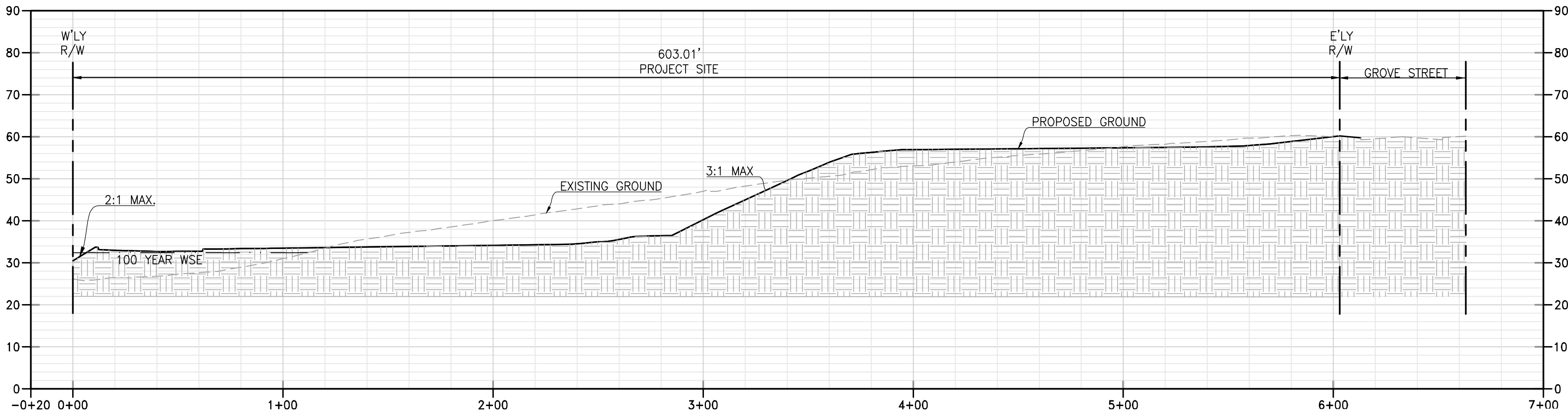






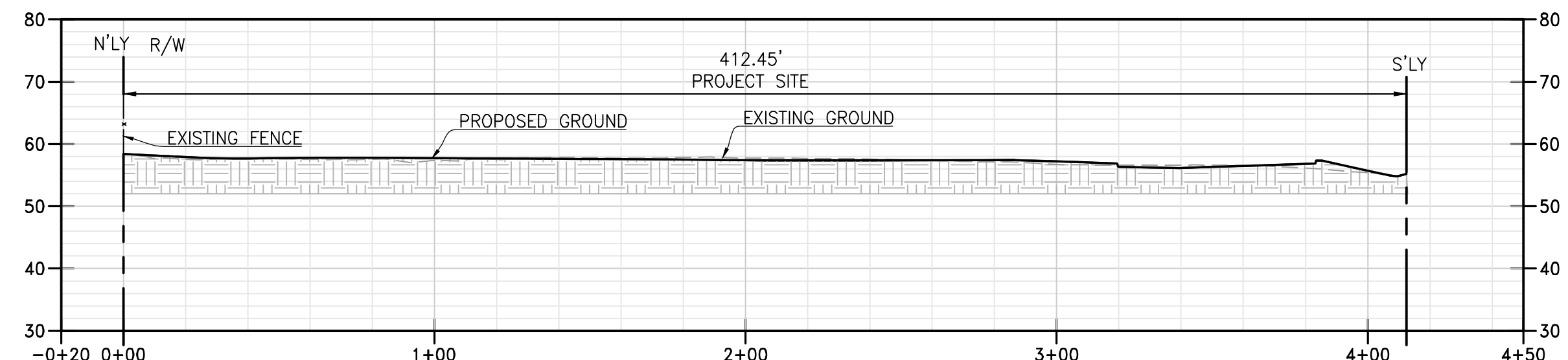
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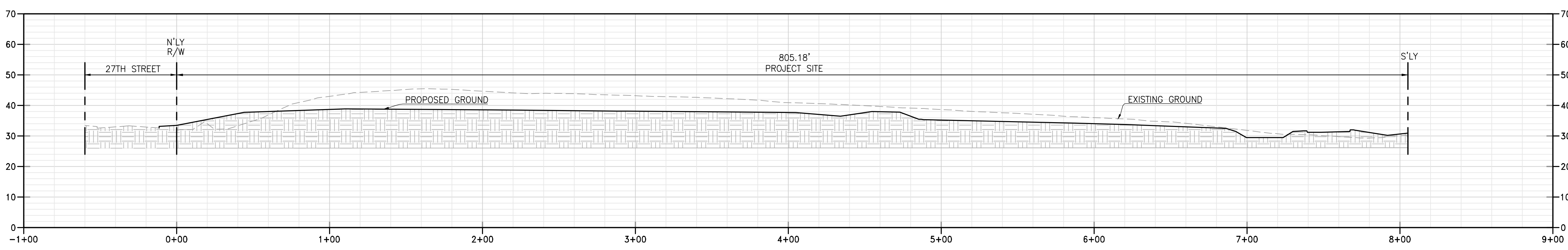
SITE SECTION

1"=40'



SITE SECTION

1"=40'



SITE SECTION

1"=40'

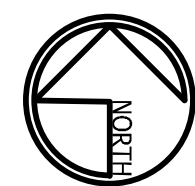
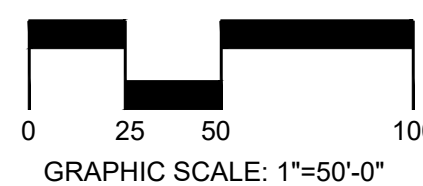
SECTIONS & DETAILS

SOUTHWEST PARK  
SAN DIEGO, CA

XXXX  
WBS #

11/11/2019  
DATE

SHEET C3  
OF 6 SHEETS



## APPENDIX 3

### RUNOFF COEFFICIENT CALCULATIONS





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

Runoff Coefficient Calculations

Runoff Coefficient 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%  
Actual % 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%  
Actual % 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%



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

Runoff Coefficient Calculations

---

Actual % 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%  
Actual % Impervious = 53%  
Calculated Cweighted = 0.56  
Design C = 0.56



## APPENDIX 4

### EXISTING HYDROLOGY CALCULATIONS

SWPEX - FINAL.RES

\*\*\*\*\*

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:

Fusco 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 |



SWPEX - FINAL.RES

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\*

| NO. | HALF-WIDTH (FT) | CROWN TO CROSSFALL (FT) | STREET-CROSSFALL: IN- / OUT- / SIDE / SIDE / WAY | CURB HEIGHT (FT) | GUTTER-GEOMETRIES: WIDTH (FT) | LIP (FT) | HIKE (FT) | MANNING FACTOR (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 FLOWPATH 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<<<<<

SWPEX - FINAL.RES

```
=====
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
```



```

                                SWPEX - FINAL.RES
    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<<<<<
    =====

```

SWPEX - FINAL.RES

\*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<<<<



# SWPEX - FINAL.RES

```
=====
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<br>NUMBER | RUNOFF<br>(CFS) | Tc<br>(MIN.) | INTENSITY<br>(INCH/HOUR) | AREA<br>(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<br>NUMBER | RUNOFF<br>(CFS) | Tc<br>(MIN.) | INTENSITY<br>(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

```

                                SWPEX - FINAL.RES
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

```

SWPEX - FINAL.RES

=====  
=====

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:

Fusco 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 |

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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\*

| NO. | HALF-<br>WIDTH<br>(FT) | CROWN TO<br>CROSSFALL<br>(FT) | STREET-CROSSFALL:<br>IN- / OUT- / PARK-<br>SIDE / SIDE / WAY | CURB<br>HEIGHT<br>(FT) | GUTTER-GEOMETRIES:<br>WIDTH<br>(FT) | LIP<br>(FT) | HIKE<br>(FT) | MANNING<br>FACTOR<br>(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 FLOWPATH 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)<<<<<



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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(curbs-to-curbs) = 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

```

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    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

```

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\*\*\*\*\*

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 T<sub>c</sub> 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                                        |
| T <sub>c</sub> (MIN.) =                            | 9.25                                        |
| LONGEST FLOWPATH FROM NODE 210.00 TO NODE 205.00 = | 501.00 FEET.                                |



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\*\*\*\*\*

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<<<<<

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```
=====
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<br>NUMBER | RUNOFF<br>(CFS) | Tc<br>(MIN.) | INTENSITY<br>(INCH/HOUR) | AREA<br>(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<br>NUMBER | RUNOFF<br>(CFS) | Tc<br>(MIN.) | INTENSITY<br>(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

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\*\*\*\*\*

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

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>>>>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:
```



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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 T<sub>c</sub> 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 T<sub>c</sub>(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):

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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 |

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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<br>NUMBER | RUNOFF<br>(CFS) | Tc<br>(MIN.) | INTENSITY<br>(INCH/HOUR) | AREA<br>(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<br>NUMBER | RUNOFF<br>(CFS) | Tc<br>(MIN.) | INTENSITY<br>(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

```

                                SWPPR - Final.RES
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

```



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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

\*\*\*\*\*

SWPPR - Final.RES

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<br>NUMBER | RUNOFF<br>(CFS) | Tc<br>(MIN.) | INTENSITY<br>(INCH/HOUR) | AREA<br>(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<br>NUMBER | RUNOFF<br>(CFS) | Tc<br>(MIN.) | INTENSITY<br>(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.

\*\*\*\*\*

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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

\*\*\*\*\*

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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(curbs-to-curbs) = 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



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

\*\* CONFLUENCE DATA \*\*

| STREAM<br>NUMBER | RUNOFF<br>(CFS) | Tc<br>(MIN.) | INTENSITY<br>(INCH/HOUR) | AREA<br>(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<br>NUMBER | RUNOFF<br>(CFS) | Tc<br>(MIN.) | INTENSITY<br>(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    | ft <sup>3</sup> /s |

### Results

|                   |             |                    |
|-------------------|-------------|--------------------|
| Discharge         | 8.34        | ft <sup>3</sup> /s |
| Normal Depth      | 1.50        | ft                 |
| Flow Area         | 1.77        | ft <sup>2</sup>    |
| 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        | ft <sup>3</sup> /s |
| Discharge Full    | 8.34        | ft <sup>3</sup> /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   | ft <sup>3</sup> /s |

### Results

|                   |             |                    |
|-------------------|-------------|--------------------|
| Discharge         | 17.52       | ft <sup>3</sup> /s |
| Normal Depth      | 2.00        | ft                 |
| Flow Area         | 3.14        | ft <sup>2</sup>    |
| 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       | ft <sup>3</sup> /s |
| Discharge Full    | 17.52       | ft <sup>3</sup> /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

| INDEX OF SHEETS |                                                  |
|-----------------|--------------------------------------------------|
| Sheet No.       | 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                             |
| " 180-189       | Dairy Mart Road Overcrossing Br. No. 57-259      |
| " 189-197       | 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                                   |

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

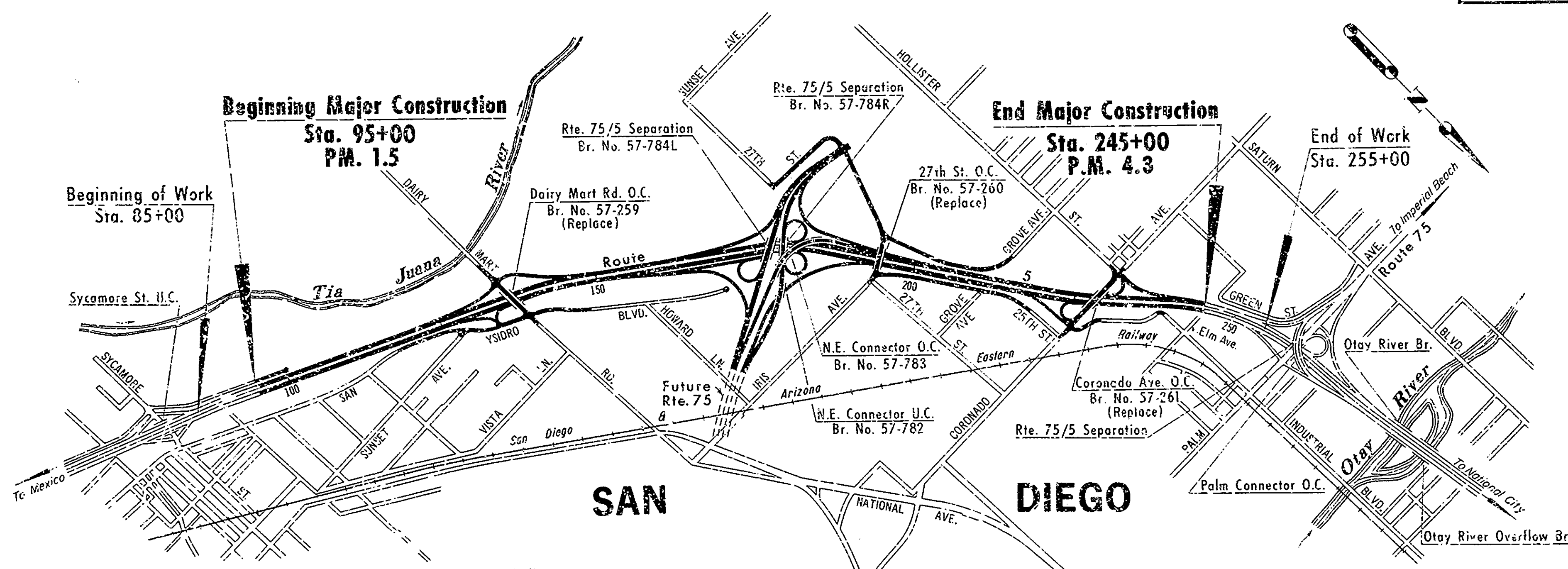
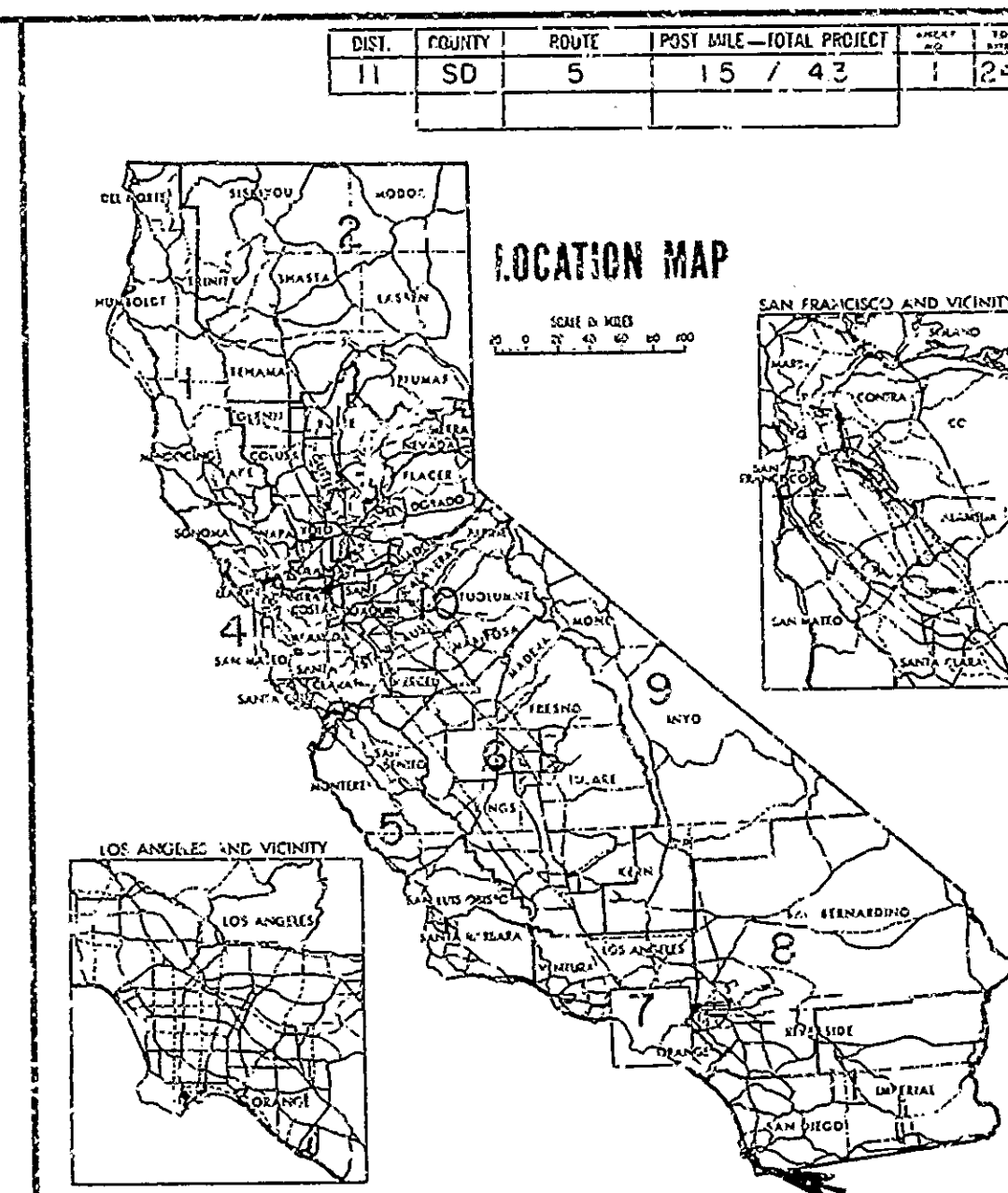
I-005-1(93)1

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



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

LEGEND  
Grading & Paving  
Future Construction

SCALE IN FEET  
1000 0 1000 2000

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

Approved February 22, 1971

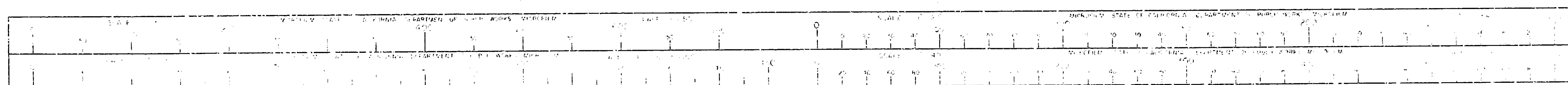
State Highway Engineer  
Registered Civil Engineer No. 5645  
Thomas A. Moe  
Director of Public Works

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 ENCLOSED TAKEN  
UNDER MY DIRECTION AND CONTROL ON THE DATE IN SAN FRANCISCO, CALIFORNIA PURSUANT TO  
AUTHORIZATION BY THE DIRECTOR OF TRANSPORTATION  
10/7/70 Dick Mountain Microfilm Supervisor

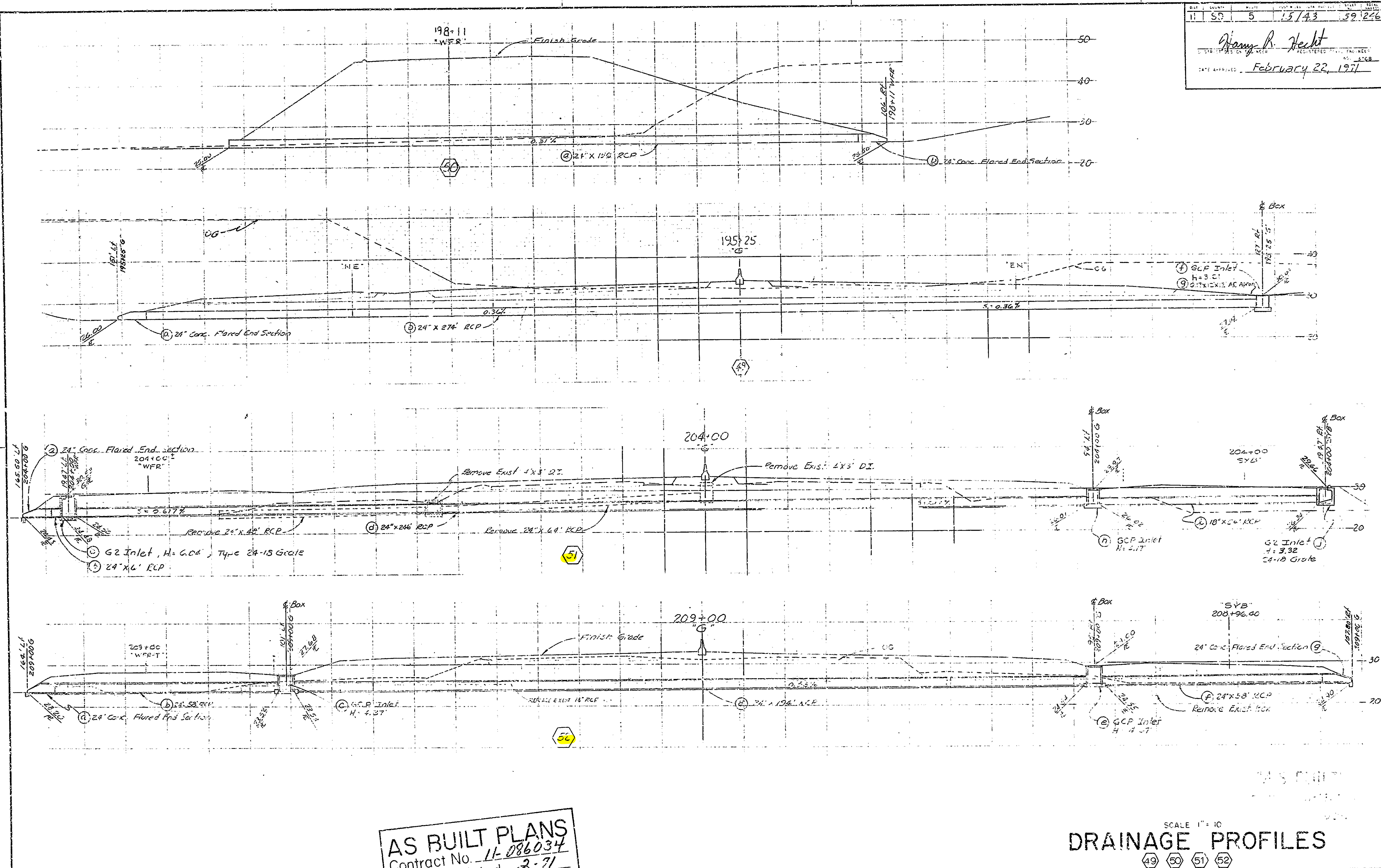








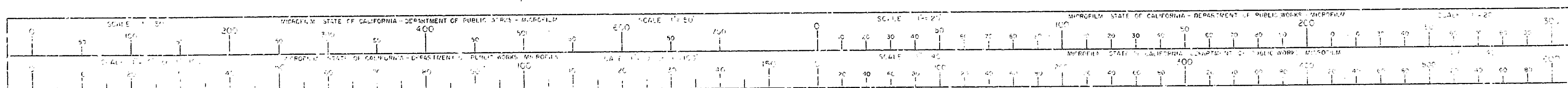
11 50 5 13/43 59/246  
 Harry R. Hecht  
 REGISTERED CIVIL ENGINEER  
 DATE APPROVED February 22, 1971



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

SCALE 1" = 10'  
 DRAINAGE PROFILES  
 49 50 51 52

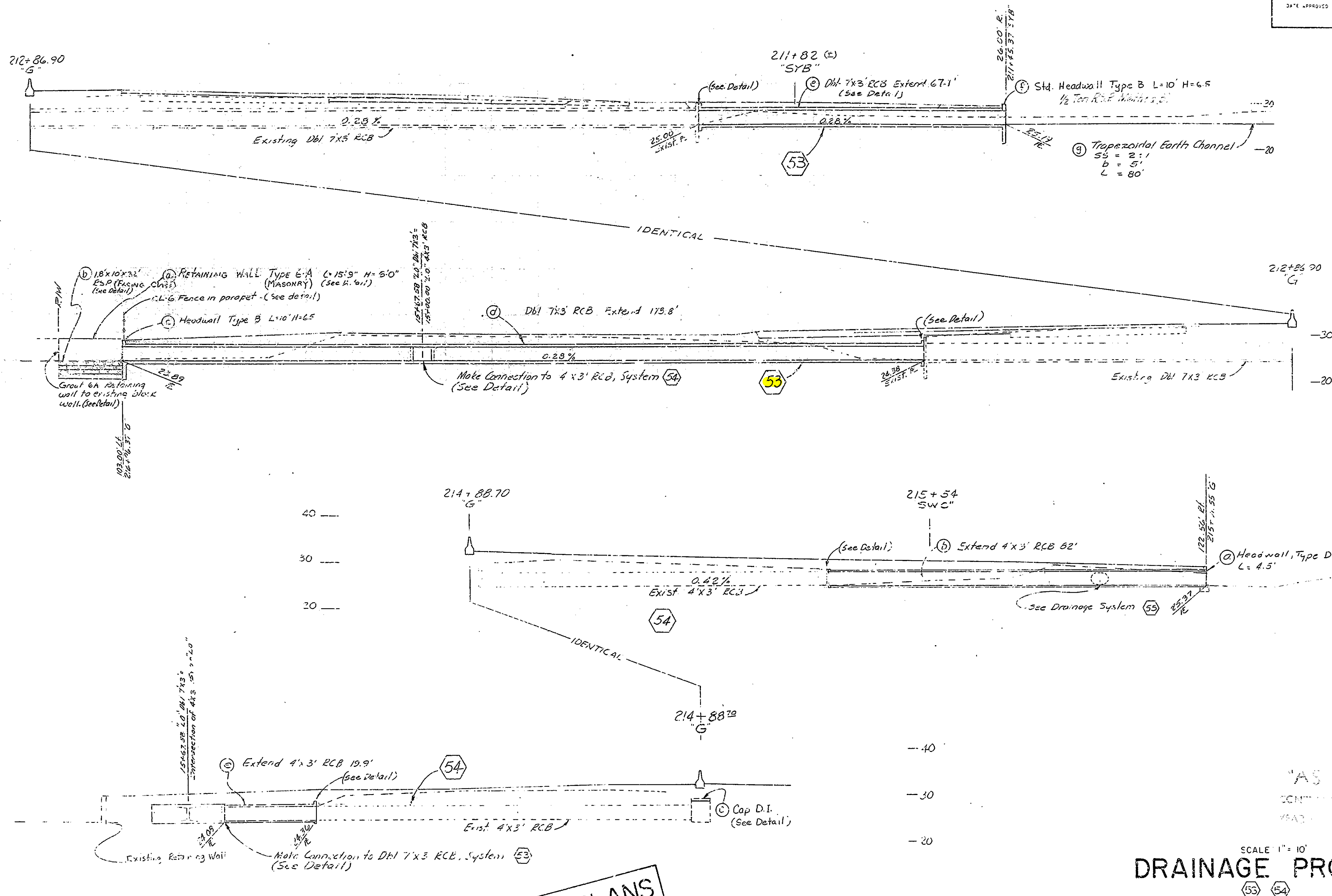
I HEREBY CERTIFY THAT THIS IS A TRUE AND ACCURATE COPY OF THE ABOVE DOCUMENT TAKEN  
 UNDER MY DIRECTION AND CONTROL ON THIS DATE IN SACRAMENTO, CALIFORNIA PURSUANT TO  
 AUTHORIZATION BY THE DIRECTOR OF TRANSPORTATION.  
 10/7/70 Dick W. [Signature] Microfilm Supervisor





|    |   |         |    |     |
|----|---|---------|----|-----|
| SD | 5 | 1.3/4.3 | 60 | 246 |
|----|---|---------|----|-----|

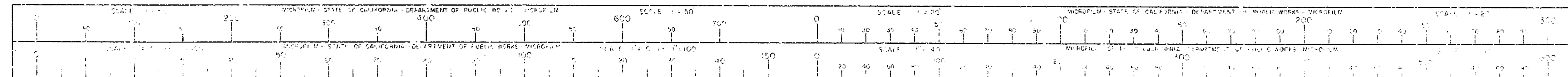
Harry R. Hecht  
 DISTRICT DESIGN ENGINEER  
 REG. NO. 11,000  
 DATE APPROVED February 22, 1971



SCALE 1" = 10'  
**DRAINAGE PROFILES**

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

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.  
 10/7/70 Dick McAdams Project Engineer



## 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, NGS12  
National Geodetic Survey  
SSM/C-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.

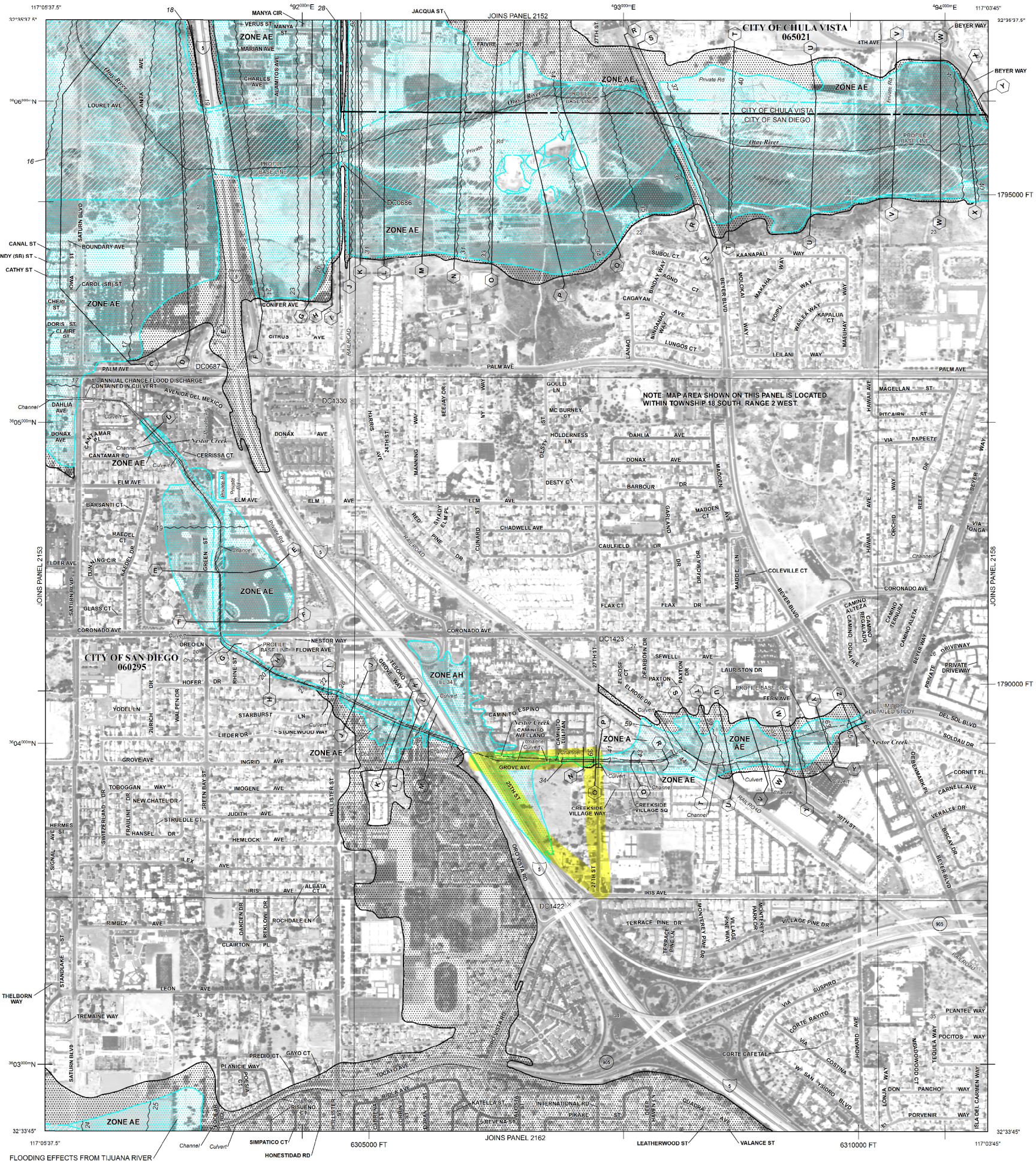
This map reflects more detailed and up-to-date **stream channel configurations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, 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 equaled 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: Zone 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 derelict. 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

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** Cross section line

**25** Intersect line

Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere

475°00'00"E

1000-meter Universal Transverse Mercator grid ticks, zone 11

5000-foot grid values: California State Plane coordinate system, Zone VI (FIPSZONE = 406), Lambert projection

Bench mark (see explanation in Notes to Users section of this FIRM panel)

**DX5510** River Mile

**M1.5** 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 Lavee 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

150 0 150 200 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   | 060296 | 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 community.

**MAP NUMBER**  
06073C2154H

**MAP REVISED**  
APRIL 5, 2016

**Federal Emergency Management Agency**