CEQA- LEVEL
PRELIMINARY DRAINAGE STUDY

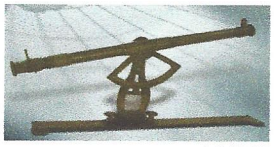
FOR

LIBERTY BELL PLAZA
PDS2017-STP-17-037

Valley Center, California

October 15, 2019

Prepared By:



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Registration Expires 6-30-2021

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1. INTRODUCTION:

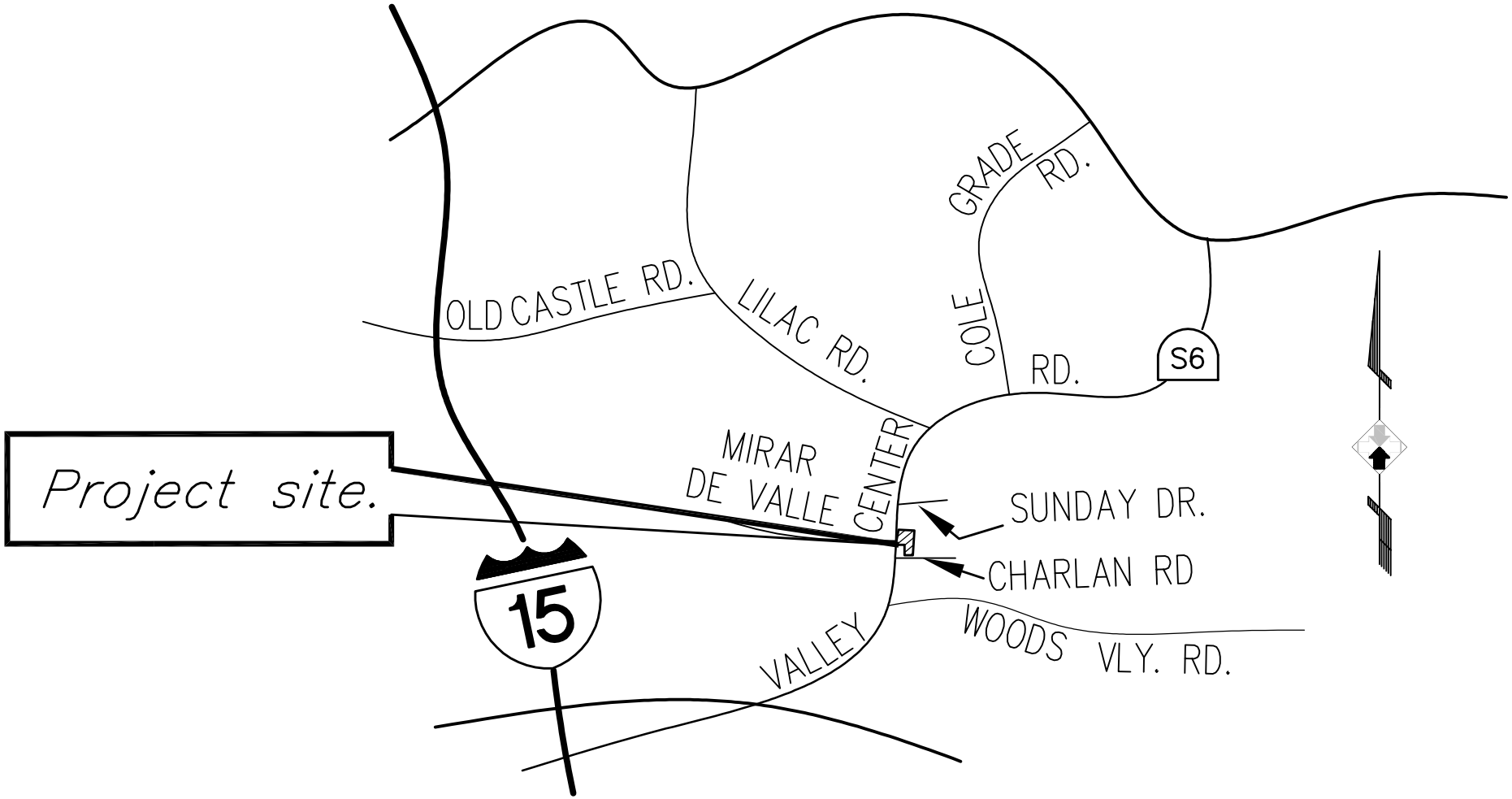
This preliminary drainage study report has been prepared as part of the discretionary approval process for the Liberty Bell Plaza project in Valley Center, California. The purpose of the study is to quantify project runoff in both the pre-development and post-development condition.

Project Location and Description

The Liberty Bell Plaza project is located in Valley Center, on the east side of Valley Center Road, approximately three-quarters of a mile south of the intersection with Lilac Road (See Figure 1). The site can be accessed from both Valley Center Road and Charlan Road.

The adjacent land uses are Woods Valley Golf Course to the north, Valley Center Municipal Water District sewer treatment plant, Woods Valley Golf Course and single-family residential to the east, commercial and single-family residential to the south and Valley Center Road to the west. The offsite tributary drainage areas originate south and east of the property and currently drain into an existing graded channel that runs east to west through the site to an existing headwall located adjacent to Valley Center Road just north of the intersection of Valley Center Road and Mirar De Valle that was constructed with the improvement of Valley Center Road. The offsite drainage basin is approximately 187.47 acres in size and is comprised mostly of single-family residential lots to the east with some tributary commercial properties to the south. The remaining contributing areas are undeveloped.

The project site is currently vacant with the majority of the site undeveloped. There was an existing vacant commercial building located just south of the existing graded channel that was demolished prior to the proposed site development. There are also two soil stockpiles located on site that were installed on site recently as part of the grading operations for the Tractor Supply project located south and west of the project on the west side of Valley Center Road. There are a couple of existing trees on site with the majority of the existing vegetation composed of native weeds and grasses. In addition, there is evidence of an old blueline/ephemeral watercourse that used to traverse the site from south to north. The old watercourse was redirected into a graded channel by others located north of Charlan Road and east of the project site. The offsite graded channel conveys the runoff from south the north to the southerly boundary of the Woods Valley Golf Club where it turns to the west and conveys the runoff to an existing headwall/box culvert storm drain located on site which was installed with the improvements of Valley Center Road. In order to determine whether the redirected channel would still be considered as Waters of the U.S., our client hired Artemis Environmental to perform an aquatic resources delineation of the graded channel. Based upon their findings in the field, Artemis Environmental confirmed that the east ï west graded channel as well as a minor channel that runs south ï north and is tributary to the east ï west channel is considered to be both Waters of the U.S. and State. Therefore, we will be applying for USACE Section 404 (Nationwide Permit), RWQCB Section 401 (Water Quality Certification) and CDFW Section 1600 (Streambed Alteration Agreement) for the projectôs impacts to the Waters of the U.S. and State.



INTERSECTION OF VALLEY CENTER ROAD AND MIRAR DE VALLE. 0.0 MILES TO INTERSECTION.

VICINITY MAP

NOT TO SCALE

The pre-project site topography (not including the temporary soil stockpiles) is characterized by gentle slopes. The pre-project site topography descends in a westerly direction with the majority of the site draining to the northwest to an existing 18-inch RCP culvert with a headwall that was constructed as part of the widening of Valley Center Road or to an existing 18-inch RCP culvert located near the northwest corner of the project that conveys runoff beneath the existing private service road to an existing graded channel that runs south to north to the existing culvert
crossings crossing located at the intersection of Sunday Drive and Valley Center Road. The remainder of the property drains to the existing graded channel noted above. The highest elevation at the extreme southeast corner adjacent to Charlan Road is approximately 1301.7 feet and the lowest elevation at the westerly terminus of the existing graded channel is approximately 1291.6. The topographic source for the project was a site topographic survey prepared by Acculine Survey in May 2017 with supplemental topography for Valley Center Road from an aerial topo survey performed by SanLo Aerial dated September 2010.

The proposed development will consist of the construction of six commercial buildings and one major market ranging in size from 1,215 square feet to 50,900 square feet with parking lot, hardscape and landscaping within an 8.604 acre developable area.

Watershed

The project site is located within the San Luis Rey Watershed and the Hydrologic Area numbered 903.14 which is in the Valley Center Area. The project area drains to Moosa Creek which is tributary to the San Luis Rey River and is included in the Rincon HSA. The San Luis Rey River Hydrologic Unit is approximately 558 square miles in area. The contributing watershed is composed of three distinct hydrological areas each with its own unique and environmental features (Lower San Luis Rey (903.1), Monserate (903.2) and Warner Valley (903.3)). The overall watershed is currently 54% undeveloped with the remaining 46% comprised of residential, agricultural, commercial, industrial and other uses.

Proposed Development Drainage Concepts

The existing 10 foot by 5 foot box culvert located at the westerly terminus of the existing graded channel that runs east to west across the project site will be extended to the easterly property line in roughly the same alignment as the existing graded channel in order to allow the entire site to be developed. A new headwall / drop structure will be constructed at the easterly property line to allow the offsite run-on being conveyed within the graded channel located east of the project site to continue to be conveyed through the project site. A proposed brow ditch will be constructed adjacent to the easternmost property line in order to intercept offsite run-on from the adjacent properties to the east and direct the run-on to the proposed extended 10 foot by 5-foot box culvert in order to bypass the proposed biofiltration basins. Proposed brow ditches will also be installed at the southeast corner of the project in order to intercept offsite run-on from the adjacent residential properties to the south and direct the run-on to the proposed extension of the 10 foot by 5 foot box culvert in order to bypass the proposed biofiltration basins. In addition, we will install a proposed inlet apron to intercept the run-on from the existing offsite graded channel that runs south to north. The run-on will be conveyed to the proposed box culvert extension and will bypass the proposed biofiltration basins. We will also install a swale along the southerly property line adjacent to the existing dental office to intercept a minor amount of offsite run-on from the adjacent property that drains to the project site today and to intercept a minor amount of landscape water from the project site to keep the runoff off of the adjacent property as we are higher than the adjacent property in

the developed condition. The intercepted run-on/runoff will be conveyed to the proposed box culvert extension and will bypass the proposed biofiltration basins.

The runoff from half of the proposed major market and Comm 1 building located immediately east of the major market along with runoff from the parking lot and loading dock on the east side of the major market will be directed to the proposed biofiltration basin located east of the major market (Basin 3). The runoff from the other half of the proposed major market along with the runoff from approximately half of the proposed parking lot located immediately south of the major marker will drain to a proposed biofiltration basin located west of the major market (Basin 1). The runoff from the other half of the proposed parking lot along with the runoff from the Comm 3 building, the runoff from the gas station (including runoff from Comm 6 building), the runoff from a portion of the parking lot serving the two commercial buildings along with the runoff from the main entry drive into the project will be directed to a proposed biofiltration basin located along the west edge of the project adjacent to Valley Center Road (Basin 2). The runoff from the Comm 2 building and associated hardscape located adjacent to the easterly property line will be directed to a proposed biofiltration basin located in between the Comm 1 and Comm 2 buildings (Basin 4). The runoff from the Comm 4 building along with the runoff from the portion of the hardscape and parking lot serving that building will be directed to a proposed biofiltration basin located adjacent to the southerly property line just south of the Comm 4 building (Basin 5). The runoff from the Comm 5 building along with the runoff from the parking lot, hardscape and access drive serving the Comm 5 building will be directed to a proposed biofiltration basin located west of the Comm 5 building adjacent to Valley Center Road (Basin 6).

The runoff from Basins 5 and 6 will be conveyed via separated private storm drains to the extended box culvert (Discharge Point 3). The runoff from Basin 1 will be conveyed via a private storm drain pipe to the existing public curb inlet located in Valley Center Road near the northwest corner of the project site. The existing culvert extending from the curb inlet to the project site will be removed and replaced in order to provide additional depth to Basin 1 (Discharge Point 2). The runoff from Basins 3 and 4 will be conveyed through the site via a dedicated private storm drain system to the overflow box for Basin 2 where the runoff from the three basins will be combined and conveyed to a proposed curb inlet in Valley Center Road (Discharge Point 4). The new curb inlet in Valley Center Road was required to provide the additional discharge point from the site to the public storm drain system in Valley Center Road. The curb inlet will connect to the existing 10 foot by 5-foot box culvert via a proposed 18-inch public storm drain. The remainder of the runoff either sheet flows directly to Valley Center Road where it gets intercepted by an existing curb inlet located adjacent to the southwest corner of the project which is connected to the public storm drain system in Valley Center Road or to the adjacent property to the north where it gets intercepted by an existing vegetated channel that conveys the runoff to the existing undercrossing at Sunday Drive. See Table 1 in Section 4 for the Summary of Project Flows.

Storm drain discharge locations into the biofiltration basins are noted on Figure 2B, Developed Hydrology Exhibit attached at the end of the report. The proposed biofiltration basins will be sized for both pollutant control and flow control. In addition, the overflow structures will be constructed with flow control orifices to mitigate the increased runoff from the 100-year storm event. A separate 100-Year Routing Analysis for the Liberty Bell Plaza project prepared by REC Consultants is included in the appendices.

Impacts of the proposed Liberty Bell Plaza project on the public storm drain system and on Moosa Creek are discussed in Section 5 of the report with backup calculations and discussion in the appendices.

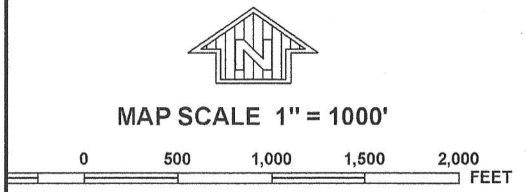
2. FLOOD HAZARD CONSIDERATIONS:

A portion of the project site is located **within** the floodplain limits for Moosa Creek as mapped on panel 06073C0810G for San Diego County Unincorporated Areas. Based upon information we received from Tory Walker Engineering, the flood plain limits do encroach onto the property at the northwest corner of the project by approximately 6 feet. We added the project boundary to the FIRM map for clarification. There is an existing solid block wall that is located along the northerly property line of the project that was not accounted for when the flood plain limits were determined which would have essentially limited the flood plain limits to the northerly property line. For the developed condition, the block wall will be removed and replaced with a varied height 2:1 slope. As shown on the projectôs Conceptual Grading Plan prepared separately as well on Figures 2A and 2B attached in Appendix C, there are no proposed structures within the flood plain limits.

In addition, as noted in Section 1, there are two existing channels located on site that have been determined to be Waters of the U.S. An aquatic resources delineation prepared by Artemis Environmental determined the limits of inundation for each channel. The limits of inundation have been added to the project Conceptual Grading Plan prepared separately as well as on Figures 2A and 2B attached in Appendix C. In order for development on this site to be viable, both channels will be disturbed by the proposed development and both channels will be intercepted at their respective project boundaries and conveyed through the site in the proposed underground storm drain system. As noted in Section 1, we will be applying for a USACE Section 404 (Nationwide Permit), RWQCB Section 401 (Water Quality Certification) and CDFW Section 1600 (Streambed Alteration Agreement).

The remainder of the project lies within Zone X which are areas determined to be outside of the 0.2% annual chance floodplain. In addition, the project would not place a building or housing within the 100-year flood hazard area for Moosa Creek.

ance Program at 1-800-638-6620.



NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0810G

FIRM

FLOOD INSURANCE RATE MAP

SAN DIEGO COUNTY, CALIFORNIA

AND INCORPORATED AREAS

PANEL 810 OF 2375

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
ESCONDIDO, CITY OF	060290	0810	G
SAN DIEGO COUNTY	060284	0810	G

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 06073C0810G

MAP REVISED MAY 16, 2012

Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

3. HYDROLOGIC METHODOLOGY:

Rational Method runoff calculations were performed for both the pre-developed and post-developed project conditions for the onsite area. The analysis is provided to sum the total runoff generated at the project discharge points into the public storm drain system in Valley Center Road including run-on from offsite areas that are tributary to the project site and areas that sheet flow either offsite or directly to Valley Center Road. A comparison of pre-developed and post-developed Q100 runoff at the points of discharge is the result with discussion and conclusions in Sections 4 and 5 of this report.

The 2003 San Diego County Hydrology Manual was used as the basis for the onsite hydrology calculations with a nodal system utilizing Advanced Engineering Software (AES) Hydrosoft Rational Method Analysis Software. The software provides for runoff routing through the drainage areas with travel times and times of concentration summed and confluence as needed.

Appendix B of this report contains pertinent San Diego County Hydrology Manual charts and nomographs as backup support for the AES Rational Method calculations. The 6-hour 100-year runoff amount is 3.7 inches for the project area as noted on the County precipitation isopluvial map and plotted on the intensity-duration nomograph. Additional charts for overland flow and land-use runoff coefficients are also provided. The AES software utilizes Table 3-2 (Initial Time of Concentration Table) including limiting the initial runoff length to the maximum overland flow length allowed in Table 3-2 for the initial basin(s) and provides travel time calculations for concentrated flows beyond the initial subareas with Manningôs n-value and approximate channel section utilized based upon the topography and vegetation for each reach in question.

The pre-developed condition runoff coefficients (C-value) are based on the appropriate soil type, vegetation and land-use which is predominately low density residential, commercial and undeveloped areas. A soil type map is provided in the report in Appendix C. Per the Natural Resources Conservation Service Web Soil Survey, the majority of the onsite soils do not have a Hydrologic Soil Rating (Co ï Clayey alluvial land) with a small area located at the northeast corner of the project being Hydrologic Soil Group A (Visalia sandy loam). Based upon our findings from other projects located in the vicinity of project area, the Co soils tend to have Hydrologic Soil Group C/D characteristics. From the flood control point of view, the worst-case scenario between C and D soils are the D soils as they produce a higher runoff volume and higher peak flow (both in pre and post-development conditions). Therefore, we utilized Type D soils in our calculations. The pre-developed conditions for the project and the offsite drainage area are described in the project description, with discussion on topography, vegetation and density noted; all affecting the C-values chosen.

4. RESULTS:

A summary of pre-developed and post-developed project flows and additional data is noted in Table 1 below for the point of compliance for the project including runoff that sheet flows directly to Valley Center Road (Nodes 401 and 501), runoff that sheet flows onto the adjacent property to the north (Node 701) and runoff generated onsite from landscaped areas and brow ditches located adjacent to property lines that bypasses the onsite biofiltration basins (Nodes 801 and 901). The Developed Condition Hydrology Exhibit 2B also notes flows and velocities at strategic project locations.

Table 1: Summary of Project Flows at Point of Compliance

Condition	Node	Area (ac)	C-value	Tc (min)	Intensity (in/hr)	Q100 (cfs)	V100 (fps)
Pre-Developed (1)	103	0.936	0.289	26.79	3.30	0.89	2.05
Pre-Developed (2)	205	4.532	0.339	29.09	3.13	4.81	8.72
Pre-Developed (3)	304	3.021	0.350	32.26	2.93	3.10	11.00**
Pre-Developed Total		**8.489**				**8.80**	
Developed (4)	605	1.790	0.827	6.28	8.42	12.46	7.49
Developed (5)	206	3.074	0.809	6.46	8.26	20.87	11.81*
Developed (6)	246	1.286	0.833	4.66	9.75	10.44	13.29*
Developed (7)	235	0.336	0.845	4.06	9.75	2.78	5.02
Developed (10)	246	4.696	0.818	6.46	8.26	34.09	19.29*
Developed (8)	325	1.239	0.810	5.92	8.74	9.16	5.18*
Developed (9)	385	0.562	0.781	7.12	7.76	3.41	5.17
Developed	401	0.006	0.900	0.72	9.75	0.05	
Developed	501	0.008	0.690	1.09	9.75	0.05	
Developed	701	0.080	0.840	1.86	9.75	0.66	
Developed	801	0.086	0.630	2.26	9.75	0.53	
Developed	901	0.064	0.500	1.94	9.75	0.31	
Developed Total		**8.531**				**60.72**	**11.09*** **

*V = Q/A **V based on Q = 500 cfs ***V based on Q = 551.9 cfs

(1) Existing condition Discharge Point 1
(2) Existing condition Discharge Point 2
(3) Existing condition Discharge Point 3
(4) Developed condition Bio Basin No. 1 (Discharge Point 2)
(5) Developed condition Bio Basin No. 2
(6) Developed condition Bio Basin No. 3 (Connects to Basin 2 outlet pipe)
(7) Developed condition Bio Basin No. 4 (Connects to Basin 2 outlet pipe)
(8) Developed condition Bio Basin No. 5 (Connects to box culvert)
(9) Developed condition Bio Basin No. 6 (Connects to box culvert)
(10) Developed condition Discharge Point 4 (Includes Basins 2, 3 and 4)

Please note that the 0.042-acre difference in overall area between the pre-developed and developed conditions due to the minor offsite grading on the adjacent property to the north (Node 701).

The majority of the runoff from the existing site discharges in a westerly direction and is intercepted by the existing storm drain infrastructure within the adjacent Valley Center Road. As illustrated in the attached Storm Drain Plans prepared by Willdan as part of the Valley Center Road Reconstruction Plans, the runoff from the Liberty Bell Plaza site, including runoff from offsite areas tributary to the Liberty Bell Plaza site, was calculated to be 500 cfs which is conveyed directly to Moosa Creek via an existing 10-foot by 5-foot box culvert. A WSPG hydraulic analysis of the 10-foot by 5-foot box culvert was undertaken to determine the HGL in the box culvert by REC Consultants. Based upon a Water Surface Elevation (WSE) of 1288.44 at the outlet structure provided to us by the County of San Diego, the box culvert in the existing condition is under pressure but the HGL is below the ground surface. The remainder of the runoff from the existing site drains onto the adjacent property to the north where it gets intercepted by an existing vegetated trapezoidal channel and conveyed to the existing storm drain under-crossings located at Sunday Drive and Valley Center Road (Node 103).

The development of the Liberty Bell Plaza site increases the amount of impervious area onsite which in turn results in an increase in the peak storm flows from the project site. Table 1 above illustrates the pre and post developed condition flows tributary to the existing 10-foot by 5-foot box culvert in Valley Center Road. In order to be conservative, the developed peak flows have not been confluenced and the total peak flow runoff provided in Table 1 for the developed condition is a direct summation of the flows at the nodes noted above. The proposed development results in an increase in peak flow runoff from the project site of 51.9 cfs (60.72 cfs minus 8.80 cfs). A WSPG hydraulic analysis of the 10-foot by 5-foot box culvert was undertaken by REC Consultants to clearly demonstrate that the existing box culvert can safely convey a peak flow of 551.9 cfs, maintaining the HGL below the finished surface similar to the existing condition based upon a WSE of 1288.44 at the outlet structure as noted above. The results of the WSPG hydraulic study demonstrates that the existing 10-foot by 5-foot box culvert can safely convey the increase in design peak flow from the project site. In addition, based upon record drawings for the public storm drain in Valley Center Road, the V100 at the outlet of the box culvert was calculated to be 11.0 fps by Willdan and the calculations performed by REC Consultants indicate that the increased runoff from the site generated a slight increase in the V100 at the outlet of 11.09 fps. Therefore, the increased runoff from the project site would not have a negative impact on the project outlet due to the negligible 0.09 fps increase in velocity.

5. CONCLUSIONS:

As noted in Section 1, there is evidence of an old blueline/ephemeral watercourse that used to traverse the site from south to north. The old watercourse was redirected into a graded channel by others located north of Charlan Road and east of the project site. The offsite graded channel conveys the runoff from south the north to the southerly boundary of the Woods Valley Golf Club where it turns to the west and conveys the runoff to an existing headwall/box culvert storm drain located on site which was installed with the improvements of Valley Center Road. In order to determine whether the redirected channel would still be considered as Waters of the U.S., our client hired Artemis Environmental to perform an aquatic resources delineation of the graded channel. Based upon their findings in the field, Artemis Environmental confirmed that the east ï west graded channel as well as a minor channel that runs south ï north and is tributary to the east ï west channel is considered to be both Waters of the U.S. and State. Therefore, we will be applying for USACE Section 404 (Nationwide Permit), RWQCB Section 401 (Water Quality Certification) and CDFW Section 1600 (Streambed Alteration Agreement) for the projectôs impacts to the Waters of the U.S. and State.

As noted in Section 2, a portion of the project site is located **within** the floodplain limits for Moosa Creek as mapped on panel 06073C0810G for San Diego County Unincorporated Areas, but no proposed buildings will be located within the flood plain limits. In addition, both channels noted above will be disturbed with the proposed development with both channels being intercepted at their respective project boundaries and conveyed through the site within the proposed onsite storm drain system. The inlet structures will be designed to mitigate upstream effects that are typically inherent when a stream is intercepted by storm drain. We have hired REC Consultants as part of our project team to help with the design of such critical structures. As a result of this disturbance, we will be applying for the necessary permits from USACE, RWQCB and CDFW as noted above.

The remainder of the project lies within Zone X which are areas determined to be outside of the 0.2% annual chance floodplain.

The project would **not** place a building or housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map, including County Floodplain Maps **nor** would the project place any structures within the 100-year flood hazard area which could impede or redirect flood flows **nor** would the project expose people or structures to a significant risk of loss, injury or death involving flooding as a result of the failure of a levee or dam.

As noted in Section 4, WSPG analyses were performed by REC Consultants the results of which indicated that the existing 10-foot by 5-foot box culvert can safely convey the increase in peak flow runoff from the project site developed during the 100-year storm event with only a minor increase in the velocity at the outlet (11.09 fps versus 11.00 fps). Therefore, the increased runoff from the project site will not negatively impact the existing box culvert in Valley Center Road.

Therefore, the proposed project should NOT substantially alter the existing drainage patterns onsite, offsite upstream of the project site or offsite, north of the project site downstream of the outlet into Moosa Creek in a manner which would result in substantial erosion or siltation both onsite and offsite. In addition, although we increase the amount of runoff from the project site in the 100-year storm event

at the outlet to Moosa Creek by 51.9 cfs, we have shown that the impact is negligible and therefore will not result in flooding either onsite or offsite. With regards to the areas upstream of the project site where we will intercept the east-west and south-north graded channels, the proposed structures will be designed as drop structures to aid in their hydraulic efficiency and they will be set back from the property line as much as possible to limit upstream offsite impacts from intercepting streams with storm water structures.

6. REFERENCES:

1. *Hydrology Manual.* County of San Diego Department of Public Works ï Flood Control Section. June 2003.
2. *County of San Diego BMP Design Manual.* County of San Diego Department of Public Works, February 2016.

DECLARATION OF RESPONSIBLE CHARGE:

I hereby declare that I am the Civil Engineer of Work for this project, that I have exercised responsible charge over the design of the project as defined in Section 6703 of the Business and Professions Code, and that the design is consistent with current standards.

I understand that the check of the project design reports and calculations by the County of San Diego is confined to review only and does not relieve me, as Engineer of Work, of my responsibilities for project design.

Brent C. Moore, RCE 59121 Date
EXP 6/30/2021

7. APPENDICES:

Appendix A: Rational Method Calculations / AES Output

EXISTING CONDITION 100-YEAR CALCULATIONS

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**************************************************************************

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
          (c) Copyright 1982-2010 Advanced Engineering Software (aes)
              Ver. 17.0 Release Date: 07/01/2010  License ID 1630

                              Analysis prepared by:

                               Alidade Engineering
                               41743 Enterprise Circle North, Suite 209
                               Temecula, CA  92590

 ************************** DESCRIPTION OF STUDY **************************
* LIBERTY BELL PLAZA                                                      *
* 100-YEAR STORM EVENT                                                    *
* EXISTING CONDITION BASIN A                                              *
 **************************************************************************

  FILE NAME: E17228A.DAT
  TIME/DATE OF STUDY: 12:50 04/10/2019
--------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
--------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   3.700
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   6.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 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    100.00 TO NODE    101.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==========================================================================
  *USER SPECIFIED(SUBAREA):
```

```
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .2000
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   122.00
  UPSTREAM ELEVATION(FEET) =   1298.60
  DOWNSTREAM ELEVATION(FEET) =   1297.60
  ELEVATION DIFFERENCE(FEET) =      1.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =   13.716
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    62.79
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.085
  SUBAREA RUNOFF(CFS) =      0.10
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.10

****************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1297.60  DOWNSTREAM(FEET) =   1296.80
  CHANNEL LENGTH THRU SUBAREA(FEET) =   150.00   CHANNEL SLOPE =  0.0053
  CHANNEL BASE(FEET) =   20.00   "Z" FACTOR =  50.000
  MANNING'S FACTOR = 0.035   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.716
  *USER SPECIFIED(SUBAREA):
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .2000
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.21
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.29
  AVERAGE FLOW DEPTH(FEET) =   0.03   TRAVEL TIME(MIN.) =   8.58
  Tc(MIN.) =   22.30
  SUBAREA AREA(ACRES) =     0.28       SUBAREA RUNOFF(CFS) =    0.21
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.200
  TOTAL AREA(ACRES) =        0.4         PEAK FLOW RATE(CFS) =       0.28

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.04   FLOW VELOCITY(FEET/SEC.) =   0.31
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    102.00 =     272.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    103.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1296.80  DOWNSTREAM(FEET) =   1293.30
  CHANNEL LENGTH THRU SUBAREA(FEET) =   221.00   CHANNEL SLOPE =  0.0158
  CHANNEL BASE(FEET) =    5.00   "Z" FACTOR =  50.000
  MANNING'S FACTOR = 0.035   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.302
  *USER SPECIFIED(SUBAREA):
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
```

```
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.60
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.82
  AVERAGE FLOW DEPTH(FEET) =   0.08   TRAVEL TIME(MIN.) =   4.49
  Tc(MIN.) =   26.79
  SUBAREA AREA(ACRES) =     0.55       SUBAREA RUNOFF(CFS) =    0.64
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.289
  TOTAL AREA(ACRES) =        0.9         PEAK FLOW RATE(CFS) =       0.89

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.10   FLOW VELOCITY(FEET/SEC.) =   0.87
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    103.00 =     493.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    103.00 TO NODE    104.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1293.30  DOWNSTREAM(FEET) =  1293.20
  FLOW LENGTH(FEET) =    47.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  18.0 INCH PIPE IS   5.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   2.06
  GIVEN PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.89
  PIPE TRAVEL TIME(MIN.) =   0.38    Tc(MIN.) =   27.17
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    104.00 =     540.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        0.9  TC(MIN.) =     27.17
  PEAK FLOW RATE(CFS)   =       0.89
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

Drains to the north within an existing graded channel to the existing storm drain under-crossings located at the intersection of Sunday Drive and Valley Center Road which outlet to Moosa Creek.

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

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                              Analysis prepared by:

                               Alidade Engineering
                               41743 Enterprise Circle North, Suite 209
                               Temecula, CA  92590

 ************************** DESCRIPTION OF STUDY **************************
* LIBERTY BELL PLAZA                                                      *
* 100-YEAR STORM EVENT                                                    *
* EXISTING CONDITION BASIN B                                              *
 **************************************************************************

  FILE NAME: E17228B.DAT
  TIME/DATE OF STUDY: 12:57 04/10/2019
--------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
--------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   3.700
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   6.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150
  2   36.0     31.0    0.010/0.010/0.020   0.50    1.50 0.0312 0.125 0.0175

  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    200.00 TO NODE    201.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==========================================================================
```

```
  *USER SPECIFIED(SUBAREA):
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    65.00
  UPSTREAM ELEVATION(FEET) =   1299.40
  DOWNSTREAM ELEVATION(FEET) =   1299.00
  ELEVATION DIFFERENCE(FEET) =      0.40
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =   11.729
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    54.62
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.625
  SUBAREA RUNOFF(CFS) =      0.43
  TOTAL AREA(ACRES) =      0.22   TOTAL RUNOFF(CFS) =      0.43

****************************************************************************
  FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1299.00  DOWNSTREAM(FEET) =   1298.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   157.00   CHANNEL SLOPE =  0.0064
  CHANNEL BASE(FEET) =   20.00   "Z" FACTOR =  50.000
  MANNING'S FACTOR = 0.035   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.438
  *USER SPECIFIED(SUBAREA):
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.77
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.50
  AVERAGE FLOW DEPTH(FEET) =   0.07   TRAVEL TIME(MIN.) =   5.21
  Tc(MIN.) =   16.93
  SUBAREA AREA(ACRES) =     0.44       SUBAREA RUNOFF(CFS) =    0.69
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =        0.7         PEAK FLOW RATE(CFS) =       1.02

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.08   FLOW VELOCITY(FEET/SEC.) =   0.54
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    202.00 =     222.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    203.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1298.00  DOWNSTREAM(FEET) =   1297.60
  CHANNEL LENGTH THRU SUBAREA(FEET) =   200.00   CHANNEL SLOPE =  0.0020
  CHANNEL BASE(FEET) =   20.00   "Z" FACTOR =  50.000
  MANNING'S FACTOR = 0.035   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.535
  *USER SPECIFIED(SUBAREA):
```

```
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3400
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.04
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.47
  AVERAGE FLOW DEPTH(FEET) =   0.16   TRAVEL TIME(MIN.) =   7.16
  Tc(MIN.) =   24.09
  SUBAREA AREA(ACRES) =     1.68       SUBAREA RUNOFF(CFS) =    2.03
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.343
  TOTAL AREA(ACRES) =        2.3         PEAK FLOW RATE(CFS) =       2.84

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.19   FLOW VELOCITY(FEET/SEC.) =   0.51
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    203.00 =     422.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    203.00 TO NODE    204.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1297.60  DOWNSTREAM(FEET) =   1297.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   132.00   CHANNEL SLOPE =  0.0045
  CHANNEL BASE(FEET) =   20.00   "Z" FACTOR =  50.000
  MANNING'S FACTOR = 0.035   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.283
  *USER SPECIFIED(SUBAREA):
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3300
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.71
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.75
  AVERAGE FLOW DEPTH(FEET) =   0.17   TRAVEL TIME(MIN.) =   2.93
  Tc(MIN.) =   27.03
  SUBAREA AREA(ACRES) =     1.60       SUBAREA RUNOFF(CFS) =    1.74
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.338
  TOTAL AREA(ACRES) =        3.9         PEAK FLOW RATE(CFS) =       4.38

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.19   FLOW VELOCITY(FEET/SEC.) =   0.79
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    204.00 =     554.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    204.00 TO NODE    205.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1297.00  DOWNSTREAM(FEET) =   1295.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   144.00   CHANNEL SLOPE =  0.0139
  CHANNEL BASE(FEET) =   20.00   "Z" FACTOR =  50.000
  MANNING'S FACTOR = 0.035   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.131
  *USER SPECIFIED(SUBAREA):
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
```

```
   TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       4.70
   TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.16
   AVERAGE FLOW DEPTH(FEET) =   0.15   TRAVEL TIME(MIN.) =   2.07
   Tc(MIN.) =   29.09
   SUBAREA AREA(ACRES) =     0.58       SUBAREA RUNOFF(CFS) =    0.64
   AREA-AVERAGE RUNOFF COEFFICIENT =  0.339
   TOTAL AREA(ACRES) =        4.5         PEAK FLOW RATE(CFS) =       4.81

   END OF SUBAREA CHANNEL FLOW HYDRAULICS:
   DEPTH(FEET) =  0.15   FLOW VELOCITY(FEET/SEC.) =   1.19
   LONGEST FLOWPATH FROM NODE    200.00 TO NODE    205.00 =     698.00 FEET.
 ============================================================================
   END OF STUDY SUMMARY:
   TOTAL AREA(ACRES)     =        4.5  TC(MIN.) =     29.09
   PEAK FLOW RATE(CFS)   =       4.81
 ============================================================================
 ============================================================================
   END OF RATIONAL METHOD ANALYSIS
```

Drains to the existing 10’ x 5’ public box culvert located in Valley Center Road that outlets to Moosa Creek.

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

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                              Analysis prepared by:

                               Alidade Engineering
                               41743 Enterprise Circle North, Suite 209
                               Temecula, CA  92590

 ************************** DESCRIPTION OF STUDY **************************
* LIBERTY BELL PLAZA                                                      *
* 100-YEAR STORM EVENT                                                    *
* EXISTING CONDITION BASIN C                                              *
 **************************************************************************

  FILE NAME: E17228C.DAT
  TIME/DATE OF STUDY: 13:44 04/10/2019
--------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
--------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   3.700
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   8.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 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    300.00 TO NODE    301.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==========================================================================
  *USER SPECIFIED(SUBAREA):
```

```
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    70.00
  UPSTREAM ELEVATION(FEET) =   1301.70
  DOWNSTREAM ELEVATION(FEET) =   1300.78
  ELEVATION DIFFERENCE(FEET) =      0.92
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =   10.312
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.112
  SUBAREA RUNOFF(CFS) =      0.12
  TOTAL AREA(ACRES) =      0.05   TOTAL RUNOFF(CFS) =      0.12

****************************************************************************
  FLOW PROCESS FROM NODE    301.00 TO NODE    302.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1300.78  DOWNSTREAM(FEET) =   1300.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   218.00   CHANNEL SLOPE =  0.0036
  CHANNEL BASE(FEET) =   20.00   "Z" FACTOR =  50.000
  MANNING'S FACTOR = 0.035   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.730
  *USER SPECIFIED(SUBAREA):
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.33
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.31
  AVERAGE FLOW DEPTH(FEET) =   0.05   TRAVEL TIME(MIN.) =  11.86
  Tc(MIN.) =   22.17
  SUBAREA AREA(ACRES) =     0.32       SUBAREA RUNOFF(CFS) =    0.42
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =        0.4         PEAK FLOW RATE(CFS) =       0.49

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.06   FLOW VELOCITY(FEET/SEC.) =   0.37
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    302.00 =     288.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    302.00 TO NODE    303.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1300.00  DOWNSTREAM(FEET) =   1298.70
  CHANNEL LENGTH THRU SUBAREA(FEET) =   251.80   CHANNEL SLOPE =  0.0052
  CHANNEL BASE(FEET) =   20.00   "Z" FACTOR =  50.000
  MANNING'S FACTOR = 0.035   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  3.072
  *USER SPECIFIED(SUBAREA):
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.17
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.54
  AVERAGE FLOW DEPTH(FEET) =   0.09   TRAVEL TIME(MIN.) =   7.79
```

```
  Tc(MIN.) =   29.96
  SUBAREA AREA(ACRES) =     1.25       SUBAREA RUNOFF(CFS) =    1.35
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =        1.6         PEAK FLOW RATE(CFS) =       1.75

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.11   FLOW VELOCITY(FEET/SEC.) =   0.61
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    303.00 =     539.80 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    303.00 TO NODE    304.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1298.70  DOWNSTREAM(FEET) =   1291.65
  CHANNEL LENGTH THRU SUBAREA(FEET) =   313.80   CHANNEL SLOPE =  0.0225
  CHANNEL BASE(FEET) =    4.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.035   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.929
  *USER SPECIFIED(SUBAREA):
  NATURAL DESERT LANDSCAPING RUNOFF COEFFICIENT = .3500
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.47
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.28
  AVERAGE FLOW DEPTH(FEET) =   0.24   TRAVEL TIME(MIN.) =   2.29
  Tc(MIN.) =   32.26
  SUBAREA AREA(ACRES) =     1.39       SUBAREA RUNOFF(CFS) =    1.43
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.350
  TOTAL AREA(ACRES) =        3.0         PEAK FLOW RATE(CFS) =       3.10

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.28   FLOW VELOCITY(FEET/SEC.) =   2.45
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    304.00 =     853.60 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        3.0  TC(MIN.) =     32.26
  PEAK FLOW RATE(CFS)   =       3.10
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

Gets intercepted by the existing headwall at the upstream end of the existing 10’ x 5’ box culvert that outlets to Moosa Creek.

DEVELOPED CONDITION 100-YEAR CALCULATIONS

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

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                              Analysis prepared by:

                               Alidade Engineering
                               41743 Enterprise Circle North, Suite 209
                               Temecula, CA  92590

 ************************** DESCRIPTION OF STUDY **************************
* LIBERTY BELL PLAZA                                                      *
* 100-YEAR STORM EVENT                                                    *
* DEVELOPED CONDITION BIO BASIN 1                                         *
 **************************************************************************

  FILE NAME: D228B1A.DAT
  TIME/DATE OF STUDY: 13:46 04/09/2019
--------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
--------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   3.700
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   8.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 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    600.00 TO NODE    601.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==========================================================================
  *USER SPECIFIED(SUBAREA):
```

```
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8700
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =   1301.78
  DOWNSTREAM ELEVATION(FEET) =   1300.10
  ELEVATION DIFFERENCE(FEET) =      1.68
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.918
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    70.20
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  9.749
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      1.20
  TOTAL AREA(ACRES) =      0.14   TOTAL RUNOFF(CFS) =      1.20

****************************************************************************
  FLOW PROCESS FROM NODE    601.00 TO NODE    602.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1300.10  DOWNSTREAM(FEET) =   1297.96
  CHANNEL LENGTH THRU SUBAREA(FEET) =   175.00   CHANNEL SLOPE =  0.0122
  CHANNEL BASE(FEET) =   20.00   "Z" FACTOR =  50.000
  MANNING'S FACTOR = 0.018   MAXIMUM DEPTH(FEET) =   0.60
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  9.749
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8800
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.69
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.70
  AVERAGE FLOW DEPTH(FEET) =   0.09   TRAVEL TIME(MIN.) =   1.71
  Tc(MIN.) =    4.63
  SUBAREA AREA(ACRES) =     0.58       SUBAREA RUNOFF(CFS) =    4.99
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.878
  TOTAL AREA(ACRES) =        0.7         PEAK FLOW RATE(CFS) =       6.19

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.12   FLOW VELOCITY(FEET/SEC.) =   2.00
  LONGEST FLOWPATH FROM NODE    600.00 TO NODE    602.00 =     275.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    602.00 TO NODE    603.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1295.35  DOWNSTREAM(FEET) =  1294.98
  FLOW LENGTH(FEET) =    73.00   MANNING'S N =  0.013
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.15
  (PIPE FLOW VELOCITY CORRESPONDING TO FULL PIPE CAPACITY FLOW)
```

```
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   2
  PIPE-FLOW(CFS) =       6.19
  PIPE TRAVEL TIME(MIN.) =   0.39    Tc(MIN.) =    5.02
  LONGEST FLOWPATH FROM NODE    600.00 TO NODE    603.00 =     348.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    602.00 TO NODE    603.00 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.) =    5.02
  RAINFALL INTENSITY(INCH/HR) =   9.73
  TOTAL STREAM AREA(ACRES) =     0.72
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      6.19

****************************************************************************
  FLOW PROCESS FROM NODE    610.00 TO NODE    611.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8600
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    88.00
  UPSTREAM ELEVATION(FEET) =   1301.48
  DOWNSTREAM ELEVATION(FEET) =   1299.60
  ELEVATION DIFFERENCE(FEET) =      1.88
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.931
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    76.36
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  9.749
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      2.05
  TOTAL AREA(ACRES) =      0.24   TOTAL RUNOFF(CFS) =      2.05

****************************************************************************
  FLOW PROCESS FROM NODE    611.00 TO NODE    603.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1296.60  DOWNSTREAM(FEET) =  1295.15
  FLOW LENGTH(FEET) =   221.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   7.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.90
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       2.05
  PIPE TRAVEL TIME(MIN.) =   0.94    Tc(MIN.) =    3.87
  LONGEST FLOWPATH FROM NODE    610.00 TO NODE    603.00 =     309.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    611.00 TO NODE    603.00 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.) =    3.87
  RAINFALL INTENSITY(INCH/HR) =   9.75
  TOTAL STREAM AREA(ACRES) =     0.24
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      2.05

****************************************************************************
  FLOW PROCESS FROM NODE    620.00 TO NODE    603.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8100
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    54.00
  UPSTREAM ELEVATION(FEET) =   1300.32
  DOWNSTREAM ELEVATION(FEET) =   1299.18
  ELEVATION DIFFERENCE(FEET) =      1.14
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.990
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  9.749
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.55
  TOTAL AREA(ACRES) =      0.07   TOTAL RUNOFF(CFS) =      0.55

****************************************************************************
  FLOW PROCESS FROM NODE    620.00 TO NODE    603.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
  TIME OF CONCENTRATION(MIN.) =    2.99
  RAINFALL INTENSITY(INCH/HR) =   9.75
  TOTAL STREAM AREA(ACRES) =     0.07
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.55

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        6.19     5.02        9.728          0.72
      2        2.05     3.87        9.749          0.24
      3        0.55     2.99        9.749          0.07

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

  ** PEAK FLOW RATE TABLE **
```

```
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1        5.82     2.99       9.749
      2        7.38     3.87       9.749
      3        8.78     5.02       9.728

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       8.78   Tc(MIN.) =    5.02
  TOTAL AREA(ACRES) =        1.0
  LONGEST FLOWPATH FROM NODE    600.00 TO NODE    603.00 =     348.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    603.00 TO NODE    604.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1294.65  DOWNSTREAM(FEET) =  1294.50
  FLOW LENGTH(FEET) =    30.00   MANNING'S N =  0.013
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.13
  (PIPE FLOW VELOCITY CORRESPONDING TO FULL PIPE CAPACITY FLOW)
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   2
  PIPE-FLOW(CFS) =       8.78
  PIPE TRAVEL TIME(MIN.) =   0.16    Tc(MIN.) =    5.18
  LONGEST FLOWPATH FROM NODE    600.00 TO NODE    604.00 =     378.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    604.00 TO NODE    605.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1294.50  DOWNSTREAM(FEET) =   1293.95
  CHANNEL LENGTH THRU SUBAREA(FEET) =   110.00   CHANNEL SLOPE =  0.0050
  CHANNEL BASE(FEET) =   14.00   "Z" FACTOR =   2.500
  MANNING'S FACTOR = 0.035   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  8.415
  *USER SPECIFIED(SUBAREA):
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .7700
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      11.23
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.66
  AVERAGE FLOW DEPTH(FEET) =   0.45   TRAVEL TIME(MIN.) =   1.10
  Tc(MIN.) =    6.28
  SUBAREA AREA(ACRES) =     0.75       SUBAREA RUNOFF(CFS) =    4.88
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.827
  TOTAL AREA(ACRES) =        1.8         PEAK FLOW RATE(CFS) =      12.46

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.48   FLOW VELOCITY(FEET/SEC.) =   1.72
  LONGEST FLOWPATH FROM NODE    600.00 TO NODE    605.00 =     488.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
```

```
  TOTAL AREA(ACRES)     =        1.8  TC(MIN.) =      6.28
  PEAK FLOW RATE(CFS)   =      12.46
================================================================================
================================================================================
  END OF RATIONAL METHOD ANALYSIS

Inflow to Bio Basin No. 1.
```

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

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
          (c) Copyright 1982-2010 Advanced Engineering Software (aes)
              Ver. 17.0 Release Date: 07/01/2010  License ID 1630

                              Analysis prepared by:

                               Alidade Engineering
                               41743 Enterprise Circle North, Suite 209
                               Temecula, CA  92590

 ************************** DESCRIPTION OF STUDY **************************
* LIBERTY BELL PLAZA                                                      *
* 100-YEAR STORM EVENT                                                    *
* DEVELOPED CONDITION BIO BASIN 2                                         *
 **************************************************************************

  FILE NAME: 1.DAT
  TIME/DATE OF STUDY: 14:18 04/09/2019
--------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
--------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   3.700
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   8.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150
  2   26.0     21.0    0.045/0.045/0.020   0.50    1.50 0.0312 0.125 0.0175
  3   26.0     21.0    0.010/0.010/0.020   0.50    1.50 0.0312 0.125 0.0175
  4   36.0     31.0    0.010/0.010/0.020   0.50    1.50 0.0312 0.125 0.0175

  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    200.00 TO NODE    201.00 IS CODE =  21
--------------------------------------------------------------------------
```

```
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
================================================================================
  *USER SPECIFIED(SUBAREA):
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8700
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    73.50
  UPSTREAM ELEVATION(FEET) =   1302.98
  DOWNSTREAM ELEVATION(FEET) =   1301.82
  ELEVATION DIFFERENCE(FEET) =      1.16
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.947
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    68.67
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  9.749
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.84
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.84

****************************************************************************
  FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  91
----------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
================================================================================
  UPSTREAM NODE ELEVATION(FEET) =   1301.82
  DOWNSTREAM NODE ELEVATION(FEET) =   1300.95
  CHANNEL LENGTH THRU SUBAREA(FEET) =   156.00
  "V" GUTTER WIDTH(FEET) =   3.00   GUTTER HIKE(FEET) =  0.130
  PAVEMENT LIP(FEET) =  0.010   MANNING'S N = .0150
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.03000
  MAXIMUM DEPTH(FEET) =   0.50
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  9.749
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8200
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      2.11
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.89
  AVERAGE FLOW DEPTH(FEET) =   0.26   FLOOD WIDTH(FEET) =   11.30
  "V" GUTTER FLOW TRAVEL TIME(MIN.) =   1.38   Tc(MIN.) =    4.32
  SUBAREA AREA(ACRES) =    0.32       SUBAREA RUNOFF(CFS) =    2.53
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.832
  TOTAL AREA(ACRES) =        0.4         PEAK FLOW RATE(CFS) =       3.37

  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  0.31   FLOOD WIDTH(FEET) =   14.11
  FLOW VELOCITY(FEET/SEC.) =   2.04   DEPTH*VELOCITY(FT*FT/SEC) =   0.63
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    202.00 =     229.50 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    203.00 IS CODE =  61
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STANDARD CURB SECTION USED)<<<<<
```

```
==========================================================================
  UPSTREAM ELEVATION(FEET) = 1300.95  DOWNSTREAM ELEVATION(FEET) = 1300.47
  STREET LENGTH(FEET) =    32.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 26.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  21.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.045
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.045

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0175
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.88
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.41
    HALFSTREET FLOOD WIDTH(FEET) =    7.15
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.12
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.28
  STREET FLOW TRAVEL TIME(MIN.) =   0.17   Tc(MIN.) =    4.49
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  9.749
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8600
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.838
  SUBAREA AREA(ACRES) =    0.12      SUBAREA RUNOFF(CFS) =    1.01
  TOTAL AREA(ACRES) =        0.5        PEAK FLOW RATE(CFS) =       4.38

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.43   HALFSTREET FLOOD WIDTH(FEET) =   7.52
  FLOW VELOCITY(FEET/SEC.) =  3.21   DEPTH*VELOCITY(FT*FT/SEC.) =   1.37
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    203.00 =     261.50 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    203.00 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.) =    4.49
  RAINFALL INTENSITY(INCH/HR) =   9.75
  TOTAL STREAM AREA(ACRES) =     0.54
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      4.38

****************************************************************************
  FLOW PROCESS FROM NODE    210.00 TO NODE    203.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .7200
```

```
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    75.00
  UPSTREAM ELEVATION(FEET) =   1302.10
  DOWNSTREAM ELEVATION(FEET) =   1300.47
  ELEVATION DIFFERENCE(FEET) =      1.63
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.573
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  9.749
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.41
  TOTAL AREA(ACRES) =      0.06   TOTAL RUNOFF(CFS) =      0.41

****************************************************************************
  FLOW PROCESS FROM NODE    210.00 TO NODE    203.00 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.) =    4.57
  RAINFALL INTENSITY(INCH/HR) =   9.75
  TOTAL STREAM AREA(ACRES) =     0.06
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.41

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        4.38     4.49        9.749          0.54
      2        0.41     4.57        9.749          0.06

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1        4.79     4.49       9.749
      2        4.79     4.57       9.749

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       4.79   Tc(MIN.) =    4.57
  TOTAL AREA(ACRES) =        0.6
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    203.00 =     261.50 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    203.00 TO NODE    204.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1297.30  DOWNSTREAM(FEET) =  1295.15
  FLOW LENGTH(FEET) =   421.50   MANNING'S N =  0.013
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.16
```

```
  (PIPE FLOW VELOCITY CORRESPONDING TO FULL PIPE CAPACITY FLOW)
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       4.79
  PIPE TRAVEL TIME(MIN.) =   2.23    Tc(MIN.) =    6.80
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    204.00 =     683.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    203.00 TO NODE    204.00 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.) =    6.80
  RAINFALL INTENSITY(INCH/HR) =   8.00
  TOTAL STREAM AREA(ACRES) =     0.60
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      4.79

****************************************************************************
  FLOW PROCESS FROM NODE    220.00 TO NODE    221.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8100
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   100.00
  UPSTREAM ELEVATION(FEET) =   1302.65
  DOWNSTREAM ELEVATION(FEET) =   1300.70
  ELEVATION DIFFERENCE(FEET) =      1.95
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.600
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    74.25
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  9.749
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.54
  TOTAL AREA(ACRES) =      0.07   TOTAL RUNOFF(CFS) =      0.54

****************************************************************************
  FLOW PROCESS FROM NODE    221.00 TO NODE    222.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1300.70  DOWNSTREAM(FEET) =   1298.87
  CHANNEL LENGTH THRU SUBAREA(FEET) =   174.00   CHANNEL SLOPE =  0.0105
  CHANNEL BASE(FEET) =   20.00   "Z" FACTOR =  50.000
  MANNING'S FACTOR = 0.018   MAXIMUM DEPTH(FEET) =   0.50
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  9.316
  *USER SPECIFIED(SUBAREA):
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
```

```
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.93
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.64
  AVERAGE FLOW DEPTH(FEET) =   0.10   TRAVEL TIME(MIN.) =   1.76
  Tc(MIN.) =    5.36
  SUBAREA AREA(ACRES) =     0.86       SUBAREA RUNOFF(CFS) =    6.79
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.847
  TOTAL AREA(ACRES) =        0.9         PEAK FLOW RATE(CFS) =       7.30

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.13   FLOW VELOCITY(FEET/SEC.) =   2.03
  LONGEST FLOWPATH FROM NODE    220.00 TO NODE    222.00 =     274.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    222.00 TO NODE    204.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1298.87  DOWNSTREAM(FEET) =   1297.42
  CHANNEL LENGTH THRU SUBAREA(FEET) =   106.00   CHANNEL SLOPE =  0.0137
  CHANNEL BASE(FEET) =   20.00   "Z" FACTOR =  30.000
  MANNING'S FACTOR = 0.018   MAXIMUM DEPTH(FEET) =   0.50
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  8.669
  *USER SPECIFIED(SUBAREA):
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8700
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      12.12
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.79
  AVERAGE FLOW DEPTH(FEET) =   0.17   TRAVEL TIME(MIN.) =   0.63
  Tc(MIN.) =    6.00
  SUBAREA AREA(ACRES) =     1.28       SUBAREA RUNOFF(CFS) =    9.66
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.860
  TOTAL AREA(ACRES) =        2.2         PEAK FLOW RATE(CFS) =      16.45

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.21   FLOW VELOCITY(FEET/SEC.) =   3.00
  LONGEST FLOWPATH FROM NODE    220.00 TO NODE    204.00 =     380.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    222.00 TO NODE    204.00 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.) =    6.00
  RAINFALL INTENSITY(INCH/HR) =   8.67
  TOTAL STREAM AREA(ACRES) =     2.21
  PEAK FLOW RATE(CFS) AT CONFLUENCE =     16.45

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
```

```
    1        4.79     6.80        7.996          0.60
    2       16.45     6.00        8.669          2.21

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
    1        20.87     6.00       8.669
    2        19.97     6.80       7.996

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      20.87   Tc(MIN.) =    6.00
  TOTAL AREA(ACRES) =        2.8
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    204.00 =     683.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    204.00 TO NODE    205.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1295.05  DOWNSTREAM(FEET) =  1295.00
  FLOW LENGTH(FEET) =    10.00   MANNING'S N =  0.013
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.13
  (PIPE FLOW VELOCITY CORRESPONDING TO FULL PIPE CAPACITY FLOW)
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   2
  PIPE-FLOW(CFS) =      20.87
  PIPE TRAVEL TIME(MIN.) =   0.05    Tc(MIN.) =    6.05
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    205.00 =     693.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    205.00 TO NODE    206.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1295.00  DOWNSTREAM(FEET) =   1294.75
  CHANNEL LENGTH THRU SUBAREA(FEET) =    50.00   CHANNEL SLOPE =  0.0050
  CHANNEL BASE(FEET) =   15.00   "Z" FACTOR =   2.500
  MANNING'S FACTOR = 0.035   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  8.264
  *USER SPECIFIED(SUBAREA):
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .3600
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      21.28
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.04
  AVERAGE FLOW DEPTH(FEET) =   0.63   TRAVEL TIME(MIN.) =   0.41
  Tc(MIN.) =    6.46
  SUBAREA AREA(ACRES) =     0.27       SUBAREA RUNOFF(CFS) =    0.81
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.809
  TOTAL AREA(ACRES) =        3.1         PEAK FLOW RATE(CFS) =      20.87
```

```
  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.62   FLOW VELOCITY(FEET/SEC.) =   2.03
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    206.00 =     743.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        3.1  TC(MIN.) =      6.46
  PEAK FLOW RATE(CFS)   =      20.87
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

Inflow to Bio Basin No. 2.

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

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
          (c) Copyright 1982-2010 Advanced Engineering Software (aes)
              Ver. 17.0 Release Date: 07/01/2010  License ID 1630

                              Analysis prepared by:

                               Alidade Engineering
                               41743 Enterprise Circle North, Suite 209
                               Temecula, CA  92590

 ************************** DESCRIPTION OF STUDY **************************
* LIBERTY BELL PLAZA                                                      *
* 100-YEAR STORM EVENT                                                    *
* DEVELOPED CONDITION BIO BASIN 3                                         *
 **************************************************************************

  FILE NAME: D228B3A.DAT
  TIME/DATE OF STUDY: 14:48 04/09/2019
--------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
--------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   3.700
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   8.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150
  2   26.0     21.0    0.010/0.010/0.020   0.50    1.50 0.0312 0.125 0.0175

  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    240.00 TO NODE    241.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==========================================================================
```

```
  *USER SPECIFIED(SUBAREA):
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .9000
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    90.00
  UPSTREAM ELEVATION(FEET) =   1301.40
  DOWNSTREAM ELEVATION(FEET) =   1299.52
  ELEVATION DIFFERENCE(FEET) =      1.88
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.453
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    75.89
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  9.749
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.22
  TOTAL AREA(ACRES) =      0.03   TOTAL RUNOFF(CFS) =      0.22

****************************************************************************
  FLOW PROCESS FROM NODE    241.00 TO NODE    242.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1299.52  DOWNSTREAM(FEET) =   1297.88
  CHANNEL LENGTH THRU SUBAREA(FEET) =    93.00   CHANNEL SLOPE =  0.0176
  CHANNEL BASE(FEET) =    0.00   "Z" FACTOR =  99.990
  MANNING'S FACTOR = 0.018   MAXIMUM DEPTH(FEET) =   0.50
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  9.749
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8900
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.91
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.38
  AVERAGE FLOW DEPTH(FEET) =   0.08   TRAVEL TIME(MIN.) =   1.12
  Tc(MIN.) =    3.57
  SUBAREA AREA(ACRES) =     0.16       SUBAREA RUNOFF(CFS) =    1.38
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.891
  TOTAL AREA(ACRES) =        0.2         PEAK FLOW RATE(CFS) =       1.60

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.10   FLOW VELOCITY(FEET/SEC.) =   1.54
  LONGEST FLOWPATH FROM NODE    240.00 TO NODE    242.00 =     183.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    242.00 TO NODE    243.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) = 1297.88  DOWNSTREAM ELEVATION(FEET) = 1297.00
  STREET LENGTH(FEET) =    84.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 26.00
```

```
  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  21.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.010
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.010

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0175
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0175

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.36
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.30
    HALFSTREET FLOOD WIDTH(FEET) =   15.91
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.69
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.51
  STREET FLOW TRAVEL TIME(MIN.) =   0.83   Tc(MIN.) =    4.40
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  9.749
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8000
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.844
  SUBAREA AREA(ACRES) =    0.19      SUBAREA RUNOFF(CFS) =    1.51
  TOTAL AREA(ACRES) =        0.4        PEAK FLOW RATE(CFS) =       3.11

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.32   HALFSTREET FLOOD WIDTH(FEET) =  17.88
  FLOW VELOCITY(FEET/SEC.) =  1.80   DEPTH*VELOCITY(FT*FT/SEC.) =   0.58
  LONGEST FLOWPATH FROM NODE    240.00 TO NODE    243.00 =     267.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    243.00 TO NODE    244.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1294.00  DOWNSTREAM(FEET) =  1293.75
  FLOW LENGTH(FEET) =    23.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   8.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.19
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.11
  PIPE TRAVEL TIME(MIN.) =   0.07    Tc(MIN.) =    4.48
  LONGEST FLOWPATH FROM NODE    240.00 TO NODE    244.00 =     290.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    243.00 TO NODE    244.00 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.) =    4.48
  RAINFALL INTENSITY(INCH/HR) =   9.75
```

```
  TOTAL STREAM AREA(ACRES) =     0.38
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      3.11

****************************************************************************
  FLOW PROCESS FROM NODE    250.00 TO NODE    251.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .9000
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    72.00
  UPSTREAM ELEVATION(FEET) =   1298.00
  DOWNSTREAM ELEVATION(FEET) =   1296.30
  ELEVATION DIFFERENCE(FEET) =      1.70
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.294
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  9.749
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.46
  TOTAL AREA(ACRES) =      0.05   TOTAL RUNOFF(CFS) =      0.46

****************************************************************************
  FLOW PROCESS FROM NODE    251.00 TO NODE    244.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1292.30  DOWNSTREAM(FEET) =  1291.88
  FLOW LENGTH(FEET) =    42.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN   8.0 INCH PIPE IS   3.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.17
  GIVEN PIPE DIAMETER(INCH) =   8.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.46
  PIPE TRAVEL TIME(MIN.) =   0.22    Tc(MIN.) =    2.52
  LONGEST FLOWPATH FROM NODE    250.00 TO NODE    244.00 =     114.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    251.00 TO NODE    244.00 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.) =    2.52
  RAINFALL INTENSITY(INCH/HR) =   9.75
  TOTAL STREAM AREA(ACRES) =     0.05
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.46

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        3.11     4.48        9.749          0.38
      2        0.46     2.52        9.749          0.05
```

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1        2.20     2.52       9.749
      2        3.57     4.48       9.749

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       3.57   Tc(MIN.) =    4.48
  TOTAL AREA(ACRES) =        0.4
  LONGEST FLOWPATH FROM NODE    240.00 TO NODE    244.00 =     290.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    244.00 TO NODE    245.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  9.749
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .9000
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.8627
  SUBAREA AREA(ACRES) =    0.13   SUBAREA RUNOFF(CFS) =    1.17
  TOTAL AREA(ACRES) =        0.6   TOTAL RUNOFF(CFS) =       4.73
  TC(MIN.) =    4.48

****************************************************************************
  FLOW PROCESS FROM NODE    244.00 TO NODE    245.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1299.00  DOWNSTREAM(FEET) =  1298.80
  FLOW LENGTH(FEET) =    20.00   MANNING'S N =  0.013
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.42
  (PIPE FLOW VELOCITY CORRESPONDING TO FULL PIPE CAPACITY FLOW)
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       4.73
  PIPE TRAVEL TIME(MIN.) =   0.08    Tc(MIN.) =    4.55
  LONGEST FLOWPATH FROM NODE    240.00 TO NODE    245.00 =     310.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    245.00 TO NODE    246.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1298.80  DOWNSTREAM(FEET) =   1298.77
  CHANNEL LENGTH THRU SUBAREA(FEET) =     6.00   CHANNEL SLOPE =  0.0050
```

```
  CHANNEL BASE(FEET) =   20.00   "Z" FACTOR =  50.000
  MANNING'S FACTOR = 0.035   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  9.749
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8100
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       7.59
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.95
  AVERAGE FLOW DEPTH(FEET) =   0.25   TRAVEL TIME(MIN.) =   0.11
  Tc(MIN.) =    4.66
  SUBAREA AREA(ACRES) =     0.72       SUBAREA RUNOFF(CFS) =    5.70
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.833
  TOTAL AREA(ACRES) =        1.3         PEAK FLOW RATE(CFS) =      10.44

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.29   FLOW VELOCITY(FEET/SEC.) =   1.03
  LONGEST FLOWPATH FROM NODE    240.00 TO NODE    246.00 =     316.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        1.3  TC(MIN.) =      4.66
  PEAK FLOW RATE(CFS)   =      10.44
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

Inflow to Bio Basin No. 3.

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

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
          (c) Copyright 1982-2010 Advanced Engineering Software (aes)
              Ver. 17.0 Release Date: 07/01/2010  License ID 1630

                              Analysis prepared by:

                               Alidade Engineering
                               41743 Enterprise Circle North, Suite 209
                               Temecula, CA  92590

 ************************** DESCRIPTION OF STUDY **************************
* LIBERTY BELL PLAZA                                                      *
* 100-YEAR STORM EVENT                                                    *
* DEVELOPED CONDITION BIO BASIN 4                                         *
 **************************************************************************

  FILE NAME: D228B4A.DAT
  TIME/DATE OF STUDY: 14:31 04/09/2019
--------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
--------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   3.700
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   8.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 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    230.00 TO NODE    231.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==========================================================================
  *USER SPECIFIED(SUBAREA):
```

```
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .9000
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    60.00
  UPSTREAM ELEVATION(FEET) =    100.60
  DOWNSTREAM ELEVATION(FEET) =    100.00
  ELEVATION DIFFERENCE(FEET) =      0.60
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.789
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    60.00
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  9.749
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.58
  TOTAL AREA(ACRES) =      0.07   TOTAL RUNOFF(CFS) =      0.58

****************************************************************************
  FLOW PROCESS FROM NODE    231.00 TO NODE    232.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1299.68  DOWNSTREAM(FEET) =  1299.07
  FLOW LENGTH(FEET) =    97.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   3.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   2.77
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.58
  PIPE TRAVEL TIME(MIN.) =   0.58    Tc(MIN.) =    3.37
  LONGEST FLOWPATH FROM NODE    230.00 TO NODE    232.00 =     157.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    231.00 TO NODE    232.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  9.749
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .9000
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.9000
  SUBAREA AREA(ACRES) =    0.08   SUBAREA RUNOFF(CFS) =    0.69
  TOTAL AREA(ACRES) =       0.1   TOTAL RUNOFF(CFS) =       1.27
  TC(MIN.) =    3.37

****************************************************************************
  FLOW PROCESS FROM NODE    232.00 TO NODE    233.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1299.07  DOWNSTREAM(FEET) =  1298.76
  FLOW LENGTH(FEET) =    50.00   MANNING'S N =  0.013
```

```
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   5.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.42
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.27
  PIPE TRAVEL TIME(MIN.) =   0.24    Tc(MIN.) =    3.62
  LONGEST FLOWPATH FROM NODE    230.00 TO NODE    233.00 =     207.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    232.00 TO NODE    233.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  9.749
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .9000
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.9000
  SUBAREA AREA(ACRES) =    0.07   SUBAREA RUNOFF(CFS) =    0.61
  TOTAL AREA(ACRES) =        0.2   TOTAL RUNOFF(CFS) =       1.89
  TC(MIN.) =    3.62

****************************************************************************
  FLOW PROCESS FROM NODE    233.00 TO NODE    234.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1298.76  DOWNSTREAM(FEET) =  1298.40
  FLOW LENGTH(FEET) =    58.00   MANNING'S N =  0.013
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   7.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.76
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       1.89
  PIPE TRAVEL TIME(MIN.) =   0.26    Tc(MIN.) =    3.87
  LONGEST FLOWPATH FROM NODE    230.00 TO NODE    234.00 =     265.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    233.00 TO NODE    234.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  9.749
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .9000
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT = 0.9000
  SUBAREA AREA(ACRES) =    0.08   SUBAREA RUNOFF(CFS) =    0.67
  TOTAL AREA(ACRES) =        0.3   TOTAL RUNOFF(CFS) =       2.55
  TC(MIN.) =    3.87

****************************************************************************
  FLOW PROCESS FROM NODE    234.00 TO NODE    235.00 IS CODE =  51
```

```
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1298.40  DOWNSTREAM(FEET) =   1298.34
  CHANNEL LENGTH THRU SUBAREA(FEET) =    12.00   CHANNEL SLOPE =  0.0050
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   2.000
  MANNING'S FACTOR = 0.035   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  9.749
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .5000
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.67
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.10
  AVERAGE FLOW DEPTH(FEET) =   0.23   TRAVEL TIME(MIN.) =   0.18
  Tc(MIN.) =    4.06
  SUBAREA AREA(ACRES) =     0.05       SUBAREA RUNOFF(CFS) =    0.22
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.845
  TOTAL AREA(ACRES) =        0.3         PEAK FLOW RATE(CFS) =       2.78

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.24   FLOW VELOCITY(FEET/SEC.) =   1.11
  LONGEST FLOWPATH FROM NODE    230.00 TO NODE    235.00 =     277.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        0.3  TC(MIN.) =      4.06
  PEAK FLOW RATE(CFS)   =       2.78
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS

Inflow to Bio Basin No. 4.
```

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

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
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              Ver. 17.0 Release Date: 07/01/2010  License ID 1630

                              Analysis prepared by:

                               Alidade Engineering
                               41743 Enterprise Circle North, Suite 209
                               Temecula, CA  92590

 ************************** DESCRIPTION OF STUDY **************************
* LIBERTY BELL PLAZA                                                      *
* 100-YEAR STORM EVENT                                                    *
* DEVELOPED CONDITION BIO BASIN 5                                         *
 **************************************************************************

  FILE NAME: D228B5A.DAT
  TIME/DATE OF STUDY: 08:28 04/10/2019
--------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
--------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   3.700
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   8.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150
  2   24.0     19.0    0.014/0.014/0.020   0.50    1.50 0.0312 0.125 0.0175
  3   44.0     39.0    0.040/0.040/0.020   0.50    1.50 0.0312 0.125 0.0175
  4   26.0     21.0    0.025/0.025/0.020   0.50    1.50 0.0312 0.125 0.0175

  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    320.00 TO NODE    321.00 IS CODE =  21
--------------------------------------------------------------------------
```

```
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==============================================================================
  *USER SPECIFIED(SUBAREA):
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8800
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    32.00
  UPSTREAM ELEVATION(FEET) =   1302.54
  DOWNSTREAM ELEVATION(FEET) =   1301.91
  ELEVATION DIFFERENCE(FEET) =      0.63
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    1.787
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  9.749
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.12
  TOTAL AREA(ACRES) =      0.01   TOTAL RUNOFF(CFS) =      0.12

******************************************************************************
  FLOW PROCESS FROM NODE    321.00 TO NODE    322.00 IS CODE =  62
------------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
==============================================================================
  UPSTREAM ELEVATION(FEET) = 1301.91  DOWNSTREAM ELEVATION(FEET) = 1300.31
  STREET LENGTH(FEET) =   204.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 24.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  19.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.014
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.014

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0175
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0175

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.72
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.25
    HALFSTREET FLOOD WIDTH(FEET) =    8.01
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.26
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.31
  STREET FLOW TRAVEL TIME(MIN.) =   2.70   Tc(MIN.) =    4.49
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  9.749
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8400
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.843
  SUBAREA AREA(ACRES) =    0.15      SUBAREA RUNOFF(CFS) =    1.20
  TOTAL AREA(ACRES) =        0.2        PEAK FLOW RATE(CFS) =       1.32

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.28   HALFSTREET FLOOD WIDTH(FEET) =  10.68
  FLOW VELOCITY(FEET/SEC.) =  1.43   DEPTH*VELOCITY(FT*FT/SEC.) =   0.41
  LONGEST FLOWPATH FROM NODE    320.00 TO NODE    322.00 =     236.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    321.00 TO NODE    322.00 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.) =    4.49
  RAINFALL INTENSITY(INCH/HR) =   9.75
  TOTAL STREAM AREA(ACRES) =     0.16
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.32

****************************************************************************
  FLOW PROCESS FROM NODE    330.00 TO NODE    331.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8800
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   105.00
  UPSTREAM ELEVATION(FEET) =   1303.00
  DOWNSTREAM ELEVATION(FEET) =   1301.97
  ELEVATION DIFFERENCE(FEET) =      1.03
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.077
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    59.62
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  9.749
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.68
  TOTAL AREA(ACRES) =      0.08   TOTAL RUNOFF(CFS) =      0.68

****************************************************************************
  FLOW PROCESS FROM NODE    331.00 TO NODE    322.00 IS CODE =  91
----------------------------------------------------------------------------
  >>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
============================================================================
  UPSTREAM NODE ELEVATION(FEET) =   1301.97
  DOWNSTREAM NODE ELEVATION(FEET) =   1300.31
  CHANNEL LENGTH THRU SUBAREA(FEET) =   159.00
  "V" GUTTER WIDTH(FEET) =   3.00   GUTTER HIKE(FEET) =  0.130
  PAVEMENT LIP(FEET) =  0.010   MANNING'S N = .0150
  PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.02000
  MAXIMUM DEPTH(FEET) =   0.50
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  9.749
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8600
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      2.46
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.30
```

```
  AVERAGE FLOW DEPTH(FEET) =   0.24   FLOOD WIDTH(FEET) =   13.34
  "V" GUTTER FLOW TRAVEL TIME(MIN.) =   1.15   Tc(MIN.) =    4.23
  SUBAREA AREA(ACRES) =    0.42       SUBAREA RUNOFF(CFS) =    3.55
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.863
  TOTAL AREA(ACRES) =        0.5         PEAK FLOW RATE(CFS) =       4.23

  END OF SUBAREA "V" GUTTER HYDRAULICS:
  DEPTH(FEET) =  0.28   FLOOD WIDTH(FEET) =   17.41
  FLOW VELOCITY(FEET/SEC.) =   2.50   DEPTH*VELOCITY(FT*FT/SEC) =   0.71
  LONGEST FLOWPATH FROM NODE    330.00 TO NODE    322.00 =     264.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    331.00 TO NODE    322.00 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.) =    4.23
  RAINFALL INTENSITY(INCH/HR) =   9.75
  TOTAL STREAM AREA(ACRES) =     0.50
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      4.23

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        1.32     4.49        9.749          0.16
      2        4.23     4.23        9.749          0.50

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1        5.48     4.23       9.749
      2        5.56     4.49       9.749

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       5.56   Tc(MIN.) =    4.49
  TOTAL AREA(ACRES) =        0.7
  LONGEST FLOWPATH FROM NODE    330.00 TO NODE    322.00 =     264.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    322.00 TO NODE    323.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  4 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) = 1300.31  DOWNSTREAM ELEVATION(FEET) = 1299.98
  STREET LENGTH(FEET) =    12.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 26.00
```

```
  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  21.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.025
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.025

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0175
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0175

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       5.76
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.38
    HALFSTREET FLOOD WIDTH(FEET) =   10.64
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.77
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.45
  STREET FLOW TRAVEL TIME(MIN.) =   0.05   Tc(MIN.) =    4.54
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  9.749
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .7900
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.853
  SUBAREA AREA(ACRES) =    0.05      SUBAREA RUNOFF(CFS) =    0.40
  TOTAL AREA(ACRES) =        0.7        PEAK FLOW RATE(CFS) =       5.96

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.39   HALFSTREET FLOOD WIDTH(FEET) =  10.80
  FLOW VELOCITY(FEET/SEC.) =  3.79   DEPTH*VELOCITY(FT*FT/SEC.) =   1.47
  LONGEST FLOWPATH FROM NODE    330.00 TO NODE    323.00 =     276.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    323.00 TO NODE    324.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1297.94  DOWNSTREAM(FEET) =  1297.80
  FLOW LENGTH(FEET) =    14.00   MANNING'S N =  0.013
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.42
  (PIPE FLOW VELOCITY CORRESPONDING TO FULL PIPE CAPACITY FLOW)
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       5.96
  PIPE TRAVEL TIME(MIN.) =   0.05    Tc(MIN.) =    4.59
  LONGEST FLOWPATH FROM NODE    330.00 TO NODE    324.00 =     290.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    324.00 TO NODE    325.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1297.80  DOWNSTREAM(FEET) =   1297.26
  CHANNEL LENGTH THRU SUBAREA(FEET) =   108.00   CHANNEL SLOPE =  0.0050
```

```
  CHANNEL BASE(FEET) =   13.00   "Z" FACTOR =   2.500
  MANNING'S FACTOR = 0.035   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  8.739
  *USER SPECIFIED(SUBAREA):
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .3600
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       6.08
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.35
  AVERAGE FLOW DEPTH(FEET) =   0.33   TRAVEL TIME(MIN.) =   1.33
  Tc(MIN.) =    5.92
  SUBAREA AREA(ACRES) =     0.08       SUBAREA RUNOFF(CFS) =    0.25
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.803
  TOTAL AREA(ACRES) =        0.8         PEAK FLOW RATE(CFS) =       5.96

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.32   FLOW VELOCITY(FEET/SEC.) =   1.33
  LONGEST FLOWPATH FROM NODE    330.00 TO NODE    325.00 =     398.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    324.00 TO NODE    325.00 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.) =    5.92
  RAINFALL INTENSITY(INCH/HR) =   8.74
  TOTAL STREAM AREA(ACRES) =     0.80
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      5.96

****************************************************************************
  FLOW PROCESS FROM NODE    340.00 TO NODE    341.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8800
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    98.50
  UPSTREAM ELEVATION(FEET) =   1302.98
  DOWNSTREAM ELEVATION(FEET) =   1301.16
  ELEVATION DIFFERENCE(FEET) =      1.82
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.752
  WARNING: INITIAL SUBAREA FLOW PATH LENGTH IS GREATER THAN
           THE MAXIMUM OVERLAND FLOW LENGTH =    72.71
           (Reference: Table 3-1B of Hydrology Manual)
           THE MAXIMUM OVERLAND FLOW LENGTH IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  9.749
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.76
  TOTAL AREA(ACRES) =      0.09   TOTAL RUNOFF(CFS) =      0.76

****************************************************************************
  FLOW PROCESS FROM NODE    341.00 TO NODE    342.00 IS CODE =  62
```

```
------------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  3 USED)<<<<<
==============================================================================
  UPSTREAM ELEVATION(FEET) = 1301.16  DOWNSTREAM ELEVATION(FEET) = 1299.87
  STREET LENGTH(FEET) =   197.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 44.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  39.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.040
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.040

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0175
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0175

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.13
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.38
    HALFSTREET FLOOD WIDTH(FEET) =    7.11
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.92
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.73
  STREET FLOW TRAVEL TIME(MIN.) =   1.71   Tc(MIN.) =    4.46
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  9.749
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8500
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.856
  SUBAREA AREA(ACRES) =    0.33      SUBAREA RUNOFF(CFS) =    2.73
  TOTAL AREA(ACRES) =        0.4        PEAK FLOW RATE(CFS) =       3.49

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.44   HALFSTREET FLOOD WIDTH(FEET) =   8.71
  FLOW VELOCITY(FEET/SEC.) =  2.16   DEPTH*VELOCITY(FT*FT/SEC.) =   0.96
  LONGEST FLOWPATH FROM NODE    340.00 TO NODE    342.00 =     295.50 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    342.00 TO NODE    343.00 IS CODE =  41
------------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
==============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1297.92  DOWNSTREAM(FEET) =  1297.80
  FLOW LENGTH(FEET) =    12.00   MANNING'S N =  0.013
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.42
  (PIPE FLOW VELOCITY CORRESPONDING TO FULL PIPE CAPACITY FLOW)
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       3.49
  PIPE TRAVEL TIME(MIN.) =   0.05    Tc(MIN.) =    4.51
  LONGEST FLOWPATH FROM NODE    340.00 TO NODE    343.00 =     307.50 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    343.00 TO NODE    325.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1297.80  DOWNSTREAM(FEET) =   1297.60
  CHANNEL LENGTH THRU SUBAREA(FEET) =    17.00   CHANNEL SLOPE =  0.0118
  CHANNEL BASE(FEET) =   25.00   "Z" FACTOR =   2.500
  MANNING'S FACTOR = 0.035   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  9.749
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .3600
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.53
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.12
  AVERAGE FLOW DEPTH(FEET) =   0.12   TRAVEL TIME(MIN.) =   0.25
  Tc(MIN.) =    4.76
  SUBAREA AREA(ACRES) =     0.02       SUBAREA RUNOFF(CFS) =    0.08
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.829
  TOTAL AREA(ACRES) =        0.4         PEAK FLOW RATE(CFS) =       3.57

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.12   FLOW VELOCITY(FEET/SEC.) =   1.13
  LONGEST FLOWPATH FROM NODE    340.00 TO NODE    325.00 =     324.50 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    343.00 TO NODE    325.00 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.) =    4.76
  RAINFALL INTENSITY(INCH/HR) =   9.75
  TOTAL STREAM AREA(ACRES) =     0.44
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      3.57

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        5.96     5.92        8.739          0.80
      2        3.57     4.76        9.749          0.44

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF      Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1        8.91     4.76        9.749
      2        9.16     5.92        8.739
```

```
  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       9.16   Tc(MIN.) =    5.92
  TOTAL AREA(ACRES) =        1.2
  LONGEST FLOWPATH FROM NODE    330.00 TO NODE    325.00 =     398.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        1.2  TC(MIN.) =      5.92
  PEAK FLOW RATE(CFS)   =       9.16
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

Inflow to Bio Basin No. 5.

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

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
          (c) Copyright 1982-2010 Advanced Engineering Software (aes)
              Ver. 17.0 Release Date: 07/01/2010  License ID 1630

                              Analysis prepared by:

                               Alidade Engineering
                               41743 Enterprise Circle North, Suite 209
                               Temecula, CA  92590

 ************************** DESCRIPTION OF STUDY **************************
* LIBERTY BELL PLAZA                                                      *
* 100-YEAR STORM EVENT                                                    *
* DEVELOPED CONDITOIN BIO BASIN NO. 6                                     *
 **************************************************************************

  FILE NAME: D228B6A.DAT
  TIME/DATE OF STUDY: 08:45 04/10/2019
--------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
--------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   3.700
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   8.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150
  2   41.0     36.0    0.020/0.020/0.020   0.50    1.50 0.0312 0.125 0.0175
  3   12.0      7.0    0.020/0.020/0.020   0.50    1.50 0.0312 0.125 0.0175

  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    380.00 TO NODE    381.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
```

```
==========================================================================
  *USER SPECIFIED(SUBAREA):
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .7800
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    68.00
  UPSTREAM ELEVATION(FEET) =   1302.80
  DOWNSTREAM ELEVATION(FEET) =   1301.25
  ELEVATION DIFFERENCE(FEET) =      1.55
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.609
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  9.749
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.21
  TOTAL AREA(ACRES) =      0.03   TOTAL RUNOFF(CFS) =      0.21

**************************************************************************
  FLOW PROCESS FROM NODE    381.00 TO NODE    382.00 IS CODE =  51
--------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1301.25  DOWNSTREAM(FEET) =   1299.73
  CHANNEL LENGTH THRU SUBAREA(FEET) =    60.00   CHANNEL SLOPE =  0.0253
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =  50.000
  MANNING'S FACTOR = 0.018   MAXIMUM DEPTH(FEET) =   0.50
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  9.749
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8300
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.40
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.28
  AVERAGE FLOW DEPTH(FEET) =   0.03   TRAVEL TIME(MIN.) =   0.78
  Tc(MIN.) =    4.39
  SUBAREA AREA(ACRES) =     0.05       SUBAREA RUNOFF(CFS) =    0.40
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.812
  TOTAL AREA(ACRES) =        0.1         PEAK FLOW RATE(CFS) =       0.60

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.04   FLOW VELOCITY(FEET/SEC.) =   1.45
  LONGEST FLOWPATH FROM NODE    380.00 TO NODE    382.00 =     128.00 FEET.

**************************************************************************
  FLOW PROCESS FROM NODE    382.00 TO NODE    383.00 IS CODE =  62
--------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  2 USED)<<<<<
==========================================================================
  UPSTREAM ELEVATION(FEET) = 1299.73  DOWNSTREAM ELEVATION(FEET) = 1299.10
  STREET LENGTH(FEET) =    51.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 41.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  36.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020
```

```
  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0175
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0175

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.25
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.28
    HALFSTREET FLOOD WIDTH(FEET) =    7.50
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.84
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.51
  STREET FLOW TRAVEL TIME(MIN.) =   0.46   Tc(MIN.) =    4.85
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  9.749
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8400
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.831
  SUBAREA AREA(ACRES) =    0.16      SUBAREA RUNOFF(CFS) =    1.29
  TOTAL AREA(ACRES) =        0.2        PEAK FLOW RATE(CFS) =       1.90

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.31   HALFSTREET FLOOD WIDTH(FEET) =   9.04
  FLOW VELOCITY(FEET/SEC.) =  2.03   DEPTH*VELOCITY(FT*FT/SEC.) =   0.62
  LONGEST FLOWPATH FROM NODE    380.00 TO NODE    383.00 =     179.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    383.00 TO NODE    384.00 IS CODE =  61
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STANDARD CURB SECTION USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) = 1299.10  DOWNSTREAM ELEVATION(FEET) = 1298.25
  STREET LENGTH(FEET) =   172.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 12.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   7.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.020
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.020

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0175
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.77
    ***STREET FLOW SPLITS OVER STREET-CROWN***
    FULL DEPTH(FEET) =    0.37   FLOOD WIDTH(FEET) =   12.00
    FULL HALF-STREET VELOCITY(FEET/SEC.) =    1.50
    SPLIT DEPTH(FEET) =    0.24   SPLIT FLOOD WIDTH(FEET) =    5.46
    SPLIT FLOW(CFS) =    0.44   SPLIT VELOCITY(FEET/SEC.) =    1.04
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.37
```

```
    HALFSTREET FLOOD WIDTH(FEET) =   12.00
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.50
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.55
  STREET FLOW TRAVEL TIME(MIN.) =   1.91   Tc(MIN.) =    6.77
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  8.020
  *USER SPECIFIED(SUBAREA):
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8400
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.836
  SUBAREA AREA(ACRES) =    0.26      SUBAREA RUNOFF(CFS) =    1.74
  TOTAL AREA(ACRES) =        0.5        PEAK FLOW RATE(CFS) =       3.30

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.37   HALFSTREET FLOOD WIDTH(FEET) =  12.00
  FLOW VELOCITY(FEET/SEC.) =  1.50   DEPTH*VELOCITY(FT*FT/SEC.) =   0.55
  LONGEST FLOWPATH FROM NODE    380.00 TO NODE    384.00 =     351.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    384.00 TO NODE    385.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1297.00  DOWNSTREAM(FEET) =   1296.88
  CHANNEL LENGTH THRU SUBAREA(FEET) =    24.00   CHANNEL SLOPE =  0.0050
  CHANNEL BASE(FEET) =   12.00   "Z" FACTOR =   2.500
  MANNING'S FACTOR = 0.035   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.758
  *USER SPECIFIED(SUBAREA):
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .3900
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.41
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.12
  AVERAGE FLOW DEPTH(FEET) =   0.24   TRAVEL TIME(MIN.) =   0.36
  Tc(MIN.) =    7.12
  SUBAREA AREA(ACRES) =     0.07       SUBAREA RUNOFF(CFS) =    0.21
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.781
  TOTAL AREA(ACRES) =        0.6         PEAK FLOW RATE(CFS) =       3.41

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.24   FLOW VELOCITY(FEET/SEC.) =   1.12
  LONGEST FLOWPATH FROM NODE    380.00 TO NODE    385.00 =     375.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        0.6  TC(MIN.) =      7.12
  PEAK FLOW RATE(CFS)   =       3.41
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS

Inflow to Bio Basin No. 6.
```

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

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                              Analysis prepared by:

                               Alidade Engineering
                               41743 Enterprise Circle North, Suite 209
                               Temecula, CA  92590

 ************************** DESCRIPTION OF STUDY **************************
* LIBERTY BELL PLAZA                                                      *
* 100-YEAR STORM EVENT                                                    *
* DEVELOPED CONDITION BASIN D                                             *
 **************************************************************************

  FILE NAME: D17228D.DAT
  TIME/DATE OF STUDY: 09:36 02/22/2019
--------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
--------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   3.700
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   8.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 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    400.00 TO NODE    401.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==========================================================================
  *USER SPECIFIED(SUBAREA):
```

```
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .9000
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =     4.00
  UPSTREAM ELEVATION(FEET) =   1300.08
  DOWNSTREAM ELEVATION(FEET) =   1300.04
  ELEVATION DIFFERENCE(FEET) =      0.04
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    0.720
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  9.749
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.05
  TOTAL AREA(ACRES) =      0.0057   TOTAL RUNOFF(CFS) =      0.05
 ============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        0.0  TC(MIN.) =      0.72
  PEAK FLOW RATE(CFS)   =       0.05
 ============================================================================
 ============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

Sheet flows directly to Valley Center Road where it will get intercepted by a proposed curb inlet.

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

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                              Analysis prepared by:

                               Alidade Engineering
                               41743 Enterprise Circle North, Suite 209
                               Temecula, CA  92590

 ************************** DESCRIPTION OF STUDY **************************
* LIBERTY BELL PLAZA                                                      *
* 100-YEAR STORM EVENT                                                    *
* DEVELOPED CONDITION BASIN E                                             *
 **************************************************************************

  FILE NAME: D17228E.DAT
  TIME/DATE OF STUDY: 12:28 02/22/2019
--------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
--------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   3.700
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   8.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 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    500.00 TO NODE    501.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==========================================================================
  *USER SPECIFIED(SUBAREA):
```

```
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .6900
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =     6.00
  UPSTREAM ELEVATION(FEET) =   1298.51
  DOWNSTREAM ELEVATION(FEET) =   1298.24
  ELEVATION DIFFERENCE(FEET) =      0.27
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    1.095
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  9.749
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.05
  TOTAL AREA(ACRES) =      0.008   TOTAL RUNOFF(CFS) =      0.05
 ============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        0.0  TC(MIN.) =      1.09
  PEAK FLOW RATE(CFS)   =       0.05
 ============================================================================
 ============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

Sheet flows directly to Valley Center Road where it will get intercepted by an existing curb inlet.

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

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                              Analysis prepared by:

                               Alidade Engineering
                               41743 Enterprise Circle North, Suite 209
                               Temecula, CA  92590

 ************************** DESCRIPTION OF STUDY **************************
* LIBERTY BELL PLAZA                                                      *
* 100-YEAR STORM EVENT                                                    *
* DEVELOPED CONDITION BASIN F                                             *
 **************************************************************************

  FILE NAME: D17228F.DAT
  TIME/DATE OF STUDY: 13:36 02/22/2019
--------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
--------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   3.700
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   8.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 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    700.00 TO NODE    701.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==========================================================================
  *USER SPECIFIED(SUBAREA):
```

```
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8400
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    12.00
  UPSTREAM ELEVATION(FEET) =   1797.20
  DOWNSTREAM ELEVATION(FEET) =   1797.12
  ELEVATION DIFFERENCE(FEET) =      0.08
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    1.856
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  9.749
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.66
  TOTAL AREA(ACRES) =      0.08   TOTAL RUNOFF(CFS) =      0.66
 ============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        0.1  TC(MIN.) =      1.86
  PEAK FLOW RATE(CFS)   =       0.66
 ============================================================================
 ============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

Sheet flows onto the adjacent property to the north. Runoff gets intercepted by an existing vegetated channel and conveyed to the existing storm drain under-crossings located at the intersection of Sunday Drive and Valley Center Road.

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

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                              Analysis prepared by:

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                               41743 Enterprise Circle North, Suite 209
                               Temecula, CA  92590

 ************************** DESCRIPTION OF STUDY **************************
* LIBERTY BELL PLAZA                                                      *
* 100-YEAR STORM EVENT                                                    *
* DEVELOPED CONDITION BASIN G                                             *
 **************************************************************************

  FILE NAME: D17228G.DAT
  TIME/DATE OF STUDY: 14:16 04/10/2019
--------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
--------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   3.700
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   8.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 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    800.00 TO NODE    801.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==========================================================================
  *USER SPECIFIED(SUBAREA):
```

```
   GENERAL COMMERCIAL RUNOFF COEFFICIENT = .6300
   S.C.S. CURVE NUMBER (AMC II) =   0
   INITIAL SUBAREA FLOW-LENGTH(FEET) =    33.00
   UPSTREAM ELEVATION(FEET) =   1302.12
   DOWNSTREAM ELEVATION(FEET) =   1293.80
   ELEVATION DIFFERENCE(FEET) =      8.32
   SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.256
   WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
    100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  9.749
   NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
   SUBAREA RUNOFF(CFS) =      0.53
   TOTAL AREA(ACRES) =      0.09   TOTAL RUNOFF(CFS) =      0.53
 ============================================================================
   END OF STUDY SUMMARY:
   TOTAL AREA(ACRES)     =        0.1  TC(MIN.) =      2.26
   PEAK FLOW RATE(CFS)   =       0.53
 ============================================================================
 ============================================================================
   END OF RATIONAL METHOD ANALYSIS
```

Portion of onsite area that does not drain to one of the six proposed biofiltration basins. The runoff from this area will comingle with offsite run-on and get intercepted by the extension of the existing 10’ x 5’ box culvert to the easterly property line.

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

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                              Analysis prepared by:

                               Alidade Engineering
                               41743 Enterprise Circle North, Suite 209
                               Temecula, CA  92590

 ************************** DESCRIPTION OF STUDY **************************
* LIBERTY BELL PLAZA                                                      *
* 100-YEAR STORM EVENT                                                    *
* DEVELOPED CONDITION BASIN H                                             *
 **************************************************************************

  FILE NAME: D17228H.DAT
  TIME/DATE OF STUDY: 14:23 04/10/2019
--------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
--------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   3.700
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   8.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 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    900.00 TO NODE    901.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
==========================================================================
  *USER SPECIFIED(SUBAREA):
```

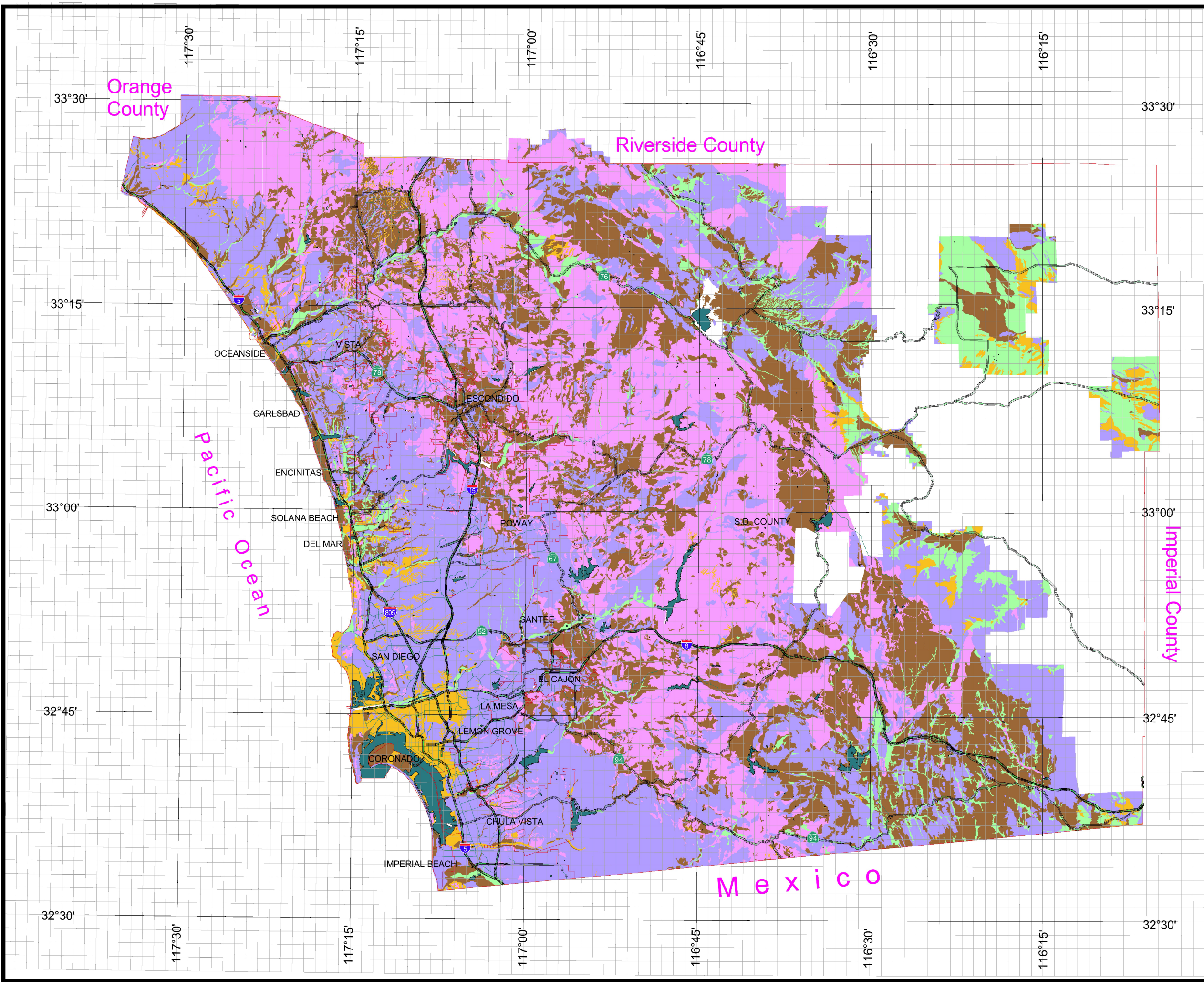
```
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .5000
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    15.00
  UPSTREAM ELEVATION(FEET) =   1307.72
  DOWNSTREAM ELEVATION(FEET) =   1293.88
  ELEVATION DIFFERENCE(FEET) =     13.84
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    1.942
  WARNING: THE MAXIMUM OVERLAND FLOW SLOPE, 10.%, IS USED IN Tc CALCULATION!
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  9.749
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.31
  TOTAL AREA(ACRES) =      0.06   TOTAL RUNOFF(CFS) =      0.31
 ============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        0.1  TC(MIN.) =      1.94
  PEAK FLOW RATE(CFS)   =       0.31
 ============================================================================
 ============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

Portion of the onsite area that does not drain to one of the six proposed biofiltration basins. Runoff from this area will comingle with offsite run-on and get intercepted by a proposed private onsite storm drain which will convey runoff directly to the proposed extension of the 10’ x 5’ box culvert.

Appendix B: San Diego County Hydrology Manual Charts and Nomographs

County of San Diego Hydrology Manual

Soil Hydrologic Groups



Legend

Soil Groups

- Group A
- Group B
- Group C
- Group D
- Undetermined
- Data Unavailable

DPW GIS
Department of Public Works
Geographic Information Services

SanGIS
We Have San Diego Covered!

N
W E
S

3 0 3 Miles

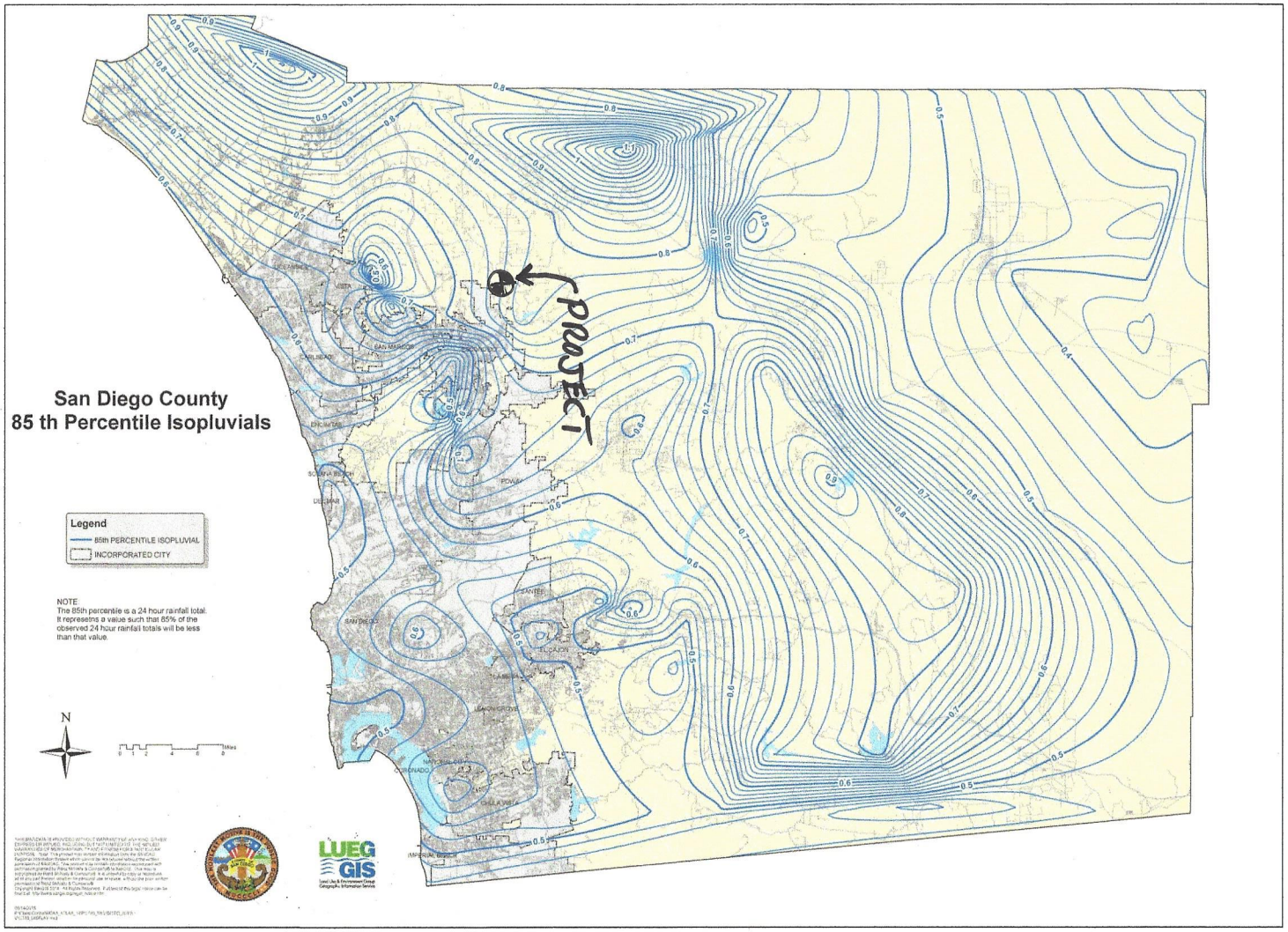
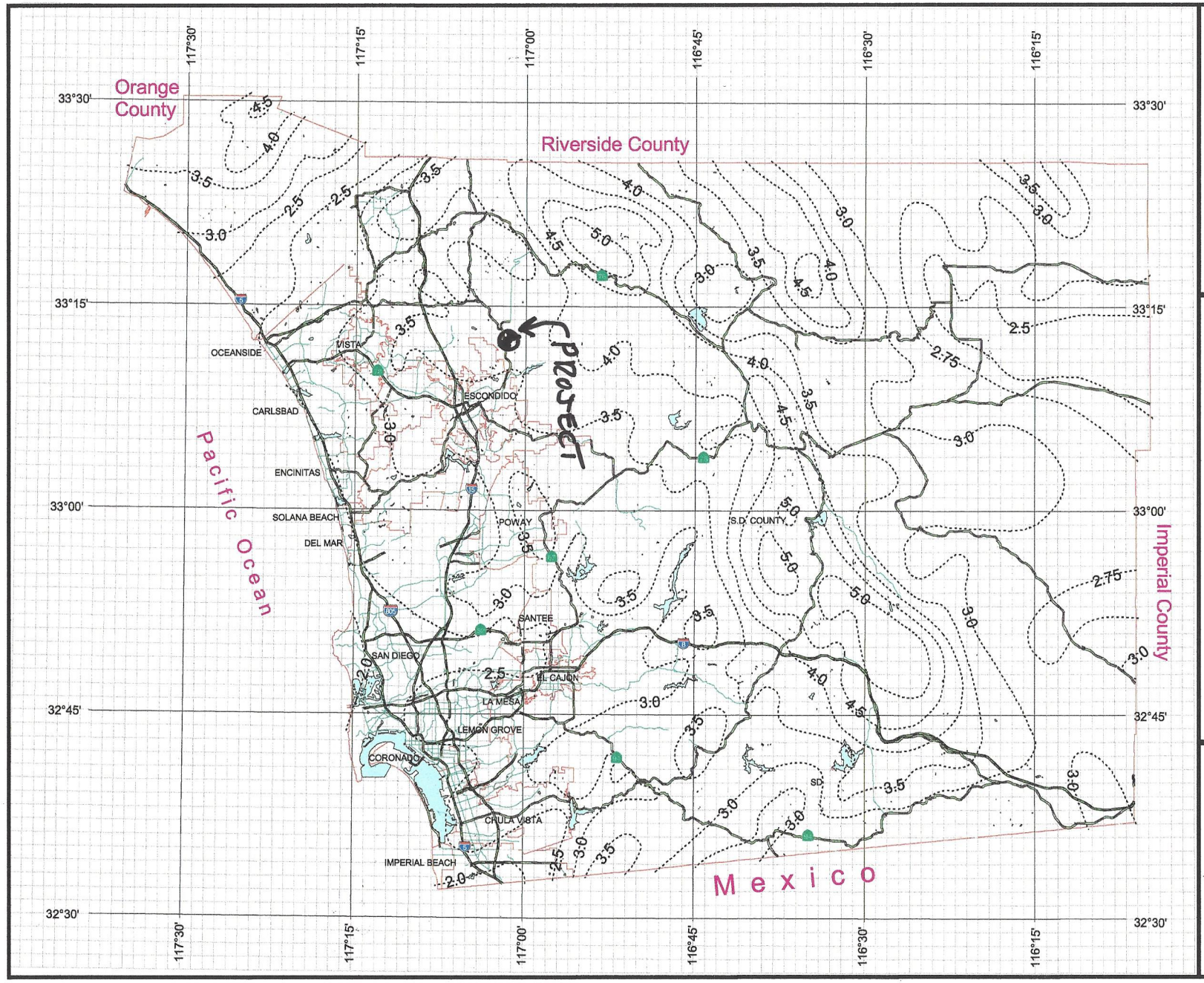


Figure B.1-1: 85th Percentile 24-hour Isopluvial Map



County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 6 Hours

Isopluvial (inches)

DPW GIS
Department of Public Works Geographic Information Services

SanGIS
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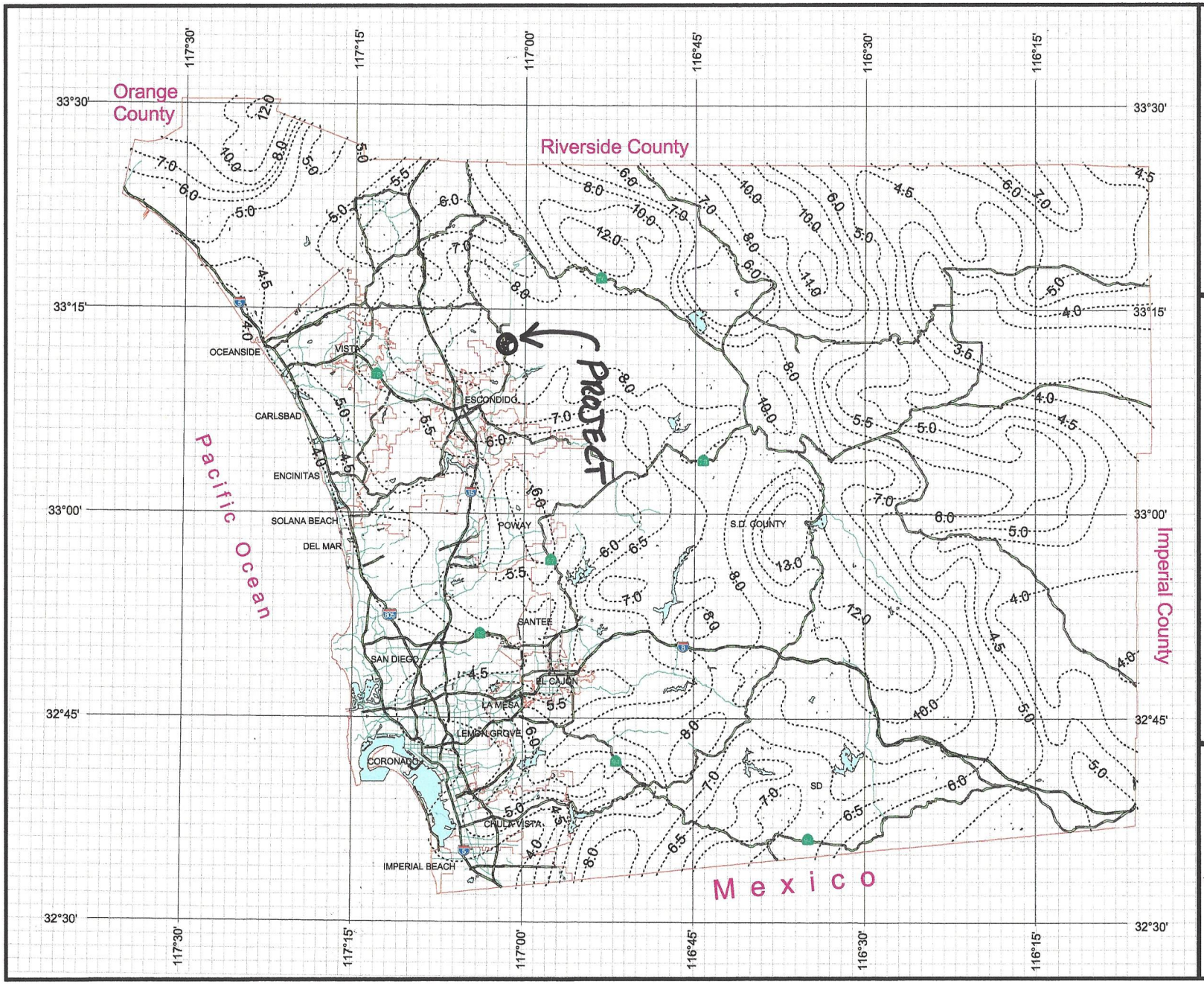
N
W E
S

3 0 3 Miles



County of San Diego Hydrology Manual

Rainfall Isopluvials

100 Year Rainfall Event - 24 Hours

Isopluvial (inches)

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Department of Public Works Geographic Information Services

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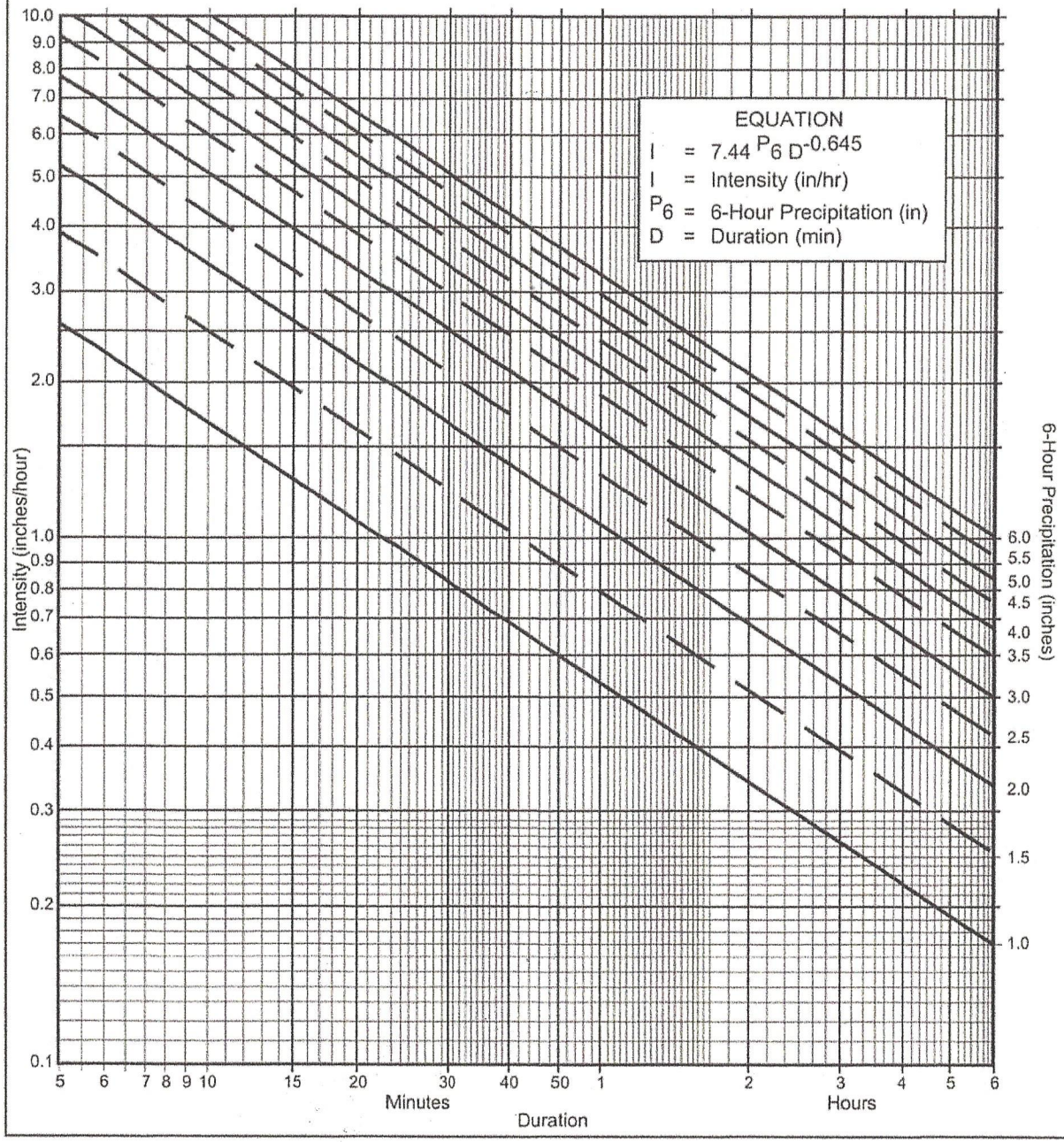
N
W E
S

3 0 3 Miles



Directions for Application:

(1) From precipitation maps determine 6 hr and 24 hr amounts for the selected frequency. These maps are included in the County Hydrology Manual (10, 50, and 100 yr maps included in the Design and Procedure Manual).

(2) Adjust 6 hr precipitation (if necessary) so that it is within the range of 45% to 65% of the 24 hr precipitation (not applicaple to Desert).

(3) Plot 6 hr precipitation on the right side of the chart.

(4) Draw a line through the point parallel to the plotted lines.

(5) This line is the intensity-duration curve for the location being analyzed.

Application Form:

(a) Selected frequency 100 year

(b) P_6 = 3.7 in., P_{24} = 8.1, $\frac{P_6}{P_{24}}$ = 46 %(2)

(c) Adjusted $P_6^{(2)}$ = _____ in.

(d) t_x = _____ min.

(e) I = _____ in./hr.

Note: This chart replaces the Intensity-Duration-Frequency curves used since 1965.

P6	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6
Duration	I	I	I	I	I	I	I	I	I	I	I
5	2.63	3.95	5.27	6.59	7.90	9.22	10.54	11.86	13.17	14.49	15.81
7	2.12	3.18	4.24	5.30	6.36	7.42	8.48	9.54	10.60	11.66	12.72
10	1.68	2.53	3.37	4.21	5.05	5.90	6.74	7.58	8.42	9.27	10.11
15	1.30	1.95	2.59	3.24	3.89	4.54	5.19	5.84	6.49	7.13	7.78
20	1.08	1.62	2.15	2.69	3.23	3.77	4.31	4.85	5.39	5.93	6.46
25	0.93	1.40	1.87	2.33	2.80	3.27	3.73	4.20	4.67	5.13	5.60
30	0.83	1.24	1.66	2.07	2.49	2.90	3.32	3.73	4.15	4.56	4.98
40	0.69	1.03	1.38	1.72	2.07	2.41	2.76	3.10	3.45	3.79	4.13
50	0.60	0.90	1.19	1.49	1.79	2.09	2.39	2.69	2.98	3.28	3.58
60	0.53	0.80	1.06	1.33	1.59	1.86	2.12	2.39	2.65	2.92	3.18
90	0.41	0.61	0.82	1.02	1.23	1.43	1.63	1.84	2.04	2.25	2.45
120	0.34	0.51	0.68	0.85	1.02	1.19	1.36	1.53	1.70	1.87	2.04
150	0.29	0.44	0.59	0.73	0.88	1.03	1.18	1.32	1.47	1.62	1.76
180	0.26	0.39	0.52	0.65	0.78	0.91	1.04	1.18	1.31	1.44	1.57
240	0.22	0.33	0.43	0.54	0.65	0.76	0.87	0.98	1.08	1.19	1.30
300	0.19	0.28	0.38	0.47	0.56	0.66	0.75	0.85	0.94	1.03	1.13
360	0.17	0.25	0.33	0.42	0.50	0.58	0.67	0.75	0.84	0.92	1.00

Intensity-Duration Design Chart - Template

FIGURE 3-1

Table 3-1
RUNOFF COEFFICIENTS FOR URBAN AREAS

Land Use		Runoff Coefficient "C"				
			Soil Type			
NRCS Elements	County Elements	% IMPER.	A	B	C	D
Undisturbed Natural Terrain (Natural)	Permanent Open Space	0*	0.20	0.25	0.30	0.35
Low Density Residential (LDR)	Residential, 1.0 DU/A or less	10	0.27	0.32	0.36	0.41
Low Density Residential (LDR)	Residential, 2.0 DU/A or less	20	0.34	0.38	0.42	0.46
Low Density Residential (LDR)	Residential, 2.9 DU/A or less	25	0.38	0.41	0.45	0.49
Medium Density Residential (MDR)	Residential, 4.3 DU/A or less	30	0.41	0.45	0.48	0.52
Medium Density Residential (MDR)	Residential, 7.3 DU/A or less	40	0.48	0.51	0.54	0.57
Medium Density Residential (MDR)	Residential, 10.9 DU/A or less	45	0.52	0.54	0.57	0.60
Medium Density Residential (MDR)	Residential, 14.5 DU/A or less	50	0.55	0.58	0.60	0.63
High Density Residential (HDR)	Residential, 24.0 DU/A or less	65	0.66	0.67	0.69	0.71
High Density Residential (HDR)	Residential, 43.0 DU/A or less	80	0.76	0.77	0.78	0.79
Commercial/Industrial (N. Com)	Neighborhood Commercial	80	0.76	0.77	0.78	0.79
Commercial/Industrial (G. Com)	General Commercial	85	0.80	0.80	0.81	0.82
Commercial/Industrial (O.P. Com)	Office Professional/Commercial	90	0.83	0.84	0.84	0.85
Commercial/Industrial (Limited I.)	Limited Industrial	90	0.83	0.84	0.84	0.85
Commercial/Industrial (General I.)	General Industrial	95	0.87	0.87	0.87	0.87

*The values associated with 0% impervious may be used for direct calculation of the runoff coefficient as described in Section 3.1.2 (representing the pervious runoff coefficient, Cp, for the soil type), or for areas that will remain undisturbed in perpetuity. Justification must be given that the area will remain natural forever (e.g., the area is located in Cleveland National Forest).
DU/A = dwelling units per acre
NRCS = National Resources Conservation Service

Note that the Initial Time of Concentration should be reflective of the general land-use at the upstream end of a drainage basin. A single lot with an area of two or less acres does not have a significant effect where the drainage basin area is 20 to 600 acres.

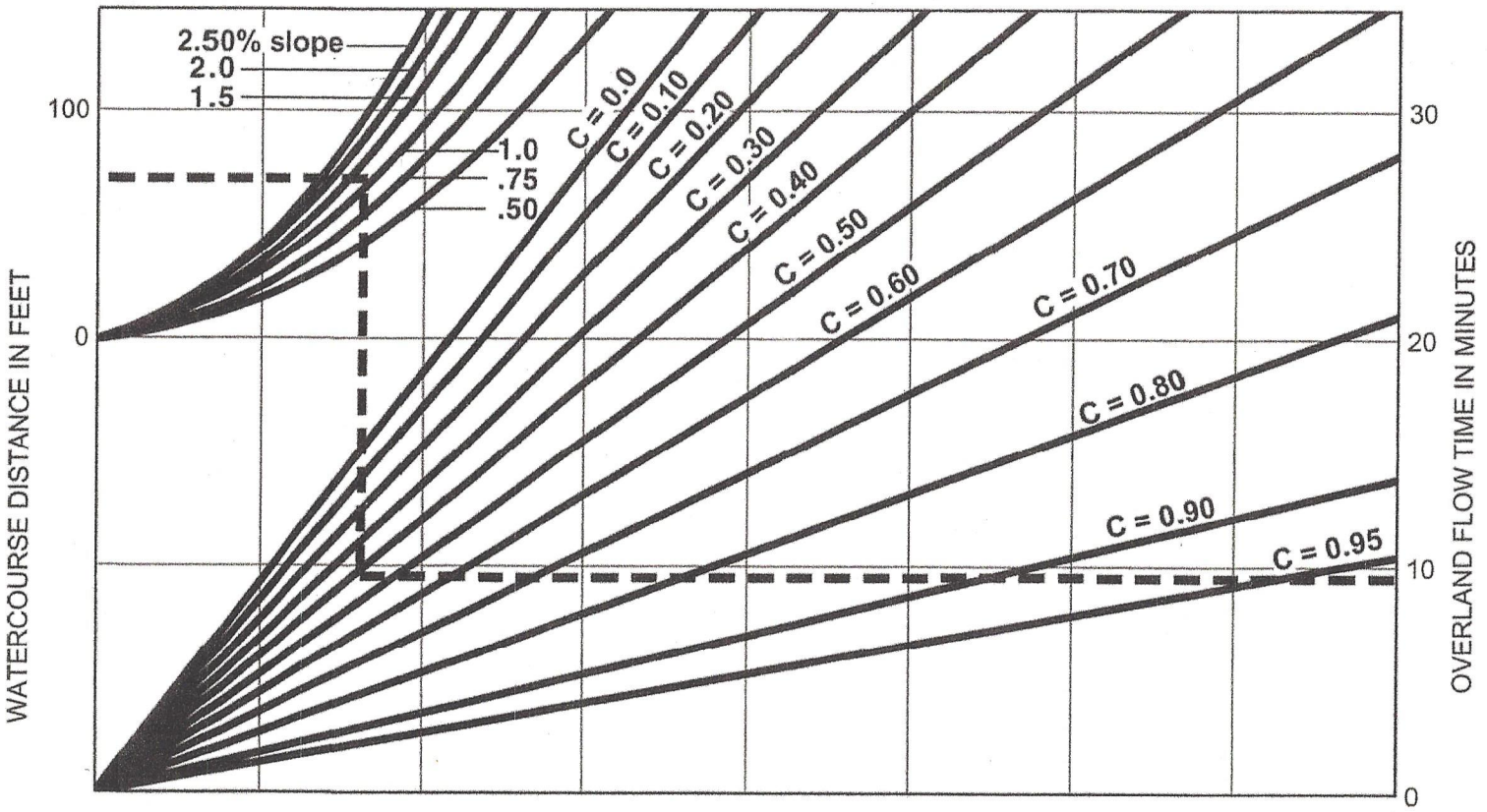
Table 3-2 provides limits of the length (Maximum Length (L_M)) of sheet flow to be used in hydrology studies. Initial T_i values based on average C values for the Land Use Element are also included. These values can be used in planning and design applications as described below. Exceptions may be approved by the "Regulating Agency" when submitted with a detailed study.

Table 3-2

MAXIMUM OVERLAND FLOW LENGTH (L_M) & INITIAL TIME OF CONCENTRATION (T_i)

Element*	DU/ Acre	.5%		1%		2%		3%		5%		10%	
		L_M	T_i	L_M	T_i	L_M	T_i	L_M	T_i	L_M	T_i	L_M	T_i
Natural		50	13.2	70	12.5	85	10.9	100	10.3	100	8.7	100	6.9
LDR	1	50	12.2	70	11.5	85	10.0	100	9.5	100	8.0	100	6.4
LDR	2	50	11.3	70	10.5	85	9.2	100	8.8	100	7.4	100	5.8
LDR	2.9	50	10.7	70	10.0	85	8.8	95	8.1	100	7.0	100	5.6
MDR	4.3	50	10.2	70	9.6	80	8.1	95	7.8	100	6.7	100	5.3
MDR	7.3	50	9.2	65	8.4	80	7.4	95	7.0	100	6.0	100	4.8
MDR	10.9	50	8.7	65	7.9	80	6.9	90	6.4	100	5.7	100	4.5
MDR	14.5	50	8.2	65	7.4	80	6.5	90	6.0	100	5.4	100	4.3
HDR	24	50	6.7	65	6.1	75	5.1	90	4.9	95	4.3	100	3.5
HDR	43	50	5.3	65	4.7	75	4.0	85	3.8	95	3.4	100	2.7
N. Com		50	5.3	60	4.5	75	4.0	85	3.8	95	3.4	100	2.7
G. Com		50	4.7	60	4.1	75	3.6	85	3.4	90	2.9	100	2.4
O.P./Com		50	4.2	60	3.7	70	3.1	80	2.9	90	2.6	100	2.2
Limited I.		50	4.2	60	3.7	70	3.1	80	2.9	90	2.6	100	2.2
General I.		50	3.7	60	3.2	70	2.7	80	2.6	90	2.3	100	1.9

*See Table 3-1 for more detailed description



EXAMPLE:

Given: Watercourse Distance (D) = 70 Feet
Slope (s) = 1.3%
Runoff Coefficient (C) = 0.41
Overland Flow Time (T) = 9.5 Minutes

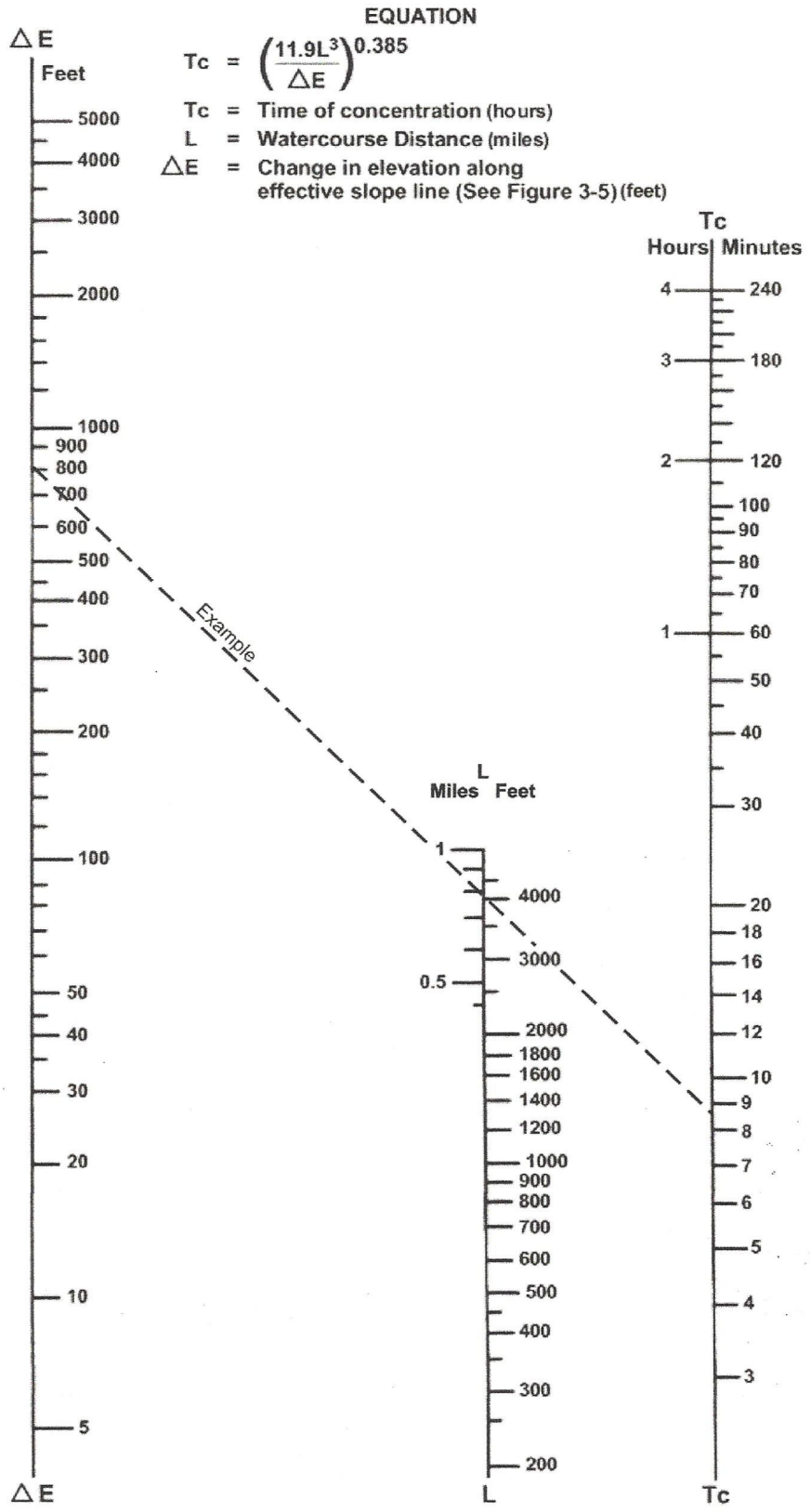
$$T = \frac{1.8\,(1.1-C)\sqrt{D}}{\sqrt[3]{s}}$$

SOURCE: Airport Drainage, Federal Aviation Administration, 1965

FIGURE

Rational Formula - Overland Time of Flow Nomograph

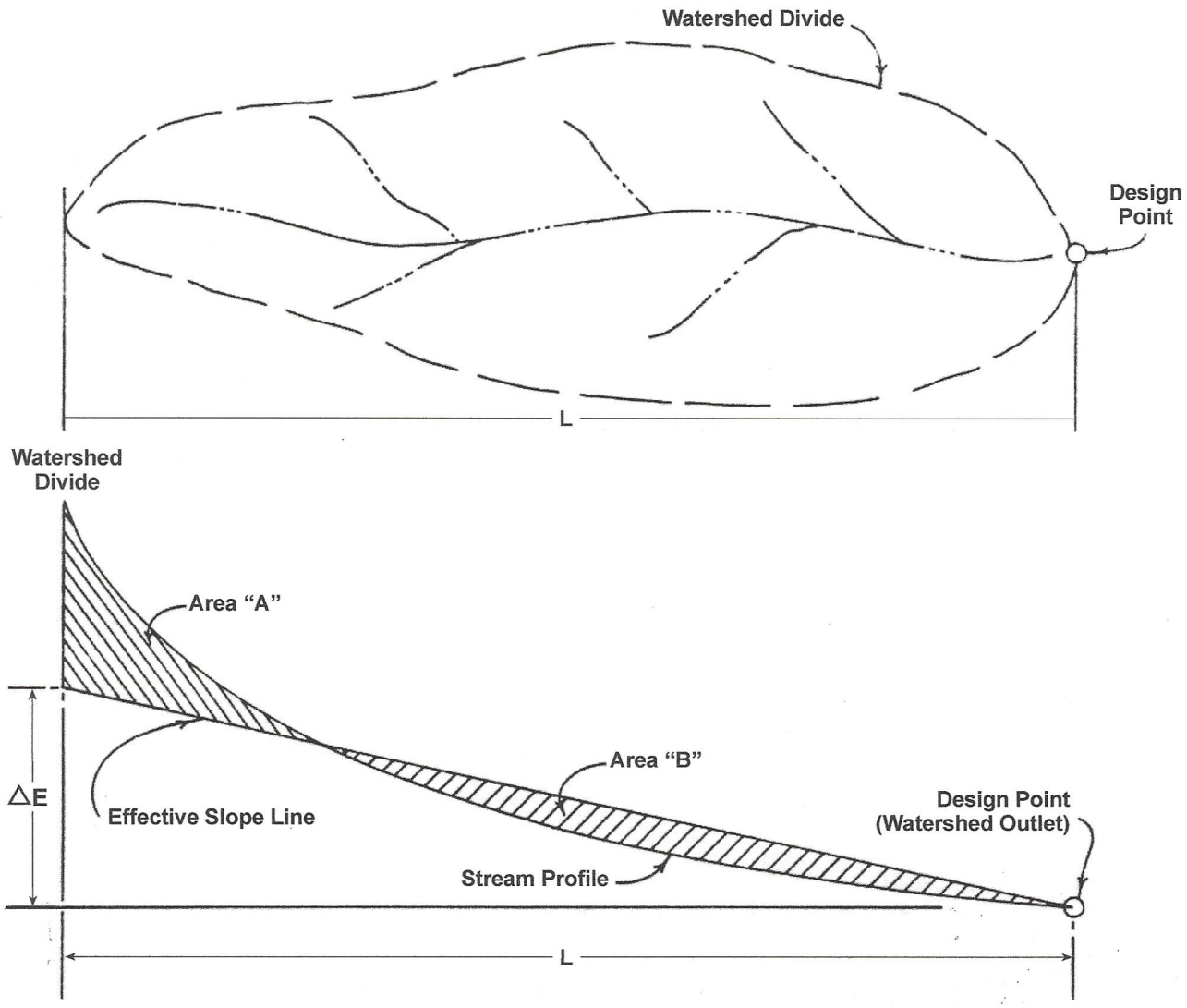
3-3



SOURCE: California Division of Highways (1941) and Kirpich (1940)

FIGURE 3-4

Nomograph for Determination of
Time of Concentration (Tc) or Travel Time (Tt) for Natural Watersheds

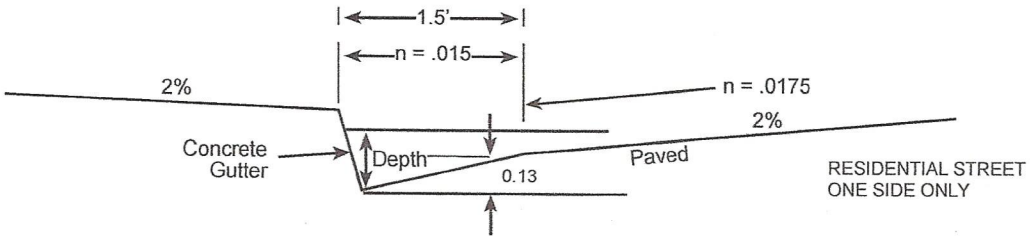


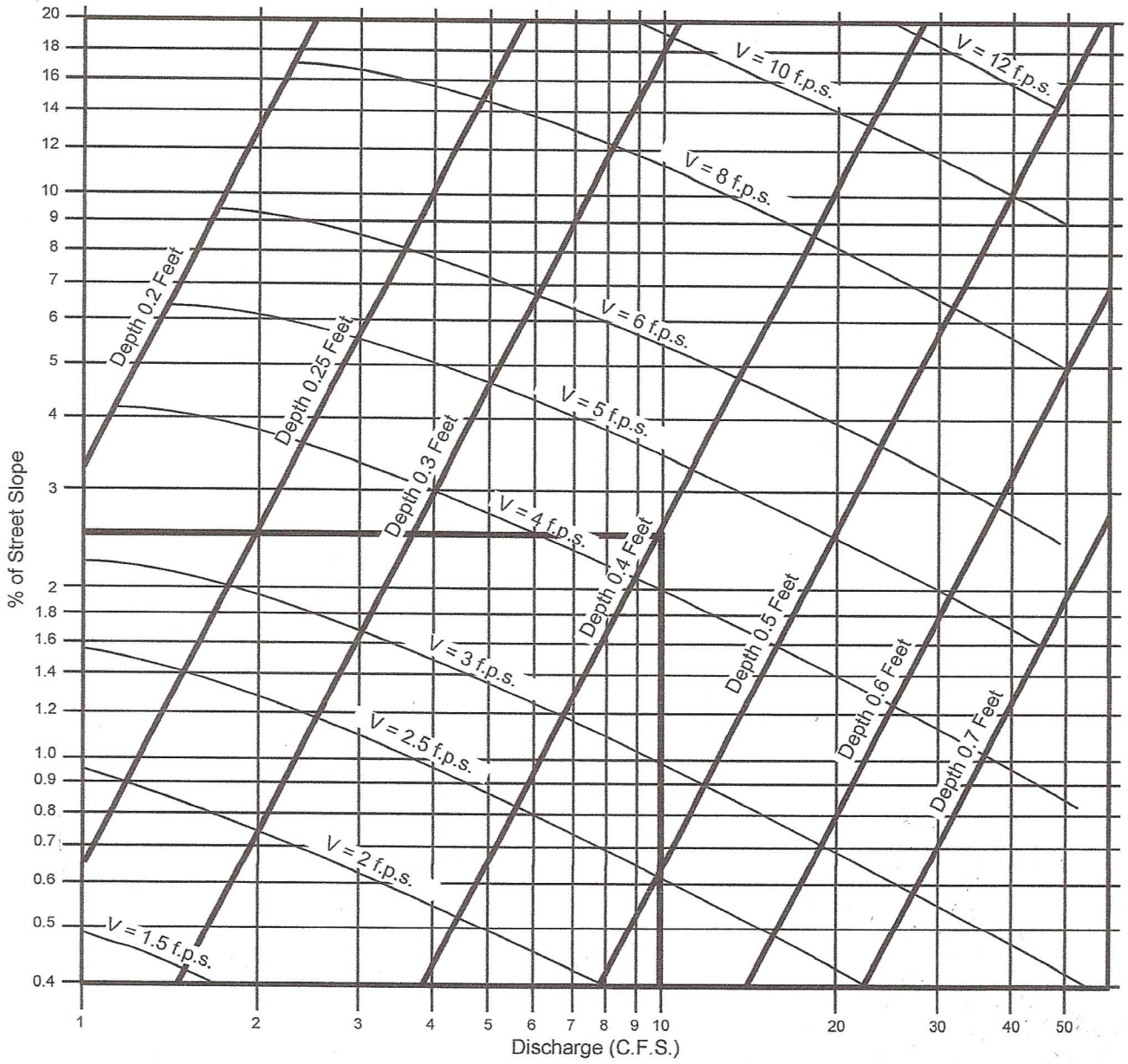
Area "A" = Area "B"

SOURCE: California Division of Highways (1941) and Kirpich (1940)

FIGURE 3-5

Computation of Effective Slope for Natural Watersheds





EXAMPLE:
Given: Q = 10 S = 2.5%
Chart gives: Depth = 0.4, Velocity = 4.4 f.p.s.

SOURCE: San Diego County Department of Special District Services Design Manual

FIGURE

Gutter and Roadway Discharge - Velocity Chart

3-6

Table A-1 Average Manning Roughness Coefficients for Pavement and Gutters[1]

Concrete Gutter[2]	
Concrete Pavement	0.015
Float Finish	
Broom Finish	0.014
Concrete Gutter with Asphalt Pavement	0.016
Smooth Finish	
Rough Texture	0.013
Asphalt Pavement	0.015
Smooth Finish	
Rough Texture	0.013
	0.016

Based on FHWA HEC-22.

[1] Based on materials and workmanship required by standard specifications.
[2] Increase roughness coefficient in gutters with mild slopes where sediment might accumulate by 0.020.

Table A-5 Average Manning Roughness Coefficients for Natural Channels

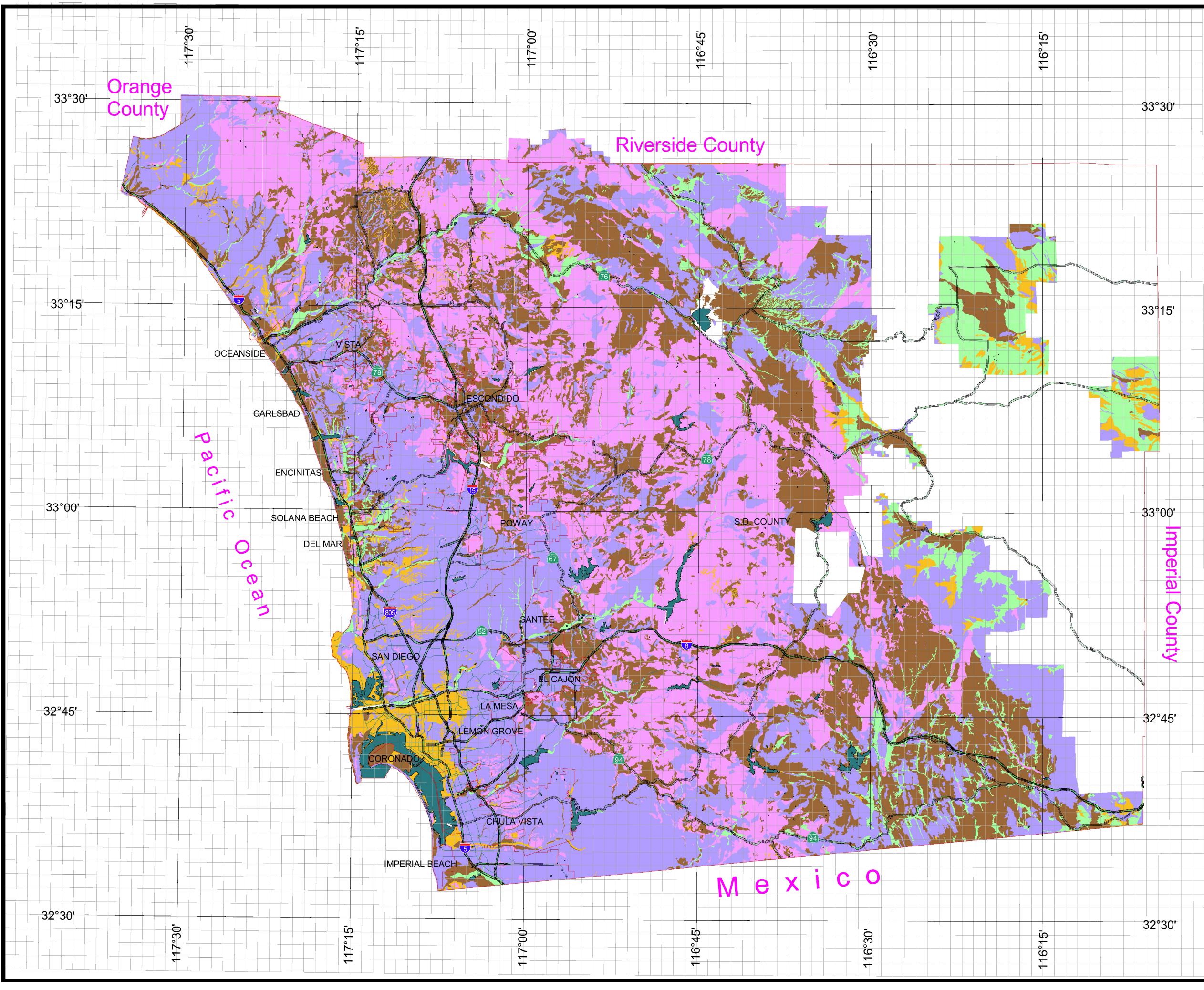
Minor Streams (Surface Width at Flood Stage < 100 ft)	
Fairly Regular Section	
(A) Some Grass and Weeds, Little or No Brush	0.030
(B) Dense Growth of Weeds, Depth of Flow Materially Greater Than Weed Height	0.040
(C) Some Weeds, Light Brush on Banks	0.040
(D) Some Weeds, Heavy Brush on Banks	0.060
(E) For Trees within Channel with Branches Submerged at High Stage, Increase All Above Values By	0.015
Irregular Section, with Pools, Slight Channel Meander	
Channels (A) to (E) Above, Increase All Values By	0.015
Mountain Streams; No Vegetation in Channel, Banks Usually Steep, Trees and Brush along Banks Submerged at High Stage	
(A) Bottom, Gravel, Cobbles and Few Boulders	0.050
(B) Bottom, Cobbles with Large Boulders	0.060
Flood Plains (Adjacent To Natural Streams)	
Pasture, No Brush	
(A) Short Grass	0.030
(B) High Grass	0.040
Cultivated Areas	
(A) No Crop	0.040
(B) Mature Row Crops	0.040
(C) Mature Field Crops	0.050
Heavy Weeds, Scattered Brush	0.050
Light Brush and Trees	0.060
Medium To Dense Brush	0.090
Dense Willows	0.170
Cleared Land with Tree Stumps, 100-150 Per Acre	0.060
Heavy Stand of Timber, Little Undergrowth	
(A) Flood Depth below Branches	0.110
(B) Flood Depth Reaches Branches	0.140

Appendix C: Project Maps

- **Soil Runoff Potential Map**
- **Pre-Developed Condition Hydrology Map**
- **Post-Developed Condition Hydrology Map**

County of San Diego Hydrology Manual

Soil Hydrologic Groups



Legend

Soil Groups

- Group A
- Group B
- Group C
- Group D
- Undetermined
- Data Unavailable

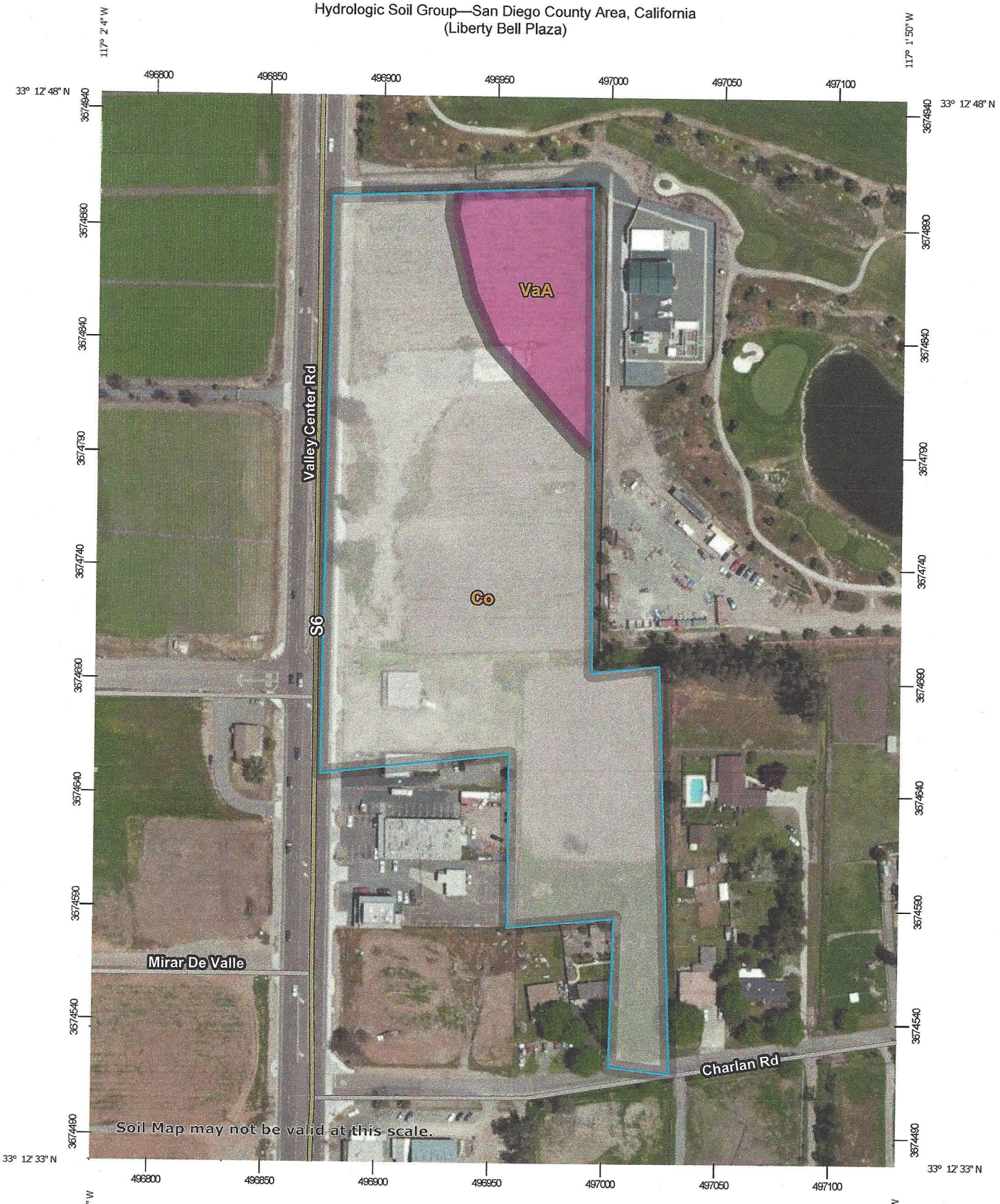
DPW GIS
Department of Public Works
Geographic Information Services

SanGIS
We Have San Diego Covered!

N
W E
S

3 0 3 Miles

Hydrologic Soil Group—San Diego County Area, California
(Liberty Bell Plaza)



Map Scale: 1:2,290 if printed on A portrait (8.5" x 11") sheet.

N

0 30 60 120 180 Meters

0 100 200 400 600 Feet

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

MAP LEGEND

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

Soils

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

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

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

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

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

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

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

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

Soil Survey Area: San Diego County Area, California
Survey Area Data: Version 10, Sep 12, 2016

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

Date(s) aerial images were photographed: Data not available.

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

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — San Diego County Area, California (CA638)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
Co	Clayey alluvial land		8.0	86.8%
VaA	Visalia sandy loam, 0 to 2 percent slopes	A	1.2	13.2%
Totals for Area of Interest			9.2	100.0%

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

WATERS OF THE STATE PER LIBERTY BELL PLAZA AQUATIC RESOURCES DELINEATION REPORT

WATERS OF THE U.S. & STATE PER LIBERTY BELL PLAZA AQUATIC RESOURCES DELINEATION REPORT

WATERS OF THE U.S. & STATE PER LIBERTY BELL PLAZA AQUATIC RESOURCES DELINEATION REPORT

WATERS OF THE STATE PER LIBERTY BELL PLAZA AQUATIC RESOURCES DELINEATION REPORT

CHARLAN ROAD

VALLEY CENTER ROAD

MIRAR DE VALLE

LIMITS OF FLOOD PLAIN PER FEMA PANEL NO. 06073C0810G DATED MAY 16, 2012

NODES 100-103
A=0.936 AC
Q100 = 0.89 CFS
DISCHARGE POINT 1

NODES 200-205
A=4.532 AC
Q100 = 4.81 CFS
DISCHARGE POINT 2

NODES 300-304
A=3.021 AC
Q100 = 3.10 CFS
DISCHARGE POINT 3

POINT OF COMPLIANCE

LEGEND:

PROJECT BOUNDARY

BASIN LIMIT

DIRECTION OF FLOW

NODE NO. 300

SCALE: 1" = 30'

0 15 30 60 90

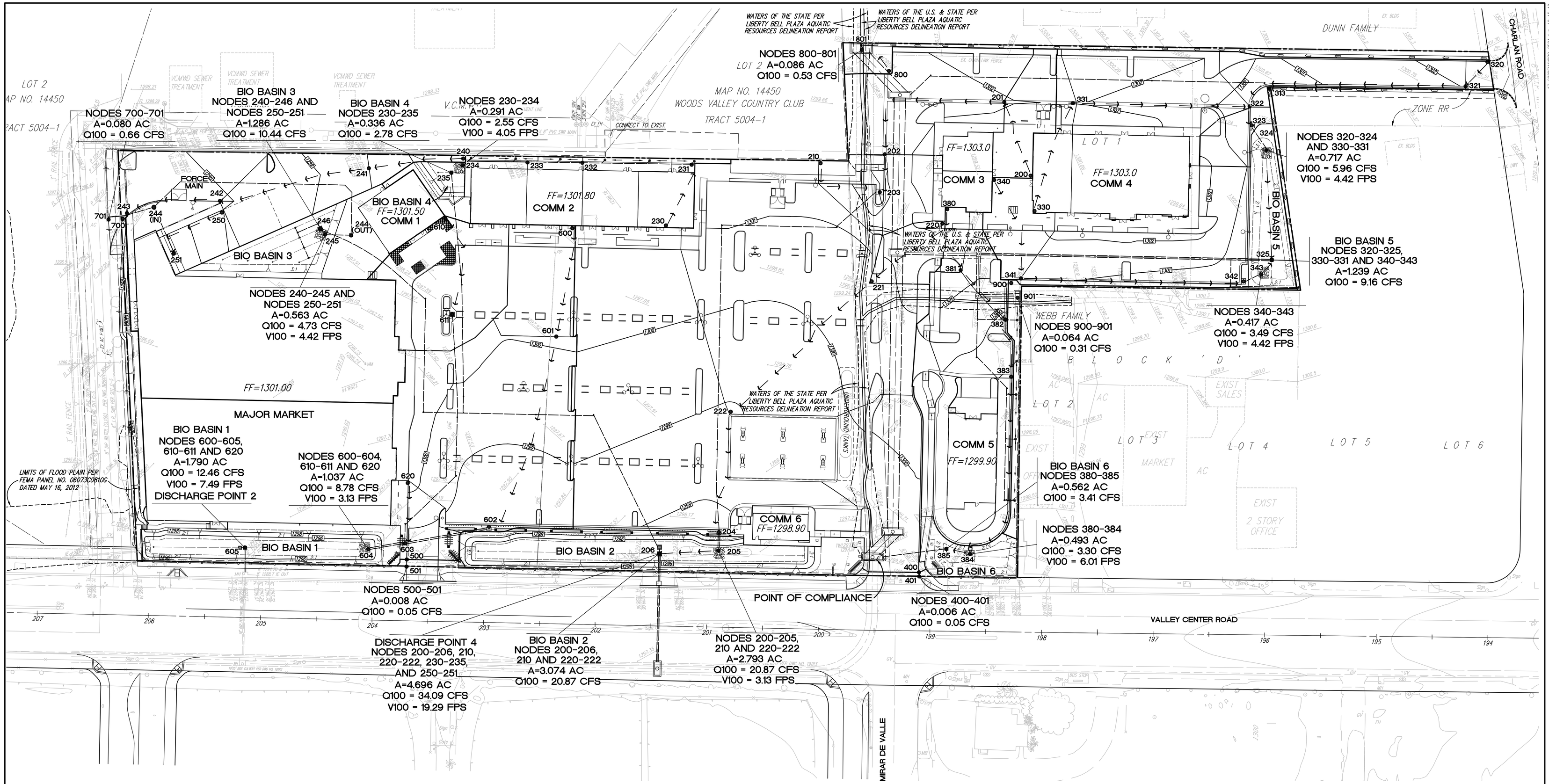
GRAPHICAL SCALE

EXISTING HYDROLOGY EXHIBIT

LIBERTY BELL PLAZA

Alidade ENGINEERING
41743 ENTERPRISE CIRCLE NORTH, SUITE 209
TEMECULA, CA 92590
PH: (951) 587-2020
FAX: (951) 587-2626

FIGURE 2A



LEGEND:

PROJECT BOUNDARY

BASIN LIMIT

DIRECTION OF FLOW

NODE NO. 300

SCALE: 1" = 30'

0 15 30 60 90

GRAPHICAL SCALE

DEVELOPED HYDROLOGY EXHIBIT

LIBERTY BELL PLAZA

Alidade ENGINEERING
41743 ENTERPRISE CIRCLE NORTH, SUITE 209
TEMECULA, CA 92590
PH: (951) 587-2020
FAX: (951) 587-2626

FIGURE 2B

Appendix D: Pipe and Channel Velocity Calculations

```
  STREAM      RUNOFF       Tc       INTENSITY
  NUMBER       (CFS)     (MIN.)    (INCH/HOUR)
     1          5.82      2.99        9.749
     2          7.38      3.87        9.749
     3          8.78      5.02        9.728

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =        8.78   Tc(MIN.) =     5.02
  TOTAL AREA(ACRES) =         1.0
  LONGEST FLOWPATH FROM NODE     600.00 TO NODE     603.00 =      348.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     603.00 TO NODE     604.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1294.65  DOWNSTREAM(FEET) =  1294.50
  FLOW LENGTH(FEET) =    30.00   MANNING'S N =  0.013
  ASSUME FULL-FLOWING PIPELINE                                  OUTLET TO
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.13                        BASIN 1
  (PIPE FLOW VELOCITY CORRESPONDING TO FULL PIPE CAPACITY FLOW)
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   2
  PIPE-FLOW(CFS) =       8.78
  PIPE TRAVEL TIME(MIN.) =   0.16    Tc(MIN.) =     5.18
  LONGEST FLOWPATH FROM NODE     600.00 TO NODE     604.00 =      378.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     604.00 TO NODE     605.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1294.50  DOWNSTREAM(FEET) =   1293.95
  CHANNEL LENGTH THRU SUBAREA(FEET) =   110.00   CHANNEL SLOPE =  0.0050
  CHANNEL BASE(FEET) =   14.00   "Z" FACTOR =   2.500
  MANNING'S FACTOR = 0.035   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  8.415
  *USER SPECIFIED(SUBAREA):
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .7700
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      11.23
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.66
  AVERAGE FLOW DEPTH(FEET) =   0.45   TRAVEL TIME(MIN.) =   1.10
  Tc(MIN.) =    6.28
  SUBAREA AREA(ACRES) =     0.75       SUBAREA RUNOFF(CFS) =    4.88
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.827
  TOTAL AREA(ACRES) =        1.8         PEAK FLOW RATE(CFS) =      12.46

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.48   FLOW VELOCITY(FEET/SEC.) =   1.72
  LONGEST FLOWPATH FROM NODE     600.00 TO NODE     605.00 =      488.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
```

```
     1        4.79      6.80        7.996          0.60
     2       16.45      6.00        8.669          2.21

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

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF       Tc       INTENSITY
  NUMBER      (CFS)     (MIN.)    (INCH/HOUR)
     1        20.87      6.00        8.669
     2        19.97      6.80        7.996

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       20.87   Tc(MIN.) =     6.00
  TOTAL AREA(ACRES) =         2.8
  LONGEST FLOWPATH FROM NODE     200.00 TO NODE     204.00 =      683.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     204.00 TO NODE     205.00 IS CODE =  41
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =  1295.05  DOWNSTREAM(FEET) =  1295.00
  FLOW LENGTH(FEET) =    10.00   MANNING'S N =  0.013
  ASSUME FULL-FLOWING PIPELINE
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.13
  (PIPE FLOW VELOCITY CORRESPONDING TO FULL PIPE CAPACITY FLOW)
  GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   2
  PIPE-FLOW(CFS) =      20.87
  PIPE TRAVEL TIME(MIN.) =   0.05    Tc(MIN.) =     6.05
  LONGEST FLOWPATH FROM NODE     200.00 TO NODE     205.00 =      693.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     205.00 TO NODE     206.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   1295.00  DOWNSTREAM(FEET) =   1294.75
  CHANNEL LENGTH THRU SUBAREA(FEET) =    50.00   CHANNEL SLOPE =  0.0050
  CHANNEL BASE(FEET) =   15.00   "Z" FACTOR =   2.500
  MANNING'S FACTOR = 0.035   MAXIMUM DEPTH(FEET) =   1.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  8.264
  *USER SPECIFIED(SUBAREA):
  GENERAL COMMERCIAL RUNOFF COEFFICIENT = .3600
  S.C.S. CURVE NUMBER (AMC II) =   0
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       21.28
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   2.04
  AVERAGE FLOW DEPTH(FEET) =   0.63   TRAVEL TIME(MIN.) =   0.41
  Tc(MIN.) =    6.46
  SUBAREA AREA(ACRES) =     0.27       SUBAREA RUNOFF(CFS) =     0.81
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.809
  TOTAL AREA(ACRES) =         3.1          PEAK FLOW RATE(CFS) =       20.87
```

OUTLET TO BASIN 2

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

 ** PEAK FLOW RATE TABLE **
 STREAM     RUNOFF      Tc       INTENSITY
 NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
     1        2.20     2.52       9.749
     2        3.57     4.48       9.749

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =       3.57   Tc(MIN.) =    4.48
 TOTAL AREA(ACRES) =        0.4
 LONGEST FLOWPATH FROM NODE    240.00 TO NODE    244.00 =     290.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    244.00 TO NODE    245.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  9.749
 NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
 *USER SPECIFIED(SUBAREA):
 GENERAL COMMERCIAL RUNOFF COEFFICIENT = .9000
 S.C.S. CURVE NUMBER (AMC II) =   0
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.8627
 SUBAREA AREA(ACRES) =    0.13   SUBAREA RUNOFF(CFS) =    1.17
 TOTAL AREA(ACRES) =       0.6   TOTAL RUNOFF(CFS) =      4.73
 TC(MIN.) =    4.48

****************************************************************************
 FLOW PROCESS FROM NODE    244.00 TO NODE    245.00 IS CODE =  41
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =  1299.00  DOWNSTREAM(FEET) =  1298.80
 FLOW LENGTH(FEET) =    20.00   MANNING'S N =  0.013
 ASSUME FULL-FLOWING PIPELINE
 PIPE-FLOW VELOCITY(FEET/SEC.) =   4.42
 (PIPE FLOW VELOCITY CORRESPONDING TO FULL PIPE CAPACITY FLOW)
 GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       4.73
 PIPE TRAVEL TIME(MIN.) =    0.08    Tc(MIN.) =    4.55
 LONGEST FLOWPATH FROM NODE    240.00 TO NODE    245.00 =     310.00 FEET.

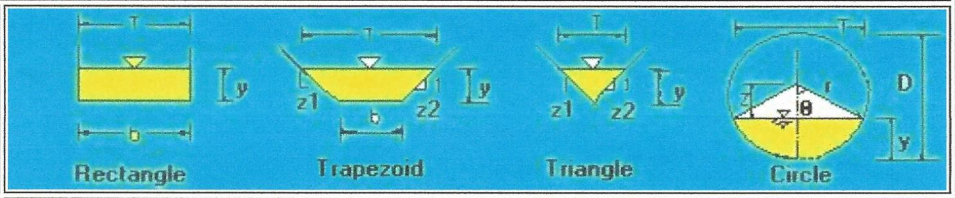
****************************************************************************
 FLOW PROCESS FROM NODE    245.00 TO NODE    246.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   1298.80  DOWNSTREAM(FEET) =   1298.77
 CHANNEL LENGTH THRU SUBAREA(FEET) =     6.00   CHANNEL SLOPE =  0.0050
```

OUTLET TO BASIN 3

17-228

The open channel flow calculator

Select Channel Type: Circle



Depth from Q | Select unit system: Feet(ft)

Channel slope: 0.0062 ft/ft	Water depth(y): 0.75 ft	Radius (r) 0.5 ft
Flow velocity 4.048 ft/s	LeftSlope (Z1): to 1 (H:V	RightSlope (Z2): to 1 (H:V
Flow discharge 2.55 ft^3/s	Input n value 0.013 or select n	
Calculate!	Status: Calculation finished	Reset
Wetted perimeter 2.09 ft	Flow area 0.63 ft^2	Top width(T) 0.87 ft
Specific energy 1 ft	Froude number 0.84	Flow status Subcritical flow
Critical depth 0.69 ft	Critical slope 0.0077 ft/ft	Velocity head 0.25 ft

OUTLET AT NODE 234 BASIN 4

```
 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  21.00
 INSIDE STREET CROSSFALL(DECIMAL) =  0.025
 OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.025

 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
 STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0175
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0175

   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       5.76
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  0.38
   HALFSTREET FLOOD WIDTH(FEET) =   10.64
   AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.77
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.45
 STREET FLOW TRAVEL TIME(MIN.) =   0.05   Tc(MIN.) =    4.54
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  9.749
 NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
 *USER SPECIFIED(SUBAREA):
 GENERAL COMMERCIAL RUNOFF COEFFICIENT = .7900
 S.C.S. CURVE NUMBER (AMC II) =   0
 AREA-AVERAGE RUNOFF COEFFICIENT =  0.853
 SUBAREA AREA(ACRES) =    0.05      SUBAREA RUNOFF(CFS) =    0.40
 TOTAL AREA(ACRES) =       0.7        PEAK FLOW RATE(CFS) =       5.96

 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.39   HALFSTREET FLOOD WIDTH(FEET) =  10.80
 FLOW VELOCITY(FEET/SEC.) =  3.79   DEPTH*VELOCITY(FT*FT/SEC.) =   1.47
 LONGEST FLOWPATH FROM NODE    330.00 TO NODE    323.00 =     276.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    323.00 TO NODE    324.00 IS CODE =  41
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =  1297.94  DOWNSTREAM(FEET) =  1297.80
 FLOW LENGTH(FEET) =    14.00   MANNING'S N =  0.013
 ASSUME FULL-FLOWING PIPELINE
 PIPE-FLOW VELOCITY(FEET/SEC.) =  4.42
 (PIPE FLOW VELOCITY CORRESPONDING TO FULL PIPE CAPACITY FLOW)
 GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       5.96
 PIPE TRAVEL TIME(MIN.) =   0.05    Tc(MIN.) =    4.59
 LONGEST FLOWPATH FROM NODE    330.00 TO NODE    324.00 =     290.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    324.00 TO NODE    325.00 IS CODE =  51
----------------------------------------------------------------------------
 >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   1297.80  DOWNSTREAM(FEET) =   1297.26
 CHANNEL LENGTH THRU SUBAREA(FEET) =   108.00   CHANNEL SLOPE =  0.0050
```

OUTLET TO BASIN 5

```
------------------------------------------------------------------------
 >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>(STREET TABLE SECTION #  3 USED)<<<<<
========================================================================
 UPSTREAM ELEVATION(FEET) = 1301.16  DOWNSTREAM ELEVATION(FEET) = 1299.87
 STREET LENGTH(FEET) =   197.00   CURB HEIGHT(INCHES) =  6.0
 STREET HALFWIDTH(FEET) = 44.00

 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  39.00
 INSIDE STREET CROSSFALL(DECIMAL) =  0.040
 OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.040

 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
 STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0175
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0175

   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.13
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  0.38
   HALFSTREET FLOOD WIDTH(FEET) =    7.11
   AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.92
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.73
 STREET FLOW TRAVEL TIME(MIN.) =   1.71   Tc(MIN.) =    4.46
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  9.749
 NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
 *USER SPECIFIED(SUBAREA):
 GENERAL COMMERCIAL RUNOFF COEFFICIENT = .8500
 S.C.S. CURVE NUMBER (AMC II) =   0
 AREA-AVERAGE RUNOFF COEFFICIENT =  0.856
 SUBAREA AREA(ACRES) =    0.33      SUBAREA RUNOFF(CFS) =    2.73
 TOTAL AREA(ACRES) =       0.4        PEAK FLOW RATE(CFS) =       3.49

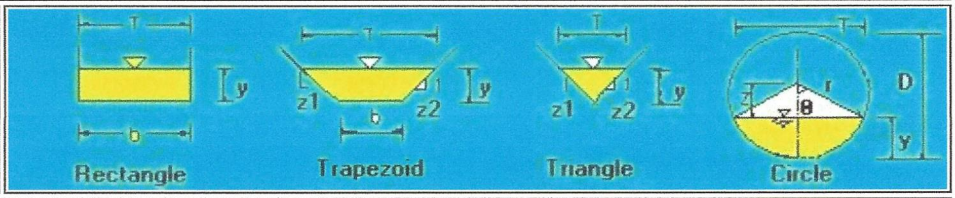
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.44   HALFSTREET FLOOD WIDTH(FEET) =   8.71
 FLOW VELOCITY(FEET/SEC.) =  2.16   DEPTH*VELOCITY(FT*FT/SEC.) =   0.96
 LONGEST FLOWPATH FROM NODE    340.00 TO NODE    342.00 =     295.50 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    342.00 TO NODE    343.00 IS CODE =  41
------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING USER-SPECIFIED PIPESIZE (EXISTING ELEMENT)<<<<<
========================================================================
 ELEVATION DATA: UPSTREAM(FEET) =  1297.92  DOWNSTREAM(FEET) =  1297.80
 FLOW LENGTH(FEET) =    12.00   MANNING'S N =  0.013
 ASSUME FULL-FLOWING PIPELINE
 PIPE-FLOW VELOCITY(FEET/SEC.) =   4.42
 (PIPE FLOW VELOCITY CORRESPONDING TO FULL PIPE CAPACITY FLOW)
 GIVEN PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       3.49
 PIPE TRAVEL TIME(MIN.) =    0.05    Tc(MIN.) =    4.51
 LONGEST FLOWPATH FROM NODE    340.00 TO NODE    343.00 =     307.50 FEET.
```

OUTLET TO BASIN 5

The open channel flow calculator

Select Channel Type: Rectangle



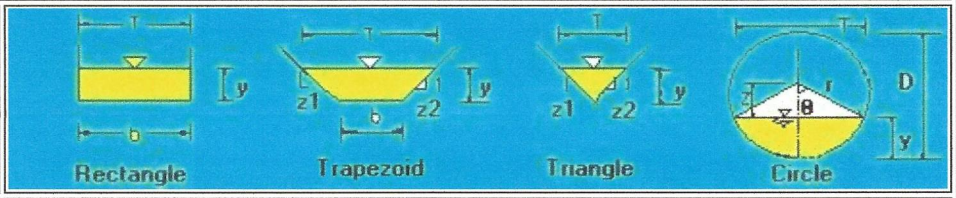
Depth from Q | Select unit system: Feet(ft)

Channel slope: 0.0296 ft/ft	Water depth(y): 0.27 ft	Bottom W(b) 2 ft
Flow velocity 6.01312 ft/s	LeftSlope (Z1): 0 to 1 (H:V	RightSlope (Z2): 0 to 1 (H:V
Flow discharge 3.30 ft^3/s	Input n value 0.015 or select n	
Calculate!	Status: Calculation finished	Reset
Wetted perimeter 2.55 ft	Flow area 0.55 ft^2	Top width(T) 2 ft
Specific energy 0.84 ft	Froude number 2.02	Flow status Supercritical flow
Critical depth 0.44 ft	Critical slope 0.0069 ft/ft	Velocity head 0.56 ft

OUTLET AT NODE 384 BASIN 6

The open channel flow calculator

Select Channel Type: Circle



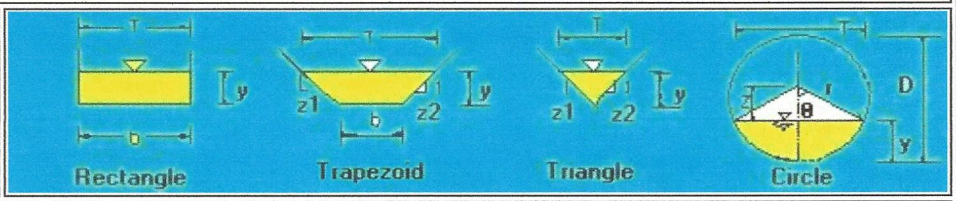
Depth from Q | Select unit system: Feet(ft)

Channel slope: 0.002 ft/ft	Water depth(y): 0.44 ft	Radius (r) 0.75 ft
Flow velocity 2.0504 ft/s	LeftSlope (Z1): to 1 (H:V	RightSlope (Z2): to 1 (H:V
Flow discharge 0.89 ft^3/s	Input n value 0.013 or select n: clean,uncoated castiron:0.014	
Calculate!	Status: Calculation finished	Reset
Wetted perimeter 1.73 ft	Flow area 0.44 ft^2	Top width(T) 1.37 ft
Specific energy 0.51 ft	Froude number 0.64	Flow status Subcritical flow
Critical depth 0.35 ft	Critical slope 0.0049 ft/ft	Velocity head 0.07 ft

PRE-DEVELOPED CONDITION AT DISCHARGE POINT #1

The open channel flow calculator

Select Channel Type: Circle



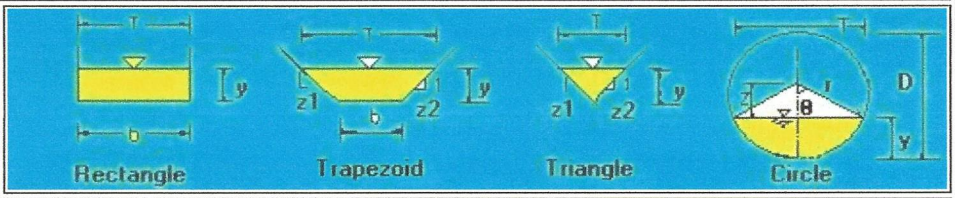
Depth from Q | Select unit system: Feet(ft)

Channel slope: 0.03 ft/ft	Water depth(y): 0.53 ft	Radius (r) 0.75 ft
Flow velocity 8.715 ft/s	LeftSlope (Z1): to 1 (H:V	RightSlope (Z2): to 1 (H:V
Flow discharge 4.81 ft^3/s	Input n value 0.013 or select n: clean,uncoated castiron:0.014	
Calculate!	Status: Calculation finished	Reset
Wetted perimeter 1.91 ft	Flow area 0.56 ft^2	Top width(T) 1.43 ft
Specific energy 1.71 ft	Froude number 2.46	Flow status Supercritical flow
Critical depth 0.85 ft	Critical slope 0.0056 ft/ft	Velocity head 1.18 ft

PRE-DEVELOPED CONDITION AT DISCHARGE POINT #2

The open channel flow calculator

Select Channel Type: Rectangle



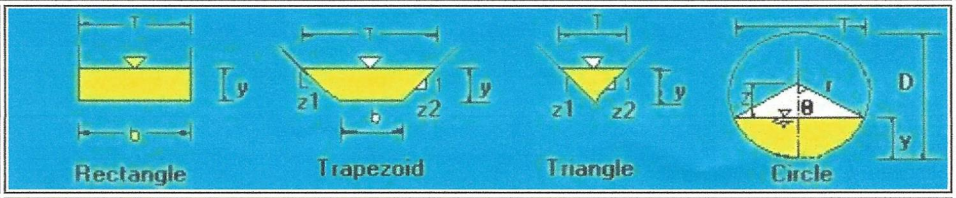
Depth from Q | Select unit system: Feet(ft)

Channel slope: 0.0047 ft/ft	Water depth(y): 4.55 ft	Bottom W(b) 10 ft
Flow velocity 10.996 ft/s	LeftSlope (Z1): 0 to 1 (H:V	RightSlope (Z2): 0 to 1 (H:V
Flow discharge 500 ft^3/s	Input n value 0.0165 or select n: clean,uncoated castiron:0.014	
Calculate!	Status: Calculation finished	Reset
Wetted perimeter 19.09 ft	Flow area 45.47 ft^2	Top width(T) 10 ft
Specific energy 6.42 ft	Froude number 0.91	Flow status Subcritical flow
Critical depth 4.27 ft	Critical slope 0.0056 ft/ft	Velocity head 1.88 ft

EXISTING CONDITION CALCULATION BASED UPON A Q_{100} = 500 CFS AND DESIGN PARAMETERS PROVIDED IN THE RECORD DRAWINGS. (DISCHARGE POINT #3)

The open channel flow calculator

Select Channel Type: Circle



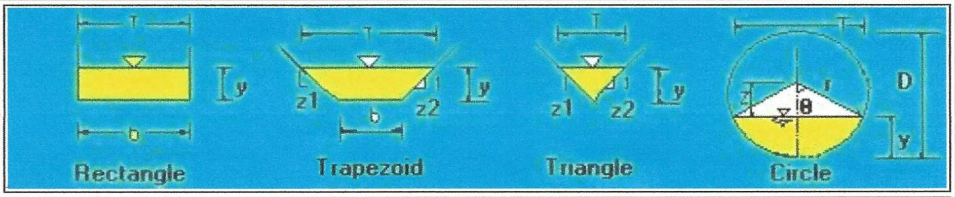
Depth from Q | Select unit system: Feet(ft)

Channel slope: 0.0125 ft/ft	Water depth(y): 1.34 ft	Radius (r) 0.75 ft
Flow velocity 7.492 ft/s	LeftSlope (Z1): to 1 (H:V	RightSlope (Z2): to 1 (H:V
Flow discharge 12.46 ft^3/s	Input n value 0.013 or select n: clean,uncoated castiron:0.014	
Calculate!	Status: Calculation finished	Reset
Wetted perimeter 3.71 ft	Flow area 1.66 ft^2	Top width(T) 0.93 ft
Specific energy 2.21 ft	Froude number 0.99	Flow status Subcritical flow
Critical depth 1.33 ft	Critical slope 0.0125 ft/ft	Velocity head 0.87 ft

DEVELOPED CONDITION AT DISCHARGE POINT #2
(BIO BASIN 1)

The open channel flow calculator

Select Channel Type: Circle



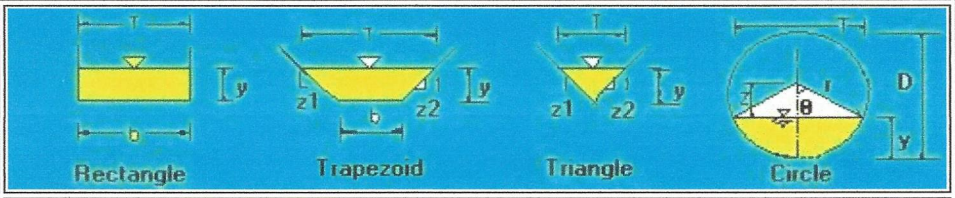
Depth from Q | Select unit system: Feet(ft)

Channel slope: 0.01 ft/ft	Water depth(y): 0.67 ft	Radius (r) 0.5 ft
Flow velocity 5.02 ft/s	LeftSlope (Z1): to 1 (H:V	RightSlope (Z2): to 1 (H:V
Flow discharge 2.78 ft^3/s	Input n value 0.013 or select n	
Calculate!	Status: Calculation finished	Reset
Wetted perimeter 1.91 ft	Flow area 0.56 ft^2	Top width(T) 0.94 ft
Specific energy 1.06 ft	Froude number 1.15	Flow status Supercritical flow
Critical depth 0.72 ft	Critical slope 0.0082 ft/ft	Velocity head 0.39 ft

DEVELOPED CONDITION DISCHARGE FROM BASIN 4

The open channel flow calculator

Select Channel Type: Circle



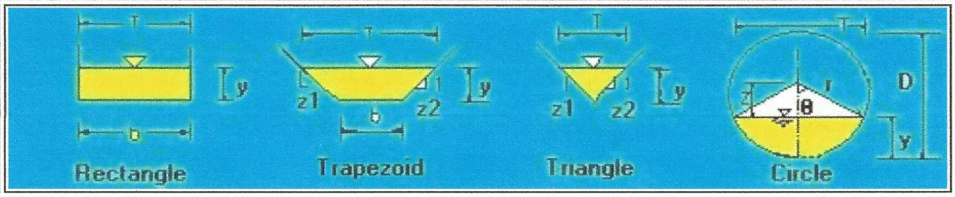
Depth from Q | Select unit system: Feet(ft)

Channel slope: 0.01 ft/ft	Water depth(y): 0.78 ft	Radius (r) 0.5 ft
Flow velocity 5.165 ft/s	LeftSlope (Z1): to 1 (H:V	RightSlope (Z2): to 1 (H:V
Flow discharge 3.41 ft^3/s	Input n value 0.013 or select n	
Calculate!	Status: Calculation finished	Reset
Wetted perimeter 2.17 ft	Flow area 0.66 ft^2	Top width(T) 0.82 ft
Specific energy 1.2 ft	Froude number 1.02	Flow status Supercritical flow
Critical depth 0.79 ft	Critical slope 0.0097 ft/ft	Velocity head 0.41 ft

DEVELOPED CONDITION DISCHARGE FROM BASIN 6

The open channel flow calculator

Select Channel Type: Rectangle



Depth from Q | Select unit system: Feet(ft)

Channel slope: 0.0047 ft/ft	Water depth(y): 4.89 ft	Bottom W(b) 10 ft
Flow velocity 11.286 ft/s	LeftSlope (Z1): 0 to 1 (H:V	RightSlope (Z2): 0 to 1 (H:V
Flow discharge 551.9 ft^3/s	Input n value 0.0165 or select n: clean,uncoated castiron:0.014	
Calculate!	Status: Calculation finished	Reset
Wetted perimeter 19.78 ft	Flow area 48.9 ft^2	Top width(T) 10 ft
Specific energy 6.87 ft	Froude number 0.9	Flow status Subcritical flow
Critical depth 4.56 ft	Critical slope 0.0057 ft/ft	Velocity head 1.98 ft

PROPOSED DEVELOPED CONDITION CALCULATION BASED UPON A Q_{100} = 551.9 CFS AND DESIGN PARAMETERS PROVIDED IN TITE RECORD DRAWINGS. (DISCHARGE POINT #3)

Appendix E: 100-Year Routing Analysis for Liberty Bell Plaza Prepared by REC Consultants

Downstream Conveyance Analysis

The majority of the pre-developed condition Liberty Bell Plaza project site discharges in a westerly direction and is intercepted by the existing storm drain infrastructure located within the adjacent Valley Center Road.

Per the "Valley Center Road Reconstruction in the Vicinity of Valley Center" County of San Diego Improvement plans dated 2006, the receiving storm drain is an existing 5'x10' RCB storm drain that conveys flow in a northerly direction, discharging directly to Moosa Creek located approximately 1,300 feet to the north of the Liberty Bell Plaza project site. Per this plan set, the existing 5'x10' RCB conveys a design flow of 500 cfs from the existing Liberty Bell Plaza project site.

The development of the Liberty Bell Plaza project site increases the sites impervious percentage such that there will be an increase in peak storm flows. Additionally, a small portion of the existing Liberty Bell Plaza project site that currently discharges to an earthen swale to the north of the project site will be diverted to the existing storm drain intercept location within Valley Center Road.

Per the hydrologic analysis within this drainage study, Table 1 below illustrates the pre and post developed condition peak flows tributary to the existing 5' x 10' RCB storm drain. In order to be conservative, developed peak flows have not been confluenced and the total provided below is a direct summation of these flows.

Table 1 – Summary of Pre & Post Developed Condition Flow to Existing 5'x10' RCP Box

Condition	Area (Ac)	100-Year Peak Flow (cfs)
Pre-Developed	8.489	8.8
Post-Developed	8.531	60.7
Difference	+ 0.042	+51.9

As presented in Table 1, the increase in peak flow to the existing 5' x 10' RCB is approximately 51.9 cfs. A WSPG hydraulic analysis of the existing storm drain was undertaken to clearly demonstrate that the existing 5' x10' RCB can safely convey a peak flow of 551.9 cfs, maintaining the HGL within the pipe cross-section, as such there are no pressure flow conditions. A conservative design assumption of critical depth was assumed as the downstream tailwater condition for this hydraulic calculation. This hydraulic calculation demonstrates that the 5' x 10' RCB can safely convey increase in design peak flow.

Please refer to the attached hydraulic calculations and supporting improvement plans.

```
************************************
Water Surface Profile Gradient (WSPG)
XP WSPG
Engine Version 1.3          06/09/2010
XP Software         www.xpsoftware.com
************************************

INPUT FILE
************************************
P:\Acad\7032 Alidade\09 Liberty Bell Plaza\Q100\WSPG\5x10Box.wsx
Computed  09/24/19  10:48:25

TITLE INFORMATION
************************************

WARNING SUMMARY
************************************

RESULTS
************************************
```

Main Line

Composite Profile:

ELEMENT NAME	TYPE	STATION	INVERT ELEV	GROUND ELEV	W.S. ELEV	DEPTH	Q	VELOC.	VELOC. HEAD	ENERGY GRADE LN	SUPER ELEV	CRITICAL DEPTH	FROUDE NUMBER	SLOPE	NORMAL DEPTH	CROSS SECTION
###																
"Node2"	Outlet	0.00	1284.32	1295.00	1292.000	7.680	500.00	10.05	1.57	1293.57	0.000	4.267	0.000	0.00000	0.000	Tr./Rect.closed
"Link1"	Reach	1332.73	1290.50	1300.00	1297.249	6.749	500.00	10.05	1.57	1298.82	0.000	4.267	0.794	0.00464	3.833	Tr./Rect.closed
"Node1"	Headwrk	1332.73	1290.50	1300.00	1297.249	6.749	500.00	10.05	1.57	1298.82	0.000	4.267	0.000	0.00000	0.000	Tr./Rect.closed

*) in the W.S.ELEV column indicates flooding, it is set whenever W.S.ELEV > GROUND ELEV
i.p. = intermediate point processing results for reaches

EXISTING CONDITION

```
************************************
Water Surface Profile Gradient (WSPG)
XP WSPG
Engine Version 1.3         06/09/2010
XP Software        www.xpsoftware.com
************************************

INPUT FILE
************************************
P:\Acad\7032 Alidade\09 Liberty Bell Plaza\Q100\WSPG\5x10Box.wsx
Computed  09/23/19  11:24:19

TITLE INFORMATION
************************************

WARNING SUMMARY
************************************

RESULTS
************************************
```

Main Line

Composite Profile:

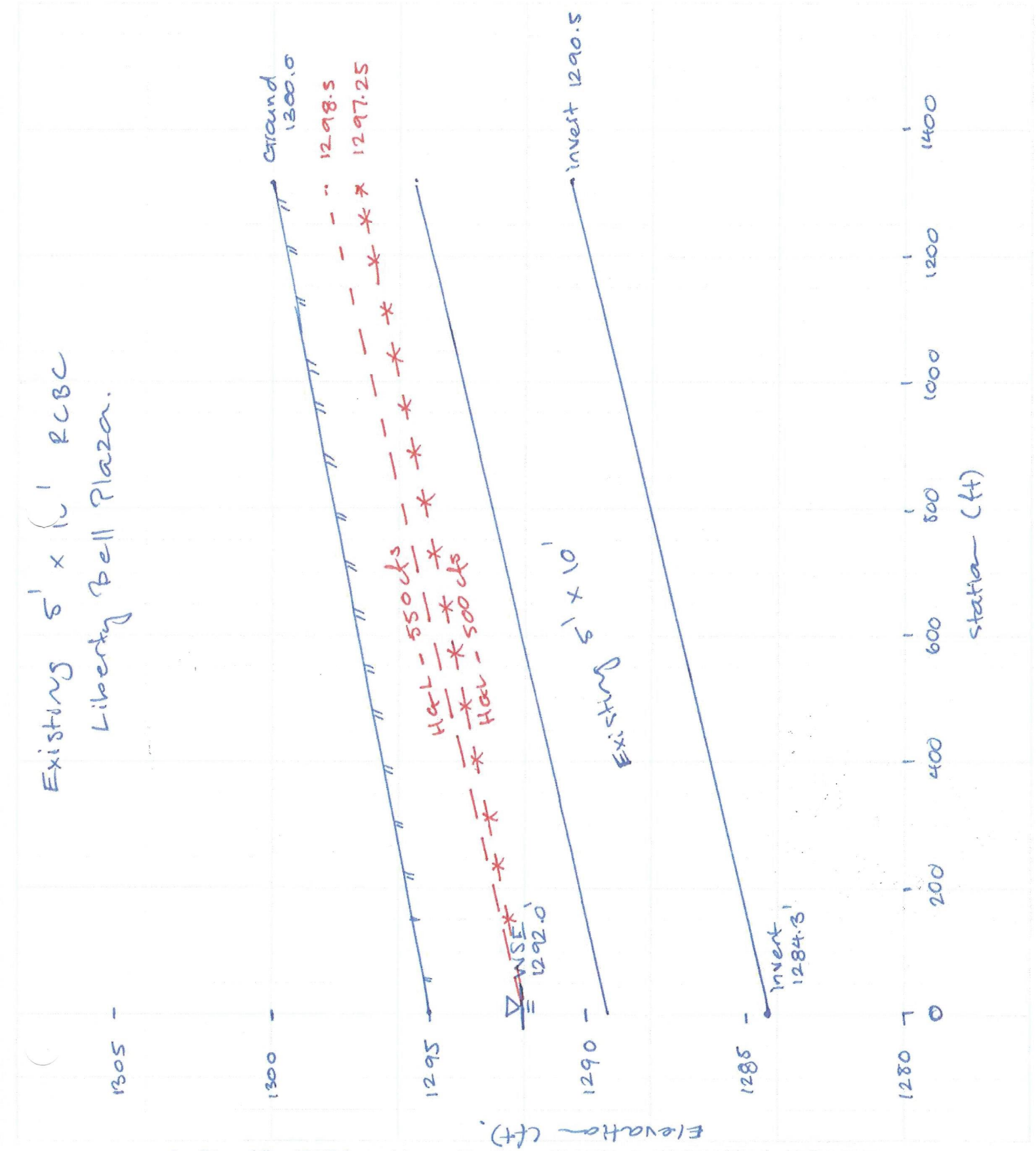
ELEMENT NAME	TYPE	STATION	INVERT ELEV	GROUND ELEV	W.S. ELEV	DEPTH	Q	VELOC.	VELOC. HEAD	ENERGY GRADE LN	SUPER ELEV	CRITICAL DEPTH	FROUDE NUMBER	SLOPE	NORMAL DEPTH	CROSS SECTION
###																
"Node2"	Outlet	0.00	1284.32	1295.00	1292.000	7.680	551.90	11.09	1.91	1293.91	0.000	4.557	0.000	0.00000	0.000	Tr./Rect.closed
"Link1"	Reach	1332.73	1290.50	1300.00	1298.395	7.895	551.90	11.09	1.91	1300.31	0.000	4.557	0.876	0.00464	4.119	Tr./Rect.closed
"Node1"	Headwrk	1332.73	1290.50	1300.00	1298.395	7.895	551.90	11.09	1.91	1300.31	0.000	4.557	0.000	0.00000	0.000	Tr./Rect.closed

*) in the W.S.ELEV column indicates flooding, it is set whenever W.S.ELEV > GROUND ELEV
i.p. = intermediate point processing results for reaches

DEVELOPED CONDITION

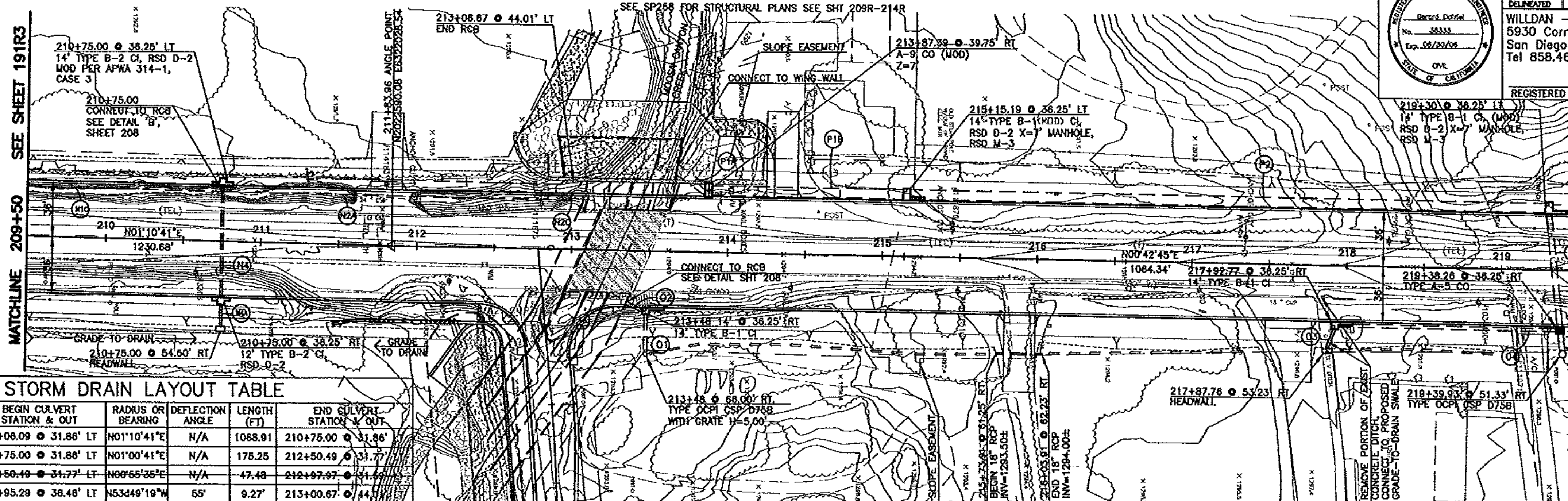
R·E·C
Consultants, Inc.
rec-consultants.com
Civil Engineering / Land Design
Environmental Analysis
Biological Analysis
Water Resources
Land Surveying
GIS Services

Client: _____ Sheet _____ of _____
Project: _____ Date: _____
Description: _____ Project No: _____
Prepared By: _____ Checked By: _____



FOR REDUCED PLANS ORIGINAL SCALE IS IN INCHES

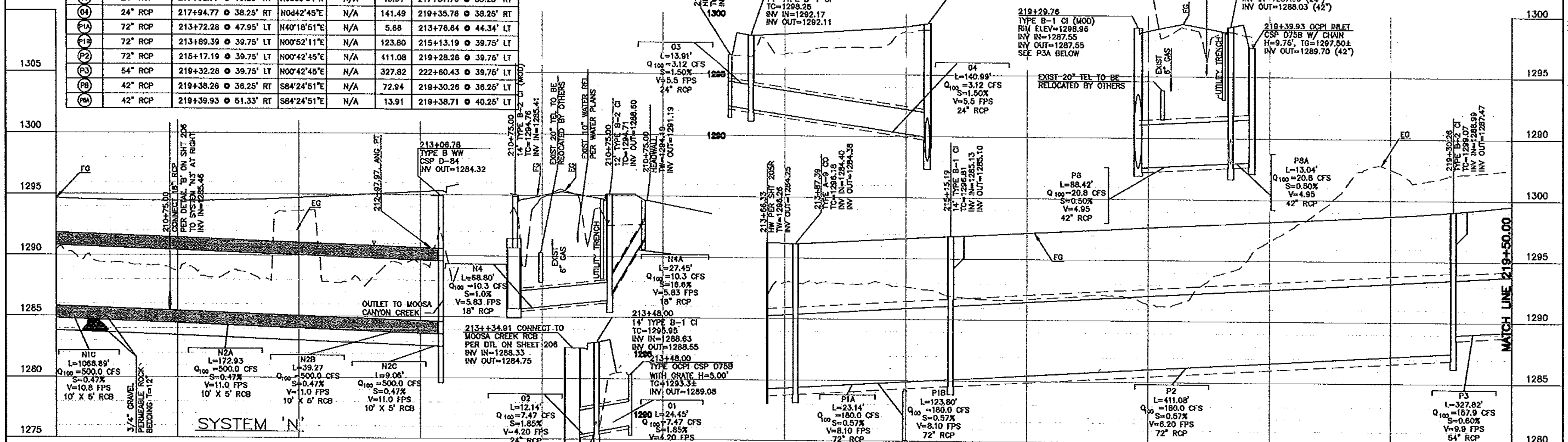
Basis of Bearings
California Coordinate System Zone 6
NAD 83



SEE SHEET 191R3
MATCHLINE 209+50
SEE SHEET 193R3
MATCHLINE 219+50
210+75.00 @ 38.25' LT
14' TYPE B-2 CI, RSD D-2
MOD PER APWA 314-1, CASE 3
210+75.00
CONNECT TO RCB
SEE DETAIL 'B', SHEET 208
213+08.67 @ 44.01' LT
END RCB
SEE SP258 FOR STRUCTURAL PLANS SEE SHT 209R-214R
SLOPE EASEMENT
CONNECT TO WING WALL
213+87.39 @ 39.75' RT
A-9 CO (MOD)
Z=7
215+15.19 @ 38.25' LT
14' TYPE B-1 (MOD) CI,
RSD D-2 X=7' MANHOLE,
RSD M-3
219+30 @ 38.25' LT
14' TYPE B-1 CI (MOD)
RSD D-2 X=7' MANHOLE,
RSD M-3
N01°10'41"E
1230.68'
N00°42'45"E
1084.34'
CONNECT TO RCB
SEE DETAIL SHT 208
217+92.77 @ 38.25' RT
14' TYPE B-1 CI
219+38.26 @ 38.25' RT
TYPE A-5 CO
213+48 14' @ 38.25' RT
14' TYPE B-1 CI
GRADE TO DRAIN
210+75.00 @ 54.60' RT
HEADWALL
210+75.00 @ 38.25' RT
12' TYPE B-2 CI,
RSD D-2
GRADE TO DRAIN
213+48 @ 68.00' RT
TYPE OCPI CSP D758
WITH GRATE H=5.00'
217+87.76 @ 53.23' RT
HEADWALL
219+39.93 @ 51.33' RT
TYPE OCPI CSP D758
REMOVE PORTION OF EXIST CONCRETE DITCH, CONNECT TO PROPOSED GRADE-TO-DRAIN SWALE

STORM DRAIN LAYOUT TABLE

SEGMENT NO.	CULVERT TYPE	BEGIN CULVERT STATION & OUT	RADIUS OR BEARING	DEFLECTION ANGLE	LENGTH (FT)	END CULVERT STATION & OUT
N1C	10'X5' RCB	200+06.09 @ 31.86' LT	N01°10'41"E	N/A	1068.91	210+75.00 @ 31.86' LT
N2A	10'X5' RCB	210+75.00 @ 31.86' LT	N01°00'41"E	N/A	175.25	212+50.49 @ 31.77'
~~N2B~~	~~10'X5' RCB~~	~~212+50.49 @ 31.77' LT~~	~~N00°55'35"E~~	~~N/A~~	~~47.48~~	~~212+97.97 @ 31.5[illegible]~~
N2C	10'X5' RCB	212+95.29 @ 36.46' LT	N53d49'19"W	55'	9.27'	213+00.67 @ 44.[illegible]' LT
N4	18" RCP	210+75.00 @ 36.00 LT	N88°49'19"W	N/A	72.25	210+75.00 @ 36.25' RT
N4A	18" RCP	210+75.00 @ 40.25' RT	N86°49'19"W	N/A	68.80	210+75.00 @ 54.63' RT
O1	24" RCP	213+48.00 @ 64.71' RT	N55°29'25"W	N/A	24.43	213+48.00 @ 40.25' RT
O2	24" RCP	213+46.00 @ 38.25' RT	S24°14'09"W	N/A	11.25	213+34.91 @ 33.30' RT
O3	24" RCP	217+92.77 @ 40.25' RT	N68d9'54"W	N/A	13.91	217+87.76 @ 53.23' RT
O4	24" RCP	217+94.77 @ 38.25' RT	N0d42'45"E	N/A	141.49	219+35.76 @ 38.25' RT
P1A	72" RCP	213+72.28 @ 47.95' LT	N40°18'51"E	N/A	5.68	213+76.64 @ 44.34' LT
P1B	72" RCP	213+89.39 @ 39.75' LT	N00°52'11"E	N/A	123.80	215+13.19 @ 39.75' LT
P2	72" RCP	215+17.19 @ 39.75' LT	N00°42'45"E	N/A	411.08	219+28.26 @ 39.75' LT
P3	54" RCP	219+32.26 @ 39.75' LT	N00°42'45"E	N/A	327.82	222+60.43 @ 39.76' LT
P8	42" RCP	219+38.26 @ 36.25' RT	S84°24'51"E	N/A	72.94	219+30.26 @ 36.25' LT
P8A	42" RCP	219+39.93 @ 51.33' RT	S84°24'51"E	N/A	13.91	219+38.71 @ 40.25' LT



SYSTEM 'N'
N1C
L=1068.89'
Q100 =500.0 CFS
S=0.47%
V=10.8 FPS
10' X 5' RCB
3/4" GRAVEL PERMEABLE ROCK BEDDING T=12"
N2A
L=172.93
Q100 =500.0 CFS
S=0.47%
V=11.0 FPS
10' X 5' RCB
N2C
L=9.06'
Q100 =500.0 CFS
S=0.47%
V=11.0 FPS
10' X 5' RCB
OUTLET TO MOOSA CANYON CREEK
N4
L=68.80'
Q100 =10.3 CFS
S=1.0%
V=5.83 FPS
18" RCP
N4A
L=27.45'
Q100 =10.3 CFS
S=18.6%
V=5.83 FPS
18" RCP
213+34.91 CONNECT TO MOOSA CREEK RCB PER DTL ON SHEET 208
INV IN=1288.33
INV OUT=1284.75
213+48.00
14' TYPE B-1 CI
TC=1295.95
INV IN=1288.63
INV OUT=1288.55
213+48.00
TYPE OCPI CSP D758 WITH GRATE H=5.00'
TC=1293.3±
INV OUT=1289.08
O2
L=12.14'
Q100 =7.47 CFS
S=1.85%
V=4.20 FPS
24" RCP
O1
L=24.45'
Q100 =7.47 CFS
S=1.85%
V=4.20 FPS
24" RCP
O3
L=13.91'
Q100 =3.12 CFS
S=1.50%
V=5.5 FPS
24" RCP
O4
L=140.99'
Q100 =3.12 CFS
S=1.50%
V=5.5 FPS
24" RCP
217+92.77
14' TYPE B-1 CI
TC=1298.25
INV IN=1292.17
INV OUT=1292.11
219+29.76
TYPE B-1 CI (MOD)
RIM ELEV=1298.96
INV IN=1287.55
INV OUT=1287.55
SEE P3A BELOW
EXIST 10" WATER
INV ELEV =1295.2
RELOCATE PER WATER PLANS
EXIST 20" TEL TO BE RELOCATED BY OTHERS
219+38.26
TYPE A-5 CO
RIM ELEV=1299.08
INV IN=1289.69 (42")
INV IN=1287.95 (24")
INV OUT=1288.03 (42")
219+39.93 OCPI INLET
CSP D758 W/ CHAIN
H=9.76', TG=1297.50±
INV OUT=1289.70 (42")
P8
L=88.42'
Q100 =20.8 CFS
S=0.50%
V=4.95
42" RCP
P8A
L=13.04'
Q100 =20.8 CFS
S=0.50%
V=4.95
42" RCP
P1A
L=23.14'
Q100 =180.0 CFS
S=0.57%
V=8.10 FPS
72" RCP
P1B
L=123.80'
Q100 =180.0 CFS
S=0.57%
V=8.10 FPS
72" RCP
P2
L=411.08'
Q100 =180.0 CFS
S=0.57%
V=8.20 FPS
72" RCP
P3
L=327.82'
Q100 =157.9 CFS
S=0.60%
V=9.9 FPS
54" RCP
MATCH LINE 219+50.00
EG
FG

COUNTY OF SAN DIEGO DEPARTMENT OF PUBLIC WORKS 5555 OVERLAND AVENUE, SAN DIEGO, CA 92123-1295

REVISIONS	BY	APPROVED	DATE
R3 STORM DRAIN REVISION			

COORDINATE INDEX 370 N. 1781 E.
CONST. COMPL.
FIELD REVISIONS

VALLEY CENTER ROAD RECONSTRUCTION IN THE VICINITY OF VALLEY CENTER

STORM DRAIN PLAN - 209+50 TO 219+50

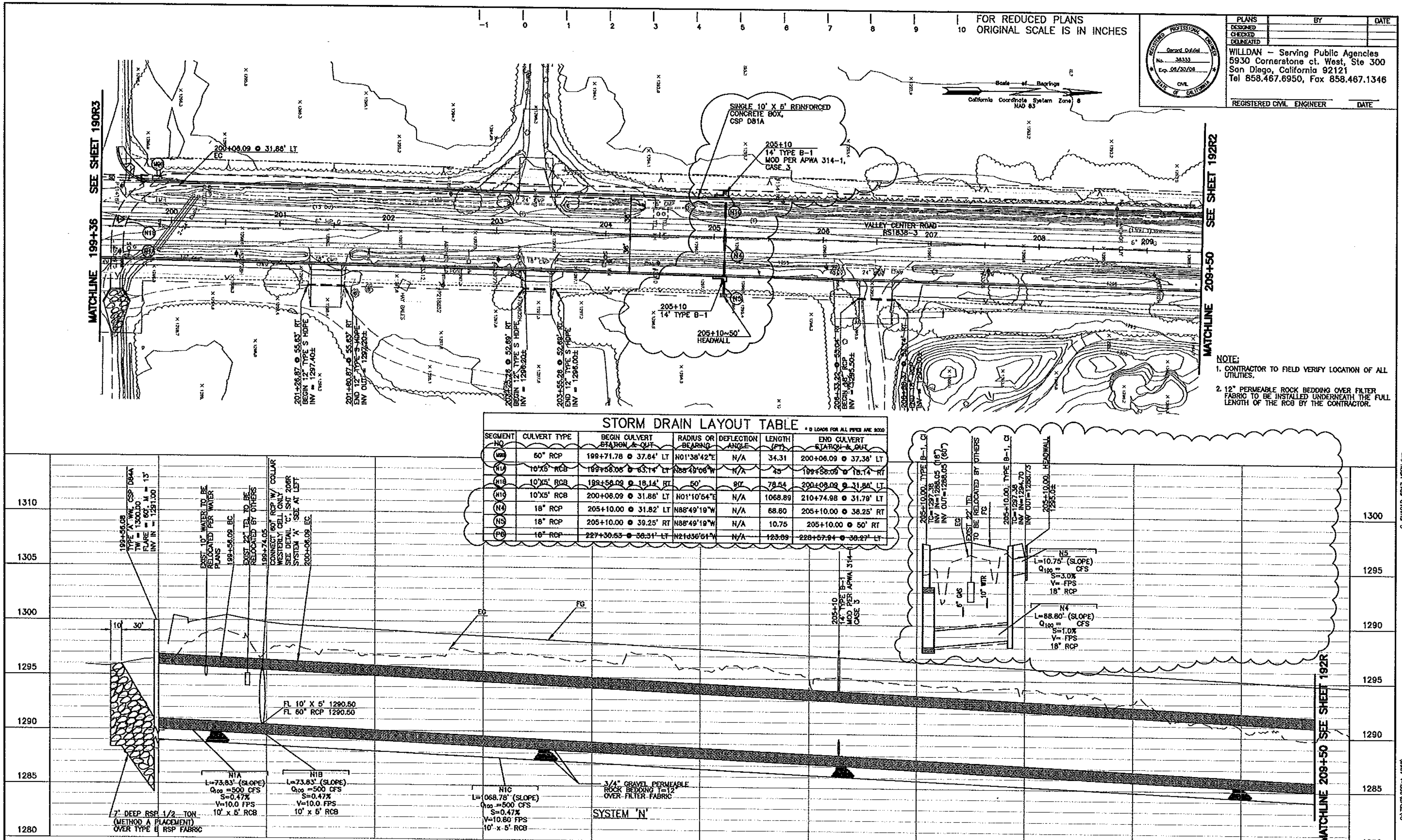
SCALE: HOR. 1"=40' VERT. 1"=4'
W.A. UJ1101 R.S. 1838-3 TO -6
FILE NO.
SHEET 192R3 OF 256 SHEETS

PLANS	BY	DATE
DESIGNED		
CHECKED		
DELINEATED		

WILLDAN – Serving Public Agencies
5930 Cornerstone ct. West, Ste 300
San Diego, California 92121
Tel 858.467.6950, Fax 858.467.1346

REGISTERED CIVIL ENGINEER DATE

REVISED SHEET



SEGMENT NO.	CULVERT TYPE	BEGIN CULVERT STATION & OUT	RADIUS OR BEARING	DEFLECTION ANGLE	LENGTH (FT)	END CULVERT STATION & OUT
N0B	60" RCP	199+71.78 @ 37.64' LT	N01°38'42"E	N/A	34.31	200+06.09 @ 37.38' LT
N1A	10'X5' RCB	199+56.06 @ 63.14' LT	N88°49'06"W	N/A	45	199+56.09 @ 18.14' RT
N1B	10'X5' RCB	199+56.09 @ 18.14' RT	50'	90°	78.54	200+06.09 @ 31.86' LT
N1C	10'X5' RCB	200+06.09 @ 31.86' LT	N01°10'54"E	N/A	1068.89	210+74.98 @ 31.79' LT
N4	18" RCP	205+10.00 @ 31.82' LT	N88°49'19"W	N/A	68.60	205+10.00 @ 38.25' RT
N5	18" RCP	205+10.00 @ 39.25' RT	N88°49'19"W	N/A	10.75	205+10.00 @ 50' RT
P6	18" RCP	227+30.53 @ 36.31' LT	N21d36'51"W	N/A	123.09	228+57.94 @ 38.27' LT

STORM DRAIN LAYOUT TABLE — * D LOADS FOR ALL PIPES ARE 2000

NOTE:
1. CONTRACTOR TO FIELD VERIFY LOCATION OF ALL UTILITIES.
2. 12" PERMEABLE ROCK BEDDING OVER FILTER FABRIC TO BE INSTALLED UNDERNEATH THE FULL LENGTH OF THE RCB BY THE CONTRACTOR.

WILLDAN – Serving Public Agencies
5930 Cornerstone ct. West, Ste 300
San Diego, California 92121
Tel 858.467.6950, Fax 858.467.1346

REGISTERED CIVIL ENGINEER — DATE

COUNTY OF SAN DIEGO
DEPARTMENT OF PUBLIC WORKS
5555 OVERLAND AVENUE, SAN DIEGO, CA 92123-1295

	REVISIONS	BY	APPROVED	DATE
R3	REVISED STORM DRAIN			

COORDINATE INDEX 370 N. 1781 E.
CONST. COMPL.
FIELD REVISIONS

VALLEY CENTER ROAD RECONSTRUCTION IN THE VICINITY OF VALLEY CENTER
STORM DRAIN PLAN 198+50 TO 209+50

SCALE: HOR. 1"=40' VERT. 1"=4'
W.A. UJ1101 R.S. 1838-3 TO -6
FILE NO.
SHEET 191R3 OF 256 SHEETS

17:00 07/17/06