# HYDROLOGY REPORT

**for**
8732 PROSPECT AVE
SANTEE, CA 92071
APN 383-112-26-00

## Project Name

PALM TREE INVESTMENTS
TPM 2020-1
for
8732 PROSPECT AVE
SANTEE, CA 92071
APN 383-112-26-00

## Owner


Mrs. Tricia Estrada
Palm Tree Investments, LLC
P.O. Box 9713 Rancho
Santa Fe, CA 92067


## Prepared By


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Rick Alzaga, PE, QSD, QSP
Principal



September 24, 2024

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## OBJECTIVE

The objective of this hydrology report is to determine overland flows, site drainage collection and storm water best management practices, onsite conveyance of overland flows, and acceptable discharge of overland flows.

## INTRODUCTION

The site is located southwest of I-125 and CA-52, and approximately 1,000 ft west of I-125 along Prospect Ave (See Attachment I, Location Map).

The site is 0.85 acres in size (36,965 sf) with one existing home intended to be demolished, with the intent to create four new parcels.

The land use is designated as residential with a zoning determination of R2 (Low-Medium Density Residential), with a use of 4.3 DU/A or less.

The legal description for the property is a portion of Lot 12 in Block C of Fanita Rancho in the County of San Diego, State of California according to Map 688. The property is bounded by single family homes to the west and to the north, Prospect Ave to the south (paved public road), and Our Way to the east (paved private road).

## DISCUSSION

### EXISTING DRAINAGE CONDITIONS

The lay of the land is from southwest to northeast, with one existing home situated on the southwesterly corner of the parcel. The high point is on the southwest corner of the property with an elevation of 366 ft, and the low point is on the northeast corner of the property with an elevation of 351 ft. The land slopes gently, approximately 5%, toward the northeast.

The site is self-tributary. The westerly parcel (APN 383-112-27) appears to drain toward the project's northwesterly corner, but also has obstructions whereby it's possible the adjacent parcel does not drain onto the site. Regardless, to be safe, this project will assume a portion of the flows to enter the site and flow along the northerly property line and toward the project's northeasterly corner. Moreover, per the hydrology study from the farther west single family tract development (Drainage Study for Prospect Fields, dated October 27, 2016) the westerly home's flows appear to be collected and drained via said tract's concrete drainage ditch. Lastly, flows from Prospect Ave traverse Prospect and then traverse Our Way along its westerly side and then surface flows toward the project's northeasterly corner.

**PROPOSED DRAINAGE CONDITIONS**

The entire site will remain self-tributary. The project proposes to demolish the existing home and subdivide into four (4) parcels to construct new single-family residences, with a single shared private driveway accessing from Prospect Ave.

Each of the four parcels will be graded to be generally flat, with 1% (min.) swales around each home to convey overland flows.

Parcels 1 and 2 (southerly parcels) will drain northward toward the front yard and onto the concrete V-Ditch gutter in the middle of the inverted drive aisle. Parcels 1 and 2 will then confluence with the driveway flows (main driveway entry from Prospect Ave (north-south alignment), drive aisle connecting to each of the 4 private driveways (east-west alignment), and each of the 4 private driveways). Then, said confluence flows will flow eastward toward the Biofiltration BMP #1 proposed on the east side of the house on Parcel 4. Then, ultimately discharge at the project's northeasterly corner (Point of Compliance (POC) 1), via the discharge pipes within BMP #1 that will be connected to the retaining wall and outletting onto the rock pad east of the wall. The rock pad will be 1% max toward the north and will allow flows to leave the project at non-erosive velocities onto the existing asphalt.

Parcels three (3) and four (4) (northerly parcels) will drain northward toward the rear yards and into tree wells − 2 tree wells per parcel, 1 per each half. Per the County of San Diego's BMP Design Manual, September 2020, Appendix I, Significant Site Design BMP (SSD-BMP), tree wells can be used for both pollutant control and hydromodification. Therefore, tree wells for parcels 3 and 4 are designed per said Manual. The tree wells are not designed to detain the 100 year flows. The 100 year flows will flow over the landscaped slopes at the rear of the yards and down a rip rap apron onto a concrete D-25 ditch. From there, flows will flow easterly onto a rip rap apron pad at the project's northeasterly corner, POC 1. At POC 1 the overall post-development flows will not exceed the pre-development flows. This is done by use of the BMP #1 and controlling the outflows of the low flow orifice and riser orifice.

All onsite flows, along with the potential flows from the neighboring westerly parcel, will outlet at the project's northeasterly corner, POC 1. Parcels 3 and 4 will be treated by the tree wells. For Parcels 1 and 2, and the driveways, Biofiltration BMP #1 will treat the initial flows ($85^{th}$ percentile Design Capture Volume (DCV)). Biofiltration BMP #2

The Biofiltration BMP #1 will be sized to capture, treat, then release the DCV flows, with a perforated pipe at the base of the BMP along with a low-flow orifice to control post-development outlet flows so they match, or are less than, the existing flows. Therefore, to ensure post-development flows are less than pre-development flows, a riser pipe with a 4.6 inch orifice will be installed to ensure total discharge flows will be equal to, or less than, pre-development flows. Moreover, the BMP surface is designed to retain the 100 year flow volume which will also slowly drain via the riser pipe orifice. In other words, all flows will discharge via the BMP discharge pipes so that post-development flows never exceed pre-development flows. In short, existing 100-year flows equal 0.92 cfs and mitigated 100-year flows also equal 0.92 cfs (0.69 cfs via the 4.6 inch orifice and 0.23 cfs via the low-flow perforated pipe at the bottom of the basin) (see summary table below). Lastly, should the system clog, a weir will be placed atop the retaining wall on the east side of the BMP to ensure water leaves the BMP before backing up into the project and potentially damaging property.

Since the Prospect Ave flows do not traverse the site, said flows will continue to drain from Prospect Ave, down Our Way, easterly of the project's improvements, to POC 1. Due to the widening of Prospect Ave, a Biofiltration Treatment BMP #2 is proposed, per the County of San Diego Guidance on Green Infrastructure, January 2019. It will be sized to treat the proposed A.C. and concrete sidewalk due to the required street widening improvements. The flows from Prospect Ave will be captured, first by the Biofiltration BMP #2 (see SWQMP for details) for the 85% percentile flows, and second by a curb inlet to capture the 100-year flows. Moreover, if incoming flows exceed the infiltration rate of the BMP and saturates the BMP, flows will saturate the BMP and simply pond until it rises enough to flow into the gutter, and then flow into the curb inlet immediately adjacent to the Biofiltration BMP #2. Additionally, a 6" diameter cleanout port will be provided at the upstream end of the Biofiltration BMP for maintenance purposes in case the 3" PVC perforated pipe needs flushing out. The BMP #2 will then connect to the curb inlet via the perforated pipe at the bottom of the Treatment BMP. These systems are proposed on the north side of Prospect Ave, immediately west of Our Way (see Attachment 5). The flows will then be piped via an 8" PVC pipe from the curb inlet to the project's northeasterly corner, POC 1, between the proposed site and Our Way.



## CONCLUSION

The hydrology analysis conducted is for the 10-yr and 100-yr storm events. The 10-yr flows are analyzed to provide biofiltration sizing for pollutant control of the 85$^{th}$ percentile DCV, as well as the sizing for hydromodification volumes. The 100-yr flows are analyzed to size the surface storage above the biofiltration BMP to detain flows and provide a controlled release to pre-development flows.

Due to the site being self-tributary and confluencing at the northeast corner of the project in its existing condition, the same will be for the proposed design. And since all flows in the area are surface flows due to non-existing storm drain infrastructure, the flows will be released as surface flows, as in the existing condition. Below is a summary table of the pre-development and post-development project flows.

### Summary of Discharges

| | Existing Flows Along Northerly Swale | Existing Flows Onsite | Proposed Flows Along D-25 Concrete Ditch | Proposed Flows Onsite | Existing Total Flows | Proposed Total Flows (Unmitigated) | Proposed Total Flows (Mitigated) |
|---|---|---|---|---|---|---|---|
| 10-year Storm | 0.158 cfs | 0.452 cfs | 0.180 cfs | 0.648 cfs | 0.610 cfs | 0.828 cfs | |
| 100-year Storm | 0.275 cfs | 0.645 cfs | 0.302 cfs | 0.928 cfs | 0.920 cfs | 1.230 cfs | 0.920 cfs |

## SUMMARY

Overland flows will be mitigated via the Tree Wells and Biofiltration BMP #1, so that post-development flows will not exceed pre-development flows. Moreover, there are no issues with erosion at the outlet since the proposed rock pad will be a near zero percent grade pad which will allow flows to slow down to non-erosive velocities and then sheet flow northerly onto the existing A.C., as it currently does.

## DESIGN CRITERIA

Per the San Diego County Hydrology Manual (2003) Table 3.1:

- The existing condition is classified as Medium Density Residential (4.3 DU/A - 30% Impervious Area).
- The proposed condition is also classified as Medium Density Residential (4.3 DU/A - 30% Impervious Area).

Per the San Diego County Hydrology Manual (2003) Rainfall Isopluvial Map:

- 10 Year Rainfall Event – 6 hours $P_6$ = 1.7 inches/hour
- 10 Year Rainfall Event – 24 hours $P_{24}$ = 2.9 inches/hour
- 100 Year Rainfall Event – 6 hours $P_6$ = 2.9 inches/hour
- 100 Year Rainfall Event – 24 hours $P_{24}$ = 4.5 inches/hour

Hydrologic calculations were performed using the CivilCADD/CivilDesign Engineering software, © 1991-2019 Version 9.1 as outlined within the San Diego Hydrology Manual (2003). CivilCADD/CivilDesign utilizes the Rational Method Hydrology Program which is based on the San Diego County Flood Control District 2003 Hydrology Manual. The hydrology calculations for proposed and existing conditions may be found within the hydrology calculations section of this report.

## REFERENCES

1. City of Santee BMP Design Manual (February 2016)
2. San Diego County Hydrology Manual (2003)
3. City of San Diego Drainage Design Manual (January 2017)
4. County of San Diego BMP Design Manual (Updated September 15, 2020)
5. County of San Diego Soils Hydrologic Group Map
6. Geocon, Inc., Geotechnical Investigation (March 4, 2020)

## DECLARATION OF RESPONSIBLE CHARGE

I hereby declare that I am the Engineer of Work for this report, that I have exercised responsible charge over the production of this report 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 this report by the City of Santee is confined to a review only and does not relieve me, as Engineer of Work of my responsibility for this report.

**CIVIL ENGINEER:**

HydroLAND Development
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Rick Alzaga, PE, QSD, QSP
#69120
Exp. 6-30-26

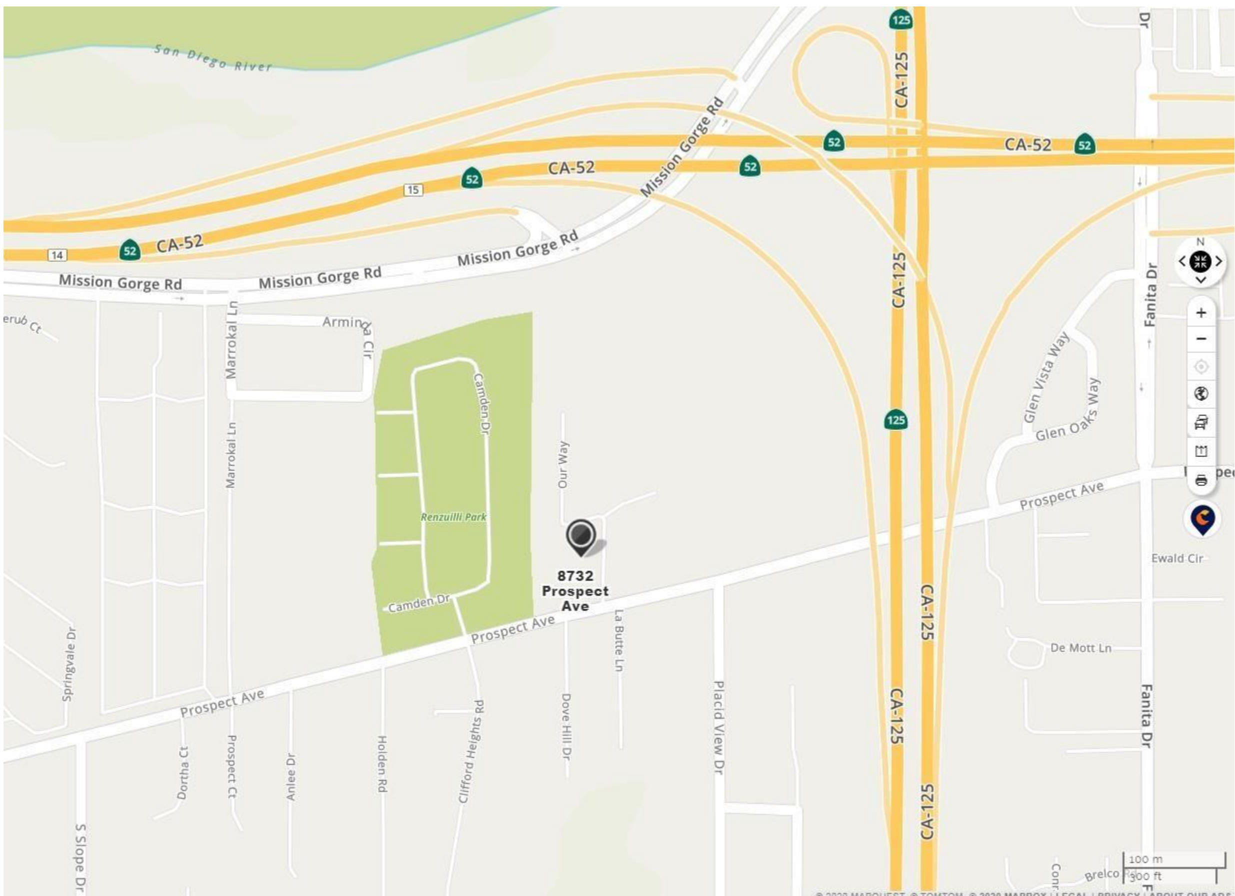
10/14/26
Date

# ATTACHMENTS

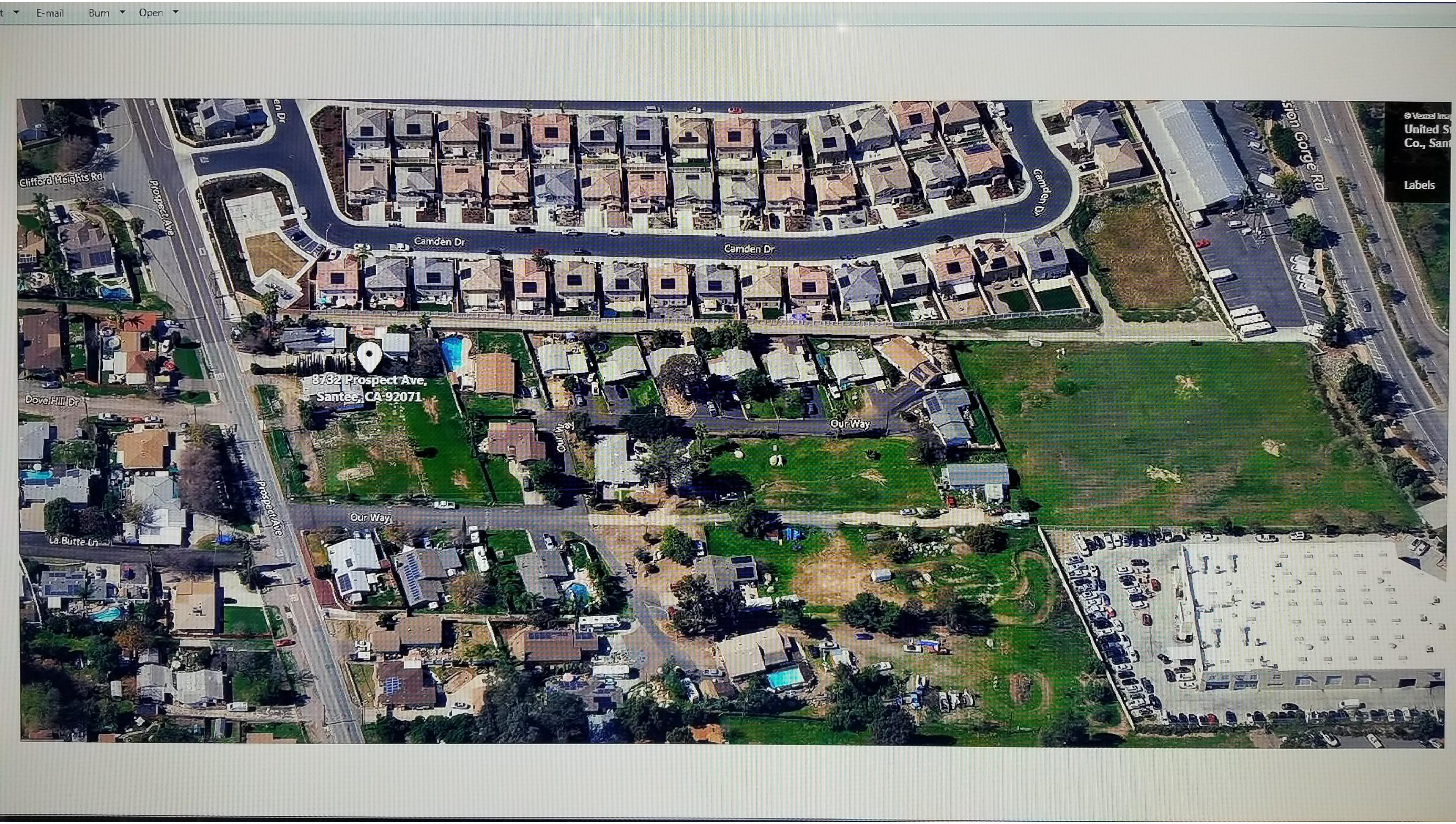
# ATTACHMENT 1

# LOCATION MAP

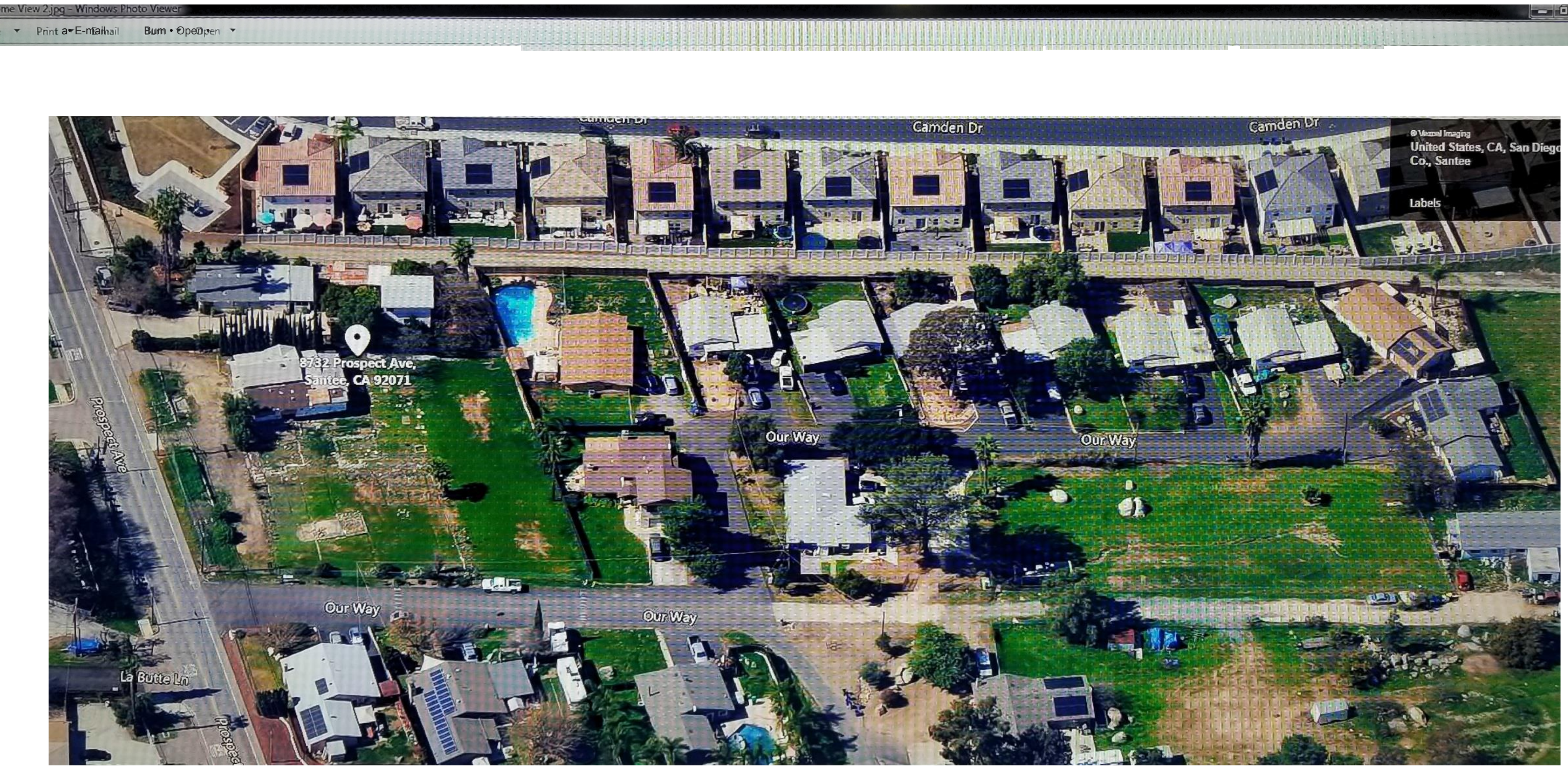
# w/ 3 AERIAL SITE PICS

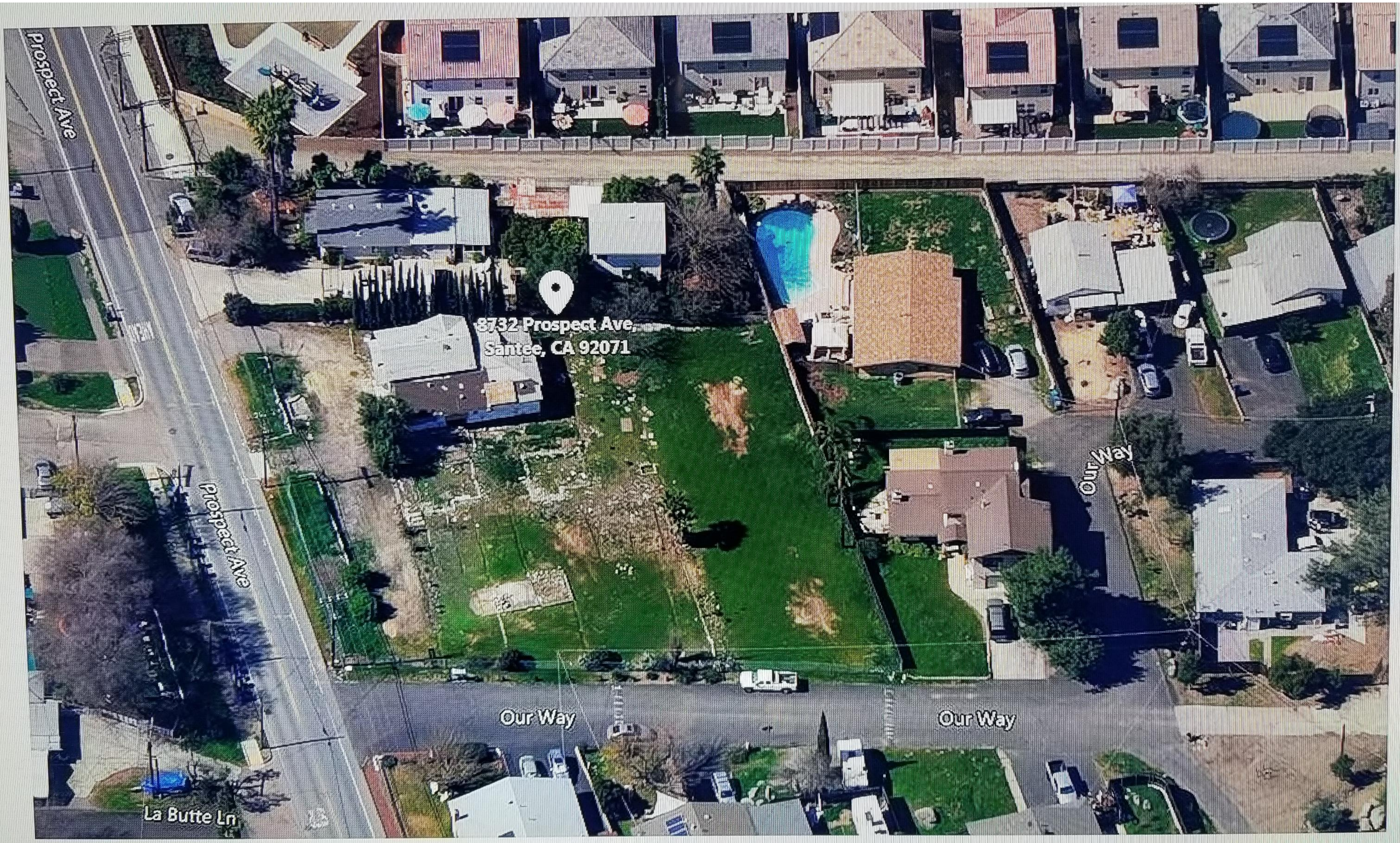


San Diego River
CA-52
Mission Gorge Rd
CA-125
Fanita Dr
Marrokal Ln
Armin Ja Cir
Camden Dr
Renzullli Park
Our Way
8732
Prospect
Ave
Prospect Ave
La Butte Ln
Dove Hill Dr
Placid View Dr
Clifford Heights Rd
Holden Rd
Anlee Dr
Prospect Ct
Dortha Ct
Springvale Dr
S Slope Dr
Glen Vista Way
Glen Oaks Way
Ewald Cir
De Mott Ln
Brelco
100 m
300 ft
© 2020 MAPQUEST, © TOMTOM, © 2020 MAPBOX | LEGAL | PRIVACY | ABOUT OUR ADS



E-mail
Burn
Open
Clifford Heights Rd
Prospect Ave
Camden Dr
Camden Dr
Camden Dr.
8732 Prospect Ave,
Santee, CA 92071
Dove Hill Dr
Our Way
Our Way
Our Way
La Butte Ln
Prospect Ave
Labels


Windows Photo Viewer
Camden Dr
Camden Dr
© Vexcel Imaging
United States, CA, San Dieg
Co., Santee
Labels
8732 Prospect Ave,
Santee, CA 92071
Our Way
Our Way
Our Way
Our Way
Prospect Ave
La Butte Ln


Prospect Ave
8732 Prospect Ave,
Santee, CA 92071
Our Way
Prospect Ave
Our Way
Our Way
La Butte Ln

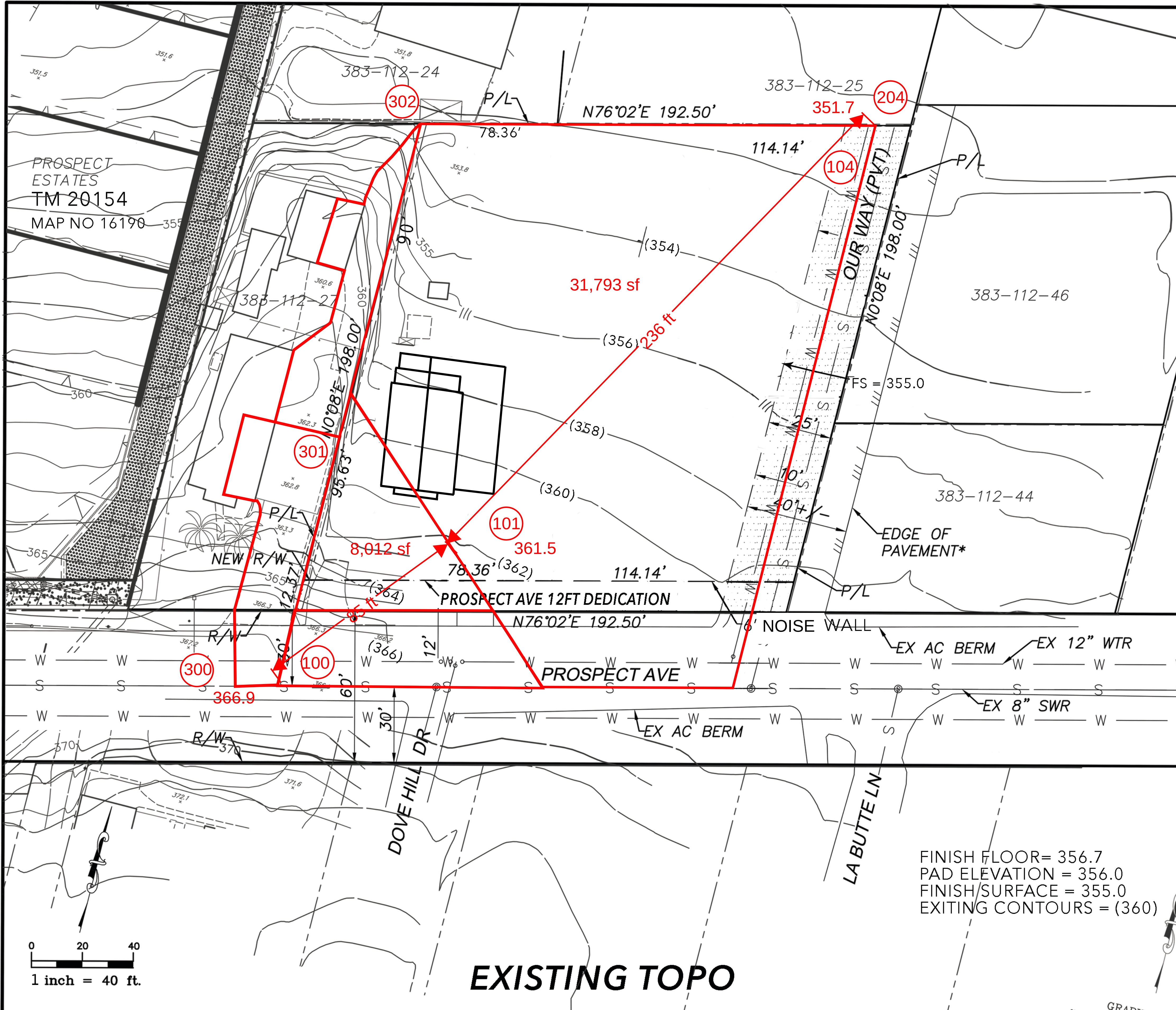
# ATTACHMENT 2

# EXISTING CONDITION

# HYDROLOGY MAP

PALM TREE INVESTMENTS

# PRE-DEVELOPMENT HYDROLOGY MAP



# ATTACHMENT 3

# EXISTING CONDITION

# 10-yr Storm Analysis

# EXISTING CONDITION

# 10-yr Storm Analysis

# Northerly Swale Flow

```
                 San Diego County Rational Hydrology Program

      CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2019 Version 9.1

      Rational method hydrology  program based on
      San Diego County Flood Control Division 2003 hydrology manual
            Rational Hydrology Study        Date: 08/25/24
      ------------------------------------------------------------------------
-----
      10yr Storm Analysis, Pre-Development
      Tributary Area - Neighbor (Natural Swale Flow)


      ------------------------------------------------------------------------
-----
       *********   Hydrology Study Control Information **********

      ------------------------------------------------------------------------
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      Program License Serial Number 6622

      ------------------------------------------------------------------------
-----
      Rational hydrology study storm event year is    10.0
      English (in-lb) input data Units used

      Map data precipitation entered:
      6 hour,  precipitation(inches) =  1.700
      24 hour precipitation(inches) =  2.900
      P6/P24 =    58.6%
      San Diego hydrology manual 'C' values used


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station      300.000 to Point/Station
301.000
      **** INITIAL AREA EVALUATION ****
      ________________________________________________________________________
___
      Decimal fraction soil group A = 0.000
      Decimal fraction soil group B = 0.000
      Decimal fraction soil group C = 0.000
      Decimal fraction soil group D = 1.000
      [LOW DENSITY RESIDENTIAL                     ]
      (1.0 DU/A or Less       )
      Impervious value, Ai = 0.100
      Sub-Area C Value = 0.410
      Initial subarea total flow distance  =  100.000(Ft.)
      Highest elevation =  367.600(Ft.)
      Lowest elevation =  362.000(Ft.)
```

Elevation difference = 5.600(Ft.) Slope = 5.600 %
Top of Initial Area Slope adjusted by User to 1.000 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 70.00 (Ft)
for the top area slope value of 1.00 %, in a development type of
1.0 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration = 10.39 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.4100)*( 70.000^.5)/( 1.000^(1/3)]= 10.39
Rainfall intensity (I) = 2.794(In/Hr) for a 10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.410
Subarea runoff = 0.076(CFS)
Total initial stream area = 0.066(Ac.)

+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station 301.000 to Point/Station 302.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________________

Upstream point/station elevation = 362.000(Ft.)
Downstream point/station elevation = 353.500(Ft.)
Pipe length = 125.00(Ft.) Slope = 0.0680 Manning's N = 0.015
No. of pipes = 1 Required pipe flow = 0.076(CFS)
Given pipe size = 24.00(In.)
Calculated individual pipe flow = 0.076(CFS)
Normal flow depth in pipe = 0.70(In.)
Flow top width inside pipe = 8.06(In.)
Critical depth could not be calculated.
Pipe flow velocity = 2.93(Ft/s)
Travel time through pipe = 0.71 min.
Time of concentration (TC) = 11.10 min.

+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station 301.000 to Point/Station 302.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________

Rainfall intensity (I) = 2.677(In/Hr) for a 10.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[LOW DENSITY RESIDENTIAL ]
(1.0 DU/A or Less )
Impervious value, Ai = 0.100
Sub-Area C Value = 0.410
Time of concentration = 11.10 min.

```
Rainfall intensity =      2.677(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.410  CA =      0.053
Subarea runoff =      0.066(CFS) for      0.063(Ac.)
Total runoff =      0.142(CFS)    Total area =       0.129(Ac.)


+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
Process from Point/Station      302.000 to Point/Station
204.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
___________________________________________________________________
___
Upstream point/station elevation =   353.500(Ft.)
Downstream point/station elevation =   351.000(Ft.)
Pipe length  =   160.00(Ft.) Slope =   0.0156  Manning's N = 0.030
No. of pipes = 1  Required pipe flow  =     0.142(CFS)
Given pipe size =     24.00(In.)
Calculated individual pipe flow  =     0.142(CFS)
Normal flow depth in pipe =    1.81(In.)
Flow top width inside pipe =   12.67(In.)
Critical Depth =    1.54(In.)
Pipe flow velocity =      1.31(Ft/s)
Travel time through pipe =    2.04 min.
Time of concentration (TC) =    13.14 min.


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+++
Process from Point/Station      302.000 to Point/Station
204.000
**** SUBAREA FLOW ADDITION ****
___________________________________________________________________
___
Rainfall intensity (I) =      2.401(In/Hr) for a    10.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[UNDISTURBED NATURAL TERRAIN                 ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.350
Time of concentration =    13.14 min.
Rainfall intensity =      2.401(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.397  CA =      0.066
Subarea runoff =      0.016(CFS) for      0.037(Ac.)
Total runoff =      0.158(CFS)    Total area =       0.166(Ac.)
End of computations, total study area =          0.166 (Ac.)
```

# EXISTING CONDITION

## 10-yr Storm Analysis

## Onsite

```
                              San Diego County Rational Hydrology Program

      CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2019 Version 9.1

      Rational method hydrology  program based on
      San Diego County Flood Control Division 2003 hydrology manual
                  Rational Hydrology Study        Date: 09/01/24
      --------------------------------------------------------------------
----
      10yr Storm Analysis, Pre-Development
      Tributary Area - Existing Site


      --------------------------------------------------------------------
----
       *********   Hydrology Study Control Information **********

      --------------------------------------------------------------------
----


      Program License Serial Number 6622

      --------------------------------------------------------------------
----
      Rational hydrology study storm event year is    10.0
      English (in-lb) input data Units used

      Map data precipitation entered:
      6 hour,  precipitation(inches) =  1.700
      24 hour precipitation(inches) =  2.900
      P6/P24 =    58.6%
      San Diego hydrology manual 'C' values used


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
++
      Process from Point/Station      100.000 to Point/Station
101.000
      **** INITIAL AREA EVALUATION ****
      ____________________________________________________________________
__
      Decimal fraction soil group A = 0.000
      Decimal fraction soil group B = 0.000
      Decimal fraction soil group C = 0.000
      Decimal fraction soil group D = 1.000
      [LOW DENSITY RESIDENTIAL                     ]
      (1.0 DU/A or Less       )
      Impervious value, Ai = 0.100
      Sub-Area C Value = 0.410
      Initial subarea total flow distance  =   85.000(Ft.)
      Highest elevation =  564.000(Ft.)
      Lowest elevation =  557.900(Ft.)
```

```
Elevation difference =    6.100(Ft.) Slope =  7.176 %
Top of Initial Area Slope adjusted by User to  2.000 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 85.00 (Ft)
for the top area slope value of   2.00 %, in a development type of
 1.0 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   9.09 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.4100)*(  85.000^.5)/(   2.000^(1/3)]=   9.09
Rainfall intensity (I) =      3.046(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.410
Subarea runoff =      0.225(CFS)
Total initial stream area =       0.180(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
++
Process from Point/Station      101.000 to Point/Station
104.000
**** IMPROVED CHANNEL TRAVEL TIME ****
______________________________________________________________________
__
Upstream point elevation =   557.900(Ft.)
Downstream point elevation =   555.600(Ft.)
Channel length thru subarea  =   110.000(Ft.)
Channel base width     =    0.000(Ft.)
Slope or 'Z' of left channel bank =  50.000
Slope or 'Z' of right channel bank =  50.000
Estimated mean flow rate at midpoint of channel =      0.370(CFS)
Manning's 'N'    = 0.030
Maximum depth of channel  =    0.500(Ft.)
Flow(q) thru subarea =      0.370(CFS)
Depth of flow =   0.090(Ft.), Average velocity =   0.908(Ft/s)
Channel flow top width =    9.026(Ft.)
Flow Velocity =    0.91(Ft/s)
Travel time  =    2.02 min.
Time of concentration =   11.11 min.
Critical depth =      0.081(Ft.)
 Adding area flow to channel
Rainfall intensity (I) =      2.677(In/Hr) for a    10.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[LOW DENSITY RESIDENTIAL                     ]
(1.0 DU/A or Less       )
Impervious value, Ai = 0.100
Sub-Area C Value = 0.410
Rainfall intensity =      2.677(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.410  CA =      0.169
Subarea runoff =      0.227(CFS) for      0.232(Ac.)
Total runoff =      0.452(CFS)    Total area =      0.412(Ac.)
```

Depth of flow = 0.097(Ft.), Average velocity = 0.955(Ft/s)
Critical depth = 0.087(Ft.)

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

Process from Point/Station 101.000 to Point/Station 104.000

**** 6 HOUR HYDROGRAPH ****

______________________________________________________________________

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Hydrograph Data - Section 6, San Diego County Hydrology manual, June 2003

Time of Concentration = 11.11
Basin Area = 0.41 Acres
6 Hour Rainfall = 1.700 Inches
Runoff Coefficient = 0.410
Peak Discharge = 0.45 CFS

| Time (Min) | Discharge (CFS) |
|---|---|
| 0 | 0.000 |
| 11 | 0.017 |
| 22 | 0.017 |
| 33 | 0.018 |
| 44 | 0.019 |
| 55 | 0.020 |
| 66 | 0.020 |
| 77 | 0.021 |
| 88 | 0.022 |
| 99 | 0.023 |
| 110 | 0.024 |
| 121 | 0.025 |
| 132 | 0.026 |
| 143 | 0.029 |
| 154 | 0.030 |
| 165 | 0.033 |
| 176 | 0.035 |
| 187 | 0.041 |
| 198 | 0.044 |
| 209 | 0.054 |
| 220 | 0.061 |
| 231 | 0.090 |
| 242 | 0.127 |
| 253 | 0.452 |
| 264 | 0.072 |
| 275 | 0.048 |
| 286 | 0.038 |
| 297 | 0.032 |
| 308 | 0.028 |
| 319 | 0.025 |
| 330 | 0.022 |
| 341 | 0.021 |

```
               352              0.019
               363              0.018
     +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                                                6 - H O U R   S T O R M
                                      R u n o f f    H y d r o g r a p h
     ---------------------------------------------------------------------
                                 Hydrograph in   1   Minute intervals ((CFS))

     ---------------------------------------------------------------------
  Time(h+m) Volume Ac.Ft   Q(CFS)  0        0.1       0.2       0.3
0.5
  -----------------------------------------------------------------------
    0+ 0       0.0000      0.00  Q         |         |         |         |
    0+ 1       0.0000      0.00  Q         |         |         |         |
    0+ 2       0.0000      0.00  Q         |         |         |         |
    0+ 3       0.0000      0.00  Q         |         |         |         |
    0+ 4       0.0000      0.01  Q         |         |         |         |
    0+ 5       0.0000      0.01  Q         |         |         |         |
    0+ 6       0.0000      0.01  Q         |         |         |         |
    0+ 7       0.0001      0.01  Q         |         |         |         |
    0+ 8       0.0001      0.01  VQ        |         |         |         |
    0+ 9       0.0001      0.01  VQ        |         |         |         |
    0+10       0.0001      0.02  VQ        |         |         |         |
    0+11       0.0001      0.02  VQ        |         |         |         |
    0+12       0.0002      0.02  VQ        |         |         |         |
    0+13       0.0002      0.02  VQ        |         |         |         |
    0+14       0.0002      0.02  VQ        |         |         |         |
    0+15       0.0002      0.02  VQ        |         |         |         |
    0+16       0.0003      0.02  VQ        |         |         |         |
    0+17       0.0003      0.02  VQ        |         |         |         |
    0+18       0.0003      0.02  VQ        |         |         |         |
    0+19       0.0003      0.02  VQ        |         |         |         |
    0+20       0.0004      0.02  VQ        |         |         |         |
    0+21       0.0004      0.02  VQ        |         |         |         |
    0+22       0.0004      0.02  VQ        |         |         |         |
    0+23       0.0004      0.02  VQ        |         |         |         |
    0+24       0.0005      0.02  VQ        |         |         |         |
    0+25       0.0005      0.02  VQ        |         |         |         |
    0+26       0.0005      0.02  VQ        |         |         |         |
    0+27       0.0005      0.02  VQ        |         |         |         |
    0+28       0.0005      0.02  VQ        |         |         |         |
    0+29       0.0006      0.02  VQ        |         |         |         |
    0+30       0.0006      0.02  |Q        |         |         |         |
    0+31       0.0006      0.02  |Q        |         |         |         |
    0+32       0.0006      0.02  |Q        |         |         |         |
    0+33       0.0007      0.02  |Q        |         |         |         |
    0+34       0.0007      0.02  |Q        |         |         |         |
    0+35       0.0007      0.02  |Q        |         |         |         |
    0+36       0.0007      0.02  |Q        |         |         |         |
    0+37       0.0008      0.02  |Q        |         |         |         |
    0+38       0.0008      0.02  |Q        |         |         |         |
    0+39       0.0008      0.02  |Q        |         |         |         |
    0+40       0.0009      0.02  |Q        |         |         |         |
    0+41       0.0009      0.02  |Q        |         |         |         |
```

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 0+42       0.0009      0.02  |Q         |         |         |         |
 0+43       0.0009      0.02  |Q         |         |         |         |
 0+44       0.0010      0.02  |Q         |         |         |         |
 0+45       0.0010      0.02  |Q         |         |         |         |
 0+46       0.0010      0.02  |Q         |         |         |         |
 0+47       0.0010      0.02  |Q         |         |         |         |
 0+48       0.0011      0.02  |Q         |         |         |         |
 0+49       0.0011      0.02  |Q         |         |         |         |
 0+50       0.0011      0.02  |Q         |         |         |         |
 0+51       0.0011      0.02  |Q         |         |         |         |
 0+52       0.0012      0.02  |Q         |         |         |         |
 0+53       0.0012      0.02  |QV        |         |         |         |
 0+54       0.0012      0.02  |QV        |         |         |         |
 0+55       0.0012      0.02  |QV        |         |         |         |
 0+56       0.0013      0.02  |QV        |         |         |         |
 0+57       0.0013      0.02  |QV        |         |         |         |
 0+58       0.0013      0.02  |QV        |         |         |         |
 0+59       0.0014      0.02  |QV        |         |         |         |
 1+ 0       0.0014      0.02  |QV        |         |         |         |
 1+ 1       0.0014      0.02  |QV        |         |         |         |
 1+ 2       0.0014      0.02  |QV        |         |         |         |
 1+ 3       0.0015      0.02  |QV        |         |         |         |
 1+ 4       0.0015      0.02  |QV        |         |         |         |
 1+ 5       0.0015      0.02  |QV        |         |         |         |
 1+ 6       0.0015      0.02  |QV        |         |         |         |
 1+ 7       0.0016      0.02  |QV        |         |         |         |
 1+ 8       0.0016      0.02  |QV        |         |         |         |
 1+ 9       0.0016      0.02  |QV        |         |         |         |
 1+10       0.0017      0.02  |QV        |         |         |         |
 1+11       0.0017      0.02  |QV        |         |         |         |
 1+12       0.0017      0.02  |QV        |         |         |         |
 1+13       0.0017      0.02  |QV        |         |         |         |
 1+14       0.0018      0.02  |QV        |         |         |         |
 1+15       0.0018      0.02  |Q V       |         |         |         |
 1+16       0.0018      0.02  |Q V       |         |         |         |
 1+17       0.0019      0.02  |Q V       |         |         |         |
 1+18       0.0019      0.02  |Q V       |         |         |         |
 1+19       0.0019      0.02  |Q V       |         |         |         |
 1+20       0.0019      0.02  |Q V       |         |         |         |
 1+21       0.0020      0.02  |Q V       |         |         |         |
 1+22       0.0020      0.02  |Q V       |         |         |         |
 1+23       0.0020      0.02  |Q V       |         |         |         |
 1+24       0.0021      0.02  |Q V       |         |         |         |
 1+25       0.0021      0.02  |Q V       |         |         |         |
 1+26       0.0021      0.02  |Q V       |         |         |         |
 1+27       0.0021      0.02  |Q V       |         |         |         |
 1+28       0.0022      0.02  |Q V       |         |         |         |
 1+29       0.0022      0.02  |Q V       |         |         |         |
 1+30       0.0022      0.02  |Q V       |         |         |         |
 1+31       0.0023      0.02  |Q V       |         |         |         |
 1+32       0.0023      0.02  |Q V       |         |         |         |
 1+33       0.0023      0.02  |Q V       |         |         |         |
 1+34       0.0024      0.02  |Q V       |         |         |         |
 1+35       0.0024      0.02  |Q  V      |         |         |         |
```

| | | | | | | |
|---|---|---|---|---|---|---|
| 1+36 | 0.0024 | 0.02 | Q V | | | |
| 1+37 | 0.0025 | 0.02 | Q V | | | |
| 1+38 | 0.0025 | 0.02 | Q V | | | |
| 1+39 | 0.0025 | 0.02 | Q V | | | |
| 1+40 | 0.0026 | 0.02 | Q V | | | |
| 1+41 | 0.0026 | 0.02 | Q V | | | |
| 1+42 | 0.0026 | 0.02 | Q V | | | |
| 1+43 | 0.0026 | 0.02 | Q V | | | |
| 1+44 | 0.0027 | 0.02 | Q V | | | |
| 1+45 | 0.0027 | 0.02 | Q V | | | |
| 1+46 | 0.0027 | 0.02 | Q V | | | |
| 1+47 | 0.0028 | 0.02 | Q V | | | |
| 1+48 | 0.0028 | 0.02 | Q V | | | |
| 1+49 | 0.0028 | 0.02 | Q V | | | |
| 1+50 | 0.0029 | 0.02 | Q V | | | |
| 1+51 | 0.0029 | 0.02 | Q V | | | |
| 1+52 | 0.0029 | 0.02 | Q V | | | |
| 1+53 | 0.0030 | 0.02 | Q  V | | | |
| 1+54 | 0.0030 | 0.02 | Q  V | | | |
| 1+55 | 0.0030 | 0.02 | Q  V | | | |
| 1+56 | 0.0031 | 0.02 | Q  V | | | |
| 1+57 | 0.0031 | 0.02 | Q  V | | | |
| 1+58 | 0.0031 | 0.03 | Q  V | | | |
| 1+59 | 0.0032 | 0.03 | Q  V | | | |
| 2+ 0 | 0.0032 | 0.03 | Q  V | | | |
| 2+ 1 | 0.0032 | 0.03 | Q  V | | | |
| 2+ 2 | 0.0033 | 0.03 | Q  V | | | |
| 2+ 3 | 0.0033 | 0.03 | Q  V | | | |
| 2+ 4 | 0.0034 | 0.03 | Q  V | | | |
| 2+ 5 | 0.0034 | 0.03 | Q  V | | | |
| 2+ 6 | 0.0034 | 0.03 | Q  V | | | |
| 2+ 7 | 0.0035 | 0.03 | Q  V | | | |
| 2+ 8 | 0.0035 | 0.03 | Q  V | | | |
| 2+ 9 | 0.0035 | 0.03 | Q  V | | | |
| 2+10 | 0.0036 | 0.03 | Q   V | | | |
| 2+11 | 0.0036 | 0.03 | Q   V | | | |
| 2+12 | 0.0036 | 0.03 | Q   V | | | |
| 2+13 | 0.0037 | 0.03 | Q   V | | | |
| 2+14 | 0.0037 | 0.03 | Q   V | | | |
| 2+15 | 0.0038 | 0.03 | Q   V | | | |
| 2+16 | 0.0038 | 0.03 | Q   V | | | |
| 2+17 | 0.0038 | 0.03 | Q   V | | | |
| 2+18 | 0.0039 | 0.03 | Q   V | | | |
| 2+19 | 0.0039 | 0.03 | Q   V | | | |
| 2+20 | 0.0039 | 0.03 | Q   V | | | |
| 2+21 | 0.0040 | 0.03 | Q   V | | | |
| 2+22 | 0.0040 | 0.03 | Q   V | | | |
| 2+23 | 0.0041 | 0.03 | Q   V | | | |
| 2+24 | 0.0041 | 0.03 | Q   V | | | |
| 2+25 | 0.0041 | 0.03 | Q   V | | | |
| 2+26 | 0.0042 | 0.03 | Q    V | | | |
| 2+27 | 0.0042 | 0.03 | Q    V | | | |
| 2+28 | 0.0043 | 0.03 | Q    V | | | |
| 2+29 | 0.0043 | 0.03 | Q    V | | | |

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2+30       0.0043      0.03   | Q    V  |         |         |         |
2+31       0.0044      0.03   | Q    V  |         |         |         |
2+32       0.0044      0.03   | Q    V  |         |         |         |
2+33       0.0045      0.03   | Q    V  |         |         |         |
2+34       0.0045      0.03   | Q    V  |         |         |         |
2+35       0.0046      0.03   | Q    V  |         |         |         |
2+36       0.0046      0.03   | Q    V  |         |         |         |
2+37       0.0046      0.03   | Q    V  |         |         |         |
2+38       0.0047      0.03   | Q    V  |         |         |         |
2+39       0.0047      0.03   | Q    V  |         |         |         |
2+40       0.0048      0.03   | Q     V |         |         |         |
2+41       0.0048      0.03   | Q     V |         |         |         |
2+42       0.0049      0.03   | Q     V |         |         |         |
2+43       0.0049      0.03   | Q     V |         |         |         |
2+44       0.0049      0.03   | Q     V |         |         |         |
2+45       0.0050      0.03   | Q     V |         |         |         |
2+46       0.0050      0.03   | Q     V |         |         |         |
2+47       0.0051      0.03   | Q     V |         |         |         |
2+48       0.0051      0.03   |  Q    V |         |         |         |
2+49       0.0052      0.03   |  Q    V |         |         |         |
2+50       0.0052      0.03   |  Q    V |         |         |         |
2+51       0.0053      0.03   |  Q    V |         |         |         |
2+52       0.0053      0.03   |  Q    V |         |         |         |
2+53       0.0054      0.03   |  Q     V|         |         |         |
2+54       0.0054      0.04   |  Q     V|         |         |         |
2+55       0.0055      0.04   |  Q     V|         |         |         |
2+56       0.0055      0.04   |  Q     V|         |         |         |
2+57       0.0056      0.04   |  Q     V|         |         |         |
2+58       0.0056      0.04   |  Q     V|         |         |         |
2+59       0.0057      0.04   |  Q     V|         |         |         |
3+ 0       0.0057      0.04   |  Q     V|         |         |         |
3+ 1       0.0058      0.04   |  Q     V|         |         |         |
3+ 2       0.0058      0.04   |  Q     V|         |         |         |
3+ 3       0.0059      0.04   |  Q     V|         |         |         |
3+ 4       0.0059      0.04   |  Q      V         |         |         |
3+ 5       0.0060      0.04   |  Q      V         |         |         |
3+ 6       0.0060      0.04   |  Q      V         |         |         |
3+ 7       0.0061      0.04   |  Q      V         |         |         |
3+ 8       0.0062      0.04   |  Q      V         |         |         |
3+ 9       0.0062      0.04   |  Q      V         |         |         |
3+10       0.0063      0.04   |  Q      V         |         |         |
3+11       0.0063      0.04   |  Q      V         |         |         |
3+12       0.0064      0.04   |  Q      V         |         |         |
3+13       0.0064      0.04   |  Q      V         |         |         |
3+14       0.0065      0.04   |  Q      V         |         |         |
3+15       0.0066      0.04   |  Q      |V        |         |         |
3+16       0.0066      0.04   |  Q      |V        |         |         |
3+17       0.0067      0.04   |  Q      |V        |         |         |
3+18       0.0067      0.04   |  Q      |V        |         |         |
3+19       0.0068      0.04   |  Q      |V        |         |         |
3+20       0.0069      0.05   |   Q     |V        |         |         |
3+21       0.0069      0.05   |   Q     |V        |         |         |
3+22       0.0070      0.05   |   Q     |V        |         |         |
3+23       0.0071      0.05   |   Q     |V        |         |         |
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3+24       0.0071      0.05  |   Q     | V       |         |         |
3+25       0.0072      0.05  |   Q     | V       |         |         |
3+26       0.0073      0.05  |   Q     | V       |         |         |
3+27       0.0073      0.05  |   Q     | V       |         |         |
3+28       0.0074      0.05  |   Q     | V       |         |         |
3+29       0.0075      0.05  |   Q     | V       |         |         |
3+30       0.0076      0.05  |   Q     | V       |         |         |
3+31       0.0076      0.06  |   Q     | V       |         |         |
3+32       0.0077      0.06  |   Q     |  V      |         |         |
3+33       0.0078      0.06  |    Q    |  V      |         |         |
3+34       0.0079      0.06  |    Q    |  V      |         |         |
3+35       0.0080      0.06  |    Q    |  V      |         |         |
3+36       0.0080      0.06  |    Q    |  V      |         |         |
3+37       0.0081      0.06  |    Q    |  V      |         |         |
3+38       0.0082      0.06  |    Q    |  V      |         |         |
3+39       0.0083      0.06  |    Q    |  V      |         |         |
3+40       0.0084      0.06  |    Q    |   V     |         |         |
3+41       0.0085      0.06  |    Q    |   V     |         |         |
3+42       0.0085      0.07  |    Q    |   V     |         |         |
3+43       0.0086      0.07  |     Q   |   V     |         |         |
3+44       0.0087      0.07  |     Q   |   V     |         |         |
3+45       0.0088      0.07  |     Q   |   V     |         |         |
3+46       0.0090      0.08  |     Q   |    V    |         |         |
3+47       0.0091      0.08  |      Q  |    V    |         |         |
3+48       0.0092      0.08  |      Q  |    V    |         |         |
3+49       0.0093      0.08  |      Q  |    V    |         |         |
3+50       0.0094      0.09  |      Q  |    V    |         |         |
3+51       0.0095      0.09  |      Q  |     V   |         |         |
3+52       0.0097      0.09  |       Q |     V   |         |         |
3+53       0.0098      0.10  |       Q |     V   |         |         |
3+54       0.0099      0.10  |       Q |     V   |         |         |
3+55       0.0101      0.10  |        Q|      V  |         |         |
3+56       0.0102      0.11  |        Q|      V  |         |         |
3+57       0.0104      0.11  |        Q|      V  |         |         |
3+58       0.0105      0.11  |         Q      V  |         |         |
3+59       0.0107      0.12  |         Q       V |         |         |
4+ 0       0.0109      0.12  |         Q       V |         |         |
4+ 1       0.0110      0.12  |         Q       V |         |         |
4+ 2       0.0112      0.13  |         |Q      V |         |         |
4+ 3       0.0114      0.16  |         |  Q     V|         |         |
4+ 4       0.0117      0.19  |         |     Q  V|         |         |
4+ 5       0.0120      0.22  |         |        QV         |         |
4+ 6       0.0123      0.25  |         |         VQ        |         |
4+ 7       0.0127      0.27  |         |         |V  Q     |         |
4+ 8       0.0131      0.30  |         |         | V   Q   |         |
4+ 9       0.0136      0.33  |         |         | V      Q|         |
4+10       0.0141      0.36  |         |         |  V      | Q       |
4+11       0.0146      0.39  |         |         |   V     |   Q     |
4+12       0.0152      0.42  |         |         |    V    |      Q  |
4+13       0.0158      0.45  |         |         |     V   |         Q
4+14       0.0164      0.42  |         |         |      V  |     Q   |
4+15       0.0169      0.38  |         |         |       V |  Q      |
4+16       0.0174      0.35  |         |         |        VQ         |
4+17       0.0178      0.31  |         |         |      Q  V         |
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4+18       0.0182      0.28  |         |         |   Q     V         |
4+19       0.0186      0.24  |         |         |Q        |V        |
4+20       0.0188      0.21  |         |       Q |         |V        |
4+21       0.0191      0.18  |         |    Q    |         | V       |
4+22       0.0193      0.14  |         | Q       |         | V       |
4+23       0.0194      0.11  |        Q|         |         | V       |
4+24       0.0195      0.07  |     Q   |         |         | V       |
4+25       0.0196      0.07  |     Q   |         |         |  V      |
4+26       0.0197      0.07  |     Q   |         |         |  V      |
4+27       0.0198      0.07  |    Q    |         |         |  V      |
4+28       0.0199      0.06  |    Q    |         |         |  V      |
4+29       0.0200      0.06  |    Q    |         |         |  V      |
4+30       0.0201      0.06  |    Q    |         |         |  V      |
4+31       0.0201      0.06  |    Q    |         |         |   V     |
4+32       0.0202      0.05  |   Q     |         |         |   V     |
4+33       0.0203      0.05  |   Q     |         |         |   V     |
4+34       0.0204      0.05  |   Q     |         |         |   V     |
4+35       0.0204      0.05  |   Q     |         |         |   V     |
4+36       0.0205      0.05  |   Q     |         |         |   V     |
4+37       0.0206      0.05  |   Q     |         |         |   V     |
4+38       0.0206      0.05  |   Q     |         |         |   V     |
4+39       0.0207      0.04  |  Q      |         |         |   V     |
4+40       0.0207      0.04  |  Q      |         |         |    V    |
4+41       0.0208      0.04  |  Q      |         |         |    V    |
4+42       0.0209      0.04  |  Q      |         |         |    V    |
4+43       0.0209      0.04  |  Q      |         |         |    V    |
4+44       0.0210      0.04  |  Q      |         |         |    V    |
4+45       0.0210      0.04  |  Q      |         |         |    V    |
4+46       0.0211      0.04  |  Q      |         |         |    V    |
4+47       0.0211      0.04  |  Q      |         |         |    V    |
4+48       0.0212      0.04  |  Q      |         |         |    V    |
4+49       0.0212      0.04  |  Q      |         |         |    V    |
4+50       0.0213      0.04  |  Q      |         |         |    V    |
4+51       0.0213      0.04  |  Q      |         |         |     V   |
4+52       0.0214      0.03  |  Q      |         |         |     V   |
4+53       0.0214      0.03  |  Q      |         |         |     V   |
4+54       0.0215      0.03  | Q       |         |         |     V   |
4+55       0.0215      0.03  | Q       |         |         |     V   |
4+56       0.0215      0.03  | Q       |         |         |     V   |
4+57       0.0216      0.03  | Q       |         |         |     V   |
4+58       0.0216      0.03  | Q       |         |         |     V   |
4+59       0.0217      0.03  | Q       |         |         |     V   |
5+ 0       0.0217      0.03  | Q       |         |         |     V   |
5+ 1       0.0218      0.03  | Q       |         |         |     V   |
5+ 2       0.0218      0.03  | Q       |         |         |     V   |
5+ 3       0.0218      0.03  | Q       |         |         |     V   |
5+ 4       0.0219      0.03  | Q       |         |         |     V   |
5+ 5       0.0219      0.03  | Q       |         |         |      V  |
5+ 6       0.0220      0.03  | Q       |         |         |      V  |
5+ 7       0.0220      0.03  | Q       |         |         |      V  |
5+ 8       0.0220      0.03  | Q       |         |         |      V  |
5+ 9       0.0221      0.03  | Q       |         |         |      V  |
5+10       0.0221      0.03  | Q       |         |         |      V  |
5+11       0.0222      0.03  | Q       |         |         |      V  |
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   5+12       0.0222       0.03  | Q        |         |         |      V  |
   5+13       0.0222       0.03  | Q        |         |         |      V  |
   5+14       0.0223       0.03  | Q        |         |         |      V  |
   5+15       0.0223       0.03  | Q        |         |         |      V  |
   5+16       0.0223       0.03  | Q        |         |         |      V  |
   5+17       0.0224       0.03  | Q        |         |         |      V  |
   5+18       0.0224       0.02  | Q        |         |         |      V  |
   5+19       0.0224       0.02  | Q        |         |         |      V  |
   5+20       0.0225       0.02  | Q        |         |         |      V  |
   5+21       0.0225       0.02  | Q        |         |         |      V  |
   5+22       0.0225       0.02  | Q        |         |         |       V |
   5+23       0.0226       0.02  | Q        |         |         |       V |
   5+24       0.0226       0.02  | Q        |         |         |       V |
   5+25       0.0226       0.02  | Q        |         |         |       V |
   5+26       0.0227       0.02  | Q        |         |         |       V |
   5+27       0.0227       0.02  | Q        |         |         |       V |
   5+28       0.0227       0.02  | Q        |         |         |       V |
   5+29       0.0228       0.02  |Q         |         |         |       V |
   5+30       0.0228       0.02  |Q         |         |         |       V |
   5+31       0.0228       0.02  |Q         |         |         |       V |
   5+32       0.0228       0.02  |Q         |         |         |       V |
   5+33       0.0229       0.02  |Q         |         |         |       V |
   5+34       0.0229       0.02  |Q         |         |         |       V |
   5+35       0.0229       0.02  |Q         |         |         |       V |
   5+36       0.0230       0.02  |Q         |         |         |       V |
   5+37       0.0230       0.02  |Q         |         |         |       V |
   5+38       0.0230       0.02  |Q         |         |         |       V |
   5+39       0.0231       0.02  |Q         |         |         |       V |
   5+40       0.0231       0.02  |Q         |         |         |       V |
   5+41       0.0231       0.02  |Q         |         |         |        V|
   5+42       0.0231       0.02  |Q         |         |         |        V|
   5+43       0.0232       0.02  |Q         |         |         |        V|
   5+44       0.0232       0.02  |Q         |         |         |        V|
   5+45       0.0232       0.02  |Q         |         |         |        V|
   5+46       0.0232       0.02  |Q         |         |         |        V|
   5+47       0.0233       0.02  |Q         |         |         |        V|
   5+48       0.0233       0.02  |Q         |         |         |        V|
   5+49       0.0233       0.02  |Q         |         |         |        V|
   5+50       0.0234       0.02  |Q         |         |         |        V|
   5+51       0.0234       0.02  |Q         |         |         |        V|
   5+52       0.0234       0.02  |Q         |         |         |        V|
   5+53       0.0234       0.02  |Q         |         |         |        V|
   5+54       0.0235       0.02  |Q         |         |         |        V|
   5+55       0.0235       0.02  |Q         |         |         |        V|
   5+56       0.0235       0.02  |Q         |         |         |        V|
   5+57       0.0235       0.02  |Q         |         |         |        V|
   5+58       0.0236       0.02  |Q         |         |         |        V|
   5+59       0.0236       0.02  |Q         |         |         |        V|
   6+ 0       0.0236       0.02  |Q         |         |         |        V|
   6+ 1       0.0236       0.02  |Q         |         |         |        V|
   6+ 2       0.0237       0.02  |Q         |         |         |        V|
   6+ 3       0.0237       0.02  |Q         |         |         |         V
-----------------------------------------------------------------------
```

End of computations, total study area = 0.412 (Ac.)

# EXISTING CONDITION

## 10-yr Storm Analysis

## Prospect Ave

San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2019 Version 9.1

Rational method hydrology  program based on
San Diego County Flood Control Division 2003 hydrology manual
Rational Hydrology Study        Date: 08/25/24

----------------------------------------------------------------------

10yr Storm Analysis, Pre-Development
Tributary Area - Prospect Ave

----------------------------------------------------------------------

********* Hydrology Study Control Information **********

----------------------------------------------------------------------

Program License Serial Number 6622

----------------------------------------------------------------------

Rational hydrology study storm event year is    10.0
English (in-lb) input data Units used

Map data precipitation entered:
6 hour,  precipitation(inches) =  1.700
24 hour precipitation(inches) =  2.900
P6/P24 =    58.6%
San Diego hydrology manual 'C' values used

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

Process from Point/Station      200.000 to Point/Station
201.000
**** INITIAL AREA EVALUATION ****

______________________________________________________________________

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[LOW DENSITY RESIDENTIAL                    ]
(1.0 DU/A or Less       )
Impervious value, Ai = 0.100
Sub-Area C Value = 0.410
Initial subarea total flow distance  =  100.000(Ft.)
Highest elevation =  367.500(Ft.)
Lowest elevation =  364.000(Ft.)

```
Elevation difference =    3.500(Ft.) Slope =  3.500 %
Top of Initial Area Slope adjusted by User to  1.000 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 70.00 (Ft)
for the top area slope value of   1.00 %, in a development type of
 1.0 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =  10.39 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.4100)*(  70.000^.5)/(   1.000^(1/3)]=  10.39
Rainfall intensity (I) =      2.794(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.410
Subarea runoff =      0.107(CFS)
Total initial stream area =       0.093(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
++
Process from Point/Station      201.000 to Point/Station
202.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
____________________________________________________________________
__
Top of street segment elevation =   364.000(Ft.)
End of street segment elevation =   362.000(Ft.)
Length of street segment  =    60.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  32.000(Ft.)
Distance from crown to crossfall grade break  =  30.500(Ft.)
Slope from gutter to grade break (v/hz) =   1.000
Slope from grade break to crown (v/hz)  =   1.000
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   2.000
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  0.175(In.)
 Manning's N in gutter =  0.0130
 Manning's N from gutter to grade break =  0.0130
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =      0.110(CFS)
Depth of flow =   0.042(Ft.), Average velocity =   2.130(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   1.527(Ft.)
Flow velocity =   2.13(Ft/s)
Travel time =    0.47 min.     TC =   10.86  min.
 Adding area flow to street
Rainfall intensity (I) =      2.716(In/Hr) for a    10.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[LOW DENSITY RESIDENTIAL                      ]
(1.0 DU/A or Less       )
Impervious value, Ai = 0.100
```

```
Sub-Area C Value = 0.410
Rainfall intensity =      2.716(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.410  CA =      0.068
Subarea runoff =      0.078(CFS) for      0.073(Ac.)
Total runoff =      0.185(CFS)    Total area =       0.166(Ac.)
Street flow at end of street =      0.185(CFS)
Half street flow at end of street =      0.185(CFS)
Depth of flow =   0.054(Ft.), Average velocity =   2.595(Ft/s)
Flow width (from curb towards crown)=   1.540(Ft.)


+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
++
Process from Point/Station      202.000 to Point/Station
204.000
**** IMPROVED CHANNEL TRAVEL TIME ****
______________________________________________________________________
__
Upstream point elevation =   362.000(Ft.)
Downstream point elevation =   351.000(Ft.)
Channel length thru subarea  =   195.000(Ft.)
Channel base width     =    3.500(Ft.)
Slope or 'Z' of left channel bank =   0.000
Slope or 'Z' of right channel bank =   0.000
Estimated mean flow rate at midpoint of channel =      0.193(CFS)
Manning's 'N'    = 0.030
Maximum depth of channel  =    0.500(Ft.)
Flow(q) thru subarea =      0.193(CFS)
Depth of flow =   0.040(Ft.), Average velocity =   1.365(Ft/s)
Channel flow top width =    3.500(Ft.)
Flow Velocity =    1.37(Ft/s)
Travel time  =    2.38 min.
Time of concentration =   13.24 min.
Critical depth =      0.045(Ft.)
 Adding area flow to channel
Rainfall intensity (I) =      2.390(In/Hr) for a    10.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[LOW DENSITY RESIDENTIAL                    ]
(1.0 DU/A or Less       )
Impervious value, Ai = 0.100
Sub-Area C Value = 0.410
The area added to the existing stream causes a
a lower flow rate of Q =      0.177(CFS)
therefore the upstream flow rate of Q =      0.185(CFS) is being
used
Rainfall intensity =      2.390(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.410  CA =      0.074
Subarea runoff =      0.000(CFS) for      0.015(Ac.)
Total runoff =      0.185(CFS)    Total area =       0.181(Ac.)
```

```
Depth of flow =   0.039(Ft.), Average velocity =   1.341(Ft/s)
Critical depth =      0.044(Ft.)
End of computations, total study area =           0.181 (Ac.)
```

# ATTACHMENT 4

# EXISTING CONDITION

# 100-yr Storm Analysis

# EXISTING CONDITION

# 100-yr Storm Analysis

# Northerly Swale Flow

San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2019 Version 9.1

Rational method hydrology program based on
San Diego County Flood Control Division 2003 hydrology manual
Rational Hydrology Study Date: 08/25/24

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----------------------------------------------------------------------
```

100yr Storm Analysis, Pre-Development
Tributary Area - Neighbor (Natural Swale Flow)

```
----------------------------------------------------------------------
```

********* Hydrology Study Control Information **********

```
----------------------------------------------------------------------
```

Program License Serial Number 6622

```
----------------------------------------------------------------------
```

Rational hydrology study storm event year is 100.0
English (in-lb) input data Units used

Map data precipitation entered:
6 hour, precipitation(inches) = 2.900
24 hour precipitation(inches) = 4.500
P6/P24 = 64.4%
San Diego hydrology manual 'C' values used

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      300.000 to Point/Station      301.000
**** INITIAL AREA EVALUATION ****
____________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[LOW DENSITY RESIDENTIAL                    ]
(1.0 DU/A or Less      )
Impervious value, Ai = 0.100
Sub-Area C Value = 0.410
Initial subarea total flow distance  =  100.000(Ft.)
Highest elevation =  367.600(Ft.)
Lowest elevation =  362.000(Ft.)
```

```
Elevation difference =    5.600(Ft.) Slope =  5.600 %
Top of Initial Area Slope adjusted by User to  1.000 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 70.00 (Ft)
for the top area slope value of   1.00 %, in a development type of
 1.0 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =  10.39 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.4100)*(  70.000^.5)/(   1.000^(1/3)]=  10.39
Rainfall intensity (I) =      4.767(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.410
Subarea runoff =      0.129(CFS)
Total initial stream area =        0.066(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
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Process from Point/Station      301.000 to Point/Station
302.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________________
__
Upstream point/station elevation =   362.000(Ft.)
Downstream point/station elevation =   353.500(Ft.)
Pipe length  =   125.00(Ft.) Slope =   0.0680  Manning's N = 0.015
No. of pipes = 1  Required pipe flow  =     0.129(CFS)
Given pipe size =     24.00(In.)
Calculated individual pipe flow  =     0.129(CFS)
Normal flow depth in pipe =    0.89(In.)
Flow top width inside pipe =    9.07(In.)
Critical depth could not be calculated.
Pipe flow velocity =      3.44(Ft/s)
Travel time through pipe =    0.61 min.
Time of concentration (TC) =    11.00 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
++
Process from Point/Station      301.000 to Point/Station
302.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
__
Rainfall intensity (I) =      4.596(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[LOW DENSITY RESIDENTIAL                     ]
(1.0 DU/A or Less       )
Impervious value, Ai = 0.100
Sub-Area C Value = 0.410
Time of concentration =    11.00 min.
```

```
Rainfall intensity =      4.596(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.410  CA =      0.053
Subarea runoff =      0.114(CFS) for      0.063(Ac.)
Total runoff =      0.243(CFS)    Total area =       0.129(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      302.000 to Point/Station      204.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________________
Upstream point/station elevation =   353.500(Ft.)
Downstream point/station elevation =   351.000(Ft.)
Pipe length  =   160.00(Ft.) Slope =   0.0156  Manning's N = 0.030
No. of pipes = 1  Required pipe flow  =     0.243(CFS)
Given pipe size =     24.00(In.)
Calculated individual pipe flow  =     0.243(CFS)
Normal flow depth in pipe =    2.34(In.)
Flow top width inside pipe =   14.25(In.)
Critical depth could not be calculated.
Pipe flow velocity =      1.54(Ft/s)
Travel time through pipe =    1.73 min.
Time of concentration (TC) =    12.73 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      302.000 to Point/Station      204.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
Rainfall intensity (I) =      4.182(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.350
Time of concentration =    12.73 min.
Rainfall intensity =      4.182(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.397  CA =      0.066
Subarea runoff =      0.032(CFS) for      0.037(Ac.)
Total runoff =      0.275(CFS)    Total area =       0.166(Ac.)
End of computations, total study area =          0.166 (Ac.)
```

# EXISTING CONDITION

## 100-yr Storm Analysis

## Onsite

San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2019 Version 9.1

Rational method hydrology  program based on
San Diego County Flood Control Division 2003 hydrology manual
Rational Hydrology Study        Date: 09/01/24

----------------------------------------------------------------------

100yr Storm Analysis, Pre-Development
Tributary Area - Existing Site

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********* Hydrology Study Control Information **********

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Program License Serial Number 6622

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Rational hydrology study storm event year is   100.0
English (in-lb) input data Units used

Map data precipitation entered:
6 hour,  precipitation(inches) =  2.400
24 hour precipitation(inches) =  4.500
P6/P24 =    53.3%
San Diego hydrology manual 'C' values used

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

Process from Point/Station      100.000 to Point/Station      101.000
**** INITIAL AREA EVALUATION ****

______________________________________________________________________

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[LOW DENSITY RESIDENTIAL                    ]
(1.0 DU/A or Less       )
Impervious value, Ai = 0.100
Sub-Area C Value = 0.410
Initial subarea total flow distance  =   85.000(Ft.)
Highest elevation =  564.000(Ft.)
Lowest elevation =  557.900(Ft.)

```
Elevation difference =    6.100(Ft.) Slope =  7.176 %
Top of Initial Area Slope adjusted by User to  2.000 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 85.00 (Ft)
for the top area slope value of   2.00 %, in a development type of
 1.0 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   9.09 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.4100)*(  85.000^.5)/(   2.000^(1/3)]=   9.09
Rainfall intensity (I) =      4.301(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.410
Subarea runoff =      0.317(CFS)
Total initial stream area =        0.180(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      101.000 to Point/Station      104.000
**** IMPROVED CHANNEL TRAVEL TIME ****
______________________________________________________________________
Upstream point elevation =   557.900(Ft.)
Downstream point elevation =   555.600(Ft.)
Channel length thru subarea  =   110.000(Ft.)
Channel base width     =    0.000(Ft.)
Slope or 'Z' of left channel bank =  50.000
Slope or 'Z' of right channel bank =  50.000
Estimated mean flow rate at midpoint of channel =      0.522(CFS)
Manning's 'N'    = 0.030
Maximum depth of channel  =    0.500(Ft.)
Flow(q) thru subarea =      0.522(CFS)
Depth of flow =   0.103(Ft.), Average velocity =   0.989(Ft/s)
Channel flow top width =   10.271(Ft.)
Flow Velocity =    0.99(Ft/s)
Travel time  =    1.85 min.
Time of concentration =   10.94 min.
Critical depth =      0.093(Ft.)
 Adding area flow to channel
Rainfall intensity (I) =      3.816(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[LOW DENSITY RESIDENTIAL                     ]
(1.0 DU/A or Less       )
Impervious value, Ai = 0.100
Sub-Area C Value = 0.410
Rainfall intensity =      3.816(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.410  CA =      0.169
Subarea runoff =      0.327(CFS) for      0.232(Ac.)
Total runoff =      0.645(CFS)    Total area =       0.412(Ac.)
```

Depth of flow = 0.111(Ft.), Average velocity = 1.043(Ft/s)
Critical depth = 0.101(Ft.)

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station 101.000 to Point/Station 104.000
**** 6 HOUR HYDROGRAPH ****
______________________________________________________________________
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Hydrograph Data - Section 6, San Diego County Hydrology manual, June 2003

Time of Concentration = 10.94
Basin Area = 0.41 Acres
6 Hour Rainfall = 2.400 Inches
Runoff Coefficient = 0.410
Peak Discharge = 0.64 CFS

| Time (Min) | Discharge (CFS) |
|---|---|
| 0 | 0.000 |
| 10 | 0.024 |
| 20 | 0.025 |
| 30 | 0.026 |
| 40 | 0.026 |
| 50 | 0.027 |
| 60 | 0.028 |
| 70 | 0.029 |
| 80 | 0.030 |
| 90 | 0.032 |
| 100 | 0.033 |
| 110 | 0.035 |
| 120 | 0.036 |
| 130 | 0.038 |
| 140 | 0.040 |
| 150 | 0.043 |
| 160 | 0.045 |
| 170 | 0.050 |
| 180 | 0.053 |
| 190 | 0.061 |
| 200 | 0.066 |
| 210 | 0.081 |
| 220 | 0.092 |
| 230 | 0.135 |
| 240 | 0.191 |
| 250 | 0.645 |
| 260 | 0.108 |
| 270 | 0.073 |
| 280 | 0.057 |
| 290 | 0.048 |
| 300 | 0.041 |
| 310 | 0.037 |

```
                320              0.034
                330              0.031
                340              0.029
                350              0.027
                360              0.025
                370              0.024
     +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                                                  6 - H O U R    S T O R M
                                       R u n o f f     H y d r o g r a p h
     ---------------------------------------------------------------------
                               Hydrograph in   1   Minute intervals ((CFS))

     ---------------------------------------------------------------------
   Time(h+m) Volume Ac.Ft   Q(CFS)  0        0.2       0.3       0.5
 0.6
   -------------------------------------------------------------------
     0+ 0       0.0000      0.00  Q         |         |         |         |
     0+ 1       0.0000      0.00  Q         |         |         |         |
     0+ 2       0.0000      0.00  Q         |         |         |         |
     0+ 3       0.0000      0.01  Q         |         |         |         |
     0+ 4       0.0000      0.01  Q         |         |         |         |
     0+ 5       0.0001      0.01  Q         |         |         |         |
     0+ 6       0.0001      0.01  Q         |         |         |         |
     0+ 7       0.0001      0.02  VQ        |         |         |         |
     0+ 8       0.0001      0.02  VQ        |         |         |         |
     0+ 9       0.0002      0.02  VQ        |         |         |         |
     0+10       0.0002      0.02  VQ        |         |         |         |
     0+11       0.0002      0.02  VQ        |         |         |         |
     0+12       0.0003      0.02  VQ        |         |         |         |
     0+13       0.0003      0.02  VQ        |         |         |         |
     0+14       0.0003      0.02  VQ        |         |         |         |
     0+15       0.0004      0.02  VQ        |         |         |         |
     0+16       0.0004      0.02  VQ        |         |         |         |
     0+17       0.0004      0.02  VQ        |         |         |         |
     0+18       0.0005      0.02  VQ        |         |         |         |
     0+19       0.0005      0.02  VQ        |         |         |         |
     0+20       0.0005      0.02  VQ        |         |         |         |
     0+21       0.0006      0.02  VQ        |         |         |         |
     0+22       0.0006      0.02  VQ        |         |         |         |
     0+23       0.0006      0.02  VQ        |         |         |         |
     0+24       0.0007      0.03  VQ        |         |         |         |
     0+25       0.0007      0.03  VQ        |         |         |         |
     0+26       0.0007      0.03  VQ        |         |         |         |
     0+27       0.0008      0.03  VQ        |         |         |         |
     0+28       0.0008      0.03  VQ        |         |         |         |
     0+29       0.0008      0.03  |Q        |         |         |         |
     0+30       0.0009      0.03  |Q        |         |         |         |
     0+31       0.0009      0.03  |Q        |         |         |         |
     0+32       0.0009      0.03  |Q        |         |         |         |
     0+33       0.0010      0.03  |Q        |         |         |         |
     0+34       0.0010      0.03  |Q        |         |         |         |
     0+35       0.0010      0.03  |Q        |         |         |         |
     0+36       0.0011      0.03  |Q        |         |         |         |
     0+37       0.0011      0.03  |Q        |         |         |         |
```

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 0+38 | 0.0012 | 0.03 | Q | | | | |
| 0+39 | 0.0012 | 0.03 | Q | | | | |
| 0+40 | 0.0012 | 0.03 | Q | | | | |
| 0+41 | 0.0013 | 0.03 | Q | | | | |
| 0+42 | 0.0013 | 0.03 | Q | | | | |
| 0+43 | 0.0013 | 0.03 | Q | | | | |
| 0+44 | 0.0014 | 0.03 | Q | | | | |
| 0+45 | 0.0014 | 0.03 | Q | | | | |
| 0+46 | 0.0014 | 0.03 | Q | | | | |
| 0+47 | 0.0015 | 0.03 | Q | | | | |
| 0+48 | 0.0015 | 0.03 | Q | | | | |
| 0+49 | 0.0016 | 0.03 | Q | | | | |
| 0+50 | 0.0016 | 0.03 | Q | | | | |
| 0+51 | 0.0016 | 0.03 | Q | | | | |
| 0+52 | 0.0017 | 0.03 | QV | | | | |
| 0+53 | 0.0017 | 0.03 | QV | | | | |
| 0+54 | 0.0017 | 0.03 | QV | | | | |
| 0+55 | 0.0018 | 0.03 | QV | | | | |
| 0+56 | 0.0018 | 0.03 | QV | | | | |
| 0+57 | 0.0019 | 0.03 | QV | | | | |
| 0+58 | 0.0019 | 0.03 | QV | | | | |
| 0+59 | 0.0019 | 0.03 | QV | | | | |
| 1+ 0 | 0.0020 | 0.03 | QV | | | | |
| 1+ 1 | 0.0020 | 0.03 | QV | | | | |
| 1+ 2 | 0.0021 | 0.03 | QV | | | | |
| 1+ 3 | 0.0021 | 0.03 | QV | | | | |
| 1+ 4 | 0.0021 | 0.03 | QV | | | | |
| 1+ 5 | 0.0022 | 0.03 | QV | | | | |
| 1+ 6 | 0.0022 | 0.03 | QV | | | | |
| 1+ 7 | 0.0023 | 0.03 | QV | | | | |
| 1+ 8 | 0.0023 | 0.03 | QV | | | | |
| 1+ 9 | 0.0023 | 0.03 | QV | | | | |
| 1+10 | 0.0024 | 0.03 | QV | | | | |
| 1+11 | 0.0024 | 0.03 | QV | | | | |
| 1+12 | 0.0025 | 0.03 | QV | | | | |
| 1+13 | 0.0025 | 0.03 | Q V | | | | |
| 1+14 | 0.0025 | 0.03 | Q V | | | | |
| 1+15 | 0.0026 | 0.03 | Q V | | | | |
| 1+16 | 0.0026 | 0.03 | Q V | | | | |
| 1+17 | 0.0027 | 0.03 | Q V | | | | |
| 1+18 | 0.0027 | 0.03 | Q V | | | | |
| 1+19 | 0.0027 | 0.03 | Q V | | | | |
| 1+20 | 0.0028 | 0.03 | Q V | | | | |
| 1+21 | 0.0028 | 0.03 | Q V | | | | |
| 1+22 | 0.0029 | 0.03 | Q V | | | | |
| 1+23 | 0.0029 | 0.03 | Q V | | | | |
| 1+24 | 0.0029 | 0.03 | Q V | | | | |
| 1+25 | 0.0030 | 0.03 | Q V | | | | |
| 1+26 | 0.0030 | 0.03 | Q V | | | | |
| 1+27 | 0.0031 | 0.03 | Q V | | | | |
| 1+28 | 0.0031 | 0.03 | Q V | | | | |
| 1+29 | 0.0032 | 0.03 | Q V | | | | |
| 1+30 | 0.0032 | 0.03 | Q V | | | | |
| 1+31 | 0.0033 | 0.03 | Q V | | | | |

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 1+32        0.0033       0.03  |Q V      |         |         |         |
 1+33        0.0033       0.03  |Q  V     |         |         |         |
 1+34        0.0034       0.03  |Q  V     |         |         |         |
 1+35        0.0034       0.03  |Q  V     |         |         |         |
 1+36        0.0035       0.03  |Q  V     |         |         |         |
 1+37        0.0035       0.03  | Q V     |         |         |         |
 1+38        0.0036       0.03  | Q V     |         |         |         |
 1+39        0.0036       0.03  | Q V     |         |         |         |
 1+40        0.0037       0.03  | Q V     |         |         |         |
 1+41        0.0037       0.03  | Q V     |         |         |         |
 1+42        0.0037       0.03  | Q V     |         |         |         |
 1+43        0.0038       0.03  | Q V     |         |         |         |
 1+44        0.0038       0.03  | Q V     |         |         |         |
 1+45        0.0039       0.03  | Q V     |         |         |         |
 1+46        0.0039       0.03  | Q V     |         |         |         |
 1+47        0.0040       0.03  | Q V     |         |         |         |
 1+48        0.0040       0.03  | Q V     |         |         |         |
 1+49        0.0041       0.03  | Q V     |         |         |         |
 1+50        0.0041       0.03  | Q V     |         |         |         |
 1+51        0.0042       0.03  | Q  V    |         |         |         |
 1+52        0.0042       0.03  | Q  V    |         |         |         |
 1+53        0.0043       0.03  | Q  V    |         |         |         |
 1+54        0.0043       0.04  | Q  V    |         |         |         |
 1+55        0.0044       0.04  | Q  V    |         |         |         |
 1+56        0.0044       0.04  | Q  V    |         |         |         |
 1+57        0.0045       0.04  | Q  V    |         |         |         |
 1+58        0.0045       0.04  | Q  V    |         |         |         |
 1+59        0.0045       0.04  | Q  V    |         |         |         |
 2+ 0        0.0046       0.04  | Q  V    |         |         |         |
 2+ 1        0.0046       0.04  | Q  V    |         |         |         |
 2+ 2        0.0047       0.04  | Q  V    |         |         |         |
 2+ 3        0.0047       0.04  | Q  V    |         |         |         |
 2+ 4        0.0048       0.04  | Q  V    |         |         |         |
 2+ 5        0.0048       0.04  | Q  V    |         |         |         |
 2+ 6        0.0049       0.04  | Q  V    |         |         |         |
 2+ 7        0.0050       0.04  | Q  V    |         |         |         |
 2+ 8        0.0050       0.04  | Q   V   |         |         |         |
 2+ 9        0.0051       0.04  | Q   V   |         |         |         |
 2+10        0.0051       0.04  | Q   V   |         |         |         |
 2+11        0.0052       0.04  | Q   V   |         |         |         |
 2+12        0.0052       0.04  | Q   V   |         |         |         |
 2+13        0.0053       0.04  | Q   V   |         |         |         |
 2+14        0.0053       0.04  | Q   V   |         |         |         |
 2+15        0.0054       0.04  | Q   V   |         |         |         |
 2+16        0.0054       0.04  | Q   V   |         |         |         |
 2+17        0.0055       0.04  | Q   V   |         |         |         |
 2+18        0.0055       0.04  | Q   V   |         |         |         |
 2+19        0.0056       0.04  | Q   V   |         |         |         |
 2+20        0.0056       0.04  | Q   V   |         |         |         |
 2+21        0.0057       0.04  | Q   V   |         |         |         |
 2+22        0.0058       0.04  | Q   V   |         |         |         |
 2+23        0.0058       0.04  | Q    V  |         |         |         |
 2+24        0.0059       0.04  | Q    V  |         |         |         |
 2+25        0.0059       0.04  | Q    V  |         |         |         |
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2+26       0.0060      0.04   | Q    V  |         |         |         |
2+27       0.0060      0.04   | Q    V  |         |         |         |
2+28       0.0061      0.04   | Q    V  |         |         |         |
2+29       0.0062      0.04   | Q    V  |         |         |         |
2+30       0.0062      0.04   | Q    V  |         |         |         |
2+31       0.0063      0.04   | Q    V  |         |         |         |
2+32       0.0063      0.04   | Q    V  |         |         |         |
2+33       0.0064      0.04   | Q    V  |         |         |         |
2+34       0.0065      0.04   | Q    V  |         |         |         |
2+35       0.0065      0.04   | Q    V  |         |         |         |
2+36       0.0066      0.04   | Q    V  |         |         |         |
2+37       0.0066      0.04   | Q     V |         |         |         |
2+38       0.0067      0.04   | Q     V |         |         |         |
2+39       0.0068      0.05   | Q     V |         |         |         |
2+40       0.0068      0.05   | Q     V |         |         |         |
2+41       0.0069      0.05   | Q     V |         |         |         |
2+42       0.0070      0.05   | Q     V |         |         |         |
2+43       0.0070      0.05   | Q     V |         |         |         |
2+44       0.0071      0.05   | Q     V |         |         |         |
2+45       0.0072      0.05   | Q     V |         |         |         |
2+46       0.0072      0.05   | Q     V |         |         |         |
2+47       0.0073      0.05   |  Q    V |         |         |         |
2+48       0.0074      0.05   |  Q    V |         |         |         |
2+49       0.0074      0.05   |  Q    V |         |         |         |
2+50       0.0075      0.05   |  Q     V|         |         |         |
2+51       0.0076      0.05   |  Q     V|         |         |         |
2+52       0.0076      0.05   |  Q     V|         |         |         |
2+53       0.0077      0.05   |  Q     V|         |         |         |
2+54       0.0078      0.05   |  Q     V|         |         |         |
2+55       0.0078      0.05   |  Q     V|         |         |         |
2+56       0.0079      0.05   |  Q     V|         |         |         |
2+57       0.0080      0.05   |  Q     V|         |         |         |
2+58       0.0081      0.05   |  Q     V|         |         |         |
2+59       0.0081      0.05   |  Q     V|         |         |         |
3+ 0       0.0082      0.05   |  Q     V|         |         |         |
3+ 1       0.0083      0.05   |  Q     V|         |         |         |
3+ 2       0.0084      0.05   |  Q      V         |         |         |
3+ 3       0.0084      0.06   |  Q      V         |         |         |
3+ 4       0.0085      0.06   |  Q      V         |         |         |
3+ 5       0.0086      0.06   |  Q      V         |         |         |
3+ 6       0.0087      0.06   |  Q      V         |         |         |
3+ 7       0.0088      0.06   |  Q      V         |         |         |
3+ 8       0.0088      0.06   |  Q      V         |         |         |
3+ 9       0.0089      0.06   |  Q      V         |         |         |
3+10       0.0090      0.06   |  Q      V         |         |         |
3+11       0.0091      0.06   |  Q      V         |         |         |
3+12       0.0092      0.06   |  Q      |V        |         |         |
3+13       0.0093      0.06   |  Q      |V        |         |         |
3+14       0.0093      0.06   |  Q      |V        |         |         |
3+15       0.0094      0.06   |  Q      |V        |         |         |
3+16       0.0095      0.06   |  Q      |V        |         |         |
3+17       0.0096      0.06   |   Q     |V        |         |         |
3+18       0.0097      0.07   |   Q     |V        |         |         |
3+19       0.0098      0.07   |   Q     |V        |         |         |
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3+20       0.0099      0.07  |   Q     |V        |         |         |
3+21       0.0100      0.07  |   Q     | V       |         |         |
3+22       0.0101      0.07  |   Q     | V       |         |         |
3+23       0.0102      0.07  |   Q     | V       |         |         |
3+24       0.0103      0.07  |   Q     | V       |         |         |
3+25       0.0104      0.07  |   Q     | V       |         |         |
3+26       0.0105      0.07  |   Q     | V       |         |         |
3+27       0.0106      0.08  |   Q     | V       |         |         |
3+28       0.0107      0.08  |   Q     | V       |         |         |
3+29       0.0108      0.08  |   Q     | V       |         |         |
3+30       0.0109      0.08  |    Q    |  V      |         |         |
3+31       0.0110      0.08  |    Q    |  V      |         |         |
3+32       0.0111      0.08  |    Q    |  V      |         |         |
3+33       0.0112      0.08  |    Q    |  V      |         |         |
3+34       0.0114      0.09  |    Q    |  V      |         |         |
3+35       0.0115      0.09  |    Q    |  V      |         |         |
3+36       0.0116      0.09  |    Q    |  V      |         |         |
3+37       0.0117      0.09  |    Q    |   V     |         |         |
3+38       0.0118      0.09  |    Q    |   V     |         |         |
3+39       0.0120      0.09  |    Q    |   V     |         |         |
3+40       0.0121      0.09  |    Q    |   V     |         |         |
3+41       0.0122      0.10  |    Q    |   V     |         |         |
3+42       0.0124      0.10  |     Q   |   V     |         |         |
3+43       0.0125      0.11  |     Q   |    V    |         |         |
3+44       0.0127      0.11  |     Q   |    V    |         |         |
3+45       0.0128      0.11  |      Q  |    V    |         |         |
3+46       0.0130      0.12  |      Q  |    V    |         |         |
3+47       0.0132      0.12  |      Q  |    V    |         |         |
3+48       0.0133      0.13  |      Q  |     V   |         |         |
3+49       0.0135      0.13  |       Q |     V   |         |         |
3+50       0.0137      0.14  |       Q |     V   |         |         |
3+51       0.0139      0.14  |       Q |     V   |         |         |
3+52       0.0141      0.15  |        Q|     V   |         |         |
3+53       0.0143      0.15  |        Q|      V  |         |         |
3+54       0.0145      0.16  |        Q|      V  |         |         |
3+55       0.0147      0.16  |         Q      V  |         |         |
3+56       0.0150      0.17  |         Q       V |         |         |
3+57       0.0152      0.17  |         Q       V |         |         |
3+58       0.0155      0.18  |         |Q      V |         |         |
3+59       0.0157      0.19  |         |Q      V |         |         |
4+ 0       0.0160      0.19  |         |Q       V|         |         |
4+ 1       0.0163      0.24  |         |   Q    V|         |         |
4+ 2       0.0167      0.28  |         |      Q  V         |         |
4+ 3       0.0171      0.33  |         |         Q         |         |
4+ 4       0.0177      0.37  |         |         |V Q      |         |
4+ 5       0.0182      0.42  |         |         |V   Q    |         |
4+ 6       0.0189      0.46  |         |         | V     Q |         |
4+ 7       0.0196      0.51  |         |         |  V      |Q        |
4+ 8       0.0203      0.55  |         |         |   V     |    Q    |
4+ 9       0.0212      0.60  |         |         |    V    |       Q |
4+10       0.0220      0.64  |         |         |     V   |         Q
4+11       0.0229      0.59  |         |         |      V  |      Q  |
4+12       0.0236      0.54  |         |         |       V |   Q     |
4+13       0.0243      0.48  |         |         |        VQ         |
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4+14       0.0249      0.43  |         |         |     Q  V|         |
4+15       0.0254      0.38  |         |         |  Q      V         |
4+16       0.0258      0.32  |         |         Q         |V        |
4+17       0.0262      0.27  |         |     Q   |         |V        |
4+18       0.0265      0.22  |         |  Q      |         |V        |
4+19       0.0267      0.16  |         Q         |         | V       |
4+20       0.0269      0.11  |     Q   |         |         | V       |
4+21       0.0270      0.10  |     Q   |         |         | V       |
4+22       0.0271      0.10  |     Q   |         |         | V       |
4+23       0.0273      0.10  |     Q   |         |         | V       |
4+24       0.0274      0.09  |    Q    |         |         | V       |
4+25       0.0275      0.09  |    Q    |         |         |  V      |
4+26       0.0277      0.09  |    Q    |         |         |  V      |
4+27       0.0278      0.08  |    Q    |         |         |  V      |
4+28       0.0279      0.08  |   Q     |         |         |  V      |
4+29       0.0280      0.08  |   Q     |         |         |  V      |
4+30       0.0281      0.07  |   Q     |         |         |  V      |
4+31       0.0282      0.07  |   Q     |         |         |  V      |
4+32       0.0283      0.07  |   Q     |         |         |   V     |
4+33       0.0284      0.07  |   Q     |         |         |   V     |
4+34       0.0285      0.07  |   Q     |         |         |   V     |
4+35       0.0286      0.06  |   Q     |         |         |   V     |
4+36       0.0286      0.06  |  Q      |         |         |   V     |
4+37       0.0287      0.06  |  Q      |         |         |   V     |
4+38       0.0288      0.06  |  Q      |         |         |   V     |
4+39       0.0289      0.06  |  Q      |         |         |   V     |
4+40       0.0290      0.06  |  Q      |         |         |   V     |
4+41       0.0290      0.06  |  Q      |         |         |   V     |
4+42       0.0291      0.05  |  Q      |         |         |    V    |
4+43       0.0292      0.05  |  Q      |         |         |    V    |
4+44       0.0293      0.05  |  Q      |         |         |    V    |
4+45       0.0293      0.05  |  Q      |         |         |    V    |
4+46       0.0294      0.05  |  Q      |         |         |    V    |
4+47       0.0295      0.05  |  Q      |         |         |    V    |
4+48       0.0295      0.05  |  Q      |         |         |    V    |
4+49       0.0296      0.05  |  Q      |         |         |    V    |
4+50       0.0297      0.05  | Q       |         |         |    V    |
4+51       0.0297      0.05  | Q       |         |         |    V    |
4+52       0.0298      0.05  | Q       |         |         |    V    |
4+53       0.0299      0.05  | Q       |         |         |    V    |
4+54       0.0299      0.05  | Q       |         |         |     V   |
4+55       0.0300      0.04  | Q       |         |         |     V   |
4+56       0.0301      0.04  | Q       |         |         |     V   |
4+57       0.0301      0.04  | Q       |         |         |     V   |
4+58       0.0302      0.04  | Q       |         |         |     V   |
4+59       0.0302      0.04  | Q       |         |         |     V   |
5+ 0       0.0303      0.04  | Q       |         |         |     V   |
5+ 1       0.0303      0.04  | Q       |         |         |     V   |
5+ 2       0.0304      0.04  | Q       |         |         |     V   |
5+ 3       0.0305      0.04  | Q       |         |         |     V   |
5+ 4       0.0305      0.04  | Q       |         |         |     V   |
5+ 5       0.0306      0.04  | Q       |         |         |     V   |
5+ 6       0.0306      0.04  | Q       |         |         |     V   |
5+ 7       0.0307      0.04  | Q       |         |         |     V   |
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5+ 8       0.0307      0.04 | Q       |         |         |    V   |
5+ 9       0.0308      0.04 | Q       |         |         |     V  |
5+10       0.0308      0.04 | Q       |         |         |     V  |
5+11       0.0309      0.04 | Q       |         |         |     V  |
5+12       0.0309      0.04 | Q       |         |         |     V  |
5+13       0.0310      0.04 | Q       |         |         |     V  |
5+14       0.0310      0.04 | Q       |         |         |     V  |
5+15       0.0311      0.04 | Q       |         |         |     V  |
5+16       0.0311      0.03 | Q       |         |         |     V  |
5+17       0.0312      0.03 | Q       |         |         |     V  |
5+18       0.0312      0.03 | Q       |         |         |     V  |
5+19       0.0313      0.03 | Q       |         |         |     V  |
5+20       0.0313      0.03 | Q       |         |         |     V  |
5+21       0.0313      0.03 | Q       |         |         |     V  |
5+22       0.0314      0.03 | Q       |         |         |     V  |
5+23       0.0314      0.03 | Q       |         |         |     V  |
5+24       0.0315      0.03 | Q       |         |         |     V  |
5+25       0.0315      0.03 |Q        |         |         |     V  |
5+26       0.0316      0.03 |Q        |         |         |      V |
5+27       0.0316      0.03 |Q        |         |         |      V |
5+28       0.0317      0.03 |Q        |         |         |      V |
5+29       0.0317      0.03 |Q        |         |         |      V |
5+30       0.0317      0.03 |Q        |         |         |      V |
5+31       0.0318      0.03 |Q        |         |         |      V |
5+32       0.0318      0.03 |Q        |         |         |      V |
5+33       0.0319      0.03 |Q        |         |         |      V |
5+34       0.0319      0.03 |Q        |         |         |      V |
5+35       0.0320      0.03 |Q        |         |         |      V |
5+36       0.0320      0.03 |Q        |         |         |      V |
5+37       0.0320      0.03 |Q        |         |         |      V |
5+38       0.0321      0.03 |Q        |         |         |      V |
5+39       0.0321      0.03 |Q        |         |         |      V |
5+40       0.0322      0.03 |Q        |         |         |      V |
5+41       0.0322      0.03 |Q        |         |         |      V |
5+42       0.0322      0.03 |Q        |         |         |      V |
5+43       0.0323      0.03 |Q        |         |         |      V |
5+44       0.0323      0.03 |Q        |         |         |      V |
5+45       0.0323      0.03 |Q        |         |         |      V |
5+46       0.0324      0.03 |Q        |         |         |      V |
5+47       0.0324      0.03 |Q        |         |         |       V|
5+48       0.0325      0.03 |Q        |         |         |       V|
5+49       0.0325      0.03 |Q        |         |         |       V|
5+50       0.0325      0.03 |Q        |         |         |       V|
5+51       0.0326      0.03 |Q        |         |         |       V|
5+52       0.0326      0.03 |Q        |         |         |       V|
5+53       0.0326      0.03 |Q        |         |         |       V|
5+54       0.0327      0.03 |Q        |         |         |       V|
5+55       0.0327      0.03 |Q        |         |         |       V|
5+56       0.0327      0.03 |Q        |         |         |       V|
5+57       0.0328      0.03 |Q        |         |         |       V|
5+58       0.0328      0.03 |Q        |         |         |       V|
5+59       0.0329      0.03 |Q        |         |         |       V|
6+ 0       0.0329      0.03 |Q        |         |         |       V|
6+ 1       0.0329      0.03 |Q        |         |         |       V|
```

```
   6+ 2       0.0330      0.02  |Q         |         |         |        V|
   6+ 3       0.0330      0.02  |Q         |         |         |        V|
   6+ 4       0.0330      0.02  |Q         |         |         |        V|
   6+ 5       0.0331      0.02  |Q         |         |         |        V|
   6+ 6       0.0331      0.02  |Q         |         |         |        V|
   6+ 7       0.0331      0.02  |Q         |         |         |        V|
   6+ 8       0.0332      0.02  |Q         |         |         |        V|
   6+ 9       0.0332      0.02  |Q         |         |         |        V|
   6+10       0.0332      0.02  |Q         |         |         |         V
-----------------------------------------------------------------------
```

End of computations, total study area =          0.412 (Ac.)

# EXISTING CONDITION

## 100-yr Storm Analysis

## Prospect Ave

```
                       San Diego County Rational Hydrology Program

      CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2019 Version 9.1

      Rational method hydrology  program based on
      San Diego County Flood Control Division 2003 hydrology manual
                  Rational Hydrology Study        Date: 08/25/24
      --------------------------------------------------------------------
----
      100yr Storm Analysis, Pre-Development
      Tributary Area - Prospect Ave


      --------------------------------------------------------------------
----
       *********   Hydrology Study Control Information **********

      --------------------------------------------------------------------
----


      Program License Serial Number 6622

      --------------------------------------------------------------------
----
      Rational hydrology study storm event year is   100.0
      English (in-lb) input data Units used

      Map data precipitation entered:
      6 hour,  precipitation(inches) =  2.900
      24 hour precipitation(inches) =  4.500
      P6/P24 =    64.4%
      San Diego hydrology manual 'C' values used


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
++
      Process from Point/Station      200.000 to Point/Station
201.000
      **** INITIAL AREA EVALUATION ****
      ____________________________________________________________________
__
      Decimal fraction soil group A = 0.000
      Decimal fraction soil group B = 0.000
      Decimal fraction soil group C = 0.000
      Decimal fraction soil group D = 1.000
      [LOW DENSITY RESIDENTIAL                     ]
      (1.0 DU/A or Less       )
      Impervious value, Ai = 0.100
      Sub-Area C Value = 0.410
      Initial subarea total flow distance  =  100.000(Ft.)
      Highest elevation =  367.500(Ft.)
      Lowest elevation =  364.000(Ft.)
```

```
      Elevation difference =    3.500(Ft.) Slope =  3.500 %
      Top of Initial Area Slope adjusted by User to  1.000 %
      INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
      The maximum overland flow distance is 70.00 (Ft)
      for the top area slope value of   1.00 %, in a development type of
       1.0 DU/A or Less
      In Accordance With Figure 3-3
      Initial Area Time of Concentration =  10.39 minutes
      TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
      TC = [1.8*(1.1-0.4100)*(  70.000^.5)/(   1.000^(1/3)]=  10.39
      Rainfall intensity (I) =      4.767(In/Hr) for a   100.0 year storm
      Effective runoff coefficient used for area (Q=KCIA) is C = 0.410
      Subarea runoff =      0.182(CFS)
      Total initial stream area =        0.093(Ac.)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
++
      Process from Point/Station      201.000 to Point/Station
202.000
      **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
      ____________________________________________________________________
__
      Top of street segment elevation =   364.000(Ft.)
      End of street segment elevation =   362.000(Ft.)
      Length of street segment  =    60.000(Ft.)
      Height of curb above gutter flowline  =    6.0(In.)
      Width of half street (curb to crown)  =  32.000(Ft.)
      Distance from crown to crossfall grade break  =  30.500(Ft.)
      Slope from gutter to grade break (v/hz) =   1.000
      Slope from grade break to crown (v/hz)  =   1.000
      Street flow is on [1] side(s) of the street
      Distance from curb to property line  =  10.000(Ft.)
      Slope from curb to property line (v/hz) =   2.000
      Gutter width =   1.500(Ft.)
      Gutter hike from flowline =  0.175(In.)
       Manning's N in gutter =  0.0130
       Manning's N from gutter to grade break =  0.0130
       Manning's N from grade break to crown =  0.0150
      Estimated mean flow rate at midpoint of street =      0.219(CFS)
      Depth of flow =   0.059(Ft.), Average velocity =   2.767(Ft/s)
      Streetflow hydraulics at midpoint of street travel:
      Halfstreet flow width =   1.545(Ft.)
      Flow velocity =   2.77(Ft/s)
      Travel time =    0.36 min.     TC =   10.75  min.
       Adding area flow to street
      Rainfall intensity (I) =      4.663(In/Hr) for a   100.0 year storm
      Decimal fraction soil group A = 0.000
      Decimal fraction soil group B = 0.000
      Decimal fraction soil group C = 0.000
      Decimal fraction soil group D = 1.000
      [LOW DENSITY RESIDENTIAL                      ]
      (1.0 DU/A or Less       )
      Impervious value, Ai = 0.100
```

Sub-Area C Value = 0.410
Rainfall intensity =      4.663(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.410  CA =      0.068
Subarea runoff =      0.136(CFS) for      0.073(Ac.)
Total runoff =      0.317(CFS)    Total area =       0.166(Ac.)
Street flow at end of street =      0.317(CFS)
Half street flow at end of street =      0.317(CFS)
Depth of flow =   0.073(Ft.), Average velocity =   3.182(Ft/s)
Flow width (from curb towards crown)=   1.558(Ft.)

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      202.000 to Point/Station
204.000
**** IMPROVED CHANNEL TRAVEL TIME ****
______________________________________________________________________
Upstream point elevation =   362.000(Ft.)
Downstream point elevation =   351.000(Ft.)
Channel length thru subarea  =   195.000(Ft.)
Channel base width     =    3.500(Ft.)
Slope or 'Z' of left channel bank =   0.000
Slope or 'Z' of right channel bank =   0.000
Estimated mean flow rate at midpoint of channel =      0.332(CFS)
Manning's 'N'    = 0.030
Maximum depth of channel  =    0.500(Ft.)
Flow(q) thru subarea =      0.332(CFS)
Depth of flow =   0.056(Ft.), Average velocity =   1.689(Ft/s)
Channel flow top width =    3.500(Ft.)
Flow Velocity =    1.69(Ft/s)
Travel time  =    1.92 min.
Time of concentration =   12.68 min.
Critical depth =      0.065(Ft.)
Adding area flow to channel
Rainfall intensity (I) =      4.193(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[LOW DENSITY RESIDENTIAL                    ]
(1.0 DU/A or Less       )
Impervious value, Ai = 0.100
Sub-Area C Value = 0.410
The area added to the existing stream causes a
a lower flow rate of Q =      0.311(CFS)
therefore the upstream flow rate of Q =      0.317(CFS) is being
used
Rainfall intensity =      4.193(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.410  CA =      0.074
Subarea runoff =      0.000(CFS) for      0.015(Ac.)
Total runoff =      0.317(CFS)    Total area =       0.181(Ac.)

```
Depth of flow =   0.055(Ft.), Average velocity =   1.660(Ft/s)
Critical depth =      0.063(Ft.)
End of computations, total study area =           0.181 (Ac.)
```

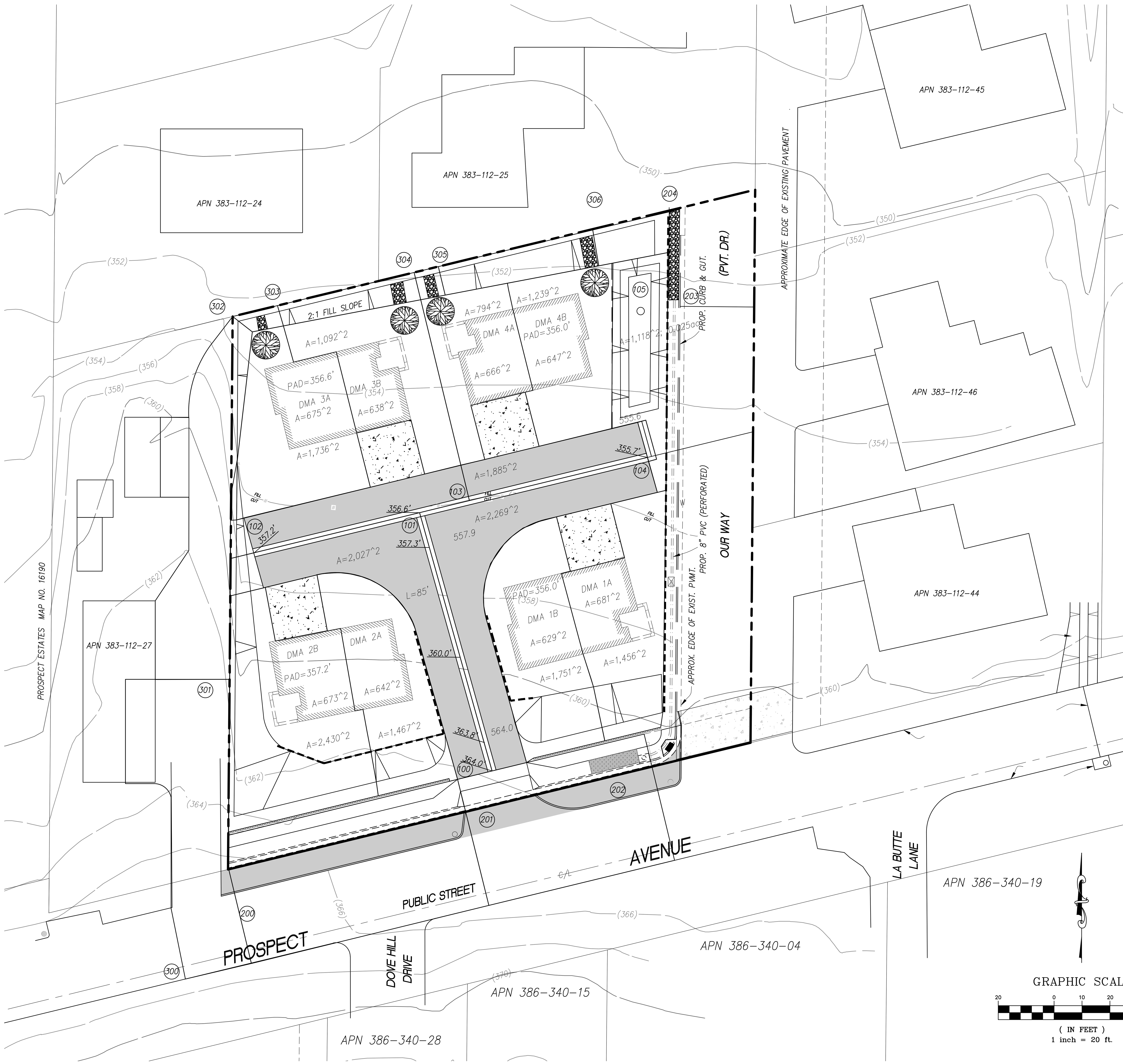
# ATTACHMENT 5

# PROPOSED DEVELOPMENT

# HYDROLOGY MAP

CITY OF SANTEE

# POST-DEVELOPMENT HYDROLOGY MAP




GRAPHIC SCALE

( IN FEET )
1 inch = 20 ft.

| |
|---|
| TENTATIVE PARCEL MAP 2020-1 |
| POST-DEVELOPMENT HYDROLOGY MAP |
| Revision 1: |
| Revision 2: |
| Revision 3: |
| Original Date: 3/18/2024 Revision 4: |
| Sheet ___ of ___ |

# ATTACHMENT 6

# PROPOSED DEVELOPMENT

## 10-yr Storm Analysis

# PROPOSED DEVELOPMENT

## 10-yr Storm Analysis

## Northerly D-25 Concrete
## Ditch Flow

San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2019 Version 9.1

Rational method hydrology program based on
San Diego County Flood Control Division 2003 hydrology manual
Rational Hydrology Study Date: 08/25/24

----------------------------------------------------------------------

10yr Storm Analysis, Post-Development
Tributary Area - Neighbor, Landscaped Slopes from Lots 3 & 4

----------------------------------------------------------------------

********* Hydrology Study Control Information **********

----------------------------------------------------------------------

Program License Serial Number 6622

----------------------------------------------------------------------

Rational hydrology study storm event year is 10.0
English (in-lb) input data Units used

Map data precipitation entered:
6 hour, precipitation(inches) = 1.700
24 hour precipitation(inches) = 2.900
P6/P24 = 58.6%
San Diego hydrology manual 'C' values used

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

Process from Point/Station 300.000 to Point/Station 301.000
**** INITIAL AREA EVALUATION ****

______________________________________________________________________

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[LOW DENSITY RESIDENTIAL ]
(1.0 DU/A or Less )
Impervious value, Ai = 0.100
Sub-Area C Value = 0.410
Initial subarea total flow distance = 100.000(Ft.)
Highest elevation = 367.600(Ft.)
Lowest elevation = 362.000(Ft.)

```
      Elevation difference =    5.600(Ft.) Slope =  5.600 %
      Top of Initial Area Slope adjusted by User to  1.000 %
      INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
      The maximum overland flow distance is 70.00 (Ft)
      for the top area slope value of   1.00 %, in a development type of
       1.0 DU/A or Less
      In Accordance With Figure 3-3
      Initial Area Time of Concentration =  10.39 minutes
      TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
      TC = [1.8*(1.1-0.4100)*(  70.000^.5)/(   1.000^(1/3)]=  10.39
      Rainfall intensity (I) =      2.794(In/Hr) for a    10.0 year storm
      Effective runoff coefficient used for area (Q=KCIA) is C = 0.410
      Subarea runoff =      0.076(CFS)
      Total initial stream area =       0.066(Ac.)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
++
      Process from Point/Station      301.000 to Point/Station
302.000
      **** PIPEFLOW TRAVEL TIME (User specified size) ****
      ____________________________________________________________________
__
      Upstream point/station elevation =   362.000(Ft.)
      Downstream point/station elevation =   353.500(Ft.)
      Pipe length  =   125.00(Ft.) Slope =   0.0680  Manning's N = 0.015
      No. of pipes = 1  Required pipe flow  =     0.076(CFS)
      Given pipe size =     24.00(In.)
      Calculated individual pipe flow  =     0.076(CFS)
      Normal flow depth in pipe =    0.70(In.)
      Flow top width inside pipe =    8.06(In.)
      Critical depth could not be calculated.
      Pipe flow velocity =     2.93(Ft/s)
      Travel time through pipe =    0.71 min.
      Time of concentration (TC) =    11.10 min.


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
++
      Process from Point/Station      301.000 to Point/Station
302.000
      **** SUBAREA FLOW ADDITION ****
      ____________________________________________________________________
__
      Rainfall intensity (I) =      2.677(In/Hr) for a    10.0 year storm
      Decimal fraction soil group A = 0.000
      Decimal fraction soil group B = 0.000
      Decimal fraction soil group C = 0.000
      Decimal fraction soil group D = 1.000
      [LOW DENSITY RESIDENTIAL                    ]
      (1.0 DU/A or Less       )
      Impervious value, Ai = 0.100
      Sub-Area C Value = 0.410
      Time of concentration =    11.10 min.
```

```
     Rainfall intensity =      2.677(In/Hr) for a    10.0 year storm
     Effective runoff coefficient used for total area
     (Q=KCIA) is C = 0.410  CA =      0.053
     Subarea runoff =      0.066(CFS) for      0.063(Ac.)
     Total runoff =      0.142(CFS)    Total area =       0.129(Ac.)


     ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
++
     Process from Point/Station      302.000 to Point/Station
204.000
     **** PIPEFLOW TRAVEL TIME (User specified size) ****
     ____________________________________________________________________
__
     Upstream point/station elevation =   353.500(Ft.)
     Downstream point/station elevation =   351.000(Ft.)
     Pipe length  =   160.00(Ft.) Slope =   0.0156  Manning's N = 0.015
     No. of pipes = 1  Required pipe flow  =     0.142(CFS)
     Given pipe size =     24.00(In.)
     Calculated individual pipe flow  =     0.142(CFS)
     Normal flow depth in pipe =    1.31(In.)
     Flow top width inside pipe =   10.89(In.)
     Critical Depth =    1.54(In.)
     Pipe flow velocity =      2.12(Ft/s)
     Travel time through pipe =    1.26 min.
     Time of concentration (TC) =    12.36 min.


     ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
++
     Process from Point/Station      302.000 to Point/Station
204.000
     **** SUBAREA FLOW ADDITION ****
     ____________________________________________________________________
__
     Rainfall intensity (I) =      2.498(In/Hr) for a    10.0 year storm
     Decimal fraction soil group A = 0.000
     Decimal fraction soil group B = 0.000
     Decimal fraction soil group C = 0.000
     Decimal fraction soil group D = 1.000
     [MEDIUM DENSITY RESIDENTIAL                  ]
     (4.3 DU/A or Less       )
     Impervious value, Ai = 0.300
     Sub-Area C Value = 0.520
     Time of concentration =    12.36 min.
     Rainfall intensity =      2.498(In/Hr) for a    10.0 year storm
     Effective runoff coefficient used for total area
     (Q=KCIA) is C = 0.435  CA =      0.072
     Subarea runoff =      0.039(CFS) for      0.037(Ac.)
     Total runoff =      0.180(CFS)    Total area =       0.166(Ac.)
     End of computations, total study area =           0.166 (Ac.)
```

# PROPOSED DEVELOPMENT

## 10-yr Storm Analysis

## Onsite

```
                           San Diego County Rational Hydrology Program

      CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2019 Version 9.1

      Rational method hydrology  program based on
      San Diego County Flood Control Division 2003 hydrology manual
                  Rational Hydrology Study        Date: 09/01/24
      --------------------------------------------------------------------
----
      10yr Storm Analysis, Post Development
      Tributary Area - Lots 1 & 2, Dwys from Lots 3 & 4


      --------------------------------------------------------------------
----
       *********   Hydrology Study Control Information **********

      --------------------------------------------------------------------
----


      Program License Serial Number 6622

      --------------------------------------------------------------------
----
      Rational hydrology study storm event year is    10.0
      English (in-lb) input data Units used

      Map data precipitation entered:
      6 hour,  precipitation(inches) =  1.700
      24 hour precipitation(inches) =  2.900
      P6/P24 =    58.6%
      San Diego hydrology manual 'C' values used


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
++
      Process from Point/Station      100.000 to Point/Station
101.000
      **** INITIAL AREA EVALUATION ****
      ____________________________________________________________________
__
      Decimal fraction soil group A = 0.000
      Decimal fraction soil group B = 0.000
      Decimal fraction soil group C = 0.000
      Decimal fraction soil group D = 1.000
      [MEDIUM DENSITY RESIDENTIAL                  ]
      (4.3 DU/A or Less       )
      Impervious value, Ai = 0.300
      Sub-Area C Value = 0.520
      Initial subarea total flow distance  =   85.000(Ft.)
      Highest elevation =  564.000(Ft.)
      Lowest elevation =  557.900(Ft.)
```

```
Elevation difference =    6.100(Ft.) Slope =  7.176 %
Top of Initial Area Slope adjusted by User to  2.000 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 80.00 (Ft)
for the top area slope value of   2.00 %, in a development type of
 4.3 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   7.41 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.5200)*(  80.000^.5)/(   2.000^(1/3)]=   7.41
Rainfall intensity (I) =      3.475(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.520
Subarea runoff =      0.325(CFS)
Total initial stream area =        0.180(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      101.000 to Point/Station
104.000
**** IMPROVED CHANNEL TRAVEL TIME ****
______________________________________________________________________
Upstream point elevation =   557.900(Ft.)
Downstream point elevation =   555.600(Ft.)
Channel length thru subarea  =   110.000(Ft.)
Channel base width     =   26.000(Ft.)
Slope or 'Z' of left channel bank =  20.000
Slope or 'Z' of right channel bank =  20.000
Estimated mean flow rate at midpoint of channel =      0.535(CFS)
Manning's 'N'    = 0.015
Maximum depth of channel  =    0.260(Ft.)
Flow(q) thru subarea =      0.535(CFS)
Depth of flow =   0.020(Ft.), Average velocity =   1.032(Ft/s)
Channel flow top width =   26.785(Ft.)
Flow Velocity =    1.03(Ft/s)
Travel time  =    1.78 min.
Time of concentration =    9.19 min.
Critical depth =      0.023(Ft.)
 Adding area flow to channel
Rainfall intensity (I) =      3.025(In/Hr) for a    10.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(4.3 DU/A or Less       )
Impervious value, Ai = 0.300
Sub-Area C Value = 0.520
Rainfall intensity =      3.025(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.520  CA =      0.214
Subarea runoff =      0.323(CFS) for      0.232(Ac.)
Total runoff =      0.648(CFS)    Total area =       0.412(Ac.)
```

Depth of flow = 0.022(Ft.), Average velocity = 1.113(Ft/s)
Critical depth = 0.027(Ft.)

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

Process from Point/Station 101.000 to Point/Station 104.000

**** 6 HOUR HYDROGRAPH ****

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

Hydrograph Data - Section 6, San Diego County Hydrology manual, June 2003

Time of Concentration = 9.19
Basin Area = 0.41 Acres
6 Hour Rainfall = 1.700 Inches
Runoff Coefficient = 0.520
Peak Discharge = 0.65 CFS

| Time (Min) | Discharge (CFS) |
|---|---|
| 0 | 0.000 |
| 9 | 0.021 |
| 18 | 0.022 |
| 27 | 0.023 |
| 36 | 0.023 |
| 45 | 0.024 |
| 54 | 0.025 |
| 63 | 0.025 |
| 72 | 0.026 |
| 81 | 0.027 |
| 90 | 0.028 |
| 99 | 0.029 |
| 108 | 0.030 |
| 117 | 0.031 |
| 126 | 0.033 |
| 135 | 0.034 |
| 144 | 0.037 |
| 153 | 0.038 |
| 162 | 0.042 |
| 171 | 0.044 |
| 180 | 0.048 |
| 189 | 0.051 |
| 198 | 0.059 |
| 207 | 0.064 |
| 216 | 0.078 |
| 225 | 0.089 |
| 234 | 0.130 |
| 243 | 0.183 |
| 252 | 0.648 |
| 261 | 0.104 |
| 270 | 0.070 |
| 279 | 0.055 |

```
                288               0.046
                297               0.040
                306               0.036
                315               0.032
                324               0.030
                333               0.027
                342               0.026
                351               0.024
                360               0.023
                369               0.022
 ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                                      6 - H O U R   S T O R M
                           R u n o f f    H y d r o g r a p h
 --------------------------------------------------------------------
                   Hydrograph in   1   Minute intervals ((CFS))

 --------------------------------------------------------------------
 Time(h+m) Volume Ac.Ft   Q(CFS)  0        0.2       0.3       0.5
0.6
 -------------------------------------------------------------------
   0+ 0       0.0000      0.00  Q         |         |         |         |
   0+ 1       0.0000      0.00  Q         |         |         |         |
   0+ 2       0.0000      0.00  Q         |         |         |         |
   0+ 3       0.0000      0.01  Q         |         |         |         |
   0+ 4       0.0000      0.01  Q         |         |         |         |
   0+ 5       0.0000      0.01  Q         |         |         |         |
   0+ 6       0.0001      0.01  Q         |         |         |         |
   0+ 7       0.0001      0.02  VQ        |         |         |         |
   0+ 8       0.0001      0.02  VQ        |         |         |         |
   0+ 9       0.0001      0.02  VQ        |         |         |         |
   0+10       0.0002      0.02  VQ        |         |         |         |
   0+11       0.0002      0.02  VQ        |         |         |         |
   0+12       0.0002      0.02  VQ        |         |         |         |
   0+13       0.0003      0.02  VQ        |         |         |         |
   0+14       0.0003      0.02  VQ        |         |         |         |
   0+15       0.0003      0.02  VQ        |         |         |         |
   0+16       0.0004      0.02  VQ        |         |         |         |
   0+17       0.0004      0.02  VQ        |         |         |         |
   0+18       0.0004      0.02  VQ        |         |         |         |
   0+19       0.0004      0.02  VQ        |         |         |         |
   0+20       0.0005      0.02  VQ        |         |         |         |
   0+21       0.0005      0.02  VQ        |         |         |         |
   0+22       0.0005      0.02  VQ        |         |         |         |
   0+23       0.0006      0.02  VQ        |         |         |         |
   0+24       0.0006      0.02  VQ        |         |         |         |
   0+25       0.0006      0.02  VQ        |         |         |         |
   0+26       0.0007      0.02  VQ        |         |         |         |
   0+27       0.0007      0.02  VQ        |         |         |         |
   0+28       0.0007      0.02  VQ        |         |         |         |
   0+29       0.0008      0.02  |Q        |         |         |         |
   0+30       0.0008      0.02  |Q        |         |         |         |
   0+31       0.0008      0.02  |Q        |         |         |         |
   0+32       0.0009      0.02  |Q        |         |         |         |
   0+33       0.0009      0.02  |Q        |         |         |         |
```

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 0+34 | 0.0009 | 0.02 | Q | | | | |
| 0+35 | 0.0009 | 0.02 | Q | | | | |
| 0+36 | 0.0010 | 0.02 | Q | | | | |
| 0+37 | 0.0010 | 0.02 | Q | | | | |
| 0+38 | 0.0010 | 0.02 | Q | | | | |
| 0+39 | 0.0011 | 0.02 | Q | | | | |
| 0+40 | 0.0011 | 0.02 | Q | | | | |
| 0+41 | 0.0011 | 0.02 | Q | | | | |
| 0+42 | 0.0012 | 0.02 | Q | | | | |
| 0+43 | 0.0012 | 0.02 | Q | | | | |
| 0+44 | 0.0012 | 0.02 | Q | | | | |
| 0+45 | 0.0013 | 0.02 | Q | | | | |
| 0+46 | 0.0013 | 0.02 | Q | | | | |
| 0+47 | 0.0013 | 0.02 | Q | | | | |
| 0+48 | 0.0014 | 0.02 | Q | | | | |
| 0+49 | 0.0014 | 0.02 | Q | | | | |
| 0+50 | 0.0014 | 0.02 | Q | | | | |
| 0+51 | 0.0015 | 0.02 | Q | | | | |
| 0+52 | 0.0015 | 0.02 | Q | | | | |
| 0+53 | 0.0015 | 0.02 | QV | | | | |
| 0+54 | 0.0016 | 0.02 | QV | | | | |
| 0+55 | 0.0016 | 0.02 | QV | | | | |
| 0+56 | 0.0016 | 0.02 | QV | | | | |
| 0+57 | 0.0017 | 0.02 | QV | | | | |
| 0+58 | 0.0017 | 0.02 | QV | | | | |
| 0+59 | 0.0017 | 0.02 | QV | | | | |
| 1+ 0 | 0.0018 | 0.03 | QV | | | | |
| 1+ 1 | 0.0018 | 0.03 | QV | | | | |
| 1+ 2 | 0.0018 | 0.03 | QV | | | | |
| 1+ 3 | 0.0019 | 0.03 | QV | | | | |
| 1+ 4 | 0.0019 | 0.03 | QV | | | | |
| 1+ 5 | 0.0020 | 0.03 | QV | | | | |
| 1+ 6 | 0.0020 | 0.03 | QV | | | | |
| 1+ 7 | 0.0020 | 0.03 | QV | | | | |
| 1+ 8 | 0.0021 | 0.03 | QV | | | | |
| 1+ 9 | 0.0021 | 0.03 | QV | | | | |
| 1+10 | 0.0021 | 0.03 | QV | | | | |
| 1+11 | 0.0022 | 0.03 | QV | | | | |
| 1+12 | 0.0022 | 0.03 | QV | | | | |
| 1+13 | 0.0022 | 0.03 | QV | | | | |
| 1+14 | 0.0023 | 0.03 | Q V | | | | |
| 1+15 | 0.0023 | 0.03 | Q V | | | | |
| 1+16 | 0.0023 | 0.03 | Q V | | | | |
| 1+17 | 0.0024 | 0.03 | Q V | | | | |
| 1+18 | 0.0024 | 0.03 | Q V | | | | |
| 1+19 | 0.0025 | 0.03 | Q V | | | | |
| 1+20 | 0.0025 | 0.03 | Q V | | | | |
| 1+21 | 0.0025 | 0.03 | Q V | | | | |
| 1+22 | 0.0026 | 0.03 | Q V | | | | |
| 1+23 | 0.0026 | 0.03 | Q V | | | | |
| 1+24 | 0.0026 | 0.03 | Q V | | | | |
| 1+25 | 0.0027 | 0.03 | Q V | | | | |
| 1+26 | 0.0027 | 0.03 | Q V | | | | |
| 1+27 | 0.0028 | 0.03 | Q V | | | | |

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 1+28      0.0028      0.03  |Q V      |         |         |         |
 1+29      0.0028      0.03  |Q V      |         |         |         |
 1+30      0.0029      0.03  |Q V      |         |         |         |
 1+31      0.0029      0.03  |Q V      |         |         |         |
 1+32      0.0030      0.03  |Q V      |         |         |         |
 1+33      0.0030      0.03  |Q V      |         |         |         |
 1+34      0.0030      0.03  |Q  V     |         |         |         |
 1+35      0.0031      0.03  |Q  V     |         |         |         |
 1+36      0.0031      0.03  |Q  V     |         |         |         |
 1+37      0.0031      0.03  |Q  V     |         |         |         |
 1+38      0.0032      0.03  |Q  V     |         |         |         |
 1+39      0.0032      0.03  |Q  V     |         |         |         |
 1+40      0.0033      0.03  |Q  V     |         |         |         |
 1+41      0.0033      0.03  |Q  V     |         |         |         |
 1+42      0.0033      0.03  |Q  V     |         |         |         |
 1+43      0.0034      0.03  |Q  V     |         |         |         |
 1+44      0.0034      0.03  |Q  V     |         |         |         |
 1+45      0.0035      0.03  |Q  V     |         |         |         |
 1+46      0.0035      0.03  |Q  V     |         |         |         |
 1+47      0.0036      0.03  |Q  V     |         |         |         |
 1+48      0.0036      0.03  |Q  V     |         |         |         |
 1+49      0.0036      0.03  |Q  V     |         |         |         |
 1+50      0.0037      0.03  |Q  V     |         |         |         |
 1+51      0.0037      0.03  |Q  V     |         |         |         |
 1+52      0.0038      0.03  |Q  V     |         |         |         |
 1+53      0.0038      0.03  |Q   V    |         |         |         |
 1+54      0.0039      0.03  |Q   V    |         |         |         |
 1+55      0.0039      0.03  |Q   V    |         |         |         |
 1+56      0.0039      0.03  |Q   V    |         |         |         |
 1+57      0.0040      0.03  |Q   V    |         |         |         |
 1+58      0.0040      0.03  |Q   V    |         |         |         |
 1+59      0.0041      0.03  |Q   V    |         |         |         |
 2+ 0      0.0041      0.03  |Q   V    |         |         |         |
 2+ 1      0.0042      0.03  |Q   V    |         |         |         |
 2+ 2      0.0042      0.03  |Q   V    |         |         |         |
 2+ 3      0.0042      0.03  | Q  V    |         |         |         |
 2+ 4      0.0043      0.03  | Q  V    |         |         |         |
 2+ 5      0.0043      0.03  | Q  V    |         |         |         |
 2+ 6      0.0044      0.03  | Q  V    |         |         |         |
 2+ 7      0.0044      0.03  | Q  V    |         |         |         |
 2+ 8      0.0045      0.03  | Q  V    |         |         |         |
 2+ 9      0.0045      0.03  | Q  V    |         |         |         |
 2+10      0.0046      0.03  | Q   V   |         |         |         |
 2+11      0.0046      0.03  | Q   V   |         |         |         |
 2+12      0.0047      0.03  | Q   V   |         |         |         |
 2+13      0.0047      0.03  | Q   V   |         |         |         |
 2+14      0.0048      0.03  | Q   V   |         |         |         |
 2+15      0.0048      0.03  | Q   V   |         |         |         |
 2+16      0.0048      0.03  | Q   V   |         |         |         |
 2+17      0.0049      0.03  | Q   V   |         |         |         |
 2+18      0.0049      0.04  | Q   V   |         |         |         |
 2+19      0.0050      0.04  | Q   V   |         |         |         |
 2+20      0.0050      0.04  | Q   V   |         |         |         |
 2+21      0.0051      0.04  | Q   V   |         |         |         |
```

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2+22       0.0051      0.04  | Q   V   |         |         |         |
2+23       0.0052      0.04  | Q   V   |         |         |         |
2+24       0.0052      0.04  | Q   V   |         |         |         |
2+25       0.0053      0.04  | Q    V  |         |         |         |
2+26       0.0053      0.04  | Q    V  |         |         |         |
2+27       0.0054      0.04  | Q    V  |         |         |         |
2+28       0.0054      0.04  | Q    V  |         |         |         |
2+29       0.0055      0.04  | Q    V  |         |         |         |
2+30       0.0056      0.04  | Q    V  |         |         |         |
2+31       0.0056      0.04  | Q    V  |         |         |         |
2+32       0.0057      0.04  | Q    V  |         |         |         |
2+33       0.0057      0.04  | Q    V  |         |         |         |
2+34       0.0058      0.04  | Q    V  |         |         |         |
2+35       0.0058      0.04  | Q    V  |         |         |         |
2+36       0.0059      0.04  | Q    V  |         |         |         |
2+37       0.0059      0.04  | Q    V  |         |         |         |
2+38       0.0060      0.04  | Q    V  |         |         |         |
2+39       0.0060      0.04  | Q    V  |         |         |         |
2+40       0.0061      0.04  | Q     V |         |         |         |
2+41       0.0061      0.04  | Q     V |         |         |         |
2+42       0.0062      0.04  | Q     V |         |         |         |
2+43       0.0063      0.04  | Q     V |         |         |         |
2+44       0.0063      0.04  | Q     V |         |         |         |
2+45       0.0064      0.04  | Q     V |         |         |         |
2+46       0.0064      0.04  | Q     V |         |         |         |
2+47       0.0065      0.04  | Q     V |         |         |         |
2+48       0.0066      0.04  | Q     V |         |         |         |
2+49       0.0066      0.04  | Q     V |         |         |         |
2+50       0.0067      0.04  | Q     V |         |         |         |
2+51       0.0067      0.04  | Q     V |         |         |         |
2+52       0.0068      0.04  | Q      V|         |         |         |
2+53       0.0069      0.04  | Q      V|         |         |         |
2+54       0.0069      0.05  | Q      V|         |         |         |
2+55       0.0070      0.05  | Q      V|         |         |         |
2+56       0.0070      0.05  | Q      V|         |         |         |
2+57       0.0071      0.05  | Q      V|         |         |         |
2+58       0.0072      0.05  | Q      V|         |         |         |
2+59       0.0072      0.05  | Q      V|         |         |         |
3+ 0       0.0073      0.05  | Q      V|         |         |         |
3+ 1       0.0074      0.05  | Q      V|         |         |         |
3+ 2       0.0074      0.05  |  Q     V|         |         |         |
3+ 3       0.0075      0.05  |  Q     V|         |         |         |
3+ 4       0.0076      0.05  |  Q      V         |         |         |
3+ 5       0.0076      0.05  |  Q      V         |         |         |
3+ 6       0.0077      0.05  |  Q      V         |         |         |
3+ 7       0.0078      0.05  |  Q      V         |         |         |
3+ 8       0.0079      0.05  |  Q      V         |         |         |
3+ 9       0.0079      0.05  |  Q      V         |         |         |
3+10       0.0080      0.05  |  Q      V         |         |         |
3+11       0.0081      0.05  |  Q      V         |         |         |
3+12       0.0081      0.05  |  Q      V         |         |         |
3+13       0.0082      0.05  |  Q      V         |         |         |
3+14       0.0083      0.06  |  Q      V         |         |         |
3+15       0.0084      0.06  |  Q      |V        |         |         |
```

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3+16       0.0085      0.06  |  Q      |V        |         |         |
3+17       0.0085      0.06  |  Q      |V        |         |         |
3+18       0.0086      0.06  |  Q      |V        |         |         |
3+19       0.0087      0.06  |  Q      |V        |         |         |
3+20       0.0088      0.06  |  Q      |V        |         |         |
3+21       0.0089      0.06  |  Q      |V        |         |         |
3+22       0.0089      0.06  |  Q      |V        |         |         |
3+23       0.0090      0.06  |  Q      |V        |         |         |
3+24       0.0091      0.06  |  Q      | V       |         |         |
3+25       0.0092      0.06  |  Q      | V       |         |         |
3+26       0.0093      0.06  |  Q      | V       |         |         |
3+27       0.0094      0.06  |  Q      | V       |         |         |
3+28       0.0095      0.07  |   Q     | V       |         |         |
3+29       0.0096      0.07  |   Q     | V       |         |         |
3+30       0.0096      0.07  |   Q     | V       |         |         |
3+31       0.0097      0.07  |   Q     | V       |         |         |
3+32       0.0098      0.07  |   Q     |  V      |         |         |
3+33       0.0099      0.07  |   Q     |  V      |         |         |
3+34       0.0100      0.07  |   Q     |  V      |         |         |
3+35       0.0102      0.08  |   Q     |  V      |         |         |
3+36       0.0103      0.08  |   Q     |  V      |         |         |
3+37       0.0104      0.08  |   Q     |  V      |         |         |
3+38       0.0105      0.08  |   Q     |  V      |         |         |
3+39       0.0106      0.08  |    Q    |   V     |         |         |
3+40       0.0107      0.08  |    Q    |   V     |         |         |
3+41       0.0108      0.08  |    Q    |   V     |         |         |
3+42       0.0109      0.08  |    Q    |   V     |         |         |
3+43       0.0111      0.09  |    Q    |   V     |         |         |
3+44       0.0112      0.09  |    Q    |   V     |         |         |
3+45       0.0113      0.09  |    Q    |   V     |         |         |
3+46       0.0114      0.09  |    Q    |    V    |         |         |
3+47       0.0116      0.10  |     Q   |    V    |         |         |
3+48       0.0117      0.10  |     Q   |    V    |         |         |
3+49       0.0118      0.11  |     Q   |    V    |         |         |
3+50       0.0120      0.11  |     Q   |    V    |         |         |
3+51       0.0122      0.12  |      Q  |     V   |         |         |
3+52       0.0123      0.12  |      Q  |     V   |         |         |
3+53       0.0125      0.13  |      Q  |     V   |         |         |
3+54       0.0127      0.13  |       Q |     V   |         |         |
3+55       0.0129      0.14  |       Q |      V  |         |         |
3+56       0.0131      0.14  |       Q |      V  |         |         |
3+57       0.0133      0.15  |        Q|      V  |         |         |
3+58       0.0135      0.15  |        Q|      V  |         |         |
3+59       0.0137      0.16  |        Q|       V |         |         |
4+ 0       0.0139      0.17  |         Q       V |         |         |
4+ 1       0.0142      0.17  |         Q       V |         |         |
4+ 2       0.0144      0.18  |         Q        V|         |         |
4+ 3       0.0147      0.18  |         |Q       V|         |         |
4+ 4       0.0150      0.23  |         |   Q    V|         |         |
4+ 5       0.0154      0.29  |         |      Q  V         |         |
4+ 6       0.0158      0.34  |         |         Q         |         |
4+ 7       0.0164      0.39  |         |         |V  Q     |         |
4+ 8       0.0170      0.44  |         |         | V    Q  |         |
4+ 9       0.0177      0.49  |         |         |  V      Q         |
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4+10       0.0184      0.54  |         |         |   V     |  Q      |
4+11       0.0192      0.60  |         |         |    V    |     Q   |
4+12       0.0201      0.65  |         |         |     V   |         Q
4+13       0.0209      0.59  |         |         |      V  |     Q   |
4+14       0.0217      0.53  |         |         |       V | Q       |
4+15       0.0223      0.47  |         |         |       QV|         |
4+16       0.0229      0.41  |         |         |    Q    V         |
4+17       0.0233      0.35  |         |         |Q        V         |
4+18       0.0237      0.29  |         |      Q  |         |V        |
4+19       0.0241      0.23  |         |  Q      |         |V        |
4+20       0.0243      0.16  |         Q         |         | V       |
4+21       0.0244      0.10  |     Q   |         |         | V       |
4+22       0.0246      0.10  |     Q   |         |         | V       |
4+23       0.0247      0.10  |    Q    |         |         | V       |
4+24       0.0248      0.09  |    Q    |         |         | V       |
4+25       0.0249      0.09  |    Q    |         |         |  V      |
4+26       0.0251      0.09  |    Q    |         |         |  V      |
4+27       0.0252      0.08  |    Q    |         |         |  V      |
4+28       0.0253      0.08  |   Q     |         |         |  V      |
4+29       0.0254      0.07  |   Q     |         |         |  V      |
4+30       0.0255      0.07  |   Q     |         |         |  V      |
4+31       0.0256      0.07  |   Q     |         |         |  V      |
4+32       0.0257      0.07  |   Q     |         |         |  V      |
4+33       0.0258      0.06  |  Q      |         |         |   V     |
4+34       0.0258      0.06  |  Q      |         |         |   V     |
4+35       0.0259      0.06  |  Q      |         |         |   V     |
4+36       0.0260      0.06  |  Q      |         |         |   V     |
4+37       0.0261      0.06  |  Q      |         |         |   V     |
4+38       0.0262      0.06  |  Q      |         |         |   V     |
4+39       0.0262      0.05  |  Q      |         |         |   V     |
4+40       0.0263      0.05  |  Q      |         |         |   V     |
4+41       0.0264      0.05  |  Q      |         |         |   V     |
4+42       0.0265      0.05  |  Q      |         |         |    V    |
4+43       0.0265      0.05  |  Q      |         |         |    V    |
4+44       0.0266      0.05  |  Q      |         |         |    V    |
4+45       0.0267      0.05  |  Q      |         |         |    V    |
4+46       0.0267      0.05  | Q       |         |         |    V    |
4+47       0.0268      0.05  | Q       |         |         |    V    |
4+48       0.0269      0.05  | Q       |         |         |    V    |
4+49       0.0269      0.05  | Q       |         |         |    V    |
4+50       0.0270      0.04  | Q       |         |         |    V    |
4+51       0.0270      0.04  | Q       |         |         |    V    |
4+52       0.0271      0.04  | Q       |         |         |    V    |
4+53       0.0272      0.04  | Q       |         |         |    V    |
4+54       0.0272      0.04  | Q       |         |         |     V   |
4+55       0.0273      0.04  | Q       |         |         |     V   |
4+56       0.0273      0.04  | Q       |         |         |     V   |
4+57       0.0274      0.04  | Q       |         |         |     V   |
4+58       0.0274      0.04  | Q       |         |         |     V   |
4+59       0.0275      0.04  | Q       |         |         |     V   |
5+ 0       0.0275      0.04  | Q       |         |         |     V   |
5+ 1       0.0276      0.04  | Q       |         |         |     V   |
5+ 2       0.0276      0.04  | Q       |         |         |     V   |
5+ 3       0.0277      0.04  | Q       |         |         |     V   |
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5+ 4       0.0277      0.04  | Q       |         |         |     V   |
5+ 5       0.0278      0.04  | Q       |         |         |     V   |
5+ 6       0.0278      0.04  | Q       |         |         |     V   |
5+ 7       0.0279      0.04  | Q       |         |         |     V   |
5+ 8       0.0279      0.03  | Q       |         |         |      V  |
5+ 9       0.0280      0.03  | Q       |         |         |      V  |
5+10       0.0280      0.03  | Q       |         |         |      V  |
5+11       0.0281      0.03  | Q       |         |         |      V  |
5+12       0.0281      0.03  | Q       |         |         |      V  |
5+13       0.0282      0.03  | Q       |         |         |      V  |
5+14       0.0282      0.03  | Q       |         |         |      V  |
5+15       0.0283      0.03  |Q        |         |         |      V  |
5+16       0.0283      0.03  |Q        |         |         |      V  |
5+17       0.0283      0.03  |Q        |         |         |      V  |
5+18       0.0284      0.03  |Q        |         |         |      V  |
5+19       0.0284      0.03  |Q        |         |         |      V  |
5+20       0.0285      0.03  |Q        |         |         |      V  |
5+21       0.0285      0.03  |Q        |         |         |      V  |
5+22       0.0286      0.03  |Q        |         |         |      V  |
5+23       0.0286      0.03  |Q        |         |         |      V  |
5+24       0.0286      0.03  |Q        |         |         |      V  |
5+25       0.0287      0.03  |Q        |         |         |      V  |
5+26       0.0287      0.03  |Q        |         |         |       V |
5+27       0.0288      0.03  |Q        |         |         |       V |
5+28       0.0288      0.03  |Q        |         |         |       V |
5+29       0.0288      0.03  |Q        |         |         |       V |
5+30       0.0289      0.03  |Q        |         |         |       V |
5+31       0.0289      0.03  |Q        |         |         |       V |
5+32       0.0290      0.03  |Q        |         |         |       V |
5+33       0.0290      0.03  |Q        |         |         |       V |
5+34       0.0290      0.03  |Q        |         |         |       V |
5+35       0.0291      0.03  |Q        |         |         |       V |
5+36       0.0291      0.03  |Q        |         |         |       V |
5+37       0.0291      0.03  |Q        |         |         |       V |
5+38       0.0292      0.03  |Q        |         |         |       V |
5+39       0.0292      0.03  |Q        |         |         |       V |
5+40       0.0293      0.03  |Q        |         |         |       V |
5+41       0.0293      0.03  |Q        |         |         |       V |
5+42       0.0293      0.03  |Q        |         |         |       V |
5+43       0.0294      0.03  |Q        |         |         |       V |
5+44       0.0294      0.03  |Q        |         |         |       V |
5+45       0.0294      0.03  |Q        |         |         |       V |
5+46       0.0295      0.03  |Q        |         |         |        V|
5+47       0.0295      0.02  |Q        |         |         |        V|
5+48       0.0295      0.02  |Q        |         |         |        V|
5+49       0.0296      0.02  |Q        |         |         |        V|
5+50       0.0296      0.02  |Q        |         |         |        V|
5+51       0.0296      0.02  |Q        |         |         |        V|
5+52       0.0297      0.02  |Q        |         |         |        V|
5+53       0.0297      0.02  |Q        |         |         |        V|
5+54       0.0297      0.02  |Q        |         |         |        V|
5+55       0.0298      0.02  |Q        |         |         |        V|
5+56       0.0298      0.02  |Q        |         |         |        V|
5+57       0.0298      0.02  |Q        |         |         |        V|
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   5+58       0.0299      0.02  |Q        |        |        |       V|
   5+59       0.0299      0.02  |Q        |        |        |       V|
   6+ 0       0.0299      0.02  |Q        |        |        |       V|
   6+ 1       0.0300      0.02  |Q        |        |        |       V|
   6+ 2       0.0300      0.02  |Q        |        |        |       V|
   6+ 3       0.0300      0.02  |Q        |        |        |       V|
   6+ 4       0.0300      0.02  |Q        |        |        |       V|
   6+ 5       0.0301      0.02  |Q        |        |        |       V|
   6+ 6       0.0301      0.02  |Q        |        |        |       V|
   6+ 7       0.0301      0.02  |Q        |        |        |       V|
   6+ 8       0.0302      0.02  |Q        |        |        |       V|
   6+ 9       0.0302      0.02  |Q        |        |        |        V
----------------------------------------------------------------------
```

End of computations, total study area = 0.412 (Ac.)

# PROPOSED DEVELOPMENT

## 10-yr Storm Analysis

## Prospect Ave

```
                          San Diego County Rational Hydrology Program

      CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2019 Version 9.1

      Rational method hydrology  program based on
      San Diego County Flood Control Division 2003 hydrology manual
                  Rational Hydrology Study        Date: 08/25/24
      --------------------------------------------------------------------
----
      10yr Storm Analysis, Post-Development
      Tributary Area - Prospect Ave


      --------------------------------------------------------------------
----
       *********   Hydrology Study Control Information **********

      --------------------------------------------------------------------
----



      Program License Serial Number 6622

      --------------------------------------------------------------------
----
      Rational hydrology study storm event year is    10.0
      English (in-lb) input data Units used

      Map data precipitation entered:
      6 hour,  precipitation(inches) =  1.700
      24 hour precipitation(inches) =  2.900
      P6/P24 =    58.6%
      San Diego hydrology manual 'C' values used


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
++
      Process from Point/Station      200.000 to Point/Station
201.000
      **** INITIAL AREA EVALUATION ****
      ____________________________________________________________________
__
      Decimal fraction soil group A = 0.000
      Decimal fraction soil group B = 0.000
      Decimal fraction soil group C = 0.000
      Decimal fraction soil group D = 1.000
      [MEDIUM DENSITY RESIDENTIAL                  ]
      (4.3 DU/A or Less       )
      Impervious value, Ai = 0.300
      Sub-Area C Value = 0.520
      Initial subarea total flow distance  =  100.000(Ft.)
      Highest elevation =  367.500(Ft.)
      Lowest elevation =  364.000(Ft.)
```

```
      Elevation difference =    3.500(Ft.) Slope =  3.500 %
      Top of Initial Area Slope adjusted by User to  1.000 %
      INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
      The maximum overland flow distance is 70.00 (Ft)
      for the top area slope value of   1.00 %, in a development type of
       4.3 DU/A or Less
      In Accordance With Figure 3-3
      Initial Area Time of Concentration =   8.73 minutes
      TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
      TC = [1.8*(1.1-0.5200)*(  70.000^.5)/(   1.000^(1/3)]=   8.73
      Rainfall intensity (I) =      3.125(In/Hr) for a    10.0 year storm
      Effective runoff coefficient used for area (Q=KCIA) is C = 0.520
      Subarea runoff =      0.151(CFS)
      Total initial stream area =        0.093(Ac.)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
++
      Process from Point/Station      201.000 to Point/Station
202.000
      **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
      ______________________________________________________________________
__
      Top of street segment elevation =   364.000(Ft.)
      End of street segment elevation =   362.000(Ft.)
      Length of street segment  =    60.000(Ft.)
      Height of curb above gutter flowline  =    6.0(In.)
      Width of half street (curb to crown)  =  32.000(Ft.)
      Distance from crown to crossfall grade break  =  30.500(Ft.)
      Slope from gutter to grade break (v/hz) =   1.000
      Slope from grade break to crown (v/hz)  =   1.000
      Street flow is on [1] side(s) of the street
      Distance from curb to property line  =  10.000(Ft.)
      Slope from curb to property line (v/hz) =   2.000
      Gutter width =   1.500(Ft.)
      Gutter hike from flowline =  0.175(In.)
       Manning's N in gutter =  0.0130
       Manning's N from gutter to grade break =  0.0130
       Manning's N from grade break to crown =  0.0150
      Estimated mean flow rate at midpoint of street =      0.157(CFS)
      Depth of flow =   0.050(Ft.), Average velocity =   2.436(Ft/s)
      Streetflow hydraulics at midpoint of street travel:
      Halfstreet flow width =   1.535(Ft.)
      Flow velocity =   2.44(Ft/s)
      Travel time =    0.41 min.     TC =    9.15  min.
       Adding area flow to street
      Rainfall intensity (I) =      3.034(In/Hr) for a    10.0 year storm
      Decimal fraction soil group A = 0.000
      Decimal fraction soil group B = 0.000
      Decimal fraction soil group C = 0.000
      Decimal fraction soil group D = 1.000
      [MEDIUM DENSITY RESIDENTIAL                   ]
      (4.3 DU/A or Less       )
      Impervious value, Ai = 0.300
```

```
     Sub-Area C Value = 0.520
     Rainfall intensity =      3.034(In/Hr) for a    10.0 year storm
     Effective runoff coefficient used for total area
     (Q=KCIA) is C = 0.520  CA =      0.086
     Subarea runoff =      0.111(CFS) for      0.073(Ac.)
     Total runoff =      0.262(CFS)    Total area =       0.166(Ac.)
     Street flow at end of street =      0.262(CFS)
     Half street flow at end of street =      0.262(CFS)
     Depth of flow =   0.065(Ft.), Average velocity =   2.961(Ft/s)
     Flow width (from curb towards crown)=   1.551(Ft.)


     ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
++
     Process from Point/Station      202.000 to Point/Station
203.000
     **** PIPEFLOW TRAVEL TIME (Program estimated size) ****
     ____________________________________________________________________
__
     Upstream point/station elevation =   358.000(Ft.)
     Downstream point/station elevation =   352.500(Ft.)
     Pipe length  =   165.00(Ft.) Slope =   0.0333  Manning's N = 0.013
     No. of pipes = 1  Required pipe flow  =     0.262(CFS)
     Nearest computed pipe diameter  =      6.00(In.)
     Calculated individual pipe flow  =     0.262(CFS)
     Normal flow depth in pipe =    2.07(In.)
     Flow top width inside pipe =    5.70(In.)
     Critical Depth =    3.09(In.)
     Pipe flow velocity =      4.36(Ft/s)
     Travel time through pipe =    0.63 min.
     Time of concentration (TC) =     9.78 min.


     ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
++
     Process from Point/Station      203.000 to Point/Station
204.000
     **** IMPROVED CHANNEL TRAVEL TIME ****
     ____________________________________________________________________
__
     Upstream point elevation =   352.500(Ft.)
     Downstream point elevation =   351.000(Ft.)
     Channel length thru subarea  =    30.000(Ft.)
     Channel base width     =    3.500(Ft.)
     Slope or 'Z' of left channel bank =   0.000
     Slope or 'Z' of right channel bank =   0.000
     Estimated mean flow rate at midpoint of channel =      0.264(CFS)
     Manning's 'N'    = 0.015
     Maximum depth of channel  =    0.500(Ft.)
     Flow(q) thru subarea =      0.264(CFS)
     Depth of flow =   0.033(Ft.), Average velocity =   2.265(Ft/s)
     Channel flow top width =    3.500(Ft.)
     Flow Velocity =    2.27(Ft/s)
     Travel time  =    0.22 min.
```

Time of concentration =   10.00 min.
Critical depth =      0.056(Ft.)
Adding area flow to channel
Rainfall intensity (I) =      2.865(In/Hr) for a    10.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(4.3 DU/A or Less       )
Impervious value, Ai = 0.300
Sub-Area C Value = 0.520
The area added to the existing stream causes a
a lower flow rate of Q =      0.252(CFS)
therefore the upstream flow rate of Q =      0.262(CFS) is being used
Rainfall intensity =      2.865(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.520  CA =      0.088
Subarea runoff =      0.000(CFS) for      0.003(Ac.)
Total runoff =      0.262(CFS)    Total area =       0.169(Ac.)
Depth of flow =   0.033(Ft.), Average velocity =   2.257(Ft/s)
Critical depth =      0.056(Ft.)
End of computations, total study area =           0.169 (Ac.)

# ATTACHMENT 7

# PROPOSED DEVELOPMENT

# 100-yr Storm Analysis

# PROPOSED DEVELOPMENT

## 100-yr Storm Analysis

## Northerly D-25 Concrete Ditch Flow

San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2019 Version 9.1

Rational method hydrology program based on
San Diego County Flood Control Division 2003 hydrology manual
Rational Hydrology Study Date: 08/25/24

------------------------------------------------------------------------

100yr Storm Analysis, Post-Development
Tribulary Area - Neighbor, Landscaped Slopes Lots 3 & 4

------------------------------------------------------------------------

********* Hydrology Study Control Information **********

------------------------------------------------------------------------

Program License Serial Number 6622

------------------------------------------------------------------------

Rational hydrology study storm event year is 100.0
English (in-lb) input data Units used

Map data precipitation entered:
6 hour, precipitation(inches) = 2.900
24 hour precipitation(inches) = 4.500
P6/P24 = 64.4%
San Diego hydrology manual 'C' values used

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

Process from Point/Station 300.000 to Point/Station 301.000
**** INITIAL AREA EVALUATION ****

________________________________________________________________________

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[LOW DENSITY RESIDENTIAL ]
(1.0 DU/A or Less )
Impervious value, Ai = 0.100
Sub-Area C Value = 0.410
Initial subarea total flow distance = 100.000(Ft.)
Highest elevation = 367.600(Ft.)
Lowest elevation = 362.000(Ft.)

```
Elevation difference =    5.600(Ft.) Slope =  5.600 %
Top of Initial Area Slope adjusted by User to  1.000 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 70.00 (Ft)
for the top area slope value of   1.00 %, in a development type of
 1.0 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =  10.39 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.4100)*(  70.000^.5)/(   1.000^(1/3)]=  10.39
Rainfall intensity (I) =      4.767(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.410
Subarea runoff =      0.129(CFS)
Total initial stream area =        0.066(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
++
Process from Point/Station      301.000 to Point/Station
302.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________________
__
Upstream point/station elevation =   362.000(Ft.)
Downstream point/station elevation =   353.500(Ft.)
Pipe length  =   125.00(Ft.) Slope =   0.0680  Manning's N = 0.015
No. of pipes = 1  Required pipe flow  =     0.129(CFS)
Given pipe size =     24.00(In.)
Calculated individual pipe flow  =     0.129(CFS)
Normal flow depth in pipe =    0.89(In.)
Flow top width inside pipe =    9.07(In.)
Critical depth could not be calculated.
Pipe flow velocity =      3.44(Ft/s)
Travel time through pipe =    0.61 min.
Time of concentration (TC) =    11.00 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
++
Process from Point/Station      301.000 to Point/Station
302.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
__
Rainfall intensity (I) =      4.596(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[LOW DENSITY RESIDENTIAL                    ]
(1.0 DU/A or Less      )
Impervious value, Ai = 0.100
Sub-Area C Value = 0.410
Time of concentration =    11.00 min.
```

```
     Rainfall intensity =      4.596(In/Hr) for a   100.0 year storm
     Effective runoff coefficient used for total area
     (Q=KCIA) is C = 0.410  CA =      0.053
     Subarea runoff =      0.114(CFS) for      0.063(Ac.)
     Total runoff =      0.243(CFS)    Total area =       0.129(Ac.)


     ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
++
     Process from Point/Station      302.000 to Point/Station
204.000
     **** PIPEFLOW TRAVEL TIME (User specified size) ****
     ____________________________________________________________________
__
     Upstream point/station elevation =   353.500(Ft.)
     Downstream point/station elevation =   351.000(Ft.)
     Pipe length  =   160.00(Ft.) Slope =   0.0156  Manning's N = 0.030
     No. of pipes = 1  Required pipe flow  =     0.243(CFS)
     Given pipe size =     24.00(In.)
     Calculated individual pipe flow  =     0.243(CFS)
     Normal flow depth in pipe =    2.34(In.)
     Flow top width inside pipe =   14.25(In.)
     Critical depth could not be calculated.
     Pipe flow velocity =      1.54(Ft/s)
     Travel time through pipe =    1.73 min.
     Time of concentration (TC) =    12.73 min.


     ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
++
     Process from Point/Station      302.000 to Point/Station
204.000
     **** SUBAREA FLOW ADDITION ****
     ____________________________________________________________________
__
     Rainfall intensity (I) =      4.182(In/Hr) for a   100.0 year storm
     Decimal fraction soil group A = 0.000
     Decimal fraction soil group B = 0.000
     Decimal fraction soil group C = 0.000
     Decimal fraction soil group D = 1.000
     [MEDIUM DENSITY RESIDENTIAL                  ]
     (4.3 DU/A or Less       )
     Impervious value, Ai = 0.300
     Sub-Area C Value = 0.520
     Time of concentration =    12.73 min.
     Rainfall intensity =      4.182(In/Hr) for a   100.0 year storm
     Effective runoff coefficient used for total area
     (Q=KCIA) is C = 0.435  CA =      0.072
     Subarea runoff =      0.059(CFS) for      0.037(Ac.)
     Total runoff =      0.302(CFS)    Total area =       0.166(Ac.)
     End of computations, total study area =           0.166 (Ac.)
```

# PROPOSED DEVELOPMENT

## 100-yr Storm Analysis

## Onsite

San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2019 Version 9.1

Rational method hydrology program based on
San Diego County Flood Control Division 2003 hydrology manual
Rational Hydrology Study Date: 09/01/24

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100yr Storm Analysis, Post-Development
Tributary Area - Lots 1 & 2, Dwys from Lots 3 & 4

----------------------------------------------------------------------

********* Hydrology Study Control Information **********

----------------------------------------------------------------------

Program License Serial Number 6622

----------------------------------------------------------------------

Rational hydrology study storm event year is 100.0
English (in-lb) input data Units used

Map data precipitation entered:
6 hour, precipitation(inches) = 2.400
24 hour precipitation(inches) = 4.500
P6/P24 = 53.3%
San Diego hydrology manual 'C' values used

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

Process from Point/Station 100.000 to Point/Station 101.000
**** INITIAL AREA EVALUATION ****

______________________________________________________________________

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL ]
(4.3 DU/A or Less )
Impervious value, Ai = 0.300
Sub-Area C Value = 0.520
Initial subarea total flow distance = 85.000(Ft.)
Highest elevation = 564.000(Ft.)
Lowest elevation = 557.900(Ft.)

```
Elevation difference =    6.100(Ft.) Slope =  7.176 %
Top of Initial Area Slope adjusted by User to  2.000 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 80.00 (Ft)
for the top area slope value of   2.00 %, in a development type of
 4.3 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration =   7.41 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.5200)*(  80.000^.5)/(   2.000^(1/3)]=   7.41
Rainfall intensity (I) =      4.906(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.520
Subarea runoff =      0.459(CFS)
Total initial stream area =       0.180(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      101.000 to Point/Station      104.000
**** IMPROVED CHANNEL TRAVEL TIME ****
______________________________________________________________________
Upstream point elevation =   557.900(Ft.)
Downstream point elevation =   555.600(Ft.)
Channel length thru subarea  =   110.000(Ft.)
Channel base width     =   26.000(Ft.)
Slope or 'Z' of left channel bank =  20.000
Slope or 'Z' of right channel bank =  20.000
Estimated mean flow rate at midpoint of channel =      0.725(CFS)
Manning's 'N'    = 0.015
Maximum depth of channel  =    0.260(Ft.)
Flow(q) thru subarea =      0.725(CFS)
Depth of flow =   0.024(Ft.), Average velocity =   1.163(Ft/s)
Channel flow top width =   26.942(Ft.)
Flow Velocity =    1.16(Ft/s)
Travel time  =    1.58 min.
Time of concentration =    8.99 min.
Critical depth =      0.029(Ft.)
 Adding area flow to channel
Rainfall intensity (I) =      4.332(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                 ]
(4.3 DU/A or Less       )
Impervious value, Ai = 0.300
Sub-Area C Value = 0.520
Rainfall intensity =      4.332(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.520  CA =      0.214
Subarea runoff =      0.469(CFS) for      0.232(Ac.)
Total runoff =      0.928(CFS)    Total area =      0.412(Ac.)
```

Depth of flow =   0.027(Ft.), Average velocity =   1.281(Ft/s)
Critical depth =      0.034(Ft.)

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

Process from Point/Station      101.000 to Point/Station
104.000

**** 6 HOUR HYDROGRAPH ****

____________________________________________________________________

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

Hydrograph Data - Section 6, San Diego County Hydrology manual, June 2003

Time of Concentration =   8.99
Basin Area =     0.41 Acres
6 Hour Rainfall =  2.400 Inches
Runoff Coefficient =  0.520
Peak Discharge =     0.93 CFS

| Time (Min) | Discharge (CFS) |
|---|---|
| 0 | 0.000 |
| 8 | 0.031 |
| 16 | 0.031 |
| 24 | 0.032 |
| 32 | 0.033 |
| 40 | 0.034 |
| 48 | 0.034 |
| 56 | 0.036 |
| 64 | 0.036 |
| 72 | 0.038 |
| 80 | 0.038 |
| 88 | 0.040 |
| 96 | 0.041 |
| 104 | 0.043 |
| 112 | 0.044 |
| 120 | 0.046 |
| 128 | 0.048 |
| 136 | 0.051 |
| 144 | 0.052 |
| 152 | 0.056 |
| 160 | 0.058 |
| 168 | 0.063 |
| 176 | 0.066 |
| 184 | 0.074 |
| 192 | 0.078 |
| 200 | 0.089 |
| 208 | 0.097 |
| 216 | 0.118 |
| 224 | 0.135 |
| 232 | 0.198 |
| 240 | 0.279 |
| 248 | 0.928 |

```
                  256               0.159
                  264               0.106
                  272               0.083
                  280               0.070
                  288               0.061
                  296               0.054
                  304               0.049
                  312               0.045
                  320               0.042
                  328               0.039
                  336               0.037
                  344               0.035
                  352               0.033
                  360               0.032
                  368               0.030
    ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                                      6 - H O U R   S T O R M
                               R u n o f f    H y d r o g r a p h
    --------------------------------------------------------------------
                          Hydrograph in   1   Minute intervals ((CFS))

    --------------------------------------------------------------------
  Time(h+m) Volume Ac.Ft   Q(CFS)  0        0.2       0.5       0.7
0.9
  -------------------------------------------------------------------
    0+ 0       0.0000      0.00  Q         |         |         |         |
    0+ 1       0.0000      0.00  Q         |         |         |         |
    0+ 2       0.0000      0.01  Q         |         |         |         |
    0+ 3       0.0000      0.01  Q         |         |         |         |
    0+ 4       0.0001      0.02  Q         |         |         |         |
    0+ 5       0.0001      0.02  Q         |         |         |         |
    0+ 6       0.0001      0.02  Q         |         |         |         |
    0+ 7       0.0001      0.03  VQ        |         |         |         |
    0+ 8       0.0002      0.03  VQ        |         |         |         |
    0+ 9       0.0002      0.03  VQ        |         |         |         |
    0+10       0.0003      0.03  VQ        |         |         |         |
    0+11       0.0003      0.03  VQ        |         |         |         |
    0+12       0.0004      0.03  VQ        |         |         |         |
    0+13       0.0004      0.03  VQ        |         |         |         |
    0+14       0.0004      0.03  VQ        |         |         |         |
    0+15       0.0005      0.03  VQ        |         |         |         |
    0+16       0.0005      0.03  VQ        |         |         |         |
    0+17       0.0006      0.03  VQ        |         |         |         |
    0+18       0.0006      0.03  VQ        |         |         |         |
    0+19       0.0007      0.03  VQ        |         |         |         |
    0+20       0.0007      0.03  VQ        |         |         |         |
    0+21       0.0007      0.03  VQ        |         |         |         |
    0+22       0.0008      0.03  VQ        |         |         |         |
    0+23       0.0008      0.03  VQ        |         |         |         |
    0+24       0.0009      0.03  VQ        |         |         |         |
    0+25       0.0009      0.03  VQ        |         |         |         |
    0+26       0.0010      0.03  VQ        |         |         |         |
    0+27       0.0010      0.03  VQ        |         |         |         |
    0+28       0.0011      0.03  |Q        |         |         |         |
```

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 0+29 | 0.0011 | 0.03 | Q | | | | |
| 0+30 | 0.0011 | 0.03 | Q | | | | |
| 0+31 | 0.0012 | 0.03 | Q | | | | |
| 0+32 | 0.0012 | 0.03 | Q | | | | |
| 0+33 | 0.0013 | 0.03 | Q | | | | |
| 0+34 | 0.0013 | 0.03 | Q | | | | |
| 0+35 | 0.0014 | 0.03 | Q | | | | |
| 0+36 | 0.0014 | 0.03 | Q | | | | |
| 0+37 | 0.0015 | 0.03 | Q | | | | |
| 0+38 | 0.0015 | 0.03 | Q | | | | |
| 0+39 | 0.0016 | 0.03 | Q | | | | |
| 0+40 | 0.0016 | 0.03 | Q | | | | |
| 0+41 | 0.0017 | 0.03 | Q | | | | |
| 0+42 | 0.0017 | 0.03 | Q | | | | |
| 0+43 | 0.0017 | 0.03 | Q | | | | |
| 0+44 | 0.0018 | 0.03 | Q | | | | |
| 0+45 | 0.0018 | 0.03 | Q | | | | |
| 0+46 | 0.0019 | 0.03 | Q | | | | |
| 0+47 | 0.0019 | 0.03 | Q | | | | |
| 0+48 | 0.0020 | 0.03 | Q | | | | |
| 0+49 | 0.0020 | 0.03 | Q | | | | |
| 0+50 | 0.0021 | 0.03 | Q | | | | |
| 0+51 | 0.0021 | 0.03 | QV | | | | |
| 0+52 | 0.0022 | 0.03 | QV | | | | |
| 0+53 | 0.0022 | 0.04 | QV | | | | |
| 0+54 | 0.0023 | 0.04 | QV | | | | |
| 0+55 | 0.0023 | 0.04 | QV | | | | |
| 0+56 | 0.0024 | 0.04 | QV | | | | |
| 0+57 | 0.0024 | 0.04 | QV | | | | |
| 0+58 | 0.0025 | 0.04 | QV | | | | |
| 0+59 | 0.0025 | 0.04 | QV | | | | |
| 1+ 0 | 0.0026 | 0.04 | QV | | | | |
| 1+ 1 | 0.0026 | 0.04 | QV | | | | |
| 1+ 2 | 0.0027 | 0.04 | QV | | | | |
| 1+ 3 | 0.0027 | 0.04 | QV | | | | |
| 1+ 4 | 0.0028 | 0.04 | QV | | | | |
| 1+ 5 | 0.0028 | 0.04 | QV | | | | |
| 1+ 6 | 0.0029 | 0.04 | QV | | | | |
| 1+ 7 | 0.0029 | 0.04 | QV | | | | |
| 1+ 8 | 0.0030 | 0.04 | QV | | | | |
| 1+ 9 | 0.0030 | 0.04 | QV | | | | |
| 1+10 | 0.0031 | 0.04 | QV | | | | |
| 1+11 | 0.0031 | 0.04 | QV | | | | |
| 1+12 | 0.0032 | 0.04 | Q V | | | | |
| 1+13 | 0.0032 | 0.04 | Q V | | | | |
| 1+14 | 0.0033 | 0.04 | Q V | | | | |
| 1+15 | 0.0033 | 0.04 | Q V | | | | |
| 1+16 | 0.0034 | 0.04 | Q V | | | | |
| 1+17 | 0.0034 | 0.04 | Q V | | | | |
| 1+18 | 0.0035 | 0.04 | Q V | | | | |
| 1+19 | 0.0035 | 0.04 | Q V | | | | |
| 1+20 | 0.0036 | 0.04 | Q V | | | | |
| 1+21 | 0.0036 | 0.04 | Q V | | | | |
| 1+22 | 0.0037 | 0.04 | Q V | | | | |

```
 1+23       0.0037      0.04  |Q V      |         |         |         |
 1+24       0.0038      0.04  |Q V      |         |         |         |
 1+25       0.0039      0.04  |Q V      |         |         |         |
 1+26       0.0039      0.04  |Q V      |         |         |         |
 1+27       0.0040      0.04  |Q V      |         |         |         |
 1+28       0.0040      0.04  |Q V      |         |         |         |
 1+29       0.0041      0.04  |Q V      |         |         |         |
 1+30       0.0041      0.04  |Q V      |         |         |         |
 1+31       0.0042      0.04  |Q V      |         |         |         |
 1+32       0.0042      0.04  |Q  V     |         |         |         |
 1+33       0.0043      0.04  |Q  V     |         |         |         |
 1+34       0.0044      0.04  |Q  V     |         |         |         |
 1+35       0.0044      0.04  |Q  V     |         |         |         |
 1+36       0.0045      0.04  |Q  V     |         |         |         |
 1+37       0.0045      0.04  |Q  V     |         |         |         |
 1+38       0.0046      0.04  |Q  V     |         |         |         |
 1+39       0.0046      0.04  |Q  V     |         |         |         |
 1+40       0.0047      0.04  |Q  V     |         |         |         |
 1+41       0.0048      0.04  |Q  V     |         |         |         |
 1+42       0.0048      0.04  |Q  V     |         |         |         |
 1+43       0.0049      0.04  |Q  V     |         |         |         |
 1+44       0.0049      0.04  |Q  V     |         |         |         |
 1+45       0.0050      0.04  |Q  V     |         |         |         |
 1+46       0.0050      0.04  |Q  V     |         |         |         |
 1+47       0.0051      0.04  |Q  V     |         |         |         |
 1+48       0.0052      0.04  |Q  V     |         |         |         |
 1+49       0.0052      0.04  |Q  V     |         |         |         |
 1+50       0.0053      0.04  |Q   V    |         |         |         |
 1+51       0.0053      0.04  |Q   V    |         |         |         |
 1+52       0.0054      0.04  |Q   V    |         |         |         |
 1+53       0.0055      0.04  |Q   V    |         |         |         |
 1+54       0.0055      0.04  |Q   V    |         |         |         |
 1+55       0.0056      0.04  |Q   V    |         |         |         |
 1+56       0.0057      0.05  |Q   V    |         |         |         |
 1+57       0.0057      0.05  |Q   V    |         |         |         |
 1+58       0.0058      0.05  |Q   V    |         |         |         |
 1+59       0.0058      0.05  |Q   V    |         |         |         |
 2+ 0       0.0059      0.05  |Q   V    |         |         |         |
 2+ 1       0.0060      0.05  | Q  V    |         |         |         |
 2+ 2       0.0060      0.05  | Q  V    |         |         |         |
 2+ 3       0.0061      0.05  | Q  V    |         |         |         |
 2+ 4       0.0062      0.05  | Q  V    |         |         |         |
 2+ 5       0.0062      0.05  | Q  V    |         |         |         |
 2+ 6       0.0063      0.05  | Q   V   |         |         |         |
 2+ 7       0.0064      0.05  | Q   V   |         |         |         |
 2+ 8       0.0064      0.05  | Q   V   |         |         |         |
 2+ 9       0.0065      0.05  | Q   V   |         |         |         |
 2+10       0.0066      0.05  | Q   V   |         |         |         |
 2+11       0.0066      0.05  | Q   V   |         |         |         |
 2+12       0.0067      0.05  | Q   V   |         |         |         |
 2+13       0.0068      0.05  | Q   V   |         |         |         |
 2+14       0.0068      0.05  | Q   V   |         |         |         |
 2+15       0.0069      0.05  | Q   V   |         |         |         |
 2+16       0.0070      0.05  | Q   V   |         |         |         |
```

```
2+17       0.0070      0.05  | Q   V   |         |         |         |
2+18       0.0071      0.05  | Q   V   |         |         |         |
2+19       0.0072      0.05  | Q   V   |         |         |         |
2+20       0.0073      0.05  | Q   V   |         |         |         |
2+21       0.0073      0.05  | Q   V   |         |         |         |
2+22       0.0074      0.05  | Q    V  |         |         |         |
2+23       0.0075      0.05  | Q    V  |         |         |         |
2+24       0.0075      0.05  | Q    V  |         |         |         |
2+25       0.0076      0.05  | Q    V  |         |         |         |
2+26       0.0077      0.05  | Q    V  |         |         |         |
2+27       0.0078      0.05  | Q    V  |         |         |         |
2+28       0.0078      0.05  | Q    V  |         |         |         |
2+29       0.0079      0.05  | Q    V  |         |         |         |
2+30       0.0080      0.06  | Q    V  |         |         |         |
2+31       0.0081      0.06  | Q    V  |         |         |         |
2+32       0.0081      0.06  | Q    V  |         |         |         |
2+33       0.0082      0.06  | Q    V  |         |         |         |
2+34       0.0083      0.06  | Q    V  |         |         |         |
2+35       0.0084      0.06  | Q    V  |         |         |         |
2+36       0.0085      0.06  | Q     V |         |         |         |
2+37       0.0085      0.06  | Q     V |         |         |         |
2+38       0.0086      0.06  | Q     V |         |         |         |
2+39       0.0087      0.06  | Q     V |         |         |         |
2+40       0.0088      0.06  | Q     V |         |         |         |
2+41       0.0089      0.06  | Q     V |         |         |         |
2+42       0.0089      0.06  | Q     V |         |         |         |
2+43       0.0090      0.06  | Q     V |         |         |         |
2+44       0.0091      0.06  | Q     V |         |         |         |
2+45       0.0092      0.06  | Q     V |         |         |         |
2+46       0.0093      0.06  | Q     V |         |         |         |
2+47       0.0094      0.06  | Q     V |         |         |         |
2+48       0.0094      0.06  | Q     V |         |         |         |
2+49       0.0095      0.06  | Q      V|         |         |         |
2+50       0.0096      0.06  | Q      V|         |         |         |
2+51       0.0097      0.06  | Q      V|         |         |         |
2+52       0.0098      0.06  | Q      V|         |         |         |
2+53       0.0099      0.07  | Q      V|         |         |         |
2+54       0.0100      0.07  | Q      V|         |         |         |
2+55       0.0101      0.07  | Q      V|         |         |         |
2+56       0.0102      0.07  | Q      V|         |         |         |
2+57       0.0103      0.07  | Q      V|         |         |         |
2+58       0.0103      0.07  | Q      V|         |         |         |
2+59       0.0104      0.07  | Q      V|         |         |         |
3+ 0       0.0105      0.07  |  Q      V         |         |         |
3+ 1       0.0106      0.07  |  Q      V         |         |         |
3+ 2       0.0107      0.07  |  Q      V         |         |         |
3+ 3       0.0108      0.07  |  Q      V         |         |         |
3+ 4       0.0109      0.07  |  Q      V         |         |         |
3+ 5       0.0110      0.07  |  Q      V         |         |         |
3+ 6       0.0111      0.07  |  Q      V         |         |         |
3+ 7       0.0112      0.08  |  Q      V         |         |         |
3+ 8       0.0113      0.08  |  Q      V         |         |         |
3+ 9       0.0115      0.08  |  Q      V         |         |         |
3+10       0.0116      0.08  |  Q      |V        |         |         |
```

```
3+11       0.0117      0.08  |  Q      |V        |         |         |
3+12       0.0118      0.08  |  Q      |V        |         |         |
3+13       0.0119      0.08  |  Q      |V        |         |         |
3+14       0.0120      0.08  |  Q      |V        |         |         |
3+15       0.0121      0.08  |  Q      |V        |         |         |
3+16       0.0122      0.08  |  Q      |V        |         |         |
3+17       0.0123      0.09  |  Q      |V        |         |         |
3+18       0.0125      0.09  |  Q      |V        |         |         |
3+19       0.0126      0.09  |  Q      |V        |         |         |
3+20       0.0127      0.09  |  Q      | V       |         |         |
3+21       0.0128      0.09  |  Q      | V       |         |         |
3+22       0.0130      0.09  |  Q      | V       |         |         |
3+23       0.0131      0.09  |  Q      | V       |         |         |
3+24       0.0132      0.09  |   Q     | V       |         |         |
3+25       0.0133      0.09  |   Q     | V       |         |         |
3+26       0.0135      0.10  |   Q     | V       |         |         |
3+27       0.0136      0.10  |   Q     | V       |         |         |
3+28       0.0137      0.10  |   Q     |  V      |         |         |
3+29       0.0139      0.10  |   Q     |  V      |         |         |
3+30       0.0140      0.10  |   Q     |  V      |         |         |
3+31       0.0142      0.10  |   Q     |  V      |         |         |
3+32       0.0143      0.11  |   Q     |  V      |         |         |
3+33       0.0145      0.11  |   Q     |  V      |         |         |
3+34       0.0146      0.11  |   Q     |  V      |         |         |
3+35       0.0148      0.12  |   Q     |   V     |         |         |
3+36       0.0149      0.12  |    Q    |   V     |         |         |
3+37       0.0151      0.12  |    Q    |   V     |         |         |
3+38       0.0153      0.12  |    Q    |   V     |         |         |
3+39       0.0154      0.12  |    Q    |   V     |         |         |
3+40       0.0156      0.13  |    Q    |   V     |         |         |
3+41       0.0158      0.13  |    Q    |    V    |         |         |
3+42       0.0160      0.13  |    Q    |    V    |         |         |
3+43       0.0162      0.13  |    Q    |    V    |         |         |
3+44       0.0163      0.13  |    Q    |    V    |         |         |
3+45       0.0165      0.14  |     Q   |    V    |         |         |
3+46       0.0167      0.15  |     Q   |    V    |         |         |
3+47       0.0170      0.16  |     Q   |     V   |         |         |
3+48       0.0172      0.17  |      Q  |     V   |         |         |
3+49       0.0174      0.17  |      Q  |     V   |         |         |
3+50       0.0177      0.18  |      Q  |     V   |         |         |
3+51       0.0179      0.19  |       Q |      V  |         |         |
3+52       0.0182      0.20  |       Q |      V  |         |         |
3+53       0.0185      0.21  |       Q |      V  |         |         |
3+54       0.0188      0.22  |        Q|      V  |         |         |
3+55       0.0191      0.23  |        Q|       V |         |         |
3+56       0.0195      0.24  |         Q       V |         |         |
3+57       0.0198      0.25  |         Q       V |         |         |
3+58       0.0202      0.26  |         |Q       V|         |         |
3+59       0.0205      0.27  |         |Q       V|         |         |
4+ 0       0.0209      0.28  |         | Q      V|         |         |
4+ 1       0.0214      0.36  |         |    Q    V         |         |
4+ 2       0.0220      0.44  |         |        QV         |         |
4+ 3       0.0227      0.52  |         |         |VQ       |         |
4+ 4       0.0236      0.60  |         |         | V   Q   |         |
```

```
4+ 5       0.0245      0.68  |         |         |  V     Q|         |
4+ 6       0.0256      0.77  |         |         |   V     |  Q      |
4+ 7       0.0267      0.85  |         |         |    V    |     Q   |
4+ 8       0.0280      0.93  |         |         |     V   |         Q
4+ 9       0.0291      0.83  |         |         |      V  |    Q    |
4+10       0.0302      0.74  |         |         |       V |Q        |
4+11       0.0310      0.64  |         |         |      Q V|         |
4+12       0.0318      0.54  |         |         |  Q      V         |
4+13       0.0324      0.45  |         |        Q|         V         |
4+14       0.0329      0.35  |         |    Q    |         |V        |
4+15       0.0332      0.26  |         Q         |         |V        |
4+16       0.0335      0.16  |     Q   |         |         |V        |
4+17       0.0337      0.15  |     Q   |         |         | V       |
4+18       0.0339      0.15  |     Q   |         |         | V       |
4+19       0.0341      0.14  |    Q    |         |         | V       |
4+20       0.0342      0.13  |    Q    |         |         | V       |
4+21       0.0344      0.13  |    Q    |         |         | V       |
4+22       0.0346      0.12  |    Q    |         |         | V       |
4+23       0.0347      0.11  |   Q     |         |         |  V      |
4+24       0.0349      0.11  |   Q     |         |         |  V      |
4+25       0.0350      0.10  |   Q     |         |         |  V      |
4+26       0.0352      0.10  |   Q     |         |         |  V      |
4+27       0.0353      0.10  |   Q     |         |         |  V      |
4+28       0.0354      0.09  |   Q     |         |         |  V      |
4+29       0.0356      0.09  |  Q      |         |         |  V      |
4+30       0.0357      0.09  |  Q      |         |         |   V     |
4+31       0.0358      0.09  |  Q      |         |         |   V     |
4+32       0.0359      0.08  |  Q      |         |         |   V     |
4+33       0.0360      0.08  |  Q      |         |         |   V     |
4+34       0.0361      0.08  |  Q      |         |         |   V     |
4+35       0.0362      0.08  |  Q      |         |         |   V     |
4+36       0.0364      0.08  |  Q      |         |         |   V     |
4+37       0.0365      0.07  |  Q      |         |         |   V     |
4+38       0.0366      0.07  |  Q      |         |         |   V     |
4+39       0.0367      0.07  |  Q      |         |         |   V     |
4+40       0.0367      0.07  |  Q      |         |         |    V    |
4+41       0.0368      0.07  | Q       |         |         |    V    |
4+42       0.0369      0.07  | Q       |         |         |    V    |
4+43       0.0370      0.07  | Q       |         |         |    V    |
4+44       0.0371      0.07  | Q       |         |         |    V    |
4+45       0.0372      0.06  | Q       |         |         |    V    |
4+46       0.0373      0.06  | Q       |         |         |    V    |
4+47       0.0374      0.06  | Q       |         |         |    V    |
4+48       0.0375      0.06  | Q       |         |         |    V    |
4+49       0.0375      0.06  | Q       |         |         |    V    |
4+50       0.0376      0.06  | Q       |         |         |    V    |
4+51       0.0377      0.06  | Q       |         |         |    V    |
4+52       0.0378      0.06  | Q       |         |         |     V   |
4+53       0.0379      0.06  | Q       |         |         |     V   |
4+54       0.0379      0.06  | Q       |         |         |     V   |
4+55       0.0380      0.05  | Q       |         |         |     V   |
4+56       0.0381      0.05  | Q       |         |         |     V   |
4+57       0.0382      0.05  | Q       |         |         |     V   |
4+58       0.0382      0.05  | Q       |         |         |     V   |
```

| | | | | | | |
|---|---|---|---|---|---|---|
| 4+59 | 0.0383 | 0.05 | Q | | | V |
| 5+ 0 | 0.0384 | 0.05 | Q | | | V |
| 5+ 1 | 0.0384 | 0.05 | Q | | | V |
| 5+ 2 | 0.0385 | 0.05 | Q | | | V |
| 5+ 3 | 0.0386 | 0.05 | Q | | | V |
| 5+ 4 | 0.0387 | 0.05 | Q | | | V |
| 5+ 5 | 0.0387 | 0.05 | Q | | | V |
| 5+ 6 | 0.0388 | 0.05 | Q | | | V |
| 5+ 7 | 0.0389 | 0.05 | Q | | | V |
| 5+ 8 | 0.0389 | 0.05 | Q | | | V |
| 5+ 9 | 0.0390 | 0.05 | Q | | | V |
| 5+10 | 0.0390 | 0.05 | Q | | | V |
| 5+11 | 0.0391 | 0.05 | Q | | | V |
| 5+12 | 0.0392 | 0.05 | Q | | | V |
| 5+13 | 0.0392 | 0.04 | Q | | | V |
| 5+14 | 0.0393 | 0.04 | Q | | | V |
| 5+15 | 0.0394 | 0.04 | Q | | | V |
| 5+16 | 0.0394 | 0.04 | Q | | | V |
| 5+17 | 0.0395 | 0.04 | Q | | | V |
| 5+18 | 0.0395 | 0.04 | Q | | | V |
| 5+19 | 0.0396 | 0.04 | Q | | | V |
| 5+20 | 0.0396 | 0.04 | Q | | | V |
| 5+21 | 0.0397 | 0.04 | Q | | | V |
| 5+22 | 0.0398 | 0.04 | Q | | | V |
| 5+23 | 0.0398 | 0.04 | Q | | | V |
| 5+24 | 0.0399 | 0.04 | Q | | | V |
| 5+25 | 0.0399 | 0.04 | Q | | | V |
| 5+26 | 0.0400 | 0.04 | Q | | | V |
| 5+27 | 0.0400 | 0.04 | Q | | | V |
| 5+28 | 0.0401 | 0.04 | Q | | | V |
| 5+29 | 0.0401 | 0.04 | Q | | | V |
| 5+30 | 0.0402 | 0.04 | Q | | | V |
| 5+31 | 0.0403 | 0.04 | Q | | | V |
| 5+32 | 0.0403 | 0.04 | Q | | | V |
| 5+33 | 0.0404 | 0.04 | Q | | | V |
| 5+34 | 0.0404 | 0.04 | Q | | | V |
| 5+35 | 0.0405 | 0.04 | Q | | | V |
| 5+36 | 0.0405 | 0.04 | Q | | | V |
| 5+37 | 0.0406 | 0.04 | Q | | | V |
| 5+38 | 0.0406 | 0.04 | Q | | | V |
| 5+39 | 0.0407 | 0.04 | Q | | | V |
| 5+40 | 0.0407 | 0.04 | Q | | | V |
| 5+41 | 0.0408 | 0.04 | Q | | | V |
| 5+42 | 0.0408 | 0.04 | Q | | | V |
| 5+43 | 0.0409 | 0.04 | Q | | | V |
| 5+44 | 0.0409 | 0.03 | Q | | | V |
| 5+45 | 0.0410 | 0.03 | Q | | | V |
| 5+46 | 0.0410 | 0.03 | Q | | | V |
| 5+47 | 0.0410 | 0.03 | Q | | | V |
| 5+48 | 0.0411 | 0.03 | Q | | | V |
| 5+49 | 0.0411 | 0.03 | Q | | | V |
| 5+50 | 0.0412 | 0.03 | Q | | | V |
| 5+51 | 0.0412 | 0.03 | Q | | | V |
| 5+52 | 0.0413 | 0.03 | Q | | | V |

```
   5+53       0.0413      0.03  |Q          |          |          |        V|
   5+54       0.0414      0.03  |Q          |          |          |        V|
   5+55       0.0414      0.03  |Q          |          |          |        V|
   5+56       0.0415      0.03  |Q          |          |          |        V|
   5+57       0.0415      0.03  |Q          |          |          |        V|
   5+58       0.0415      0.03  |Q          |          |          |        V|
   5+59       0.0416      0.03  |Q          |          |          |        V|
   6+ 0       0.0416      0.03  |Q          |          |          |        V|
   6+ 1       0.0417      0.03  |Q          |          |          |        V|
   6+ 2       0.0417      0.03  |Q          |          |          |        V|
   6+ 3       0.0418      0.03  |Q          |          |          |        V|
   6+ 4       0.0418      0.03  |Q          |          |          |        V|
   6+ 5       0.0418      0.03  |Q          |          |          |        V|
   6+ 6       0.0419      0.03  |Q          |          |          |        V|
   6+ 7       0.0419      0.03  |Q          |          |          |        V|
   6+ 8       0.0420      0.03  |Q          |          |          |         V
----------------------------------------------------------------------
```

End of computations, total study area = 0.412 (Ac.)

# PROPOSED DEVELOPMENT

## 100-yr Storm Analysis

## Prospect Ave

```
                         San Diego County Rational Hydrology Program

      CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2019 Version 9.1

      Rational method hydrology  program based on
      San Diego County Flood Control Division 2003 hydrology manual
                 Rational Hydrology Study        Date: 08/18/24
      --------------------------------------------------------------------
----
      100yr Storm Analysis, Post-Development
      Tributary Area - Prospect Ave


      --------------------------------------------------------------------
----
       *********   Hydrology Study Control Information **********

      --------------------------------------------------------------------
----


      Program License Serial Number 6622

      --------------------------------------------------------------------
----
      Rational hydrology study storm event year is   100.0
      English (in-lb) input data Units used

      Map data precipitation entered:
      6 hour,  precipitation(inches) =  2.400
      24 hour precipitation(inches) =  4.500
      P6/P24 =    53.3%
      San Diego hydrology manual 'C' values used


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
++
      Process from Point/Station      200.000 to Point/Station
201.000
      **** INITIAL AREA EVALUATION ****
      ____________________________________________________________________
__
      Decimal fraction soil group A = 0.000
      Decimal fraction soil group B = 0.000
      Decimal fraction soil group C = 0.000
      Decimal fraction soil group D = 1.000
      [MEDIUM DENSITY RESIDENTIAL                  ]
      (4.3 DU/A or Less       )
      Impervious value, Ai = 0.300
      Sub-Area C Value = 0.520
      Initial subarea total flow distance  =  100.000(Ft.)
      Highest elevation =  367.500(Ft.)
      Lowest elevation =  364.000(Ft.)
```

```
Elevation difference =    3.500(Ft.) Slope =  3.500 %
USER ENTRY OF INITIAL AREA TIME OF CONCENTRATION
Time of Concentration =   0.63 minutes
Calculated TC of    0.630 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      6.323(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.520
Subarea runoff =      0.306(CFS)
Total initial stream area =       0.093(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
++
Process from Point/Station      201.000 to Point/Station
202.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
____________________________________________________________________
__
Top of street segment elevation =   364.000(Ft.)
End of street segment elevation =   362.000(Ft.)
Length of street segment  =    60.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  32.000(Ft.)
Distance from crown to crossfall grade break  =  30.500(Ft.)
Slope from gutter to grade break (v/hz) =   1.000
Slope from grade break to crown (v/hz)  =   1.000
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   2.000
Gutter width =   1.500(Ft.)
Gutter hike from flowline =  0.175(In.)
 Manning's N in gutter =  0.0130
 Manning's N from gutter to grade break =  0.0130
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =      0.399(CFS)
Depth of flow =   0.082(Ft.), Average velocity =   3.463(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   1.568(Ft.)
Flow velocity =   3.46(Ft/s)
Travel time =    0.29 min.     TC =    0.92  min.
 Adding area flow to street
Calculated TC of    0.919 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      6.323(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                 ]
(4.3 DU/A or Less       )
Impervious value, Ai = 0.300
Sub-Area C Value = 0.520
Rainfall intensity =      6.323(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
```

```
(Q=KCIA) is C = 0.520  CA =       0.086
Subarea runoff =       0.240(CFS) for      0.073(Ac.)
Total runoff =      0.546(CFS)    Total area =       0.166(Ac.)
Street flow at end of street =      0.546(CFS)
Half street flow at end of street =      0.546(CFS)
Depth of flow =   0.099(Ft.), Average velocity =   3.887(Ft/s)
Flow width (from curb towards crown)=   1.584(Ft.)


+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
++
Process from Point/Station      202.000 to Point/Station
203.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
__
Upstream point/station elevation =   358.000(Ft.)
Downstream point/station elevation =   352.500(Ft.)
Pipe length  =   165.00(Ft.) Slope =   0.0333  Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.546(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.546(CFS)
Normal flow depth in pipe =    3.12(In.)
Flow top width inside pipe =    6.00(In.)
Critical Depth =    4.52(In.)
Pipe flow velocity =      5.30(Ft/s)
Travel time through pipe =    0.52 min.
Time of concentration (TC) =     1.44 min.


+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
++
Process from Point/Station      203.000 to Point/Station
204.000
**** IMPROVED CHANNEL TRAVEL TIME ****
______________________________________________________________________
__
Upstream point elevation =   352.500(Ft.)
Downstream point elevation =   351.000(Ft.)
Channel length thru subarea  =    30.000(Ft.)
Channel base width     =    3.500(Ft.)
Slope or 'Z' of left channel bank =   0.000
Slope or 'Z' of right channel bank =   0.000
Estimated mean flow rate at midpoint of channel =      0.551(CFS)
Manning's 'N'    = 0.015
Maximum depth of channel  =    0.500(Ft.)
Flow(q) thru subarea =      0.551(CFS)
Depth of flow =   0.052(Ft.), Average velocity =   3.026(Ft/s)
Channel flow top width =    3.500(Ft.)
Flow Velocity =    3.03(Ft/s)
Travel time  =    0.17 min.
Time of concentration =    1.60 min.
Critical depth =      0.092(Ft.)
 Adding area flow to channel
```

```
Calculated TC of    1.603 minutes is less than 5 minutes,
 resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) =      6.323(In/Hr) for a   100.0 year storm
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MEDIUM DENSITY RESIDENTIAL                  ]
(4.3 DU/A or Less       )
Impervious value, Ai = 0.300
Sub-Area C Value = 0.520
Rainfall intensity =      6.323(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.520  CA =      0.088
Subarea runoff =      0.010(CFS) for      0.003(Ac.)
Total runoff =      0.556(CFS)    Total area =       0.169(Ac.)
Depth of flow =   0.052(Ft.), Average velocity =   3.037(Ft/s)
Critical depth =      0.092(Ft.)
End of computations, total study area =           0.169 (Ac.)
```

# ATTACHMENT 8

# TREE WELL SIZING

# &

# BIOFILTRATION

# BMP #2 SIZING

# County of San Diego Automated Worksheets for Significant Site Design BMPs (SSD-BMPs)
## SD-A Tree Wells and SD-B Impervious Area Dispersion (Dispersion Areas)
## (Version 1.0)

**WELCOME:**

Welcome to the County of San Diego Automated Worksheets for Significant Site Design BMPs. These worksheets may be used to demonstrate compliance with stormwater pollutant control standards and hydromodification flow control standards set forth in the 2013 MS4 Permit for Priority Development Projects (PDPs).

This workbook is intended for use to demonstrate compliance when significant site design BMPs (SSD-BMPs) are proposed. SSD-BMPs are passive treatment systems that include SD-A Tree Wells and SD-B Dispersion Areas. This worksheet does not support the use of underdrains in SD-A or SD-B. If underdrains are proposed, then continuous simlation modeling should be performed.

When structural BMPs (INF-1, INF-2, INF-3, PR-1, BF-1, BF-2) are proposed, a different workbook, "County of San Diego Automated Stormwater Pollutant Control Worksheets" must be used.

**INSTRUCTIONS:**

**General:** To use this workbook, navigate to each of the worksheet tabs below and populate all light green cells with project specific information. Light green cells require user input, white cells are locked for editing and are automatically calculated, bright green cells are also locked for editing and are automatically populated based on results from previous worksheet tabs, grey cells are items that do not require user input because of previous user inputs, orange cells represent warnings where supplemental information and/or revisions may be required for compliance. The worksheets are formatted to accommodate calculations for up to 10 drainage areas and associated BMPs. Each drainage area and BMP is represented as a discrete column with corresponding user inputs and calculations appearing in the rows below. Please note that projects with more than 10 drainage areas may need to use more than one workbook to accommodate the entire project.

**Step 1. DCV:** Provide the required inputs to determine the design capture volume (DCV) for each PDP drainage management area (DMA). The calculations in this worksheet determine the initial design capture volume and also apply any applicable reductions associated with dispersion to pervious surfaces and incorporation of rain barrels. For DMAs intended to satisfy pollutant control and hydromodification control (when applicable) requirements using Dispersion Areas alone (i.e., not in combination with Tree Wells), the data entered in this tab must provide sufficient pervious area to reduce the remaining DCV in Line 37 to zero. Note that the use of semi-pervious surfaces as dispersion area will not reduce DCV to zero, but the use of engineered pervious surfaces and/or natural pervious surfaces can. For DMAs intended to incorporate Tree Wells, the remaining DCV in Line 37 is the amount to be managed by Tree Wells.

**Step 2. Dispersion Areas:** [Projects that do not use Dispersion Areas skip this step and go on to Step 3.] When the project includes Dispersion Areas per SD-B, provide required inputs to demonstrate that the requirements for Dispersion Areas are satisfied. If the DMA will also use SD-A Tree Wells downstream of the Dispersion Area to satisfy pollutant control and hydromodification control (when applicable), continue to Step 3. Tree Wells.

**Step 3. Tree Wells:** [Projects that do not use Tree Wells do not use this Step.] When the project includes Tree Wells per SD-A, provide required inputs to demonstrate that the requirements for Tree Wells are satisfied.

**DISCLAIMER:**

The County of San Diego has developed this tool in an effort to streamline traditionally complex efforts associated with planning, design, submittal, and review of PDPs. While the calculations performed herein are deemed to be in compliance with 2013 MS4 Permit requirements, applicants may elect to provide their own calculations. Use of this tool is optional and the County will not be held liable for any errors or other negative impacts associated with its use. In the event that the County performs updates to these worksheets, applicants that have not established reliance on previous versions of the worksheet via discretionary approval may be required to utilize the latest version of the worksheets. A summary of version releases is included below.

**QUESTIONS:**

-Questions relating to specific projects, submittal requirements, approval process, and/or policy-related issues should be directed your PDS Land Development Project Manager (link below).

PDS Land Development Project Manager

-General questions/comments on this worksheet may be directed via email to BMP.Program@sdcounty.ca.gov with the subject line "SSD-BMP assistance."

## SSD-BMP Automated Worksheet I-1: Step 1. Calculation of Design Capture Volume (V1.0)

| Category | # | Description | *i* | *ii* | *iii* | *iv* | *v* | *vi* | *vii* | *viii* | *ix* | *x* | Units |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Standard Drainage Basin Inputs | 1 | Drainage Basin ID or Name | | | | | DMA 3A | DMA 3B | DMA 4A | DMA 4B | | | unitless |
| | 2 | 85th Percentile 24-hr Storm Depth | | | | | 0.58 | 0.58 | 0.58 | 0.58 | | | inches |
| | 3 | Is Hydromodification Control Applicable? | | | | | Yes | Yes | Yes | Yes | | | yes/no |
| | 4 | Impervious Surfaces Not Directed to Dispersion Area (C=0.90) | | | | | 675 | 638 | 666 | 647 | | | sq-ft |
| | 5 | Semi-Pervious Surfaces Not Serving as Dispersion Area (C=0.30) | | | | | | | | | | | sq-ft |
| | 6 | Engineered Pervious Surfaces Not Serving as Dispersion Area (C=0.10) | | | | | | | | | | | sq-ft |
| | 7 | Natural Type A Soil Not Serving as Dispersion Area (C=0.10) | | | | | | | | | | | sq-ft |
| | 8 | Natural Type B Soil Not Serving as Dispersion Area (C=0.14) | | | | | | | | | | | sq-ft |
| | 9 | Natural Type C Soil Not Serving as Dispersion Area (C=0.23) | | | | | | | | | | | sq-ft |
| | 10 | Natural Type D Soil Not Serving as Dispersion Area (C=0.30) | | | | | 1,736 | 1,092 | 794 | 1,239 | | | sq-ft |
| SSD-BMPs Proposed | 11 | Does Tributary Incorporate Dispersion and/or Rain Barrels? | | | | | No | No | No | No | | | yes/no |
| | 12 | Does Tributary Incorporate Tree Wells? | | | | | Yes | Yes | Yes | Yes | | | yes/no |
| Dispersion Area & Rain Barrel Inputs (Optional) | 13 | Impervious Surfaces **Directed to Dispersion Area** per SD-B (Ci=0.90) | | | | | | | | | | | sq-ft |
| | 14 | Semi-Pervious Surfaces **Serving as Dispersion Area** per SD-B (Ci=0.30) | | | | | | | | | | | sq-ft |
| | 15 | Engineered Pervious Surfaces **Serving as Dispersion Area** per SD-B (Ci=0.10) | | | | | | | | | | | sq-ft |
| | 16 | Natural Type A Soil **Serving as Dispersion Area** per SD-B (Ci=0.10) | | | | | | | | | | | sq-ft |
| | 17 | Natural Type B Soil **Serving as Dispersion Area** per SD-B (Ci=0.14) | | | | | | | | | | | sq-ft |
| | 18 | Natural Type C Soil **Serving as Dispersion Area** per SD-B (Ci=0.23) | | | | | | | | | | | sq-ft |
| | 19 | Natural Type D Soil **Serving as Dispersion Area** per SD-B (Ci=0.30) | | | | | | | | | | | sq-ft |
| | 20 | Number of Rain Barrels Proposed per SD-E | | | | | | | | | | | # |
| | 21 | Average Rain Barrel Size | | | | | | | | | | | gal |
| Initial Runoff Factor Calculation | 22 | Total Tributary Area | 0 | 0 | 0 | 0 | 2,411 | 1,730 | 1,460 | 1,886 | 0 | 0 | sq-ft |
| | 23 | Initial Runoff Factor for Standard Drainage Areas | 0.00 | 0.00 | 0.00 | 0.00 | 0.47 | 0.52 | 0.57 | 0.51 | 0.00 | 0.00 | unitless |
| | 24 | Initial Runoff Factor for Dispersed & Dispersion Areas | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | unitless |
| | 25 | Initial Weighted Runoff Factor | 0.00 | 0.00 | 0.00 | 0.00 | 0.47 | 0.52 | 0.57 | 0.51 | 0.00 | 0.00 | unitless |
| | 26 | Initial Design Capture Volume | 0 | 0 | 0 | 0 | 55 | 43 | 40 | 46 | 0 | 0 | cubic-feet |
| Dispersion Area Adjustment & Rain Barrel Adjustment | 27 | Total Impervious Area Dispersed to Pervious Surface | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | sq-ft |
| | 28 | Total Pervious Dispersion Area | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | sq-ft |
| | 29 | Ratio of Dispersed Impervious Area to Pervious Dispersion Area for DCV Reduction | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | ratio |
| | 30 | Adjustment Factor for Dispersed & Dispersion Areas | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | ratio |
| | 31 | Runoff Factor After Dispersion Techniques | n/a | n/a | n/a | n/a | 0.47 | 0.52 | 0.57 | 0.51 | n/a | n/a | unitless |
| | 32 | Design Capture Volume After Dispersion Techniques | 0 | 0 | 0 | 0 | 55 | 43 | 40 | 46 | 0 | 0 | cubic-feet |
| | 33 | Total Rain Barrel Volume Reduction | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | cubic-feet |
| Results | 34 | Final Adjusted Runoff Factor | 0.00 | 0.00 | 0.00 | 0.00 | 0.47 | 0.52 | 0.57 | 0.51 | 0.00 | 0.00 | unitless |
| | 35 | Final Effective Tributary Area | 0 | 0 | 0 | 0 | 1,133 | 900 | 832 | 962 | 0 | 0 | sq-ft |
| | 36 | Initial Design Capture Volume Retained by Dispersion Area and Rain Barrel(s) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | cubic-feet |
| | 37 | Remaining Design Capture Volume Tributary to Tree Well(s) | 0 | 0 | 0 | 0 | 55 | 43 | 40 | 46 | 0 | 0 | cubic-feet |

**No Warning Messages**

## SSD-BMP Automated Worksheet I-3: Step 3. Tree Well Sizing (V1.0)

| Category | # | Description | *i* | *ii* | *iii* | *iv* | *v* | *vi* | *vii* | *viii* | *ix* | *x* | Units |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Standard Tree Well Inputs | 1 | Drainage Basin ID or Name | - | - | - | - | DMA 3A | DMA 3B | DMA 4A | DMA 4B | - | - | unitless |
| | 2 | Design Capture Volume Tributary to BMP | - | - | - | - | 55 | 43 | 40 | 46 | - | - | cubic-feet |
| | 3 | Is Hydromodification Control Applicable? | - | - | - | - | Yes | Yes | Yes | Yes | - | - | yes/no |
| | 4 | Predominant NRCS Soil Type Within Tree Well(s) Location | D | D | D | D | D | D | D | D | D | | unitless |
| | 5 | Select a Tree Species for the Tree Well(s) Consistent with SD-A Tree Palette Table<br>Note: Numbers shown in list are Tree Species Mature Canopy Diameters | 20' - Other | 20' - Other | 20' - Other | 25' - Other | 20' - Other | 20' - Other | 20' - Other | 20' - Other | 25' - Other | | unitless |
| | 6 | Tree Well(s) Soil Depth (Installation Depth)<br>Must be 30, 36, 42, or 48 Inches; Select from Standard Depths** | | | | | 30 | 30 | 30 | 30 | | | inches |
| | 7 | Number of Identical* Tree Wells Proposed for this DMA | | | | | 1 | 1 | 1 | 1 | | | trees |
| | 8 | Proposed Width of Tree Well(s) Soil Installation for One (1) Tree | | | | | 16.0 | 16.0 | 16.0 | 16.0 | | | feet |
| | 9 | Proposed Length of Tree Well(s) Soil Installation for One (1) Tree | | | | | 16.0 | 16.0 | 16.0 | 16.0 | | | feet |
| Tree Data | 10 | Botanical Name of Tree Species | - | - | - | - | Provide in PDP SWQMP | Provide in PDP SWQMP | Provide in PDP SWQMP | Provide in PDP SWQMP | - | - | unitless |
| | 11 | Tree Species Mature Height per SD-A | - | - | - | - | Provide in PDP SWQMP | Provide in PDP SWQMP | Provide in PDP SWQMP | Provide in PDP SWQMP | - | - | feet |
| | 12 | Tree Species Mature Canopy Diameter per SD-A | - | - | - | - | 20 | 20 | 20 | 20 | - | - | feet |
| | 13 | Minimum Soil Volume Required In Tree Well<br>(2 Cubic Feet Per Square Foot of Mature Tree Canopy Projection Area) | - | - | - | - | 628 | 628 | 628 | 628 | - | - | cubic-feet |
| | 14 | Credit Volume Per Tree | - | - | - | - | 180 | 180 | 180 | 180 | - | - | cubic-feet |
| Tree Well Sizing Calculations | 15 | DCV Multiplier To Meet Flow Control Requirements | - | - | - | - | 2.90 | 2.90 | 2.90 | 2.90 | - | - | unitless |
| | 16 | Required Retention Volume (RRV) To Meet Flow Control Requirements | - | - | - | - | 160 | 125 | 116 | 133 | - | - | cubic-feet |
| | 17 | Number of Trees Required | - | - | - | - | 1 | 1 | 1 | 1 | - | - | trees |
| | 18 | Total Area of Tree Well Soil Required for Each Tree | - | - | - | - | 251 | 251 | 251 | 251 | - | - | sq-ft |
| | 19 | Approximate Required Width of Tree Well Soil Area for Each Tree | - | - | - | - | 16 | 16 | 16 | 16 | - | - | feet |
| | 20 | Approximate Required Length of Tree Well Soil Area for Each Tree | - | - | - | - | 16 | 16 | 16 | 16 | - | - | feet |
| | 21 | Number of Trees Proposed for this DMA | - | - | - | - | 1 | 1 | 1 | 1 | - | - | trees |
| | 22 | Total Area of Tree Well Soil Proposed for Each Tree | - | - | - | - | 256 | 256 | 256 | 256 | - | - | sq-ft |
| | 23 | Minimum Spacing Between Multiple Trees To Meet Soil Area Requirements<br>(when applicable)*** | - | - | - | - | n/a | n/a | n/a | n/a | - | - | feet |
| Results | 24 | Are Tree Well Soil Installation Requirements Met? | - | - | - | - | Yes | Yes | Yes | Yes | - | - | yes/no |
| | 25 | Is Remaining DCV Requirement Fully Satisfied by Tree Well(s)? | - | - | - | - | Yes | Yes | Yes | Yes | - | - | yes/no |
| | 26 | Is Hydromodification Control Requirement Satisfied by Tree Well(s)? | - | - | - | - | Yes | Yes | Yes | Yes | - | - | yes/no |

**Attention!**

-[Line 12] Applicant to provide supporting documentation for tree species in PDP SWQMP.

**Notes:**

*If using more than one mature canopy diameter within the same DMA, only the smallest mature canopy diameter should be entered. Alternatively, if more than one mature canopy diameter is proposed and/or the dimensions of multiple tree well installations will vary, separate DMAs may be delineated.

**If the actual proposed installation depth is not available in the table of standard depths, select the next lower depth.

***Tree Canopy or Agency Requirements May Also Influence the Minimum Spacing of Trees.

## Automated Worksheet B.1: Calculation of Design Capture Volume (V2.0)

| Category | # | Description | *i* | *ii* | *iii* | *iv* | *v* | *vi* | *vii* | *viii* | *ix* | *x* | Units |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Standard Drainage Basin Inputs | 1 | Drainage Basin ID or Name | Prospect BMP 2 | | | | | | | | | | unitless |
| | 2 | 85th Percentile 24-hr Storm Depth | 0.58 | | | | | | | | | | inches |
| | 3 | Impervious Surfaces Not Directed to Dispersion Area (C=0.90) | 2,500 | | | | | | | | | | sq-ft |
| | 4 | Semi-Pervious Surfaces Not Serving as Dispersion Area (C=0.30) | | | | | | | | | | | sq-ft |
| | 5 | Engineered Pervious Surfaces Not Serving as Dispersion Area (C=0.10) | | | | | | | | | | | sq-ft |
| | 6 | Natural Type A Soil Not Serving as Dispersion Area (C=0.10) | | | | | | | | | | | sq-ft |
| | 7 | Natural Type B Soil Not Serving as Dispersion Area (C=0.14) | | | | | | | | | | | sq-ft |
| | 8 | Natural Type C Soil Not Serving as Dispersion Area (C=0.23) | | | | | | | | | | | sq-ft |
| | 9 | Natural Type D Soil Not Serving as Dispersion Area (C=0.30) | | | | | | | | | | | sq-ft |
| Dispersion Area, Tree Well & Rain Barrel Inputs (Optional) | 10 | Does Tributary Incorporate Dispersion, Tree Wells, and/or Rain Barrels? | No | No | No | No | No | No | No | No | No | No | yes/no |
| | 11 | Impervious Surfaces **Directed to Dispersion Area** per SD-B (Ci=0.90) | | | | | | | | | | | sq-ft |
| | 12 | Semi-Pervious Surfaces **Serving as Dispersion Area** per SD-B (Ci=0.30) | | | | | | | | | | | sq-ft |
| | 13 | Engineered Pervious Surfaces **Serving as Dispersion Area** per SD-B (Ci=0.10) | | | | | | | | | | | sq-ft |
| | 14 | Natural Type A Soil **Serving as Dispersion Area** per SD-B (Ci=0.10) | | | | | | | | | | | sq-ft |
| | 15 | Natural Type B Soil **Serving as Dispersion Area** per SD-B (Ci=0.14) | | | | | | | | | | | sq-ft |
| | 16 | Natural Type C Soil **Serving as Dispersion Area** per SD-B (Ci=0.23) | | | | | | | | | | | sq-ft |
| | 17 | Natural Type D Soil **Serving as Dispersion Area** per SD-B (Ci=0.30) | | | | | | | | | | | sq-ft |
| | 18 | Number of Tree Wells Proposed per SD-A | | | | | | | | | | | # |
| | 19 | Average Mature Tree Canopy Diameter | | | | | | | | | | | ft |
| | 20 | Number of Rain Barrels Proposed per SD-E | | | | | | | | | | | # |
| | 21 | Average Rain Barrel Size | | | | | | | | | | | gal |
| Initial Runoff Factor Calculation | 22 | Total Tributary Area | 2,500 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | sq-ft |
| | 23 | Initial Runoff Factor for Standard Drainage Areas | 0.90 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | unitless |
| | 24 | Initial Runoff Factor for Dispersed & Dispersion Areas | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | unitless |
| | 25 | Initial Weighted Runoff Factor | 0.90 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | unitless |
| | 26 | Initial Design Capture Volume | 109 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | cubic-feet |
| Dispersion Area Adjustments | 27 | Total Impervious Area Dispersed to Pervious Surface | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | sq-ft |
| | 28 | Total Pervious Dispersion Area | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | sq-ft |
| | 29 | Ratio of Dispersed Impervious Area to Pervious Dispersion Area | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | ratio |
| | 30 | Adjustment Factor for Dispersed & Dispersion Areas | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | ratio |
| | 31 | Runoff Factor After Dispersion Techniques | 0.90 | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | n/a | unitless |
| | 32 | Design Capture Volume After Dispersion Techniques | 109 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | cubic-feet |
| Tree & Barrel Adjustments | 33 | Total Tree Well Volume Reduction | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | cubic-feet |
| | 34 | Total Rain Barrel Volume Reduction | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | cubic-feet |
| Results | 35 | Final Adjusted Runoff Factor | 0.90 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | unitless |
| | 36 | Final Effective Tributary Area | 2,250 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | sq-ft |
| | 37 | Initial Design Capture Volume Retained by Site Design Elements | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | cubic-feet |
| | 38 | Final Design Capture Volume Tributary to BMP | 109 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | cubic-feet |

**No Warning Messages**

## Automated Worksheet B.2: Retention Requirements (V2.0)

| Category | # | Description | *i* | *ii* | *iii* | *iv* | *v* | *vi* | *vii* | *viii* | *ix* | *x* | Units |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Basic Analysis | 1 | Drainage Basin ID or Name | Prospect BMP 2 | - | - | - | - | - | - | - | - | - | unitless |
| | 2 | 85th Percentile Rainfall Depth | 0.58 | - | - | - | - | - | - | - | - | - | inches |
| | 3 | Predominant NRCS Soil Type Within BMP Location | D | | | | | | | | | | unitless |
| | 4 | Is proposed BMP location Restricted or Unrestricted for Infiltration Activities? | Restricted | | | | | | | | | | unitless |
| | 5 | Nature of Restriction | Soil Type | | | | | | | | | | unitless |
| | 6 | Do Minimum Retention Requirements Apply to this Project? | No | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | yes/no |
| | 7 | Are Habitable Structures Greater than 9 Stories Proposed? | No | | | | | | | | | | yes/no |
| Advanced Analysis | 8 | Has Geotechnical Engineer Performed an Infiltration Analysis? | Yes | | | | | | | | | | yes/no |
| | 9 | Design Infiltration Rate Recommended by Geotechnical Engineer | 0.000 | | | | | | | | | | in/hr |
| Result | 10 | Design Infiltration Rate Used To Determine Retention Requirements | 0.000 | - | - | - | - | - | - | - | - | - | in/hr |
| | 11 | Percent of Average Annual Runoff that Must be Retained within DMA | 0.0% | - | - | - | - | - | - | - | - | - | percentage |
| | 12 | Fraction of DCV Requiring Retention | 0.00 | - | - | - | - | - | - | - | - | - | ratio |
| | 13 | Required Retention Volume | 0 | - | - | - | - | - | - | - | - | - | cubic-feet |

**Attention!**

-Retention requirements have been omitted in these calculations. Such an omission is only be acceptable for Green Street projects or projects that submit supplemental calculations demonstrating retention requirements are satisfied at the project-level.

## Automated Worksheet B.3: BMP Performance (V2.0)

| Category | # | Description | i | ii | iii | iv | v | vi | vii | viii | ix | x | Units |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BMP Inputs | 1 | Drainage Basin ID or Name | Prospect BMP 2 | - | - | - | - | - | - | - | - | - | sq-ft |
| | 2 | Design Infiltration Rate Recommended | 0.000 | - | - | - | - | - | - | - | - | - | in/hr |
| | 3 | Design Capture Volume Tributary to BMP | 109 | - | - | - | - | - | - | - | - | - | cubic-feet |
| | 4 | Is BMP Vegetated or Unvegetated? | Vegetated | | | | | | | | | | unitless |
| | 5 | Is BMP Impermeably Lined or Unlined? | Lined | | | | | | | | | | unitless |
| | 6 | Does BMP Have an Underdrain? | Underdrain | | | | | | | | | | unitless |
| | 7 | Does BMP Utilize Standard or Specialized Media? | Standard | | | | | | | | | | unitless |
| | 8 | Provided Surface Area | 68 | | | | | | | | | | sq-ft |
| | 9 | Provided Surface Ponding Depth | 6 | | | | | | | | | | inches |
| | 10 | Provided Soil Media Thickness | 18 | | | | | | | | | | inches |
| | 11 | Provided Gravel Thickness (Total Thickness) | 6 | | | | | | | | | | inches |
| | 12 | Underdrain Offset | 3 | | | | | | | | | | inches |
| | 13 | Diameter of Underdrain or Hydromod Orifice (Select Smallest) | 1.00 | | | | | | | | | | inches |
| | 14 | Specialized Soil Media Filtration Rate | | | | | | | | | | | in/hr |
| | 15 | Specialized Soil Media Pore Space for Retention | | | | | | | | | | | unitless |
| | 16 | Specialized Soil Media Pore Space for Biofiltration | | | | | | | | | | | unitless |
| | 17 | Specialized Gravel Media Pore Space | | | | | | | | | | | unitless |
| Retention Calculations | 18 | Volume Infiltrated Over 6 Hour Storm | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | cubic-feet |
| | 19 | Ponding Pore Space Available for Retention | 0.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | unitless |
| | 20 | Soil Media Pore Space Available for Retention | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | unitless |
| | 21 | Gravel Pore Space Available for Retention (Above Underdrain) | 0.00 | 0.40 | 0.40 | 0.40 | 0.40 | 0.40 | 0.40 | 0.40 | 0.40 | 0.40 | unitless |
| | 22 | Gravel Pore Space Available for Retention (Below Underdrain) | 0.40 | 0.40 | 0.40 | 0.40 | 0.40 | 0.40 | 0.40 | 0.40 | 0.40 | 0.40 | unitless |
| | 23 | Effective Retention Depth | 2.10 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | inches |
| | 24 | Fraction of DCV Retained (Independent of Drawdown Time) | 0.11 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | ratio |
| | 25 | Calculated Retention Storage Drawdown Time | 120 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | hours |
| | 26 | Efficacy of Retention Processes | 0.13 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | ratio |
| | 27 | Volume Retained by BMP (Considering Drawdown Time) | 14 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | cubic-feet |
| | 28 | Design Capture Volume Remaining for Biofiltration | 95 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | cubic-feet |
| Biofiltration Calculations | 29 | Max Hydromod Flow Rate through Underdrain | 0.0390 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | cfs |
| | 30 | Max Soil Filtration Rate Allowed by Underdrain Orifice | 24.79 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | in/hr |
| | 31 | Soil Media Filtration Rate per Specifications | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | in/hr |
| | 32 | Soil Media Filtration Rate to be used for Sizing | 5.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | in/hr |
| | 33 | Depth Biofiltered Over 6 Hour Storm | 30.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | inches |
| | 34 | Ponding Pore Space Available for Biofiltration | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | unitless |
| | 35 | Soil Media Pore Space Available for Biofiltration | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 | unitless |
| | 36 | Gravel Pore Space Available for Biofiltration (Above Underdrain) | 0.40 | 0.40 | 0.40 | 0.40 | 0.40 | 0.40 | 0.40 | 0.40 | 0.40 | 0.40 | unitless |
| | 37 | Effective Depth of Biofiltration Storage | 10.80 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | inches |
| | 38 | Drawdown Time for Surface Ponding | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | hours |
| | 39 | Drawdown Time for Effective Biofiltration Depth | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | hours |
| | 40 | Total Depth Biofiltered | 40.80 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | inches |
| | 41 | Option 1 - Biofilter 1.50 DCV: Target Volume | 142 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | cubic-feet |
| | 42 | Option 1 - Provided Biofiltration Volume | 142 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | cubic-feet |
| | 43 | Option 2 - Store 0.75 DCV: Target Volume | 71 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | cubic-feet |
| | 44 | Option 2 - Provided Storage Volume | 61 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | cubic-feet |
| | 45 | Portion of Biofiltration Performance Standard Satisfied | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | ratio |
| Result | 46 | Do Site Design Elements and BMPs Satisfy Annual Retention Requirements? | Yes | - | - | - | - | - | - | - | - | - | yes/no |
| | 47 | Overall Portion of Performance Standard Satisfied (BMP Efficacy Factor) | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | ratio |
| | 48 | **Deficit of Effectively Treated Stormwater** | **0** | **n/a** | **n/a** | **n/a** | **n/a** | **n/a** | **n/a** | **n/a** | **n/a** | **n/a** | cubic-feet |

**No Warning Messages**

# ATTACHMENT 9

# CURB INLET SIZING

## 3.2.2 Inlet Design

### 3.2.2.1 Curb Inlets on Grade

#### Full Interception

The capacity of a curb inlet on continuous grade depends on gutter slope, depth of flow in the gutter, the dimensions of the curb opening, and the amount of depression at the catch basin. Equation 3–2 describes the capacity of a curb inlet assuming full (100 %) interception.

**Equation 3-2. Capacity of Curb Inlet**

$$\frac{Q}{L_T} = 0.7\,(a+y)^{3/2}$$

where:

| | | |
|---|---|---|
| $Q$ | = | interception capacity of the curb inlet ($ft^3/s$) |
| $y$ | = | depth of flow approaching the curb inlet (ft; maximum of $y$ = 0.4) |
| $a$ | = | depth of depression of curb at inlet (ft; use $a$=0.33) |
| $L_T$ | = | length of clear opening of inlet for total interception (ft) |

Figure 3–4 illustrates the relationship between interception capacity, depth of approaching flow, and curb inlet depression, and may be used to determine curb inlet interception capacity.

Curb Inlet Sizing
Verifying Q=0.85 cfs will be 100% capture

Per Equation 3-2, Q/Lt=0.7(a+y)^3/2 but solving for Q:

The maximum Q that an L=5' curb inlet opening can handle is:

equation 3-2, solving for Q

| | | |
|---|---|---|
| Input | a= | 0.33 |
| Input | y= | 0.4 |
| Input | L= | 5 |
| | | |
| Output | Q= | 2.182993 |

Therefore, since the 100-yr street flow is 0.85 cfs, L=5' is acceptable

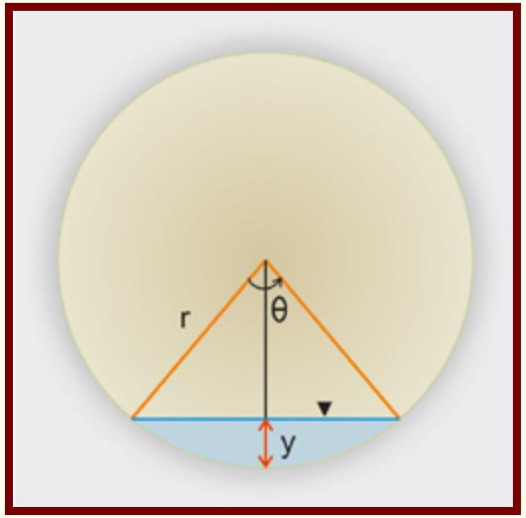
# ATTACHMENT 10

# D-25 CONCRETE DITCH

# CAPACITY ANALYSIS

secure | uon.sdsu.edu/onlinechannel03.php

**onlinechannel03.php: Discharge in a partially full circular culvert**




## Formulas

$$\theta = 2\cos^{-1}[1 - 2(y/D)]$$

$$A = (D^2/8)\ (\theta - \sin\theta)$$

$$P = r\theta$$

$$R = A/P$$

$$Q = (k/n)\ AR^{2/3}S^{1/2}$$

$$V = Q/A$$

**INPUT DATA:**

Select: SI units (metric) / U.S. Customary units

Pipe diameter D: 2 ft

Flow depth y: 1 ft

Bottom slope S: 0.01 ft/ft

Manning's n: 0.013

**INTERMEDIATE CALCS:**

Constant k: 1.485

Flow area A: 1.570 $ft^2$

Wetted perimeter P: 3.141 ft

Hydraulic radius R: 0.5 ft

Relative depth y/D: 0.5

Froude number [based on y]: 1.269

**OUTPUT:**

Discharge Q: 11.310 cfs

Flow velocity V: 7.2004 fps

# ATTACHMENT 11

# 8″ PVC PIPE

# CAPACITY ANALYSIS

online_hazen_williams: Pipe discharge by the Hazen-Williams formula

**Formula**

$$Q = 0.432\ C_h\ D^{2.63}\ S^{0.54}$$

**INPUT DATA:**

Units: [U.S. Customary Units]

Pipe diameter D [ft]: 0.66

Energy slope S [ft/ft]: 0.06

Hazen-Williams $C_h$: 140

**OUTPUT:**

Discharge Q = 4.438 cfs

Calculate

Reset

**online_hazen_williams: Pipe discharge by the Hazen-Williams formula**

**Formula**

$$Q = 0.432\ C_h\ D^{2.63}\ S^{0.54}$$

**INPUT DATA:**

Units: [U.S. Customary Units]

Pipe diameter D [ft]: 0.66

Energy slope S [ft/ft]: 0.015

Hazen-Williams $C_h$: 140

**OUTPUT:**

Discharge Q = 2.099 cfs

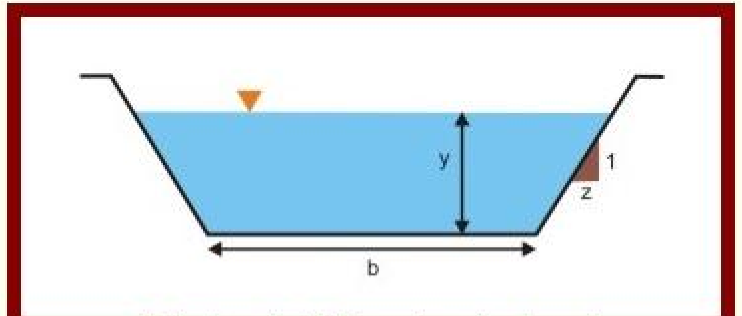
Calculate

Reset

# ATTACHMENT 12

# COBBLESTONE (RIP RAP)

# ANALYSIS




Definition sketch for a prismatic channel

**Normal depth formulas**

$A = y(b + zy)$

$P = b + 2y(1 + z^2)^{1/2}$

$T = b + 2zy$

$R = A/P$

$D = A/T$

$Q = (k/n)\ AR^{2/3}S^{1/2}$

$V = Q/A$

$F = V/(gD)^{1/2}$

**Critical depth formulas**

$F^2 = (Q^2T)/(gA^3)$

$F = 1$

$(Q^2/g)T - A^3 = 0$

$A = y(b + zy)$

$T = b + 2zy$

$V = Q/A$

$D = A/T$

**INPUT DATA:**

Select: SI units (metric) / U.S. Customary units

Flow discharge Q: 2.21 cfs

Bottom width b: 4 ft

Side slope z: 0.1

Bottom slope S: 0.055

Manning's n: 0.03

**INTERMEDIATE CALCS (normal depth):**

Units selected: U.S. Customary

Gravitational acceleration g: 32.17 ft $s^{-2}$

Units constant k: 1.486

Flow area $A_n$: 0.66 $ft^2$

Wetted perimeter $P_n$: 4.332 ft

Top width $T_n$: 4.033 ft

Hydraulic radius $R_n$: 0.153 ft

Hydraulic depth $D_n$: 0.165 ft

**OUTPUT (normal depth):**

Depth $y_n$: 0.165 ft

Velocity $V_n$: 3.327 fps

Froude number $F_n$: 1.446

**INTERMEDIATE CALCS (critical depth):**

Units selected: U.S. Customary

Gravitational acceleration g: 32.17 ft $s^{-2}$

Flow area $A_c$: 0.85 $ft^2$

Wetted perimeter $P_c$: 4.425 ft

Top width $T_c$: 4.042 ft

Hydraulic radius $R_c$: 0.192 ft

Hydraulic depth $D_c$: 0.21 ft

**OUTPUT (critical depth):**

Depth $y_c$: 0.211 ft

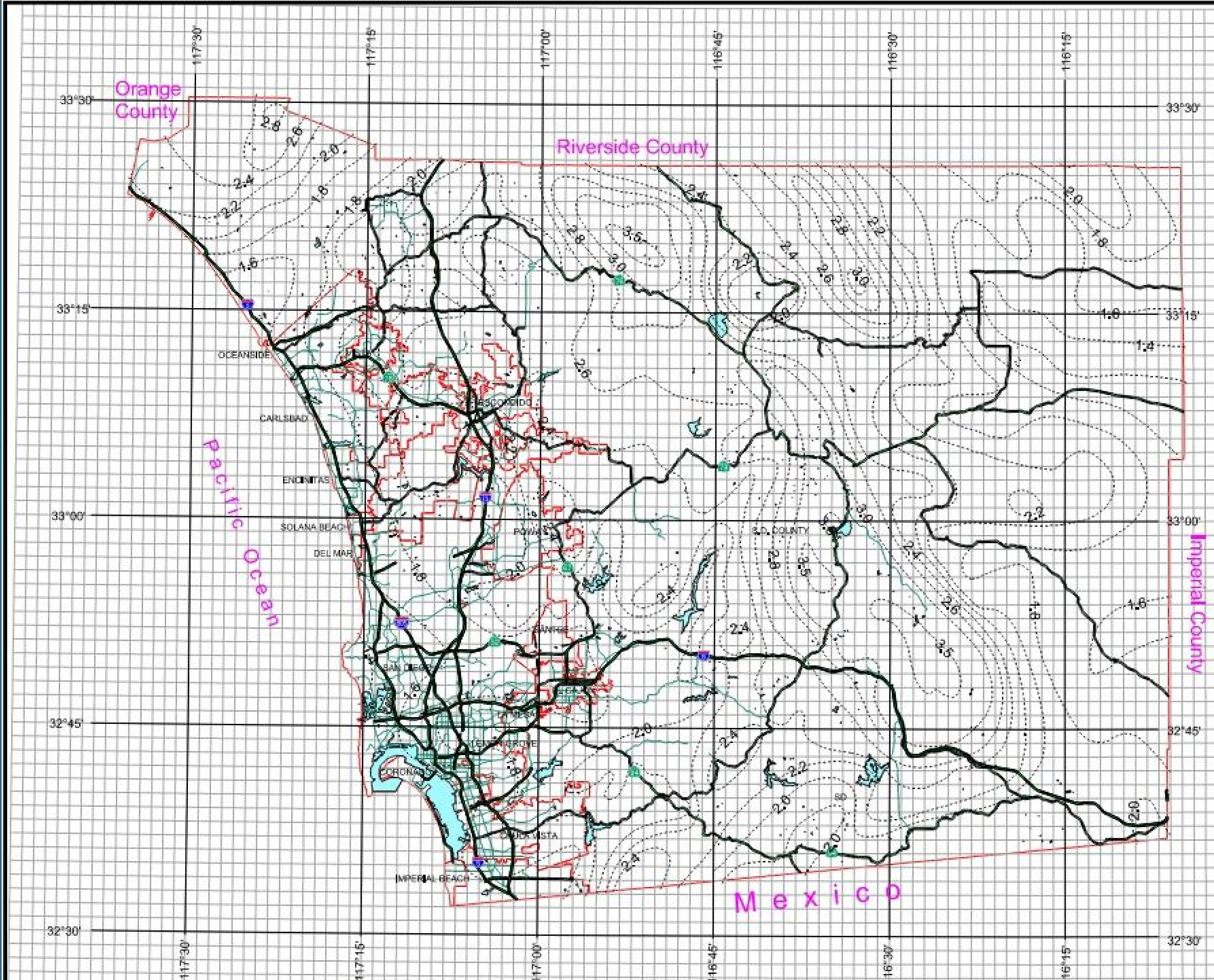
Velocity $V_c$: 2.601 fps

Froude number $F_c$: 1

# ATTACHMENT 13

# ISOPLUVIAL MAPS

**10yr-6hr**
**10yr-24hr**
**100yr-6hr**
**100yr-24hr**




# County of San Diego Hydrology Manual

*Rainfall Isopluvials*

**10 Year Rainfall Event - 6 Hours**

Isopluvial (inches)

DPW GIS

Department of Public Works Geographic Information Services

SanGIS

We Have San Diego Covered!

N S E W

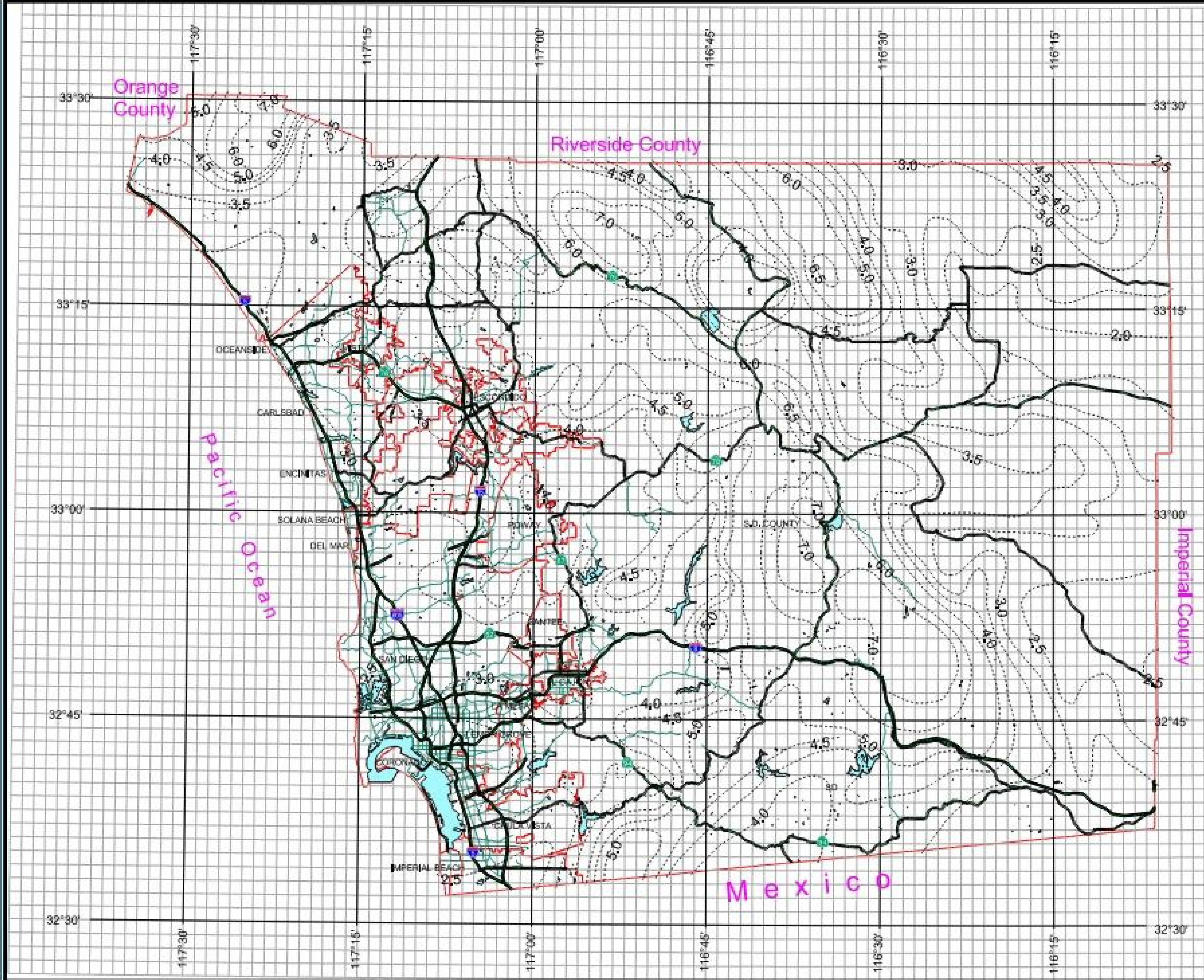
3 0 3 Miles

# County of San Diego Hydrology Manual

*Rainfall Isopluvials*

**10 Year Rainfall Event - 24 Hours**

Isopluvial (inches)




N
W E
S

3 0 3 Miles


# County of San Diego Hydrology Manual

*Rainfall Isopluvials*

**100 Year Rainfall Event - 6 Hours**

Isopluvial (inches)

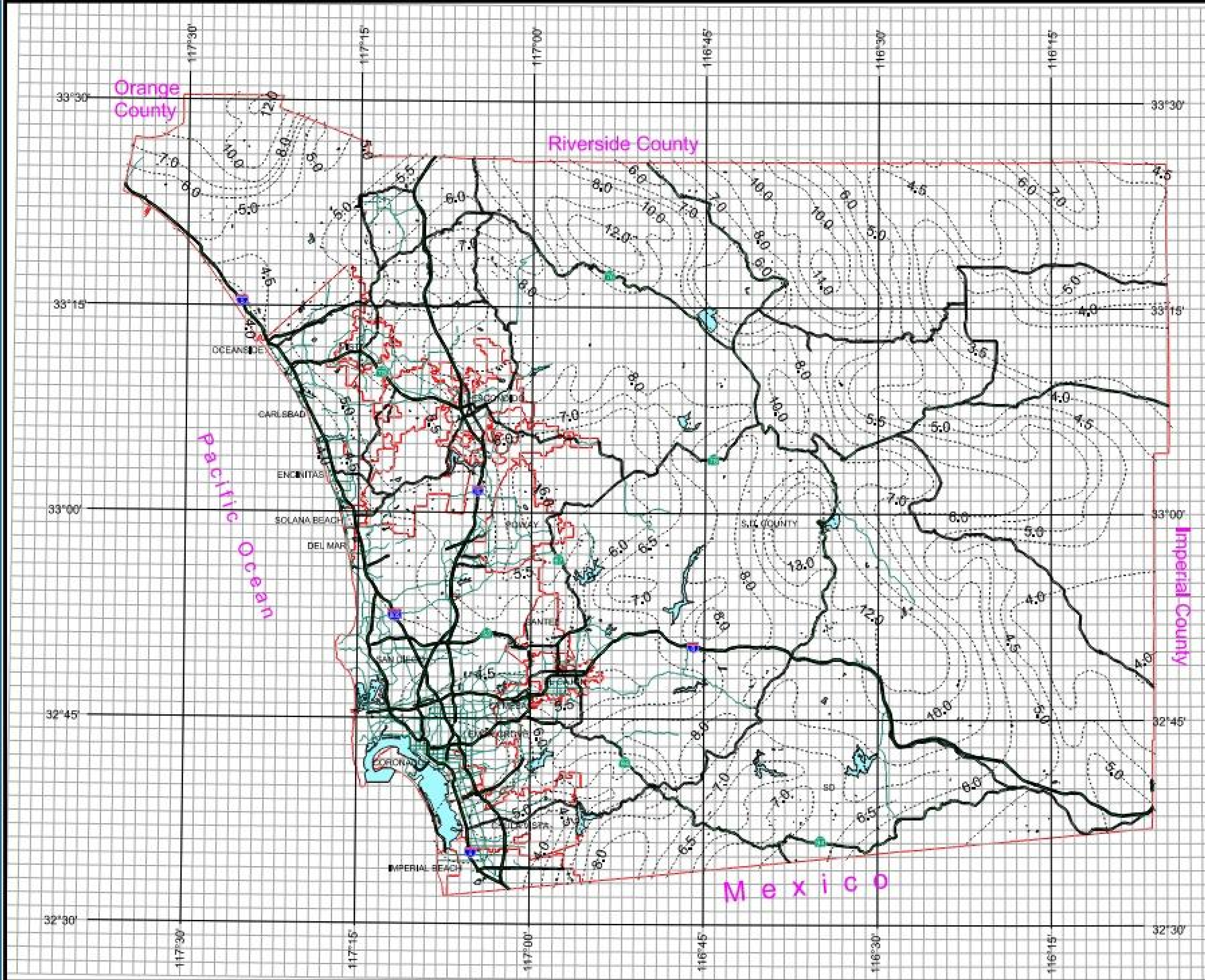
N
W E
S

3 0 3 Miles

# County of San Diego Hydrology Manual

*Rainfall Isopluvials*

**100 Year Rainfall Event - 24 Hours**




Isopluvial (inches)

N
W E
S

3 0 3 Miles

DPW GIS
SanGIS
We Have San Diego Covered!

# ATTACHMENT 14

# GEOCON, INC.

# GEOTECHNICAL INVESTIGATION

# GEOTECHNICAL INVESTIGATION

## 8732 PROSPECT AVENUE
## SANTEE, CALIFORNIA

GEOCON
INCORPORATED

GEOTECHNICAL
ENVIRONMENTAL
MATERIALS

PREPARED FOR

**PALM TREE INVESTMENTS**
**RANCHO SANTA FE, CALIFORNIA 92067**

**MARCH 4, 2020**
**PROJECT NO. G2500-32-01**

GEOCON
INCORPORATED
GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS

Project No. G2500-32-01
March 4, 2020

Palm Tree Investments
Post Office Box 9713
Rancho Santa Fe, California 92067

Attention: Ms. Tricia Estrada

Subject: GEOTECHNICAL INVESTIGATION
8732 PROSPECT AVENUE
SAN DIEGO, CALIFORNIA

Dear Ms. Estrada:

In accordance with your request, and our Proposal No. LG-20021 dated January 16, 2020, we have performed a geotechnical investigation on the subject property in Santee, California. The accompanying report presents our conclusions and recommendations pertaining to the geotechnical aspects of project development. The results of our study indicate that the site can be developed as planned, provided the recommendations of this report are followed.

Should you have questions regarding this report, or if we may be of further service, please contact the undersigned at your convenience.

Very truly yours,

GEOCON INCORPORATED

Trevor E. Myers
RCE 63773

REGISTERED PROFESSIONAL ENGINEER
TREVOR E. MYERS
No. RCE63773
CIVIL
STATE OF CALIFORNIA

David B. Evans
CEG 1860

PROFESSIONAL GEOLOGIST
DAVID B. EVANS
NO. 1860
CERTIFIED ENGINEERING GEOLOGIST
STATE OF CALIFORNIA

TEM:DBE:dmc

(4/del) Addressee

6960 Flanders Drive ■ San Diego, California 92121-2974 ■ Telephone 858.558.6900 ■ Fax 858.558.6159

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## TABLE OF CONTENTS (Concluded)

# GEOTECHNICAL INVESTIGATION

## 1. PURPOSE AND SCOPE

This report presents the results of a geotechnical investigation for the proposed 8732 Prospect Avenue residential development located in Santee, California (See Vicinity Map, Figure 1). The purpose of this study was to evaluate the soil and geologic conditions on the site and provide specific geotechnical recommendations pertaining to the development of the property as proposed based on the conditions encountered.

The scope of our study consisted of the following:

- Reviewing satellite imagery and readily available published and unpublished geologic literature.
- Excavating five exploratory trenches to evaluate the general extent and condition of surficial deposits across the site (see Appendix A for trench logs). In addition, two pavement cores were excavated on Prospect Avenue.
- Performing laboratory tests on selected soil samples collected to evaluate their physical properties (see Appendix B).
- Providing a storm water infiltration investigation to assist in evaluating feasibility of infiltrating storm water on-site in accordance with the 2016 storm water standards (see Appendix C). One Aardvark constant head permeameter test was performed to evaluate the permeability characteristics of the underlying soil.
- Preparing this report presenting our exploratory information and our conclusions and recommendations regarding the geotechnical aspects of developing the site as presently proposed.

## 2. SITE AND PROJECT DESCRIPTION

The approximate 0.85-acre property consists of one parcel of land located at 8732 Prospect Avenue in Santee, California (see Vicinity Map, Figure 1). The property is currently occupied by a dilapidated residential structure. Remnants of several detached structure foundations and previous residential uses currently exist. Based on a review of historical aerial photographs, the property and surrounding area was undeveloped in 1953. The site was developed prior to 1964.

Topographically, the site is characterized as sloping to the north with elevations ranging from approximately 364 feet to 352 feet above Mean Sea Level (MSL). The interior of the property is relatively void of vegetation. Some trees and shrubs exist along the perimeter of the property.

It is our understanding that the proposed development will consist of grading the property to accommodate four residential buildings with associated underground utility and landscape improvements, and a central driveway. Maximum cut and fill depths prior to remedial grading are expected to be approximately 5 and 4 feet, respectively. The southernmost 12-feet of the property will be dedicated to the future widening of Prospect Avenue.

The descriptions contained herein are based upon the site reconnaissance and, a review of the conceptual site plan. If project details vary significantly from those outlined herein, Geocon Incorporated should be notified for review and possible revisions to this report prior to final design submittal.

## 3. SOIL AND GEOLOGIC CONDITIONS

Two surficial soil types and one geologic formation was encountered during the field investigation. The surficial deposits consist of topsoil and colluvium and the formational unit consists of granitic rock. Each of the geologic units is described below in order of increasing age. The approximate extent of the deposits are shown on the *Geologic Map*. A *Regional Geology and Fault Map* is presented as Figure 3.

### 3.1 Topsoil (Qtp)

We encountered topsoil on the order of a ½-foot thick that generally blankets the surface of the property. The topsoil consists of loose, yellowish-brown to brown, silty to clayey sand. Topsoil is considered unsuitable in its present condition for the support of fill or structural loads and will require complete removal and compaction.

### 3.2 Colluvium (Qcol)

Colluvium on the order of 2 to 5 feet thick underlies the topsoil and consists of soft, brown to olive-brown, highly plastic, fine to medium sandy clay. The colluvium is considered unsuitable in its present condition and will require complete removal and recompaction.

### 3.3 Granitic Rock (Kt)

We encountered Cretaceous-age granitic rock beneath the colluvium within all of the exploratory trenches. The granitic rock generally excavates as a silty, fine to coarse sand. This material exhibits adequate shear strength and a very low to low expansion potential and is considered suitable in its present condition to support additional loads. The upper 2 feet was rippable using a John Deere 310L backhoe.

## 4. GROUNDWATER

Groundwater was not encountered during the field investigation and is not anticipated to significantly impact project development as presently proposed. However, it is not uncommon for groundwater or seepage conditions to develop where none previously existed.

## 5. GEOLOGIC HAZARDS

### 5.1 Ground Rupture

USGS (2016) shows that there are no mapped Quaternary faults crossing or trending toward the property. In addition, the site is not located within a currently established Alquist-Priolo Earthquake Fault Zone.

The nearest known active-faults are the Rose Canyon and Newport Inglewood Faults, located approximately 12 miles west of the subject site. The risk associated with ground rupture hazard is low.

### 5.2 Seismicity

The San Diego County and Southern California region is seismically active. Considerations important in seismic design include the frequency and duration of motion and the soil conditions underlying the site. Seismic design of structures should be performed in accordance with the California Building Code (CBC) guidelines currently adopted by the local agency. The risk associated with strong ground shaking due to earthquake at the site is no greater than that for the region.

### 5.3 Liquefaction and Seismically Induced Settlement

The risk associated with liquefaction and seismically induced settlement hazard is low due to the dense nature of the underlying formational materials and lack of shallow groundwater.

### 5.4 Landslides

The risk associated with landslide hazards at the site is low.

### 5.5 Seiches and Tsunamis

Considering the project location in relation to the ocean and proposed grade elevation (352 to 366 feet above MSL), the site is not located within a tsunami inundation zone. Seiche-related phenomena are defined as being proximal to a lake, reservoir, or bay. The project is not located near a large body of water, therefore the risk associated with seiches at the site is low.

## 5.6 Flooding from Dam Hazards

The California Department of Water Resources identifies the site as being located within the zone of inundation in the San Diego River Valley downstream of three major dams in San Diego County. These include the San Vicente Dam, the El Capitan Dam, and the Chet Harrit Dam (Lake Jennings). Information concerning the safety of these dams, which is reviewed annually by the California Department of Water Resources, Division of Dam Safety, may be obtained from that department.

# 6. CONCLUSIONS AND RECOMMENDATIONS

## 6.1 General

6.1.1 No soil or geologic conditions were encountered that, in the opinion of Geocon Incorporated, would preclude the development of the property as proposed, provided the recommendations of this report are followed.

6.1.2 The site is underlain by surficial soils consisting of topsoil and colluvium. The topsoil and colluvium is not considered suitable for the support of fill or structural loads in its present condition and will require remedial grading. The surficial soil is underlain by granitic rock which is considered suitable for the support of fill or structural loads.

6.1.3 The colluvium is a highly plastic clay exhibiting a high expansion potential. In order to reduce the effects of soil expansion on the proposed improvements, special design and remedial grading recommendations are recommended in Section 6.4. It should be noted that incorporation of these recommendations will not eliminate the potential for impacts to improvements due to highly expansive soil, unless completely removed and replaced with soil exhibiting a very low to low expansion potential, especially for lightweight improvements such as slabs-on grade, sidewalks, curb and gutters, etc.

6.1.4 Subsurface conditions observed may be extrapolated to reflect general soil and geologic conditions; however, variations in subsurface conditions between exploratory trenches should be expected.

## 6.2 Excavation and Soil Characteristics

6.2.1 We expect that excavation of the topsoil, colluvium, and weathered granitic rock to be possible with moderate to heavy effort using conventional heavy-duty equipment. Excavating into the granitic rock could require special equipment and very heavy effort for deep excavations, if proposed.

6.2.2 The contractor should ensure that all excavations and trenches are properly maintained and/or shored in accordance with applicable OSHA rules and regulations for the safety and stability of adjacent existing improvements.

6.2.3 The on-site surficial soil is “expansive” (EI greater than 20) as defined by 2019 California Building Code (CBC) Section 1803.5.3. The on-site granitic rock is considered “non-expansive”. Table 6.2.1 presents soil classifications based on the expansion index. Laboratory expansion index test results are presented in Appendix B.

**TABLE 6.2.1**
**EXPANSION CLASSIFICATION BASED ON EXPANSION INDEX**

| Expansion Index (EI) | Soil Classification | 2019 CBC Expansion Classification |
|---|---|---|
| 0 – 20 | Very Low | Non-Expansive |
| 21 – 50 | Low | Expansive |
| 51 – 90 | Medium | |
| 91 – 130 | High | |
| Greater Than 130 | Very High | |

6.2.4 The laboratory test results indicate that the near-surface on-site materials at the locations tested possess a "*Not Applicable*" sulfate severity and "*S0*" sulfate exposure class to concrete structures as defined by 2019 CBC Section 1904 and ACI 318-14 Chapter 19. Table 6.2.2 presents a summary of concrete requirements set forth by 2019 CBC Section 1904 and ACI 318. ACI guidelines should be followed when determining the type of concrete to be used. The presence of water-soluble sulfates is not a visually discernible characteristic; therefore, other soil samples from the site could yield different concentrations. Additionally, over time landscaping activities (i.e., addition of fertilizers and other soil nutrients) may affect the concentration.

**TABLE 6.2.2**
**REQUIREMENTS FOR CONCRETE EXPOSED TO SULFATE-CONTAINING SOLUTIONS**

| Sulfate Severity | Exposure Class | Water-Soluble Sulfate % by Weight | Cement Type | Maximum Water to Cement Ratio by Weight | Minimum Compressive Strength (psi) |
|---|---|---|---|---|---|
| Not Applicable | S0 | 0.00-0.10 | I or II | -- | 2,500 |
| Moderate | S1 | 0.10-0.20 | II | 0.50 | 4,000 |
| Severe | S2 | 0.20-2.00 | V | 0.45 | 4,500 |
| Very Severe | S3 | > 2.00 | V + pozzolan or slag | 0.45 | 4,500 |

6.2.5 Geocon Incorporated does not practice in the field of corrosion engineering. Therefore, if improvements that could be susceptible to corrosion are planned, further evaluation by a corrosion engineer may be needed.

## 6.3 Seismic Design Criteria

6.3.1 Table 6.3.1 summarizes site-specific design criteria obtained from the 2019 California Building Code (CBC; Based on the 2018 International Building Code [IBC] and ASCE 7-16), Chapter 16 Structural Design, Section 1613 Earthquake Loads. We used the computer program *Seismic Design Maps*, provided by the Structural Engineers Association (SEA) to calculate the seismic design parameters. The short spectral response uses a period of 0.2 second. We evaluated the Site Class based on the discussion in Section 1613.2.2 of the 2019 CBC and Table 20.3-1 of ASCE 7-16. The values presented herein are for the risk-targeted maximum considered earthquake ($MCE_R$) for Site Class C. The project structural engineer and architect should evaluate the appropriate Risk Category and Seismic Design Category for the planned structures. The values presented herein assume a Risk Category of II and resulting in a Seismic Design Category D.

**TABLE 6.3.1**
**2019 CBC SEISMIC DESIGN PARAMETERS**

| Parameter | Value | 2019 CBC Reference |
|---|---|---|
| Site Class | C | Section 1613.3.2 |
| $MCE_R$ Ground Motion Spectral Response Acceleration – Class B (short), $S_S$ | 0.782 | Figure 1613.2.1(1) |
| $MCE_R$ Ground Motion Spectral Response Acceleration – Class B (1 sec), $S_1$ | 0.287g | Figure 1613.2.1(2) |
| Site Coefficient, $F_A$ | 1.2 | Table 1613.2.3(1) |
| Site Coefficient, $F_V$ | 1.5 | Table 1613.2.3(2) |
| Site Class Modified $MCE_R$ Spectral Response Acceleration (short), $S_{MS}$ | 0.938g | Section 1613.2.3 (Eqn 16-36) |
| Site Class Modified $MCE_R$ Spectral Response Acceleration (1 sec), $S_{M1}$ | 0.43g | Section 1613.2.3 (Eqn 16-37) |
| 5% Damped Design Spectral Response Acceleration (short), $S_{DS}$ | 0.625g | Section 1613.2.4 (Eqn 16-38) |
| 5% Damped Design Spectral Response Acceleration (1 sec), $S_{D1}$ | 0.287g | Section 1613.2.4 (Eqn 16-39) |

* Using the code-based values presented in this table, in lieu of a performing a ground motion hazard analysis, requires the exceptions outlined in ASCE 7-16 Section 11.4.8 be followed by the project structural engineer. Per Section 11.4.8 of ASCE/SEI 7-16, a ground motion hazard analysis should be performed for projects for Site Class "E" sites with Ss greater than or equal to 1.0g and for Site Class "D" and "E" sites with S1 greater than 0.2g; however, Section 11.4.8 also provides exceptions which indicates that the ground motion hazard analysis may be waived provided the exceptions are followed.

6.3.2 Table 6.3.2 presents the mapped maximum considered geometric mean ($MCE_G$) seismic design parameters for projects located in Seismic Design Categories of D through F in accordance with ASCE 7-16.

**TABLE 6.3.2**
**2019 CBC SITE ACCELERATION PARAMETERS**

| Parameter | Value | ASCE 7-16 Reference |
|---|---|---|
| Mapped $MCE_G$ Peak Ground Acceleration, PGA | 0.335g | Figure 22-7 |
| Site Coefficient, $F_{PGA}$ | 1.2 | Table 11.8-1 |
| Site Class Modified $MCE_G$ Peak Ground Acceleration, $PGA_M$ | 0.402g | Section 11.8.3 (Eqn 11.8-1) |

6.3.3 Conformance to the criteria in Tables 6.3.1 and 6.3.2 for seismic design does not constitute any kind of guarantee or assurance that significant structural damage or ground failure will not occur if a large earthquake occurs. The primary goal of seismic design is to protect life, not to avoid all damage, since such design may be economically prohibitive.

6.3.4 The project structural engineer and architect should evaluate the appropriate Risk Category and Seismic Design Category for the planned structures. The values presented herein assume a Risk Category of II and resulting in a Seismic Design Category D. Table 6.3.3 presents a summary of the risk categories in accordance with ASCE 7-16.

**TABLE 6.3.3**
**ASCE 7-16 RISK CATEGORIES**

| Risk Category | Building Use | Examples |
|---|---|---|
| I | Low risk to Human Life at Failure | Barn, Storage Shelter |
| II | Nominal Risk to Human Life at Failure (Buildings Not Designated as I, III or IV) | Residential, Commercial and Industrial Buildings |
| III | Substantial Risk to Human Life at Failure | Theaters, Lecture Halls, Dining Halls, Schools, Prisons, Small Healthcare Facilities, Infrastructure Plants, Storage for Explosives/Toxins |
| IV | Essential Facilities | Hazardous Material Facilities, Hospitals, Fire and Rescue, Emergency Shelters, Police Stations, Power Stations, Aviation Control Facilities, National Defense, Water Storage |

## 6.4 Grading

6.4.1 All grading should be performed in accordance with the attached *Recommended Grading Specifications* (Appendix D). Where the recommendations of this section conflict with

Appendix D, the recommendations of this section take precedence. All earthwork should be observed and all fills tested for proper compaction by Geocon Incorporated.

6.4.2 Prior to commencing grading, a preconstruction conference should be held at the site with the owner or developer, grading contractor, civil engineer, and geotechnical engineer in attendance. Special soil handling and/or the grading plans can be discussed at that time.

6.4.3 Site preparation should begin with the removal of all deleterious material, construction debris, and vegetation. The depth of removal should be such that material exposed in cut areas or soils to be used as fill are relatively free of organic matter. Material generated during stripping and/or site demolition should be exported from the site.

6.4.4 Abandoned foundations and buried utilities should be removed and the subsequent depressions and/or trenches filled with properly compacted fill as part of the remedial grading.

6.4.5 All compressible soil deposits (i.e., topsoil and colluvium) within areas where structural improvements are planned should be removed and properly compacted prior to placing additional fill and/or structural loads. The actual extent of unsuitable soil removals will be determined in the field during grading by the geotechnical engineer and/or engineering geologist.

6.4.6 In order to mitigate the adverse effects of the highly expansive colluvium, we recommend that the colluvium be completely removed and replaced with imported very low to low expansive soils. Alternatively, the very low expansive granitic rock may be mined to allow the highly expansive clay to be buried at a depth of at least 5 feet below proposed grade or to a depth that allows placement of a 5-foot-thick cap of the *very low to low* expansive soil.

6.4.7 To reduce the potential for differential settlement and facilitate ease of excavating shallow footings and utility trenches, it is recommended that the cut portion of cut-fill transitions, if present after remedial grading, or shallow fills (less than 3 feet) over granitic rock, be undercut a minimum of three feet below proposed finish grade and replaced with properly compacted "very low" to "low" expansive soil fill. The lateral limits of the undercutting should extend at least 5 feet outside the structure footprint, where practical. Geocon Incorporated should be retained on a full-time basis during the overexcavation operations to identify areas where unsuitable materials may extend deeper than anticipated. Any such areas should be overexcavated until suitable materials are encountered.

6.4.8 The areas to receive fill soils should be scarified to a depth of approximately 12 inches, moisture conditioned to above optimum moisture content, and compacted to a minimum relative compaction of 90 percent in accordance with ASTM D 1557. Highly expansive soil should be uniformly moisture conditioned to above optimum moisture content.

6.4.9 After removal of unsuitable materials is performed, the site should then be brought to final subgrade elevations with structural fill compacted in layers. Layers of fill should be no thicker than will allow for adequate bonding and compaction. All fill, including backfill and scarified ground surfaces, should be compacted to at least 90 percent of maximum dry density at or above optimum moisture content, as determined in accordance with ASTM Test Procedure D1557. Fill materials below optimum moisture content will require additional moisture conditioning prior to placing additional fill.

6.4.10 Grading operations should be scheduled to permit the placement of oversize material (if deep excavations into the granitic rock are planned) and highly expansive soils in the deeper fill areas and to cap the building pads and driveway with granular materials having a *very low to low* expansive potential.

6.4.11 Imported fill soil (if necessary) should consist of granular materials with a “very low” to “low” expansion potential (EI of 50 or less), “not applicable” water-soluble sulfate content, and free of deleterious material or stones larger than 3 inches. Geocon Incorporated should be notified of the import soil source and should be authorized to perform laboratory testing of import soil prior to its arrival at the site to evaluate its suitability as fill material.

## 6.5 Conventional Foundations

6.5.1 Provided the highly expansive soils are mitigated in accordance with the recommendations presented herein, the project is suitable for the use of conventional shallow foundations. The following recommendations assume soil within 5 feet of pad grade will consist of *very low to low* expansive soils (EI less than 50). Geocon incorporated should be consulted to provide additional foundation recommendations and/or modifications if highly expansive soils are left in-place within the upper 5 feet of finish pad subgrade.

6.5.2 Foundations may consist of continuous strip footings and/or isolated spread footings. Continuous footings should be at least 12 inches wide and extend at least 12 inches below lowest adjacent grade. Isolated spread footings should have a minimum width and depth of 2 feet. Concrete reinforcement for continuous footings should consist of at least two, No. 4 steel reinforcing bars placed horizontally in the footings; one near the top and one near the bottom. The project structural engineer should design the reinforcement for the spread footings. A typical wall/column footing dimension detail is presented on Figure 4.

6.5.3 The minimum reinforcement recommended herein is based on soil characteristics only (EI of 50 or less) and is not intended to replace reinforcement required for structural considerations.

6.5.4 The recommended allowable bearing capacity for foundations with minimum dimensions described above is 2,000 psf for footings founded on properly compacted fill. This allowable soil bearing pressure may be increased by an additional 400 psf for each additional foot of depth and 200 psf for each additional foot of width, to a maximum allowable bearing capacity of 4,000 psf. The allowable bearing pressure is for dead plus live loads and may be increased by one-third when considering transient loads due to wind or seismic forces.

6.5.5 Settlement due to footing loads conforming to the above recommended allowable soil bearing pressures are expected to be less than 1-inch total and ½-inch differential across the building.

6.5.6 Foundation excavations should be observed by the geotechnical engineer (a representative of Geocon Incorporated) prior to the placement of reinforcing steel to check that the exposed soil conditions are similar to those expected and that they have been extended to the appropriate bearing strata. If unexpected soil conditions are encountered, foundation modifications may be required.

## 6.6 Conventional Concrete Slabs-on-Grade

6.6.1 Concrete slabs-on-grade for the buildings should be at least 5 inches thick and reinforced with No. 3 steel reinforcing bars at 18 inches on center in both horizontal directions.

6.6.2 Slabs that may receive moisture-sensitive floor coverings or may be used to store moisture-sensitive materials should be underlain by a vapor retarder. The vapor retarder design should be consistent with the guidelines presented in the American Concrete Institute's (ACI) *Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials* (ACI 302.2R-06). In addition, the membrane should be installed in accordance with manufacturer's recommendations and ASTM requirements and installed in a manner that prevents puncture. The vapor retarder used should be specified by the project architect or developer based on the type of floor covering that will be installed and if the structure will possess a humidity controlled environment.

6.6.3 The bedding sand thickness should be determined by the project foundation engineer, architect, and/or developer. However, we should be contacted to provide recommendations if the bedding sand is thicker than 6 inches. Typically, 4 inches of bedding sand with a vapor retarder placed at the midpoint is used. The foundation design engineer should provide appropriate concrete mix design criteria and curing measures to assure proper curing of the slab by reducing the potential for rapid moisture loss and subsequent cracking and/or slab curl. We suggest that the foundation design engineer present the concrete mix design and proper curing methods on the foundation plans. It is critical that the foundation contractor understands and follows the recommendations presented on the foundation plans.

6.6.4 The concrete slab-on-grade recommendations are based on soil support characteristics only. The project structural engineer should evaluate the structural requirements of the concrete slabs for supporting equipment and storage loads.

6.6.5 The recommendations presented herein are intended to reduce the potential for cracking of slabs and foundations as a result of differential movement. However, even with the incorporation of the recommendations presented herein, foundations and slabs-on-grade will still exhibit some cracking. The occurrence of concrete shrinkage cracks is independent of the soil supporting characteristics. Their occurrence may be reduced and/or controlled by: limiting the slump of the concrete; the use of crack control joints; and proper concrete placement and curing. Crack-control joints should be spaced at intervals no greater than 12 feet. Literature provided by the Portland Concrete Association (PCA) and the American Concrete Institute (ACI) present recommendations for proper concrete mix and construction and curing practices, and should be incorporated into project construction.

## 6.7 Post-Tensioned Foundations

6.7.1 As an alternative to the conventional foundation recommendations, consideration should be given to the use of post-tensioned concrete slab and foundation systems for the support of the proposed structures. The post-tensioned systems should be designed by a structural engineer experienced in post-tensioned slab design and design criteria of the Post-Tensioning Institute (PTI) DC10.5 as required by the 2019 California Building Code (CBC Section 1808.6.2). Although this procedure was developed for expansive soil conditions, we understand it can also be used to reduce the potential for foundation distress due to differential fill settlement. The post-tensioned design should incorporate the geotechnical parameters presented on Table 6.7. The parameters presented in Table 6.7 are based on the guidelines presented in the PTI, DC10.5 design manual.

**TABLE 6.7**
**POST-TENSIONED FOUNDATION SYSTEM DESIGN PARAMETERS**

| Post-Tensioning Institute (PTI) DC10.5 Design Parameters | Value |
|---|---|
| Thornthwaite Index | -20 |
| Equilibrium Suction | 3.9 |
| Edge Lift Moisture Variation Distance, $e_M$ (feet) | 5.3 |
| Edge Lift, $y_M$ (inches) | 0.61 |
| Center Lift Moisture Variation Distance, $e_M$ (feet) | 9.0 |
| Center Lift, $y_M$ (inches) | 0.30 |

6.7.2 The foundations for the post-tensioned slabs should be embedded in accordance with the recommendations of the structural engineer. If a post-tensioned mat foundation system is planned, the slab should possess a thickened edge with a minimum width of 12 inches and extend below the clean sand or crushed rock layer.

6.7.3 If the structural engineer proposes a post-tensioned foundation design method other than the 2019 CBC:

- The criteria presented in Table 6.7 are still applicable.
- Interior stiffener beams should be used.
- The width of the perimeter foundations should be at least 12 inches.
- The perimeter footing embedment depths should be at least 24 inches. The embedment depths should be measured from the lowest adjacent pad grade.

6.7.4 Our experience indicates post-tensioned slabs are susceptible to excessive edge lift, regardless of the underlying soil conditions. Placing reinforcing steel at the bottom of the perimeter footings and the interior stiffener beams may mitigate this potential. Current PTI design procedures primarily address the potential center lift of slabs but, because of the placement of the reinforcing tendons in the top of the slab, the resulting eccentricity after tensioning reduces the ability of the system to mitigate edge lift. The structural engineer should design the foundation system to reduce the potential of edge lift occurring for the proposed structures.

6.7.5 During the construction of the post-tension foundation system, the concrete should be placed monolithically. Under no circumstances should cold joints be allowed to form between the footings/grade beams and the slab during the construction of the post-tension foundation system unless designed by the project structural engineer.

6.7.6 The post-tensioned foundations may be designed for an allowable soil bearing pressure of 2,000 pounds per square foot (psf) (dead plus live load). This bearing pressure may be increased by one-third for transient loads due to wind or seismic forces. The estimated maximum total and differential settlement for the planned structures due to foundation loads is 1 inch and ½ inch, respectively.

6.7.7 Isolated footings, if present, should have the minimum embedment depth and width recommended for conventional foundations. The use of isolated footings, which are located beyond the perimeter of the building and support structural elements connected to the building, are not recommended. Where this condition cannot be avoided, the isolated footings should be connected to the building foundation system with grade beams in both directions.

6.7.8 Consideration should be given to using interior stiffening beams and connecting isolated footings and/or increasing the slab thickness.

6.7.9 Slabs that may receive moisture-sensitive floor coverings or may be used to store moisture-sensitive materials should be underlain by a vapor retarder. The vapor retarder design should be consistent with the guidelines presented in the American Concrete Institute's (ACI) *Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials* (ACI 302.2R-06). In addition, the membrane should be installed in accordance with manufacturer's recommendations and ASTM requirements and installed in a manner that prevents puncture. The vapor retarder used should be specified by the project architect or developer based on the type of floor covering that will be installed and if the structure will possess a humidity-controlled environment.

6.7.10 The bedding sand thickness should be determined by the project foundation engineer, architect, and/or developer. It is common in the southern California region to have 4 inches of sand with the vapor inhibitor placed in the midpoint. However, we should be contacted to provide recommendations if the bedding sand is thicker than 6 inches. The foundation design engineer should provide appropriate concrete mix design criteria and curing measures to assure proper curing of the slab by reducing the potential for rapid moisture loss and subsequent cracking and/or slab curl. We suggest that the foundation design engineer present the concrete mix design and proper curing methods on the foundation plans. It is critical that the foundation contractor understands and follows the recommendations presented on the foundation plans.

6.7.11 We should observe the foundation excavations prior to the placement of reinforcing steel to check that the exposed soil conditions are similar to those expected and that they have been extended to the appropriate bearing strata. If unexpected soil conditions are encountered, foundation modifications may be required.

## 6.8 Exterior Concrete Flatwork Recommendations

6.8.1 The exterior concrete flatwork recommendations provided herein assume that the near surface soils exhibit a very low to medium expansion potential (EI $\leq$90). Exterior slabs not subjected to vehicular traffic should be a minimum of four inches thick, and when panels are in excess of 8 feet wide, reinforced with 6 x 6-6/6 welded wire mesh. The mesh should be placed in the middle of the slab. Proper mesh positioning is critical to future performance of the slabs. The contractor should take extra measures to provide proper mesh placement. Prior to construction of slabs, the upper 12 inches of subgrade soils should be moisture conditioned at or slightly above optimum moisture content and compacted to at least 90 percent of the laboratory maximum dry density per ASTM 1557.

6.8.2 If highly expansive soils (EI greater than 90) are present near finish grade, the following recommendations apply. Exterior slabs should be at least 5 inches thick and reinforced with No. 3 steel bars spaced 18 inches on center each direction positioned at the slab midpoint. Driveways should be constructed with a 6-inch deep slab edge (measured from the bottom of the slab). Slabs should be doweled to the building foundation where they abut the stem wall. Sidewalks should be doweled to the curbs. Prior to construction of slabs, the upper 12 inches of subgrade soils should scarified and moisture conditioned to **a minimum of 3% above optimum moisture content** just prior to placing the concrete. Moisture conditioning should be observed and checked by a representative of Geocon Incorporated.

6.8.3 Consideration should be given to adding concrete cut-off walls beneath exterior flatwork supported by highly expansive soils (EI greater than 90). The cut-off walls are recommended where any water (e.g. landscape) may migrate laterally beneath the flatwork and cause adverse soil movement. The cut-off walls should be located along the perimeter of the concrete slab adjacent to landscaping areas and extend at least 6-inches into the soil subgrade.

6.8.4 Concrete flatwork should be provided with crack control joints to reduce and/or control shrinkage cracking. Crack control spacing should be determined by the project structural engineer based upon the slab thickness and intended usage. Criteria of the American Concrete Institute (ACI) should be taken into consideration when establishing crack control spacing. A 4-inch-thick slab should have a maximum joint spacing of 10 feet. Subgrade soil for exterior slabs not subjected to vehicle loads should be compacted in accordance with criteria presented above prior to concrete placement. Subgrade soil should be properly compacted and the moisture content of subgrade soil should be checked prior to placing concrete.

6.8.5 The recommendations of this report are intended to reduce the potential for cracking of slabs due to expansive soil (if present), differential settlement of existing soil or soil with varying thicknesses. However, even with the incorporation of the recommendations presented herein, foundations, stucco walls, and slabs-on-grade placed on such conditions may still exhibit some cracking due to soil movement and/or shrinkage. Periodic maintenance such as slab replacement and/or grinding of elevated slab margins may be necessary due to the highly expansive soils. The occurrence of concrete shrinkage cracks is independent of the supporting soil characteristics. Their occurrence may be reduced and/or controlled by limiting the slump of the concrete, proper concrete placement and curing, and by the placement of crack control joints at periodic intervals, in particular, where re-entrant slab corners occur.

## 6.9 Preliminary Interlocking Concrete Pavement Recommendations

6.9.1 We understand interlocking concrete pavement may be used for the central driveway.

6.9.2 We calculated the pavement section in general conformance with the *Caltrans Highway Design Manual* and the *Interlocking Concrete Pavement Institute (ICPI) Technical Specifications* using an estimated Traffic Index (TI) of 6. Based on the ICPI technical specifications, the pavers should possess a minimum thickness of 3⅛ inches (80-mm) overlying 1- inch of bedding sand. We have assumed an R-Value of 20 for the subgrade soil for the purposes of this preliminary analysis. This assumes that low expansive or mined decomposed granite materials will be exposed in the upper 2 feet of the roadway subgrade. Table 6.9 presents the preliminary interlocking concrete pavement recommendations. Class 2 permeable base should be placed below pavement. The Class 2 permeable base can be replaced by aggregate in accordance with ASTM C 33 and the civil engineer/ manufacturer's recommendations.

**TABLE 6.9**
**PAVER SECTION RECOMMENDATIONS**

| Location | Traffic Index (TI) | Assumed Subgrade R-Value | Equivalent Paver Asphalt Concrete Thickness (inches) | Option 1 | | Option 2 |
|---|---|---|---|---|---|---|
| | | | | Estimated Sand Thickness (inches) | Class 2 Permeable Base Thickness (inches) | ASTM C33 Aggregate |
| Drive Lanes | 6.0 | 20 | 3⅛ | 1 | 6 | 2" #8 / 2" #57 / 6" #2 |

6.9.3 The Class 2 permeable base/aggregate section can be thickened to increase the water capacity as required by the project civil engineer. Prior to placing base/aggregate materials, the subgrade soil should be scarified, moisture conditioned as necessary, and recompacted to a dry density of at least 95 percent of the laboratory maximum dry density near to slightly above optimum moisture content as determined by ASTM D 1557. The depth of compaction should be at least 12 inches. Similarly, the base materials should be compacted to a dry density of at least 95 percent of the laboratory maximum dry density near to slightly above optimum moisture content.

6.9.4 The compacted fill supporting the pavement is expected to be relatively impervious to infiltration, and as such, water through the pavers is expected to perch on the underlying subgrade. To collect water and transmit it to the storm drain system, the subgrade of pavers should be sloped and graded to allow water to flow to a subdrain. The subdrain should be placed at the bottom of the base/aggregate section below the pavers and extend the distance of the paver area to reduce the potential for water to build up within the paving section. The drain should be connected to an approved drainage device. A continuous impermeable liner could be installed along the sides and bottom of the porous pavement section to prevent water migration along the edge adjacent. The liner, if used, should consist of a high density polyethylene (HDPE) with a minimum thickness of 15 mil or equivalent. The liner should be sealed at the connections in accordance with manufacturer recommendations and should be properly waterproofed at the drain connection. If a liner is not used to prevent lateral water migration, the edge restraint should be deepened at least 6-inches into the subgrade. The drain should consist of a 3-inch diameter perforated Schedule 40, PVC pipe and placed at the bottom of the base materials.

6.9.5 The pavers should be installed and maintained in accordance with the manufacturer’s recommendations. The future owners should be made aware and responsible for the maintenance program. In addition, pavers tend to shift vertically and horizontally during the life of the pavement and should be expected. The pavers normally require a concrete border to prevent lateral movement from traffic. The concrete border surrounding the pavers should be embedded at least 6 inches into the subgrade to reduce the potential for water migration to the adjacent landscape areas and pavement areas, if liners are not used. If a liner is used, the edge restraint should be at least 6-inches thick. The pavers should be placed tightly adjacent to each other and the spacing between the paver units should be filled with appropriate filler. A polymer sand (Poly-Sand) can be used on decorative, non-storm water quality paver area to help prevent water infiltration.

6.9.6 The performance of pavement is highly dependent on providing positive surface drainage away from the edge of the pavement. Ponding of water on or adjacent to the pavement will likely result in pavement distress and subgrade failure. Drainage from landscaped areas should be directed to controlled drainage structures. Landscape areas adjacent to the edge of asphalt pavements are not recommended due to the potential for surface or irrigation water to infiltrate the underlying permeable aggregate base and cause distress. Where such a condition cannot be avoided, consideration should be given to incorporating measures that will significantly reduce the potential for subsurface water migration into the aggregate base. If planter islands are planned, the perimeter curb should extend at least 6 inches below the level of the base materials.

## 6.10 Existing Pavements

6.10.1 Table 6.10 presents the existing pavement sections based on a total of 2 cores drilled on Prospect Avenue fronting the proposed residential development. The core locations are presented on Figure 2. The existing asphalt concrete is underlain by a fine to coarse sand. No aggregate base was observed.

**TABLE 6.10**
**EXISTING PAVEMENT SECTIONS**

| Roadway (Sample Location) | Core No. | Existing AC Pavement Thickness (inch) | Existing Sand Base Thickness (Inches) |
|---|---|---|---|
| Prospect Avenue (west) | C-1 | 6 | 7 |
| Prospect Avenue (east) | C-2 | 6 | 18 |

## 6.11 Pavement Recommendations (Prospect Avenue)

6.11.1 The following recommendations are presented in the event that Prospect Avenue requires a complete removal and replacement to meet current City of Santee public roadway standards.

6.11.2 Asphalt concrete pavement sections were calculated using procedures outlined in the *California Highway Design Manual* (Caltrans). For preliminary design purposes, we have utilized a Traffic Index of 6.0 and R-values of 5 and 40. The R-value test results are presented in Appendix B. Summarized on Table 6.11 are the recommended pavement sections. The project civil engineer or developer should determine the appropriate Traffic Index for the traffic loading expected on the project.

**TABLE 6.11**
**ASPHALT CONCRETE PAVEMENT SECTION**

| Traffic Index | R-Value | Asphalt Concrete (inches) | Class 2 Base (inches) |
|---|---|---|---|
| 6.0 | 5 | 4 | 12 |
| 6.0 | 40 | 4* | 5* |

* If the sand base course exhibiting the higher R-values is at least 2 feet thick below the proposed structural section, this pavement section may be utilized.

6.11.3 Prior to placing base materials, the subgrade soil should be scarified, moisture conditioned as necessary, and recompacted to a dry density of at least 95 percent of the laboratory maximum dry density near to slightly above optimum moisture content as determined by ASTM D 1557. The depth of compaction should be at least 12 inches. Similarly, the base materials should be compacted to a dry density of at least 95 percent of the laboratory maximum dry density near to slightly above optimum moisture content. Asphalt concrete should be compacted to a density of at least 95 percent of the laboratory Hveem density in accordance with ASTM D 2726.

6.11.4 Base materials should conform to Section 26-1.028 of the *Standard Specifications for The State of California Department of Transportation (Caltrans)* with ¾-inch maximum size aggregate. The asphalt concrete should conform to Section 203-6 of the *Standard Specifications for Public Works Construction (Greenbook).*

6.11.5 The performance of pavement is highly dependent on providing positive surface drainage away from the edge of the pavement. Ponding of water on or adjacent to the pavement will likely result in pavement distress and subgrade failure. Drainage from landscaped areas should be directed to controlled drainage structures.

## 6.12 Retaining Walls and Lateral Loads Recommendations

6.12.1 Retaining walls not restrained at the top and having a level backfill surface should be designed for an active soil pressure equivalent to the pressure exerted by a fluid with a density of 35 pounds per cubic foot (pcf). Where the backfill will be inclined at 2:1 (horizontal:vertical), an active soil pressure of 50 pcf is recommended. These soil pressures assume that the backfill materials within an area bounded by the wall and a 1:1 plane extending upward from the base of the wall possess an Expansion Index $\leq$50. Geocon Incorporated should be consulted for additional recommendations if backfill materials have an EI >50.

6.12.2 Retaining walls shall be designed to ensure stability against overturning sliding, excessive foundation pressure and water uplift. Where a keyway is extended below the wall base with the intent to engage passive pressure and enhance sliding stability, it is not necessary to consider active pressure on the keyway.

6.12.3 Where walls are restrained from movement at the top, an additional uniform pressure of 8H psf (where H equals the height of the retaining wall portion of the wall in feet) should be added to the active soil pressure where the wall possesses a height of 8 feet or less and 12H where the wall is greater than 8 feet. For retaining walls subject to vehicular loads within a horizontal distance equal to two-thirds the wall height, a surcharge equivalent to two feet of fill soil should be added (total unit weight of soil should be taken as 130 pcf).

6.12.4 Soil contemplated for use as retaining wall backfill, including import materials, should be identified in the field prior to backfill. At that time Geocon Incorporated should obtain samples for laboratory testing to evaluate its suitability. Modified lateral earth pressures may be necessary if the backfill soil does not meet the required expansion index or shear strength. City or regional standard wall designs, if used, are based on a specific active lateral earth pressure and/or soil friction angle. In this regard, on-site soil to be used as backfill may or may not meet the values for standard wall designs. Geocon Incorporated should be consulted to assess the suitability of the on-site soil for use as wall backfill if standard wall designs will be used.

6.12.5 Unrestrained walls will move laterally when backfilled and loading is applied. The amount of lateral deflection is dependent on the wall height, the type of soil used for backfill, and loads acting on the wall. The wall designer should provide appropriate lateral deflection quantities for planned retaining walls structures, if applicable. These lateral values should be considered when planning types of improvements above retaining wall structures.

6.12.6 Retaining walls should be provided with a drainage system adequate to prevent the buildup of hydrostatic forces and should be waterproofed as required by the project architect. The use of drainage openings through the base of the wall (weep holes) is not recommended where the seepage could be a nuisance or otherwise adversely affect the property adjacent to the base of the wall. The above recommendations assume a properly compacted granular (EI $\leq$50) free-draining backfill material with no hydrostatic forces or imposed surcharge load. A typical retaining wall drainage detail is presented on Figure 5. If conditions different than those described are expected, or if specific drainage details are desired, Geocon Incorporated should be contacted for additional recommendations.

6.12.7 In general, wall foundations having a minimum depth and width of one foot may be designed for an allowable soil bearing pressure of 2,000 psf, provided the soil within three feet below the base of the wall has an Expansion Index $\leq$ 90. The recommended allowable soil bearing pressure may be increased by 300 psf and 500 psf for each additional foot of foundation width and depth, respectively, up to a maximum allowable soil bearing pressure of 4,000 psf.

6.12.8 The proximity of the foundation to the top of a slope steeper than 3:1 could impact the allowable soil bearing pressure. Therefore, Geocon Incorporated should be consulted where such a condition is anticipated. As a minimum, wall footings should be deepened such that the bottom outside edge of the footing is at least seven feet from the face of slope when located adjacent and/or at the top of descending slopes.

6.12.9 The structural engineer should determine the Seismic Design Category for the project in accordance with Section 1613.3.5 of the 2019 CBC or Section 11.6 of ASCE 7-10. For structures assigned to Seismic Design Category of D, E, or F, retaining walls that support more than 6 feet of backfill should be designed with seismic lateral pressure in accordance with Section 1803.5.12 of the 2019 CBC. The seismic load is dependent on the retained height where H is the height of the wall, in feet, and the calculated loads result in pounds per square foot (psf) exerted at the base of the wall and zero at the top of the wall. A seismic load of 20H should be used for design. We used the peak ground acceleration adjusted for Site Class effects, $PGA_M$, of 0.402g calculated from ASCE 7-10 Section 11.8.3 and applied a pseudo-static coefficient of 0.33.

6.12.10 For resistance to lateral loads, a passive earth pressure equivalent to a fluid density of 300 pcf is recommended for footings or shear keys poured neat against properly compacted granular fill soils. The passive pressure assumes a horizontal surface extending away from the base of the wall at least five feet or three times the surface generating the passive pressure, whichever is greater. The upper 12 inches of material not protected by floor slabs or pavement should not be included in the design for lateral resistance.

6.12.11 An ultimate friction coefficient of 0.35 may be used for resistance to sliding between soil and concrete. This friction coefficient may be combined with the passive earth pressure when determining resistance to lateral loads.

6.12.12 The recommendations presented above are generally applicable to the design of rigid concrete or masonry retaining walls having a maximum height of 12 feet. In the event that walls higher than 12 feet are planned, Geocon Incorporated should be consulted for additional recommendations.

## 6.13 Site Drainage and Moisture Protection

6.13.1 Adequate site drainage is critical to reduce the potential for differential soil movement, erosion and subsurface seepage. Under no circumstances should water be allowed to pond adjacent to footings. The site should be graded and maintained such that surface drainage is directed away from structures in accordance with 2019 CBC 1804.4 or other applicable standards. In addition, surface drainage should be directed away from the top of slopes into swales or other controlled drainage devices. Roof and pavement drainage should be directed into conduits that carry runoff away from the proposed structure.

6.13.2 In the case of basement walls or building walls retaining landscaping areas, a water-proofing system should be used on the wall and joints, and a Miradrain drainage panel (or similar) should be placed over the waterproofing. The project architect or civil engineer should provide detailed specifications on the plans for all waterproofing and drainage.

6.13.3 Underground utilities should be leak free. Utility and irrigation lines should be checked periodically for leaks, and detected leaks should be repaired promptly. Detrimental soil movement could occur if water is allowed to infiltrate the soil for prolonged periods of time.

6.13.4 Landscaping planters adjacent to paved areas are not recommended due to the potential for surface or irrigation water to infiltrate the pavement's subgrade and base course. We recommend that subdrains to collect excess irrigation water and transmit it to drainage structures or impervious above-grade planter boxes be used. In addition, where landscaping is planned adjacent to the pavement, we recommend construction of a cutoff wall along the edge of the pavement that extends at least 6 inches below the bottom of the base material.

## 6.14 Grading and Foundation Plan Review

6.14.1 Geocon Incorporated should review the grading and foundation plans for the project prior to final design submittal to determine if additional analysis and/or recommendations are required.

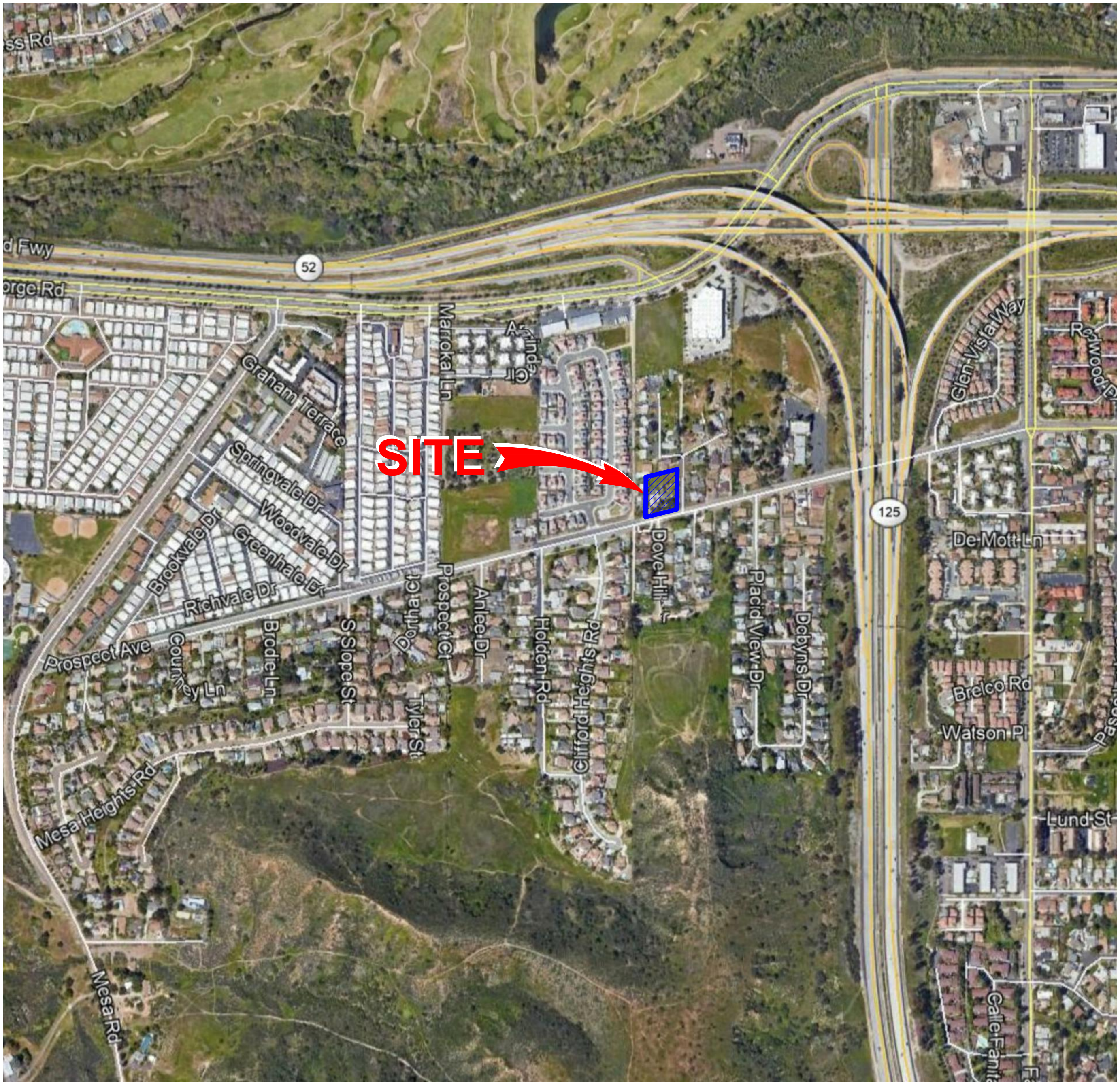
## LIMITATIONS AND UNIFORMITY OF CONDITIONS

1. The firm that performed the geotechnical investigation for the project should be retained to provide testing and observation services during construction to provide continuity of geotechnical interpretation and to check that the recommendations presented for geotechnical aspects of site development are incorporated during site grading, construction of improvements, and excavation of foundations. If another geotechnical firm is selected to perform the testing and observation services during construction operations, that firm should prepare a letter indicating their intent to assume the responsibilities of project geotechnical engineer of record. A copy of the letter should be provided to the regulatory agency for their records. In addition, that firm should provide revised recommendations concerning the geotechnical aspects of the proposed development, or a written acknowledgement of their concurrence with the recommendations presented in our report. They should also perform additional analyses deemed necessary to assume the role of Geotechnical Engineer of Record.

2. The recommendations of this report pertain only to the site investigated and are based upon the assumption that the soil conditions do not deviate from those disclosed in the investigation. If any variations or undesirable conditions are encountered during construction, or if the proposed construction will differ from that anticipated herein, Geocon Incorporated should be notified so that supplemental recommendations can be given. The evaluation or identification of the potential presence of hazardous or corrosive materials was not part of the scope of services provided by Geocon Incorporated.

3. This report is issued with the understanding that it is the responsibility of the owner or his representative to ensure that the information and recommendations contained herein are brought to the attention of the architect and engineer for the project and incorporated into the plans, and the necessary steps are taken to see that the contractor and subcontractors carry out such recommendations in the field.

4. The findings of this report are valid as of the present date. However, changes in the conditions of a property can occur with the passage of time, whether they be due to natural processes or the works of man on this or adjacent properties. In addition, changes in applicable or appropriate standards may occur, whether they result from legislation or the broadening of knowledge. Accordingly, the findings of this report may be invalidated wholly or partially by changes outside our control. Therefore, this report is subject to review and should not be relied upon after a period of three years.

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N

NO SCALE

# VICINITY MAP

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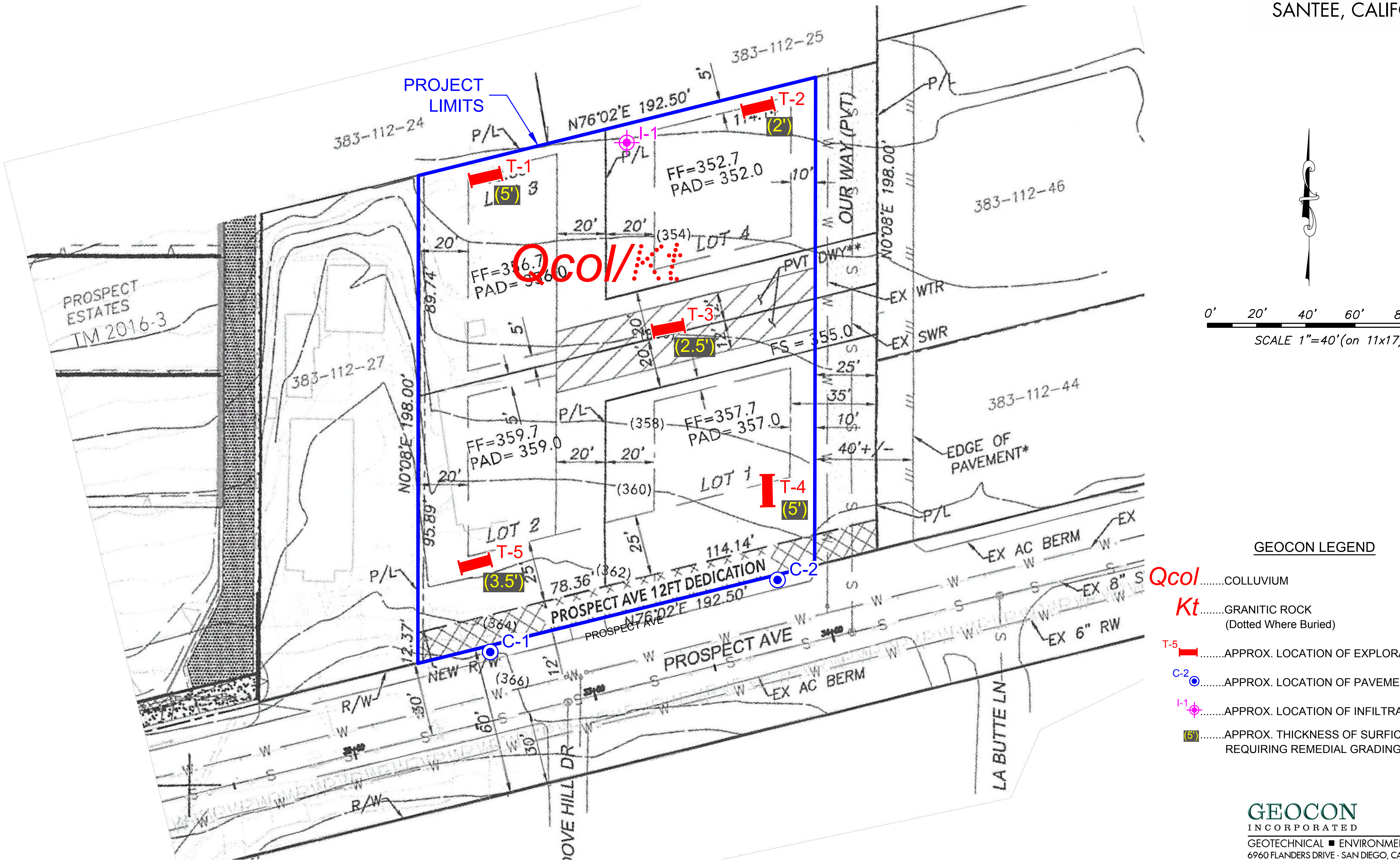
8732 PROSPECT AVENUE
SANTEE, CALIFORNIA

| | | | | | |
|---|---|---|---|---|---|
| DG / CW | | DSK/GTYPD | DATE 03 - 04 - 2020 | PROJECT NO. G2500 - 32 - 01 | FIG. 1 |

Plotted:03/04/2020 7:26AM \| By:JONATHAN WILKINS \| File Location:Y:\PROJECTS\G2500-32-01 (8732 Prospect Ave)\DETAILS\G2500-32-01 Vic Map.dwg

8732 PROSPECT AVENUE
SANTEE, CALIFORNIA




GEOCON LEGEND

Qcol........COLLUVIUM

Kt........GRANITIC ROCK
(Dotted Where Buried)

T-5 ........APPROX. LOCATION OF EXPLORATORY TRENCH

C-2 ........APPROX. LOCATION OF PAVEMENT CORE

I-1 ........APPROX. LOCATION OF INFILTRATION TEST

(5') ........APPROX. THICKNESS OF SURFICIAL SOIL
REQUIRING REMEDIAL GRADING (In Feet)

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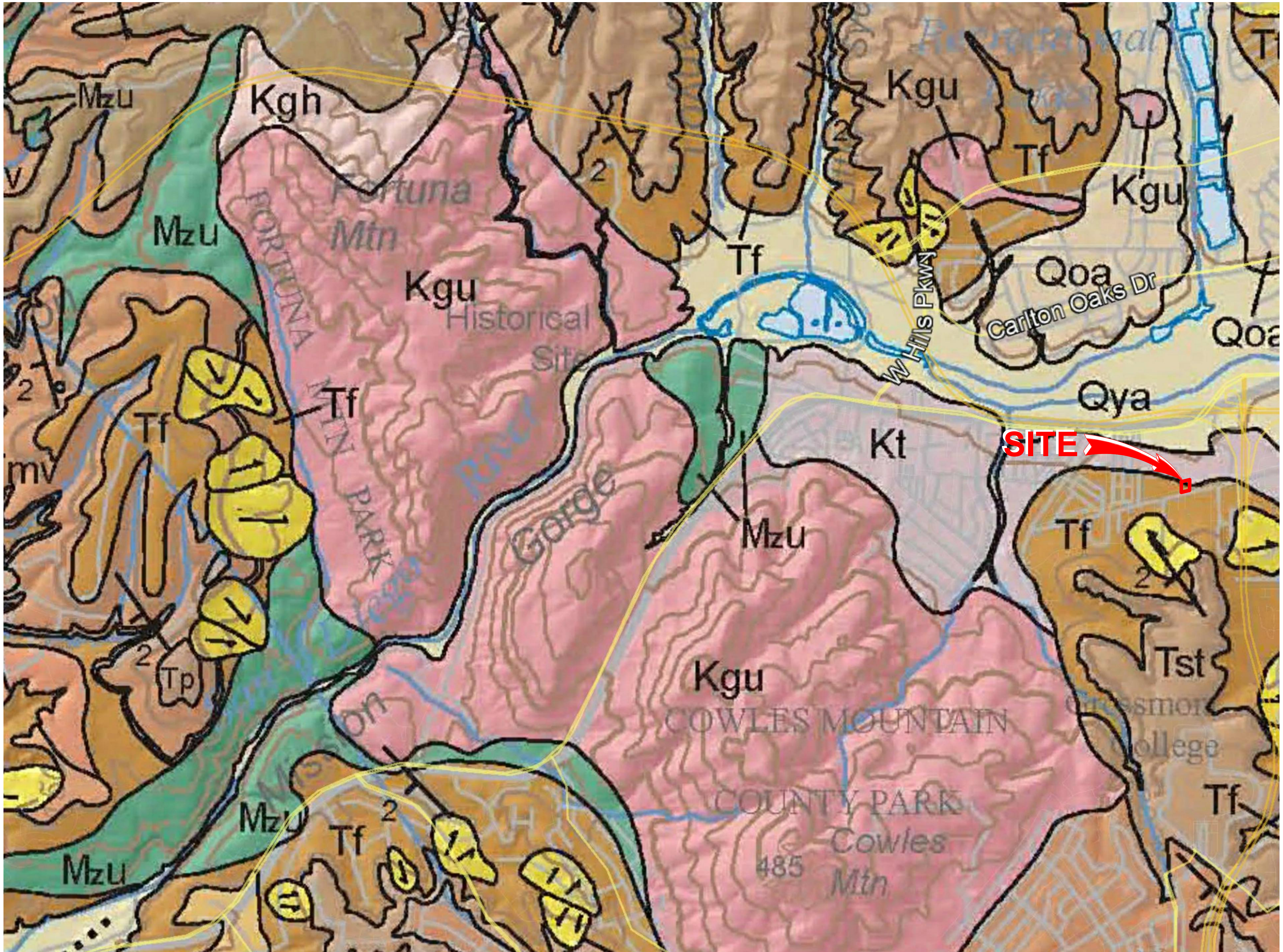
GEOLOGIC MAP

PROJECT NO. G2500 - 32 - 01
FIGURE 2
DATE 03 - 04 - 2020

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**GEOCON LEGEND**

**Qya** ........YOUNG ALLUVIUM
**Qoa** ........OLDER ALLUVIUM
**Tst** ........STADIUM CONGLOMERATE
**Tf** ........FRIARS FORMATION
**Kgu** ........GRANODIORITE AND TONALITE, UNDIVIDED
**Kt** ........TONALITE, UNDIVIDED
**MzU** ........METAMORPHOSED VOLCANIC ROCK

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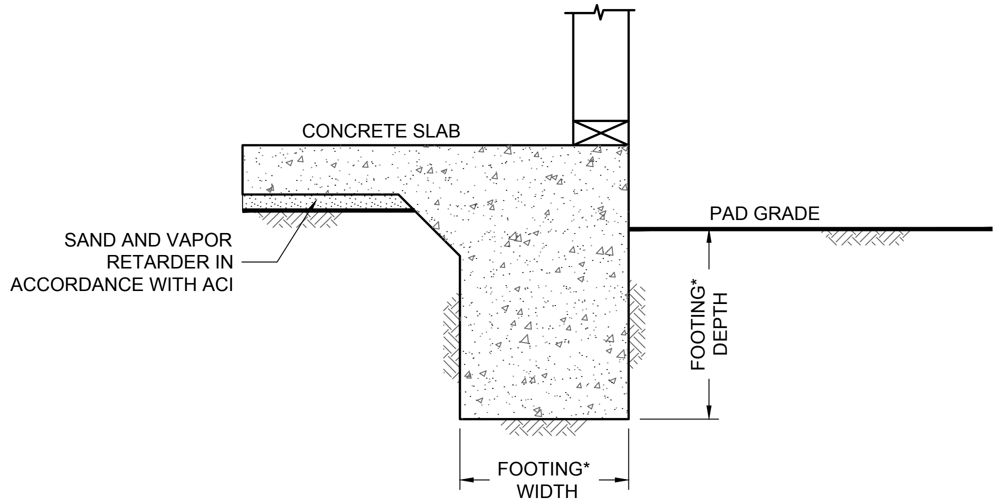
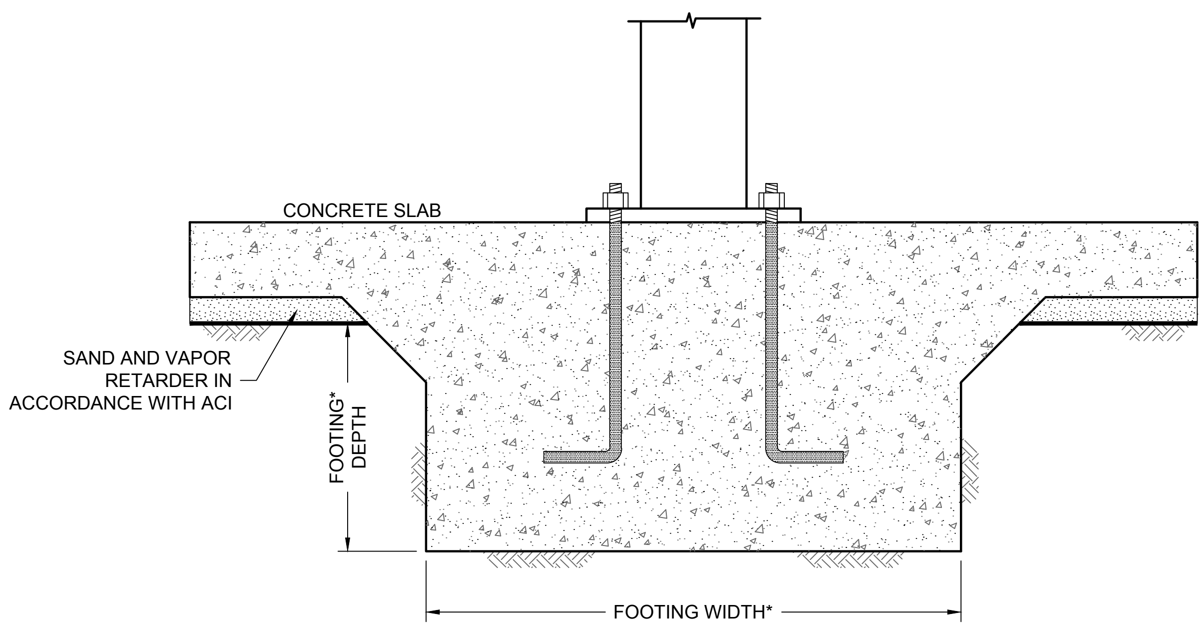
SOURCE: Kennedy P. Michael and Tan S. Siang, 2008, *Geologic Map of San Diego 30'x60' Quadrangle, California*
*U.S. Geological Survey, Department of Earth Sciences, University of California, Riverside*

REGIONAL GEOLOGIC MAP

PROJECT NO. G2500 - 32 - 01
FIGURE 3
DATE 03 - 04 - 2020




*....SEE REPORT FOR FOUNDATION WIDTH AND DEPTH RECOMMENDATION

NO SCALE

# WALL / COLUMN FOOTING DIMENSION DETAIL

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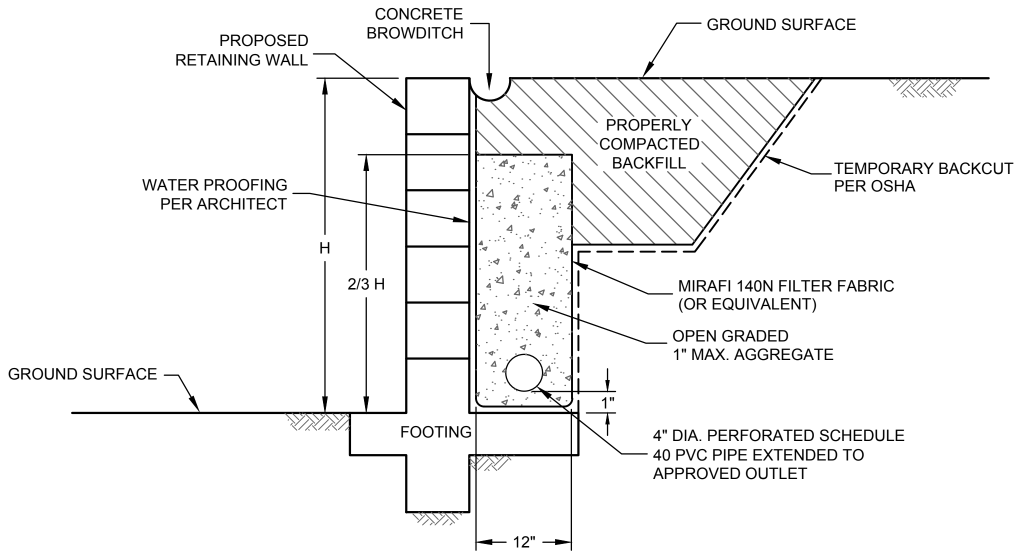
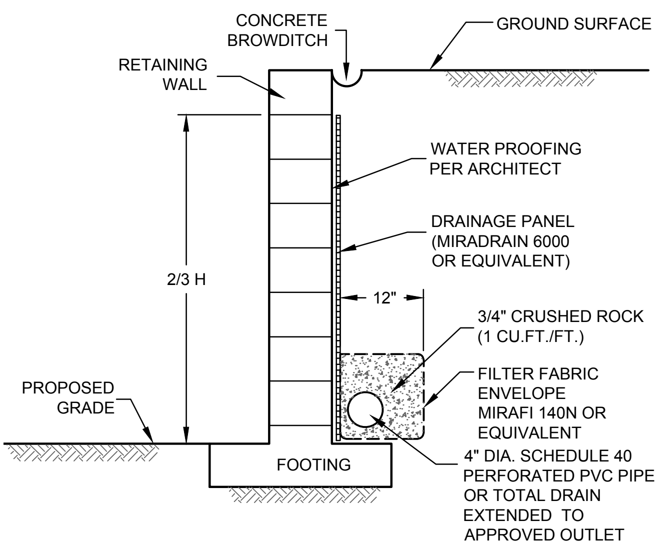
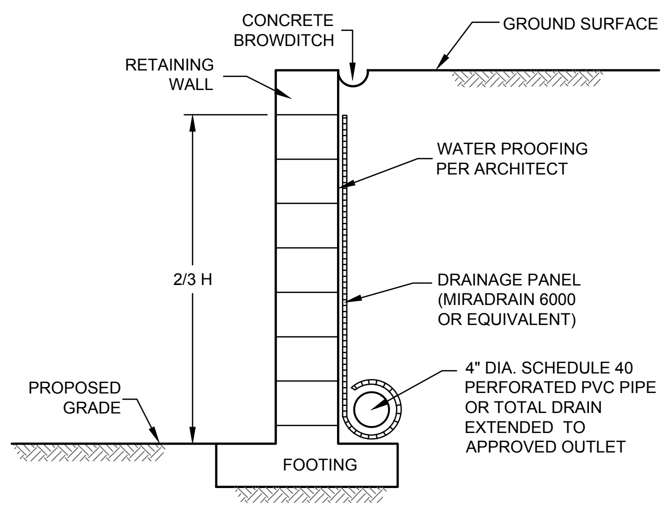
| | | | | | |
|---|---|---|---|---|---|
| DG / CW | | DSK/GTYPD | DATE 03 - 04 - 2020 | PROJECT NO. G2500 - 32 - 01 | FIG. 4 |




NOTE :

DRAIN SHOULD BE UNIFORMLY SLOPED TO GRAVITY OUTLET
OR TO A SUMP WHERE WATER CAN BE REMOVED BY PUMPING

NO SCALE

# TYPICAL RETAINING WALL DRAIN DETAIL

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| | | | | | |
|---|---|---|---|---|---|
| DG / CW | | DSK/GTYPD | DATE 03 - 04 - 2020 | PROJECT NO. G2500 - 32 - 01 | FIG. 5 |

Plotted:03/04/2020 7:26AM | By:JONATHAN WILKINS | File Location:Y:\PROJECTS\G2500-32-01 (8732 Prospect Ave)\DETAILS\Typical Retaining Wall Drainage Detail (RWDD7A).dwg

# APPENDIX A

## APPENDIX A

## FIELD INVESTIGATION

The field investigation was performed on January 31, 2020, and consisted of a visual site reconnaissance and advancing five exploratory trenches (Trench Nos. T-1 through T-5). In addition, 2 pavement cores and one infiltration test was performed. The approximate locations of the trenches, pavement cores, and infiltration test are shown on the *Geologic Map*, Figure 2. The infiltration test results are presented in Appendix C.

The exploratory trenches were performed by MCM Construction and advanced to a depth of approximately 8 feet using a John Deere 310L backhoe with a 24” bucket. Bulk samples were obtained for laboratory testing.

The soils encountered in the excavations were visually classified and logged in general accordance with American Society for Testing and Materials (ASTM) practice for Description and Identification of Soils (Visual Manual Procedure D 2488).

PROJECT NO. G2500-32-01

# TRENCH T 1

ELEV. (MSL.) **353'** DATE COMPLETED **01-31-2020**

EQUIPMENT **JD 310L BACKHOE** BY: **T. MYERS**

| DEPTH IN FEET | SAMPLE NO. | LITHOLOGY | GROUNDWATER | SOIL CLASS (USCS) | MATERIAL DESCRIPTION | PENETRATION RESISTANCE (BLOWS/FT.) | DRY DENSITY (P.C.F.) | MOISTURE CONTENT (%) |
|---|---|---|---|---|---|---|---|---|
| 0 | | | | SC | **TOPSOIL**<br>Loose, moist to very moist, brown, Clayey SAND | | | |
| | T1-1 | | | CH | **COLLUVIUM**<br>Very soft to soft, very moist, brown, fine to medium Sandy CLAY | | | |
| 2 | | | | | | | | |
| | | | | | -Becomes stiff, blocky, increase in coarse sand | | | |
| 4 | | | | | **WEATHERED GRANITIC ROCK**<br>Completely weathered, weak, light brown to orangish brown, GRANITIC ROCK, excavated as a clayey, fine to coarse sand with gravel and cobble (transition zone) | | | |
| | | | | | **GRANITIC ROCK**<br>Highly weathered, moderately weak, tan, orangish-brown, GRANITIC ROCK; excavates as silty, fine to coarse sand | | | |
| 6 | T1-2 | | | | | | | |
| 8 | | | | | TRENCH TERMINATED AT 8 FEET<br>Groundwater not encountered | | | |

**Figure A-1,**
**Log of Trench T 1, Page 1 of 1**

G2500-32-01.GPJ

SAMPLE SYMBOLS

- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

# TRENCH T 2

ELEV. (MSL.) 352' DATE COMPLETED 01-31-2020

EQUIPMENT JD 310L BACKHOE BY: T. MYERS

| DEPTH IN FEET | SAMPLE NO. | LITHOLOGY | GROUNDWATER | SOIL CLASS (USCS) | MATERIAL DESCRIPTION | PENETRATION RESISTANCE (BLOWS/FT.) | DRY DENSITY (P.C.F.) | MOISTURE CONTENT (%) |
|---|---|---|---|---|---|---|---|---|
| 0 | | | | SC | **TOPSOIL** Loose, moist, brown, Clayey, fine to medium SAND | | | |
| | | | | CH | **COLLUVIUM** Soft, moist, brown, fine to medium Sandy CLAY | | | |
| 2 | | | | SM | **GRANITIC ROCK** Highly weathered, moderately weak, black, orange and white, GRANITIC ROCK; excavates as silty, fine to coarse sand | | | |
| 4 | | | | | | | | |
| | | | | | TRENCH TERMINATED AT 5 FEET<br>Groundwater not encountered | | | |

**Figure A-2,**
**Log of Trench T 2, Page 1 of 1**

G2500-32-01.GPJ

SAMPLE SYMBOLS
- ... SAMPLING UNSUCCESSFUL
- ... STANDARD PENETRATION TEST
- ... DRIVE SAMPLE (UNDISTURBED)
- ... DISTURBED OR BAG SAMPLE
- ... CHUNK SAMPLE
- ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G2500-32-01

# TRENCH T 3

ELEV. (MSL.) **356'** DATE COMPLETED **01-31-2020**

EQUIPMENT **JD 310L BACKHOE** BY: **T. MYERS**

| DEPTH IN FEET | SAMPLE NO. | LITHOLOGY | GROUNDWATER | SOIL CLASS (USCS) | MATERIAL DESCRIPTION | PENETRATION RESISTANCE (BLOWS/FT.) | DRY DENSITY (P.C.F.) | MOISTURE CONTENT (%) |
|---|---|---|---|---|---|---|---|---|
| 0 | | | | SM | **TOPSOIL**<br>Loose, moist, reddish brown, Silty SAND | | | |
| | T3-1 | | | CH | **COLLUVIUM**<br>Soft, very moist, brown, fine to medium Sandy CLAY | | | |
| 2 | | | | | | | | |
| | T3-2 | | | | **GRANITIC ROCK**<br>Highly weathered, moderately weak, orange black and white, GRANITIC ROCK; excavates as silty, fine to coarse sand | | | |
| 4 | | | | | TRENCH TERMINATED AT 4 FEET<br>Groundwater not encountered | | | |

**Figure A-3,**
**Log of Trench T 3, Page 1 of 1**

G2500-32-01.GPJ

| SAMPLE SYMBOLS | | | |
|---|---|---|---|
| | ... SAMPLING UNSUCCESSFUL | ... STANDARD PENETRATION TEST | ... DRIVE SAMPLE (UNDISTURBED) |
| | ... DISTURBED OR BAG SAMPLE | ... CHUNK SAMPLE | ... WATER TABLE OR SEEPAGE |

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G2500-32-01

# TRENCH T 4

ELEV. (MSL.) **359'** DATE COMPLETED **01-31-2020**

EQUIPMENT **JD 310L BACKHOE** BY: **T. MYERS**

| DEPTH IN FEET | SAMPLE NO. | LITHOLOGY | GROUNDWATER | SOIL CLASS (USCS) | MATERIAL DESCRIPTION | PENETRATION RESISTANCE (BLOWS/FT.) | DRY DENSITY (P.C.F.) | MOISTURE CONTENT (%) |
|---|---|---|---|---|---|---|---|---|
| 0 | | | | SM | **TOPSOIL**<br>Loose, moist to very moist, brown, Clayey SAND | | | |
| | | | | CH | **COLLUVIUM**<br>Soft, very moist to wet, dark grayish brown, Sandy CLAY | | | |
| 2 | T4-1 | | | | | | | |
| | | | | | -Becomes stiff | | | |
| 4 | | | | | | | | |
| | | | | SM | **GRANITIC ROCK**<br>Highly weathered, moderately weak, yellowish brown, orange, black, GRANITIC ROCK; excavates as silty, fine to coarse sand | | | |
| 6 | | | | | | | | |

TRENCH TERMINATED AT 7.5 FEET
Groundwater not encountered

**Figure A-4,**
**Log of Trench T 4, Page 1 of 1**

G2500-32-01.GPJ

| SAMPLE SYMBOLS | | | |
|---|---|---|---|
| | ... SAMPLING UNSUCCESSFUL | ... STANDARD PENETRATION TEST | ... DRIVE SAMPLE (UNDISTURBED) |
| | ... DISTURBED OR BAG SAMPLE | ... CHUNK SAMPLE | ... WATER TABLE OR SEEPAGE |

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

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PROJECT NO. G2500-32-01

# TRENCH T 5

ELEV. (MSL.) **362'** DATE COMPLETED **01-31-2020**

EQUIPMENT **JD 310L BACKHOE** BY: **T. MYERS**

| DEPTH IN FEET | SAMPLE NO. | LITHOLOGY | GROUNDWATER | SOIL CLASS (USCS) | MATERIAL DESCRIPTION | PENETRATION RESISTANCE (BLOWS/FT.) | DRY DENSITY (P.C.F.) | MOISTURE CONTENT (%) |
|---|---|---|---|---|---|---|---|---|
| 0 | | | | SM | **TOPSOIL**<br>Loose, damp, yellowish-brown, Silty, fine to coarse SAND with gravel | | | |
| | | | | CH | **COLLUVIUM**<br>Soft, moist, dark grayish-brown, Sandy CLAY | | | |
| 2 | | | | | | | | |
| | | | | | -Becomes stiff to very stiff | | | |
| 4 | | | | | **GRANITIC ROCK**<br>Highly weathered, weak, yellowish-brown, GRANITIC ROCK; excavates as silty, fine to coarse sand | | | |
| 6 | | | | | TRENCH TERMINATED AT 6 FEET<br>Groundwater not encountered | | | |

**Figure A-5,**
**Log of Trench T 5, Page 1 of 1**

G2500-32-01.GPJ

SAMPLE SYMBOLS
... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

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# APPENDIX B

## APPENDIX B

## LABORATORY TESTING

We performed the laboratory tests in accordance with the current versions of the generally accepted American Society for Testing Materials (ASTM) procedures or other suggested procedures. We tested selected soil samples for the maximum dry density and optimum moisture content, shear strength, plasticity, R-Value, expansion index, and water-soluble sulfate characteristics. The results of our laboratory tests are presented on Tables B-I through B-V and Figures B-1 and B-2.

**TABLE B-I**
**SUMMARY OF LABORATORY MAXIMUM DRY DENSITY AND OPTIMUM MOISTURE CONTENT TEST RESULTS**
**ASTM D 1557**

| Sample No. | Description | Maximum Dry Density (pcf) | Optimum Moisture Content (% dry wt.) |
|---|---|---|---|
| T1-1 | Brown, Sandy CLAY with trace gravel | 117.1 | 11.5 |
| T3-2 | Light Brown, Silty, fine to coarse SAND | 128.9 | 10.7 |

**TABLE B-II**
**SUMMARY OF LABORATORY EXPANSION INDEX TEST RESULTS**
**ASTM D 4829**

| Sample No. | Moisture Content (%) | | Dry Density (pcf) | Expansion Index | 2019 CBC Expansion Classification | Expansion Classification |
|---|---|---|---|---|---|---|
| | Before Test | After Test | | | | |
| T1-1 | 14.2 | 34.6 | 95.7 | 115 | Expansive | High |
| T4-1 | 15.3 | 37.3 | 92.0 | 127 | Expansive | High |

**TABLE B-III**
**SUMMARY OF LABORATORY WATER-SOLUBLE SULFATE TEST RESULTS**
**CALIFORNIA TEST NO. 417**

| Sample No. | Water-Soluble Sulfate (%) | Classification |
|---|---|---|
| T1-1 | 0.001 | Not Applicable (S0) |

**TABLE B-IV**
**SUMMARY OF LABORATORY PLASTICITY INDEX TEST RESULTS**

| Sample No. | Liquid Limit (LL) | Plastic Limit (PL) | Plasticity Index (PI) | Unified Soil Classification (Group Symbol) |
|---|---|---|---|---|
| T1-1 | 67 | 19 | 48 | CH |

**TABLE B -V**
**SUMMARY OF LABORATORY R-VALUE TEST RESULTS**

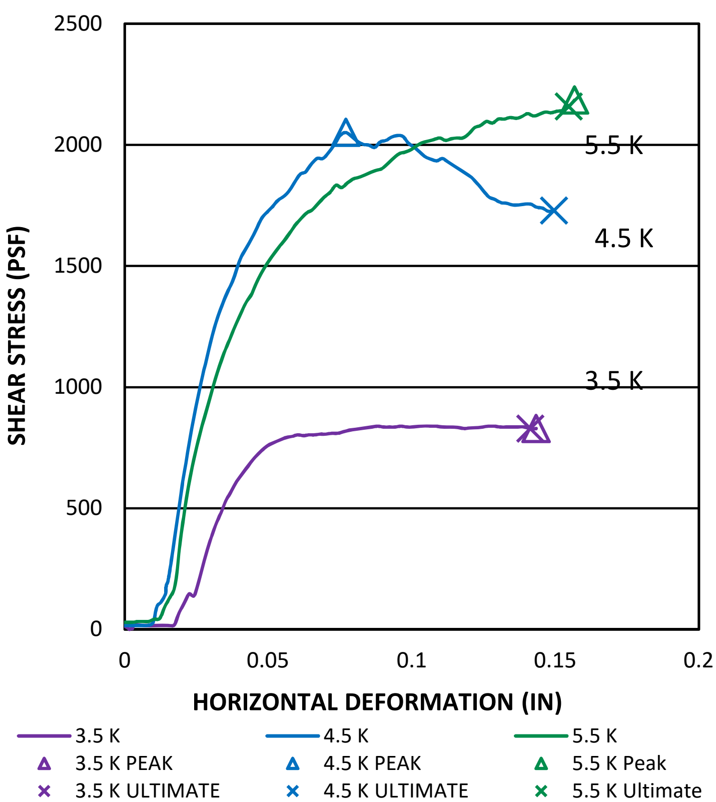
| Sample No. | Location | R-Value |
|---|---|---|
| C-1 | Prospect Avenue | < 5 |
| C-2 | Prospect Avenue | 40 |

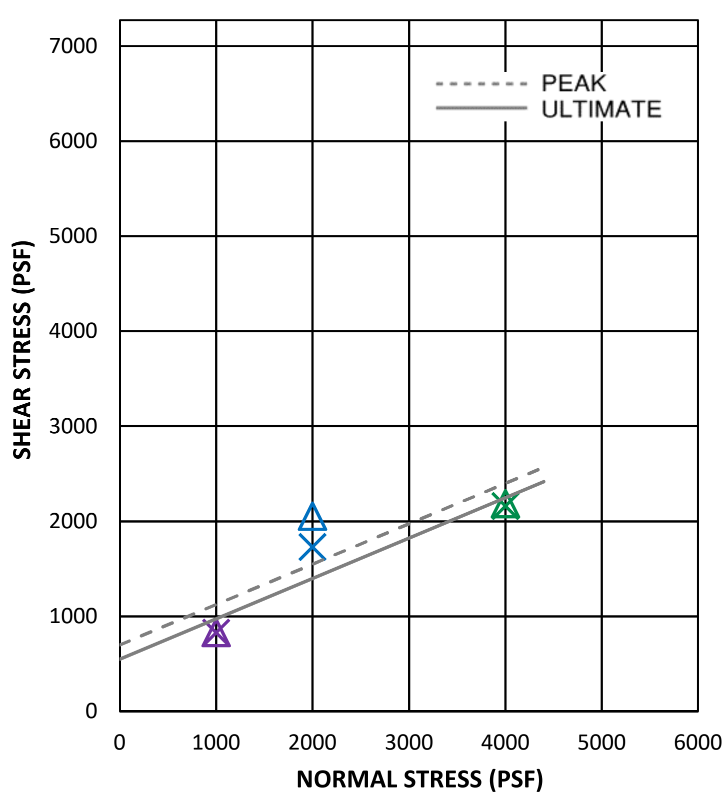
| SAMPLE NO.: | T1-1 | GEOLOGIC UNIT: | Qcol |
|---|---|---|---|
| SAMPLE DEPTH (FT): | 2 | NATURAL/REMOLDED: | R |

| INITIAL CONDITIONS | | | | |
|---|---|---|---|---|
| NORMAL STRESS TEST LOAD | 3.5 K | 4.5 K | 5.5 K | AVERAGE |
| ACTUAL NORMAL STRESS (PSF): | 1000 | 2000 | 4000 | -- |
| WATER CONTENT (%): | 13.5 | 11.4 | 12.9 | 12.6 |
| DRY DENSITY (PCF): | 102.8 | 104.7 | 103.4 | 103.6 |

| AFTER TEST CONDITIONS | | | | |
|---|---|---|---|---|
| NORMAL STRESS TEST LOAD | 1 K | 2 K | 4 K | AVERAGE |
| WATER CONTENT (%): | 25.3 | 25.5 | 27.5 | 26.1 |
| PEAK SHEAR STRESS (PSF): | 829 | 2051 | 2184 | -- |
| ULT.-E.O.T. SHEAR STRESS (PSF): | 829 | 1729 | 2158 | -- |

| RESULTS | | |
|---|---|---|
| PEAK | COHESION, C (PSF) | 700 |
| | FRICTION ANGLE (DEGREES) | 23 |
| ULTIMATE | COHESION, C (PSF) | 550 |
| | FRICTION ANGLE (DEGREES) | 23 |

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**DIRECT SHEAR - ASTM D 3080**

**8732 PROSPECT AVE, SANTEE, CA**

**PROJECT NO.: G2500-32-01**

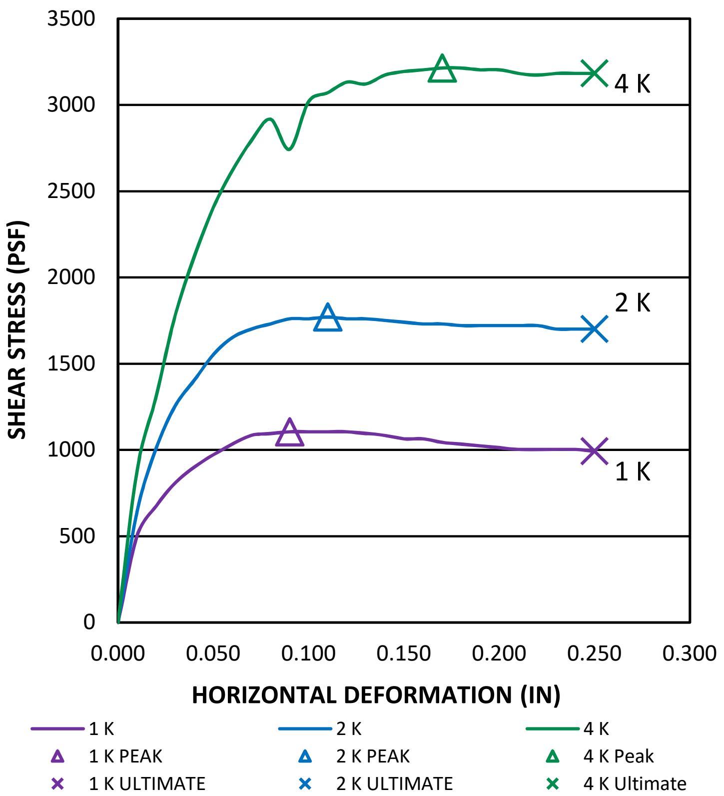
**FIGURE B-1**

| SAMPLE NO.: | T3-2 | GEOLOGIC UNIT: | Kt |
|---|---|---|---|
| SAMPLE DEPTH (FT): | 3 | NATURAL/REMOLDED: | R |

| INITIAL CONDITIONS | | | | |
|---|---|---|---|---|
| NORMAL STRESS TEST LOAD | 1 K | 2 K | 4 K | AVERAGE |
| ACTUAL NORMAL STRESS (PSF): | 890 | 2030 | 4300 | -- |
| WATER CONTENT (%): | 9.6 | 9.0 | 9.5 | 9.4 |
| DRY DENSITY (PCF): | 117.5 | 114.7 | 117.6 | 116.6 |

| AFTER TEST CONDITIONS | | | | |
|---|---|---|---|---|
| NORMAL STRESS TEST LOAD | 1 K | 2 K | 4 K | AVERAGE |
| WATER CONTENT (%): | 14.9 | 15.1 | 15.1 | 15.0 |
| PEAK SHEAR STRESS (PSF): | 1105 | 1770 | 3214 | -- |
| ULT.-E.O.T. SHEAR STRESS (PSF): | 993 | 1701 | 3183 | -- |

| RESULTS | | |
|---|---|---|
| PEAK | COHESION, C (PSF) | 500 |
| | FRICTION ANGLE (DEGREES) | 32 |
| ULTIMATE | COHESION, C (PSF) | 400 |
| | FRICTION ANGLE (DEGREES) | 32 |



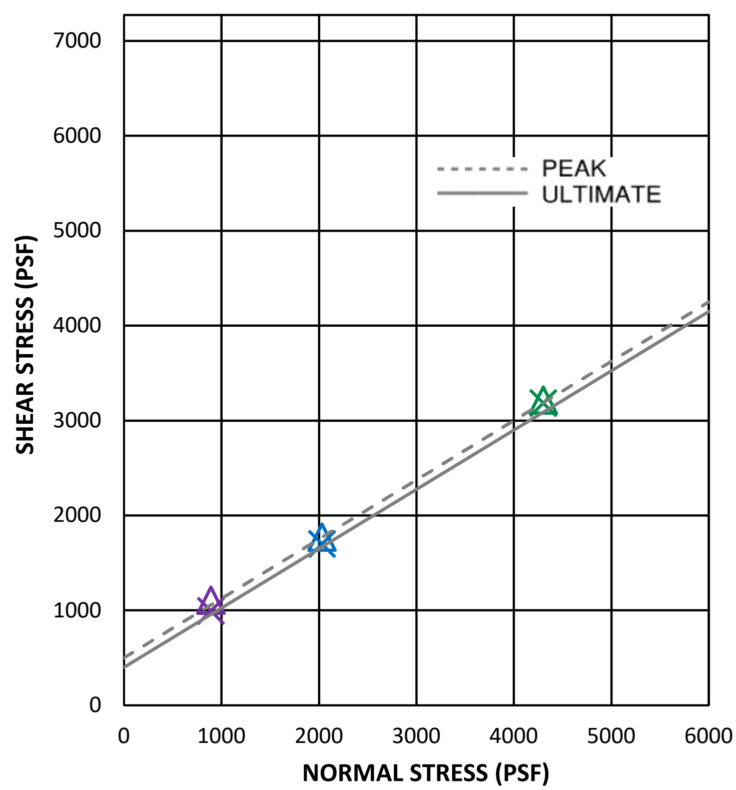





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**FIGURE B-2**

# APPENDIX C

# APPENDIX C

# STORM WATER MANAGEMENT INVESTIGATION

# FOR

# 8732 PROSPECT AVENUE
# SAN DIEGO, CALIFORNIA

# PROJECT NO. G2500-32-01

## APPENDIX C

## STORM WATER MANAGEMENT INVESTIGATION

We understand storm water management devices are being proposed in accordance with the *2016 City of Santee BMP Design Manual for Permanent Site Design, Storm Water Treatment and Hydromodification Management*, commonly referred to as the *Storm Water Standards* (SWS). If not properly constructed, there is a potential for distress to improvements and properties located hydrologically down gradient or adjacent to these devices. Factors such as the amount of water to be detained, its residence time, and soil permeability have an important effect on seepage transmission and the potential adverse impacts that may occur if the storm water management features are not properly designed and constructed. We have not performed a hydrogeological study at the site. If infiltration of storm water runoff occurs, downstream properties may be subjected to seeps, springs, slope instability, raised groundwater, movement of foundations and slabs, or other undesirable impacts as a result of water infiltration.

### Hydrologic Soil Group

The United States Department of Agriculture (USDA), Natural Resources Conservation Services, possesses general information regarding the existing soil conditions for areas within the United States. The USDA website also provides the Hydrologic Soil Group. Table C-1 presents the descriptions of the hydrologic soil groups. In addition, the USDA website also provides an estimated saturated hydraulic conductivity for the existing soil.

**TABLE C-1**
**HYDROLOGIC SOIL GROUP DEFINITIONS**

| Soil Group | Soil Group Definition |
|---|---|
| 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. |
| 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. |
| 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. |
| 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. |

The property is underlain by one unit identified as Diablo Clay (DaC). The Diablo Clay is classified as belonging to Hydrologic Soil Group D. Table C-2 presents the information from the USDA website for the property.

**TABLE C-2**
**USDA WEB SOIL SURVEY – HYDROLOGIC SOIL GROUP**

| Map Unit Name | Map Unit Symbol | Approximate Percentage of Property | Hydrologic Soil Group | $k_{SAT}$ of Most Limiting Layer (inches/hour) |
|---|---|---|---|---|
| Diablo Clay | DaC | 100 | D | 0.06 – 0.20 |

## In-Situ Testing

The infiltration rate, percolation rates and saturated hydraulic conductivity are different and have different meanings. Percolation rates tend to overestimate infiltration rates and saturated hydraulic conductivities by a factor of 10 or more. Table C-3 describes the differences in the definitions.

**TABLE C-3**
**SOIL PERMEABILITY DEFINITIONS**

| Term | Definition |
|---|---|
| Infiltration Rate | The observation of the flow of water through a material into the ground downward into a given soil structure under long term conditions. This is a function of layering of soil, density, pore space, discontinuities and initial moisture content. |
| Percolation Rate | The observation of the flow of water through a material into the ground downward and laterally into a given soil structure under long term conditions. This is a function of layering of soil, density, pore space, discontinuities and initial moisture content. |
| Saturated Hydraulic Conductivity ($k_{SAT}$, Permeability) | The volume of water that will move in a porous medium under a hydraulic gradient through a unit area. This is a function of density, structure, stratification, fines content and discontinuities. It is also a function of the properties of the liquid as well as of the porous medium. |

The degree of soil compaction or in-situ density has a significant impact on soil permeability and infiltration. Based on our experience and other studies we performed, an increase in compaction results in a decrease in soil permeability.

We performed one Aardvark Permeameter Test at location shown on the attached *Geologic Map*, Figure 2. The test boring was 4 inches in diameter. The results of the test provide parameters for the saturated hydraulic conductivity characteristics of onsite colluvial soil/granitic rock. Table C-4 presents the results of the estimated field saturated hydraulic conductivity and estimated infiltration rates obtained from the Aardvark Permeameter test. The test results are attached herein. We applied a feasibility factor of safety of 2 to the field results for use in preparation of Worksheet C.4-1. The results of the testing indicate an adjusted soil infiltration rate of 0.004 inches per hour (iph) after applying a Factor of Safety of 2. Based on a discussion in the County of Riverside *Design Handbook for Low Impact Development Best Management Practices*, the infiltration rate should be considered equal to the saturated hydraulic conductivity rate.

**TABLE C-4**
**FIELD PERMEAMETER INFILTRATION TEST RESULTS**

| Test No. | Geologic Unit | Test Depth (feet) | Field-Saturated Hydraulic Conductivity, $k_{sat}$ (inch/hour) | Worksheet[1] Saturated Hydraulic Conductivity, $k_{sat}$ (inch/hour) |
|---|---|---|---|---|
| I-1 | Qcol/Kt | 2.2 | 0.007 | 0.004 |

[1] Using a factor of safety of 2 for Worksheet C.4-1.

## STORM WATER MANAGEMENT CONCLUSIONS

The *Geologic Map*, Figure 2, depicts the existing property, proposed development, the approximate lateral limits of the geologic units, the locations of the field excavations and the in-situ infiltration test locations.

### Soil Types

**Proposed Compacted Fill** – Compacted fill will be placed across the entire property during site development. Proposed remedial grading will consist of removing the surficial soils and replacement as compacted fill. The proposed storm water BMP's will be founded in compacted fill placed above formational materials consisting of granitic rock. The compacted fill will be comprised of the onsite clay and imported granular soils. The fill will be compacted to a dry density of at least 90 percent of the laboratory maximum dry density. In our experience, compacted fill does not possess infiltration rates appropriate for infiltration BMP's. Hazards that occur as a result of fill soil saturation include a potential for hydro-consolidation of the granular fill soils, long term fill settlement, differential fill settlement, and lateral movement associated with saturated fill relaxation. The potential for lateral water migration to adversely impact existing or proposed structures, foundations, utilities, and roadways, is high. Therefore, full infiltration should be considered infeasible.

Section D.4.2 of the *2016 Storm Water Standards* (SWS) provides a discussion regarding fill materials used for infiltration. The SWS states:

- For engineered fills, infiltration rates may still be quite uncertain due to layering and heterogeneities introduced as part of construction that cannot be precisely controlled. Due to these uncertainties, full infiltration should be considered geotechnically infeasible and liners and subdrains should be used in areas where infiltration BMP's are founded in compacted fill.

- *Where possible, infiltration BMPs on fill material should be designed such that their infiltrating surface extends into native soils.* Full and partial infiltration should be considered geotechnically infeasible within the compacted fill and liners and subdrains should be used.

- *Because of the uncertainty of fill parameters as well as potential compaction of the native soils, an infiltration BMP may not be feasible.* Therefore, full infiltration should be considered geotechnically infeasible.

**Granitic Rock –** Cretaceous-age granitic rock is expected to be exposed beneath the compacted fill. Granitic rock is very dense and exhibits very slow infiltration rates.

## Infiltration Rates

The infiltration rate (including the feasibility factor of safety of 2) was measured to be 0.004 inches per hour. Therefore, based on the results of the infiltration testing, full and partial infiltration should be considered feasible.

## Groundwater Elevations

Groundwater is not expected to be encountered or within 10 feet from the bottom of a storm water BMP. In accordance with the 2016 SWS, groundwater must be at least 10 feet below the bottom of the basin for infiltration BMP's to be allowed. Therefore, full and partial infiltration BMP's are considered feasible based on the groundwater elevations.

## Soil or Groundwater Contamination

No soil or groundwater contamination is known to exist on or adjacent to the property.

## New or Existing Utilities

We expect that any existing on-site utilities would be removed prior to site development. Full or partial infiltration near existing or proposed utilities should be avoided to prevent lateral water migration into the permeable trench backfill materials.

## Existing and Planned Structures

The property is surrounded by residential developments to the west and north, a private roadway to the east, and a public roadway to the south. Four residences are planned in close proximity to the proposed BMP's. Drainage will flow to the north towards proposed onsite and existing neighboring residences. The potential for lateral water migration to adversely impact existing and proposed structures and improvements is high.

## Slopes

The property slopes to the north towards existing residential developments. Lateral water migration and daylight water seepage on on-site and neighboring properties could occur as a result of infiltration BMP's.

## Recommendations

Due to the highly expansive soils, depth to encounter relatively impervious granitic rock, and close proximity to planned structures, full or partial infiltration is considered infeasible and liners and subdrains should be incorporated into the design and construction of the planned storm water devices. The liners should be impermeable (e.g. High-density polyethylene, HDPE, with a thickness of about 30 mil or equivalent Polyvinyl Chloride, PVC) to prevent water migration. The subdrains should be perforated within the liner area, installed at the base and above the liner, be at least 4 inches in diameter and consist of Schedule 40 PVC pipe. The subdrains outside of the liner should consist of solid pipe. Seams and penetrations of the liners should be properly waterproofed. The subdrains should be connected to a proper outlet. The devices should also be installed in accordance with the manufacturer's recommendations.

## Storm Water Standard Worksheets

The SWS requests the geotechnical engineer complete the *Categorization of Infiltration Feasibility Condition* (Worksheet C.4-1 or I-8) worksheet information to help evaluate the potential for infiltration on the property. The attached Worksheet C.4-1 presents the completed information for the submittal process.

The regional storm water standards also have a worksheet (Worksheet D.5-1 or Form I-9) that helps the project civil engineer estimate the factor of safety based on several factors. Table C-5 describes the suitability assessment input parameters related to the geotechnical engineering aspects for the factor of safety determination.

**TABLE C-5**
**SUITABILITY ASSESSMENT RELATED CONSIDERATIONS FOR INFILTRATION FACILITY SAFETY FACTORS**

| Consideration | High Concern – 3 Points | Medium Concern – 2 Points | Low Concern – 1 Point |
|---|---|---|---|
| Assessment Methods | Use of soil survey maps or simple texture analysis to estimate short-term infiltration rates. Use of well permeameter or borehole methods without accompanying continuous boring log. Relatively sparse testing with direct infiltration methods | Use of well permeameter or borehole methods with accompanying continuous boring log. Direct measurement of infiltration area with localized infiltration measurement methods (e.g., Infiltrometer). Moderate spatial resolution | Direct measurement with localized (i.e. small-scale) infiltration testing methods at relatively high resolution or use of extensive test pit infiltration measurement methods. |
| Predominant Soil Texture | Silty and clayey soils with significant fines | Loamy soils | Granular to slightly loamy soils |
| Site Soil Variability | Highly variable soils indicated from site assessment or unknown variability | Soil boring/test pits indicate moderately homogenous soils | Soil boring/test pits indicate relatively homogenous soils |
| Depth to Groundwater/ Impervious Layer | <5 feet below facility bottom | 5-15 feet below facility bottom | >15 feet below facility bottom |

Based on our geotechnical investigation and the information in Table C-5, Table C-6 presents the estimated factor values for the evaluation of the factor of safety. This table only provides the suitability assessment safety factor (Part A) of the worksheet. The project civil engineer should evaluate the safety factor for design (Part B) and use the combined safety factor for the design infiltration rate.

**TABLE C-6**
**FACTOR OF SAFETY WORKSHEET DESIGN VALUES – PART A[1]**

| Suitability Assessment Factor Category | Assigned Weight (w) | Factor Value (v) | Product (p = w x v) |
|---|---|---|---|
| Assessment Methods | 0.25 | 3 | 0.75 |
| Predominant Soil Texture | 0.25 | 3 | 0.75 |
| Site Soil Variability | 0.25 | 1 | 0.25 |
| Depth to Groundwater/ Impervious Layer | 0.25 | 1 | 0.25 |
| Suitability Assessment Safety Factor, $S_A = \sum p$ | | | 2.00 |

[1] The project civil engineer should complete Worksheet D.5-1 or Form I-9 using the data on this table. Additional information is required to evaluate the design factor of safety.

8732 Prospect Ave, Santee, CA

| Categorization of Infiltration Feasibility Condition | | | Worksheet C.4-1 |
|---|---|---|---|
| **Part 1 - Full Infiltration Feasibility Screening Criteria**<br>**Would infiltration of the full design volume be feasible from a physical perspective without any undesirable consequences that cannot be reasonably mitigated?** | | | |
| Criteria | Screening Question | Yes | No |
| 1 | **Is the estimated reliable infiltration rate below proposed facility locations greater than 0.5 inches per hour?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D. | | X |
| Provide basis:<br>Based on information collected from the USDA NRCS website, the site is underlain with Diablo Clay (DaC) which is classified as Hydrologic Soil Group D, which is not considered suitable for infiltration BMP's. The onsite surficial soils are highly expansive. The site will be graded with compacted fill placed over granitic rock. Infiltration BMP's supported by compacted fill are not recommended due to the increased potential for soil saturation, heaving of expansive soils, settlement of granular fill soils, lateral water migration, and daylight water seepage on down gradient properties. The underlying granitic rock is considered practically impermeable.<br><br>Infiltration testing indicates an unfactored infiltration rate of 0.014 inches per hour (iph). Using a factor of safety of 2, the factored infiltration rate is 0.007 iph, which is below the minimum threshold for full infiltration. | | | |
| 2 | **Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2. | | X |
| Provide basis:<br><br>The property slopes to the north towards existing residential developments. Infiltration of storm water may result in lateral water migration, daylight water seepage on slopes, and slope instability. The underlying the on-site and off-site soils are highly expansive and water infiltration may result in distress to proposed and existing private and public improvements. | | | |

| Worksheet C.4-1 Page 2 of 4 | | | |
|---|---|---|---|
| Criteria | Screening Question | **Yes** | **No** |
| 3 | **Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of groundwater contamination (shallow water table, storm water pollutants or other factors) that cannot be mitigated to an acceptable level?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3. | X | |
| Provide basis:<br><br>Groundwater is not located within 10 feet from the bottom of the any storm water BMP, therefore the risk of storm water infiltration BMP's adversely impacting groundwater is considered negligible. | | | |
| 4 | **Can infiltration greater than 0.5 inches per hour be allowed without causing potential water balance issues such as change of seasonality of ephemeral streams or increased discharge of contaminated groundwater to surface waters?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3. | X | |
| Provide basis:<br><br>It is our opinion there are no adverse impacts to groundwater, water balance impacts to stream flow, or impacts on any downstream water rights. It should be noted that researching downstream water rights or evaluating water balance issues to stream flows is beyond the scope of the geotechnical consultant. | | | |
| **Part 1 Result*** | If all answers to rows 1 - 4 are "**Yes**" a full infiltration design is potentially feasible. The feasibility screening category is **Full Infiltration**<br><br>If any answer from row 1-4 is "**No**", infiltration may be possible to some extent but would not generally be feasible or desirable to achieve a "full infiltration" design. Proceed to Part 2 | | No Infiltration |

*To be completed using gathered site information and best professional judgment considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by the City to substantiate findings.

| Worksheet C.4-1 Page 3 of 4 | | | |
|---|---|---|---|
| **<u>Part 2 – Partial Infiltration vs. No Infiltration Feasibility Screening Criteria</u>**<br><br>**Would infiltration of water in any appreciable amount be physically feasible without any negative consequences that cannot be reasonably mitigated?** | | | |
| Criteria | Screening Question | **Yes** | **No** |
| 5 | **Do soil and geologic conditions allow for infiltration in any appreciable rate or volume?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D. | | X |
| Provide basis:<br>Based on information collected from the USDA NRCS website, the site is underlain with Diablo Clay (DaC) which is classified as Hydrologic Soil Group D, which is not considered suitable for infiltration BMP's. The onsite surficial soils are highly expansive. The site will be graded with compacted fill placed over granitic rock. Infiltration BMP's supported by compacted fill are not recommended due to the increased potential for soil saturation, heaving of expansive soils, settlement of granular fill soils, lateral water migration, and daylight water seepage on down gradient properties. The underlying granitic rock is considered practically impermeable.<br><br>Infiltration testing indicates an unfactored infiltration rate of 0.014 inches per hour (iph). Using a factor of safety of 2, the factored infiltration rate is 0.007 iph, which is considered too slow for infiltration BMP's. | | | |
| 6 | **Can Infiltration in any appreciable quantity be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2. | | X |
| Provide basis:<br><br>The property slopes to the north towards existing residential developments. Infiltration of storm water may result in lateral water migration, daylight water seepage on slopes, and slope instability. The underlying the on-site and off-site soils are highly expansive and water infiltration may result in distress to proposed and existing private and public improvements. | | | |

<table>
<tr><th colspan="4">Worksheet C.4-1 Page 4 of 4</th></tr>
<tr><th>Criteria</th><th>Screening Question</th><th>Yes</th><th>No</th></tr>
<tr><td>7</td><td>Can Infiltration in any appreciable quantity be allowed without posing significant risk for groundwater related concerns (shallow water table, storm water pollutants or other factors)? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.</td><td>X</td><td></td></tr>
<tr><td colspan="4">Provide basis:<br><br>Groundwater is not located within 10 feet from the bottom of any storm water BMP, therefore the risk of storm water infiltration BMP's adversely impacting groundwater is considered negligible.</td></tr>
<tr><td>8</td><td>Can infiltration be allowed without violating downstream water rights? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.</td><td>X</td><td></td></tr>
<tr><td colspan="4">Provide basis:<br><br>Geocon is not aware of any downstream water rights that would be affected by incidental infiltration of storm water. Researching downstream water rights is beyond the scope of the geotechnical consultant.</td></tr>
<tr><td>Part 2 Result*</td><td colspan="2">If all answers from row 1-4 are yes then partial infiltration design is potentially feasible. The feasibility screening category is Partial Infiltration.<br><br>If any answer from row 5-8 is no, then infiltration of any volume is considered to be infeasible within the drainage area. The feasibility screening category is No Infiltration.</td><td>No Infiltration</td></tr>
</table>

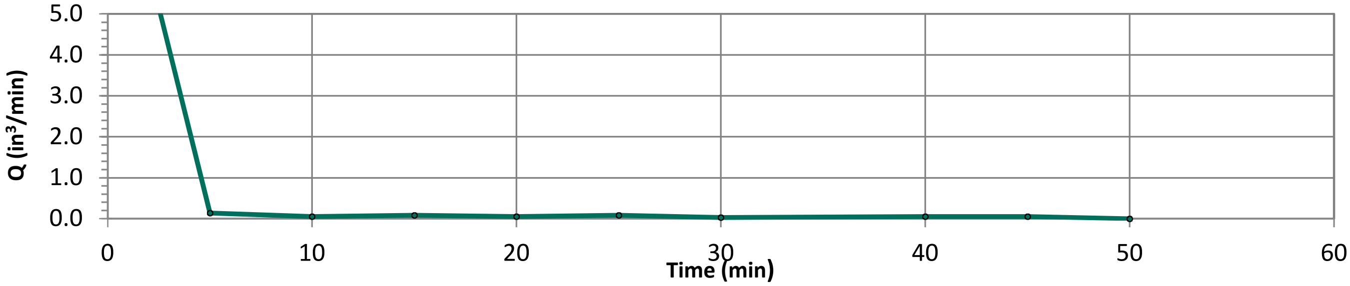
*To be completed using gathered site information and best professional judgment considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by the City to substantiate findings.

TEST NO.: **I-1** GEOLOGIC UNIT: **Qcol**

EXCAVATION ELEVATION (MSL, FT): **352**

| TEST INFORMATION | |
|---|---|
| BOREHOLE DIAMETER (IN): | 4 |
| BOREHOLE DEPTH (FT): | 2.2 |
| TEST/BOTTOM ELEVATION (MSL, FT): | 350 |
| MEASURED HEAD HEIGHT (IN): | 4.5 |
| CALCULATED HEAD HEIGHT (IN): | 4.8 |
| FACTOR OF SAFETY: | 2.0 |

| TEST RESULTS | |
|---|---|
| STEADY FLOW RATE ($IN^3$/MIN): | **0.055** |
| FIELD-SATURATED INFILTRATION RATE (IN/HR): | **0.014** |
| FACTORED INFILTRATION RATE (IN/HR): | **0.007** |




| TEST DATA | | | | |
|---|---|---|---|---|
| Reading | Time Elapsed (min) | Water Weight Consumed (lbs) | Water Volume Consumed ($in^3$) | Q ($in^3$/min) |
| 1 | 0.00 | 0.000 | 0.00 | 0.00 |
| 2 | 5.00 | 1.835 | 50.82 | 10.163 |
| 3 | 5.00 | 0.025 | 0.69 | 0.138 |
| 4 | 5.00 | 0.010 | 0.28 | 0.055 |
| 5 | 5.00 | 0.015 | 0.42 | 0.083 |
| 6 | 5.00 | 0.010 | 0.28 | 0.055 |
| 7 | 5.00 | 0.015 | 0.42 | 0.083 |
| 8 | 10.00 | 0.010 | 0.28 | 0.028 |
| 9 | 5.00 | 0.010 | 0.28 | 0.055 |
| 10 | 5.00 | 0.010 | 0.28 | 0.055 |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**AARDVARK PERMEAMETER TEST RESULTS**

**8732 Prospect Ave, Santee, CA**

**PROJECT NO.: G2500-32-01**

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

# Custom Soil Resource Report for

# San Diego County Area, California

## 8732 Prospect Avenue


February 18, 2020

# Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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# Contents

# How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

# Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map

## MAP LEGEND

**Area of Interest (AOI)**

Area of Interest (AOI)

**Soils**

Soil Map Unit Polygons

Soil Map Unit Lines

Soil Map Unit Points

**Special Point Features**

Blowout

Borrow Pit

Clay Spot

Closed Depression

Gravel Pit

Gravelly Spot

Landfill

Lava Flow

Marsh or swamp

Mine or Quarry

Miscellaneous Water

Perennial Water

Rock Outcrop

Saline Spot

Sandy Spot

Severely Eroded Spot

Sinkhole

Slide or Slip

Sodic Spot

Spoil Area

Stony Spot

Very Stony Spot

Wet Spot

Other

Special Line Features

**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 14, Sep 16, 2019

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

Date(s) aerial images were photographed: Dec 7, 2014—Jan 4, 2015

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.

# Map Unit Legend

| Map Unit Symbol | Map Unit Name | Acres in AOI | Percent of AOI |
|---|---|---|---|
| DaC | Diablo clay, 2 to 9 percent slopes | 0.8 | 100.0% |
| **Totals for Area of Interest** | | **0.8** | **100.0%** |

# Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

# San Diego County Area, California

## DaC—Diablo clay, 2 to 9 percent slopes

### Map Unit Setting

*National map unit symbol:* hbb8
*Elevation:* 30 to 3,000 feet
*Mean annual precipitation:* 12 to 35 inches
*Mean annual air temperature:* 57 to 61 degrees F
*Frost-free period:* 200 to 320 days
*Farmland classification:* Farmland of statewide importance

### Map Unit Composition

*Diablo and similar soils:* 85 percent
*Minor components:* 15 percent
*Estimates are based on observations, descriptions, and transects of the mapunit.*

### Description of Diablo

#### Setting

*Landform:* Hillslopes
*Landform position (two-dimensional):* Backslope
*Landform position (three-dimensional):* Side slope
*Down-slope shape:* Convex
*Across-slope shape:* Convex
*Parent material:* Calcareous sandstone and shale

#### Typical profile

*H1 - 0 to 15 inches:* clay
*H2 - 15 to 32 inches:* clay, silty clay loam
*H2 - 15 to 32 inches:* weathered bedrock
*H3 - 32 to 36 inches:*

#### Properties and qualities

*Slope:* 2 to 9 percent
*Depth to restrictive feature:* 24 to 40 inches to paralithic bedrock
*Natural drainage class:* Well drained
*Runoff class:* Very high
*Capacity of the most limiting layer to transmit water (Ksat):* Moderately low to moderately high (0.06 to 0.20 in/hr)
*Depth to water table:* More than 80 inches
*Frequency of flooding:* None
*Frequency of ponding:* None
*Calcium carbonate, maximum in profile:* 10 percent
*Available water storage in profile:* Moderate (about 7.7 inches)

#### Interpretive groups

*Land capability classification (irrigated):* 3e
*Land capability classification (nonirrigated):* 3e
*Hydrologic Soil Group:* D
*Hydric soil rating:* No

### Minor Components

#### Altamont

*Percent of map unit:* 10 percent

*Hydric soil rating:* No

**Linne**

*Percent of map unit:* 3 percent
*Hydric soil rating:* No

**Olivenhain**

*Percent of map unit:* 2 percent
*Hydric soil rating:* No

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# APPENDIX D

# APPENDIX D

# RECOMMENDED GRADING SPECIFICATIONS

# FOR

# 8732 PROSPECT AVENUE
# SAN DIEGO, CALIFORNIA

# PROJECT NO. G2500-32-01

# RECOMMENDED GRADING SPECIFICATIONS

## 1. GENERAL

1.1 These Recommended Grading Specifications shall be used in conjunction with the Geotechnical Report for the project prepared by Geocon. The recommendations contained in the text of the Geotechnical Report are a part of the earthwork and grading specifications and shall supersede the provisions contained hereinafter in the case of conflict.

1.2 Prior to the commencement of grading, a geotechnical consultant (Consultant) shall be employed for the purpose of observing earthwork procedures and testing the fills for substantial conformance with the recommendations of the Geotechnical Report and these specifications. The Consultant should provide adequate testing and observation services so that they may assess whether, in their opinion, the work was performed in substantial conformance with these specifications. It shall be the responsibility of the Contractor to assist the Consultant and keep them apprised of work schedules and changes so that personnel may be scheduled accordingly.

1.3 It shall be the sole responsibility of the Contractor to provide adequate equipment and methods to accomplish the work in accordance with applicable grading codes or agency ordinances, these specifications and the approved grading plans. If, in the opinion of the Consultant, unsatisfactory conditions such as questionable soil materials, poor moisture condition, inadequate compaction, and/or adverse weather result in a quality of work not in conformance with these specifications, the Consultant will be empowered to reject the work and recommend to the Owner that grading be stopped until the unacceptable conditions are corrected.

## 2. DEFINITIONS

2.1 **Owner** shall refer to the owner of the property or the entity on whose behalf the grading work is being performed and who has contracted with the Contractor to have grading performed.

2.2 **Contractor** shall refer to the Contractor performing the site grading work.

2.3 **Civil Engineer** or **Engineer of Work** shall refer to the California licensed Civil Engineer or consulting firm responsible for preparation of the grading plans, surveying and verifying as-graded topography.

2.4 **Consultant** shall refer to the soil engineering and engineering geology consulting firm retained to provide geotechnical services for the project.

2.5 **Soil Engineer** shall refer to a California licensed Civil Engineer retained by the Owner, who is experienced in the practice of geotechnical engineering. The Soil Engineer shall be responsible for having qualified representatives on-site to observe and test the Contractor's work for conformance with these specifications.

2.6 **Engineering Geologist** shall refer to a California licensed Engineering Geologist retained by the Owner to provide geologic observations and recommendations during the site grading.

2.7 **Geotechnical Report** shall refer to a soil report (including all addenda) which may include a geologic reconnaissance or geologic investigation that was prepared specifically for the development of the project for which these Recommended Grading Specifications are intended to apply.

## 3. MATERIALS

3.1 Materials for compacted fill shall consist of any soil excavated from the cut areas or imported to the site that, in the opinion of the Consultant, is suitable for use in construction of fills. In general, fill materials can be classified as *soil* fills, *soil-rock* fills or *rock* fills, as defined below.

3.1.1 **Soil fills** are defined as fills containing no rocks or hard lumps greater than 12 inches in maximum dimension and containing at least 40 percent by weight of material smaller than ¾ inch in size.

3.1.2 **Soil-rock fills** are defined as fills containing no rocks or hard lumps larger than 4 feet in maximum dimension and containing a sufficient matrix of soil fill to allow for proper compaction of soil fill around the rock fragments or hard lumps as specified in Paragraph 6.2. **Oversize rock** is defined as material greater than 12 inches.

3.1.3 **Rock fills** are defined as fills containing no rocks or hard lumps larger than 3 feet in maximum dimension and containing little or no fines. Fines are defined as material smaller than ¾ inch in maximum dimension. The quantity of fines shall be less than approximately 20 percent of the rock fill quantity.

3.2 Material of a perishable, spongy, or otherwise unsuitable nature as determined by the Consultant shall not be used in fills.

3.3 Materials used for fill, either imported or on-site, shall not contain hazardous materials as defined by the California Code of Regulations, Title 22, Division 4, Chapter 30, Articles 9 and 10; 40CFR; and any other applicable local, state or federal laws. The Consultant shall not be responsible for the identification or analysis of the potential presence of hazardous materials. However, if observations, odors or soil discoloration cause Consultant to suspect the presence of hazardous materials, the Consultant may request from the Owner the termination of grading operations within the affected area. Prior to resuming grading operations, the Owner shall provide a written report to the Consultant indicating that the suspected materials are not hazardous as defined by applicable laws and regulations.

3.4 The outer 15 feet of *soil-rock* fill slopes, measured horizontally, should be composed of properly compacted *soil* fill materials approved by the Consultant. *Rock* fill may extend to the slope face, provided that the slope is not steeper than 2:1 (horizontal:vertical) and a soil layer no thicker than 12 inches is track-walked onto the face for landscaping purposes. This procedure may be utilized provided it is acceptable to the governing agency, Owner and Consultant.

3.5 Samples of soil materials to be used for fill should be tested in the laboratory by the Consultant to determine the maximum density, optimum moisture content, and, where appropriate, shear strength, expansion, and gradation characteristics of the soil.

3.6 During grading, soil or groundwater conditions other than those identified in the Geotechnical Report may be encountered by the Contractor. The Consultant shall be notified immediately to evaluate the significance of the unanticipated condition.

## 4. CLEARING AND PREPARING AREAS TO BE FILLED

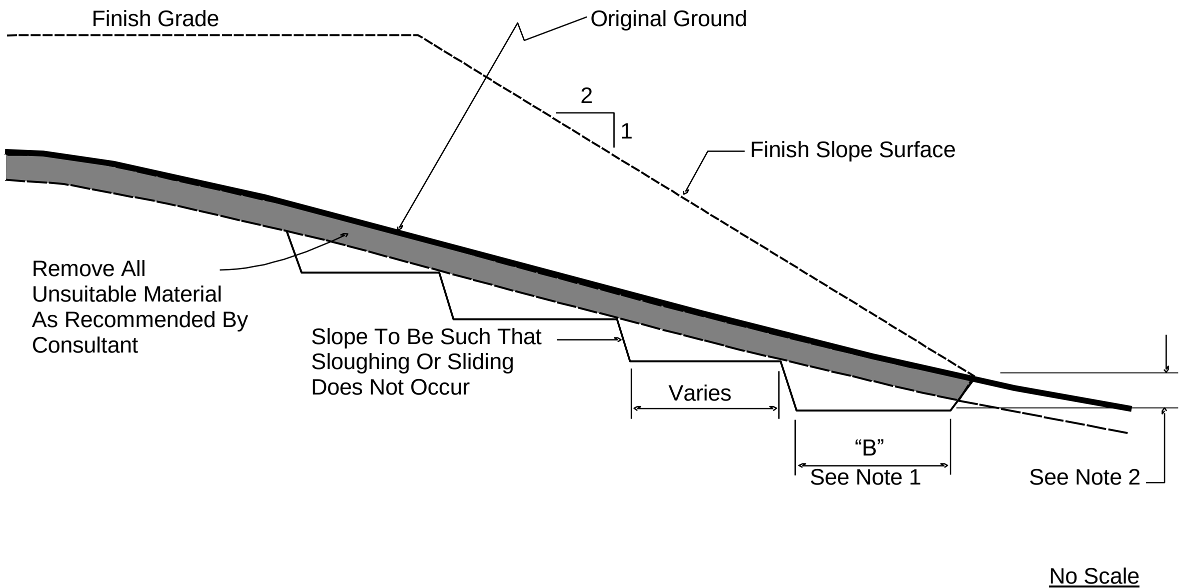
4.1 Areas to be excavated and filled shall be cleared and grubbed. Clearing shall consist of complete removal above the ground surface of trees, stumps, brush, vegetation, man-made structures, and similar debris. Grubbing shall consist of removal of stumps, roots, buried logs and other unsuitable material and shall be performed in areas to be graded. Roots and other projections exceeding 1½ inches in diameter shall be removed to a depth of 3 feet below the surface of the ground. Borrow areas shall be grubbed to the extent necessary to provide suitable fill materials.

4.2 Asphalt pavement material removed during clearing operations should be properly disposed at an approved off-site facility or in an acceptable area of the project evaluated by Geocon and the property owner. Concrete fragments that are free of reinforcing steel may be placed in fills, provided they are placed in accordance with Section 6.2 or 6.3 of this document.

4.3 After clearing and grubbing of organic matter and other unsuitable material, loose or porous soils shall be removed to the depth recommended in the Geotechnical Report. The depth of removal and compaction should be observed and approved by a representative of the Consultant. The exposed surface shall then be plowed or scarified to a minimum depth of 6 inches and until the surface is free from uneven features that would tend to prevent uniform compaction by the equipment to be used.

4.4 Where the slope ratio of the original ground is steeper than 5:1 (horizontal:vertical), or where recommended by the Consultant, the original ground should be benched in accordance with the following illustration.

TYPICAL BENCHING DETAIL




DETAIL NOTES: (1) Key width "B" should be a minimum of 10 feet, or sufficiently wide to permit complete coverage with the compaction equipment used. The base of the key should be graded horizontal, or inclined slightly into the natural slope.

(2) The outside of the key should be below the topsoil or unsuitable surficial material and at least 2 feet into dense formational material. Where hard rock is exposed in the bottom of the key, the depth and configuration of the key may be modified as approved by the Consultant.

4.5 After areas to receive fill have been cleared and scarified, the surface should be moisture conditioned to achieve the proper moisture content, and compacted as recommended in Section 6 of these specifications.

## 5. COMPACTION EQUIPMENT

5.1 Compaction of *soil* or *soil-rock* fill shall be accomplished by sheepsfoot or segmented-steel wheeled rollers, vibratory rollers, multiple-wheel pneumatic-tired rollers, or other types of acceptable compaction equipment. Equipment shall be of such a design that it will be capable of compacting the *soil* or *soil-rock* fill to the specified relative compaction at the specified moisture content.

5.2 Compaction of *rock* fills shall be performed in accordance with Section 6.3.

## 6. PLACING, SPREADING AND COMPACTION OF FILL MATERIAL

6.1 *Soil* fill, as defined in Paragraph 3.1.1, shall be placed by the Contractor in accordance with the following recommendations:

6.1.1 *Soil* fill shall be placed by the Contractor in layers that, when compacted, should generally not exceed 8 inches. Each layer shall be spread evenly and shall be thoroughly mixed during spreading to obtain uniformity of material and moisture in each layer. The entire fill shall be constructed as a unit in nearly level lifts. Rock materials greater than 12 inches in maximum dimension shall be placed in accordance with Section 6.2 or 6.3 of these specifications.

6.1.2 In general, the *soil* fill shall be compacted at a moisture content at or above the optimum moisture content as determined by ASTM D 1557.

6.1.3 When the moisture content of *soil* fill is below that specified by the Consultant, water shall be added by the Contractor until the moisture content is in the range specified.

6.1.4 When the moisture content of the *soil* fill is above the range specified by the Consultant or too wet to achieve proper compaction, the *soil* fill shall be aerated by the Contractor by blading/mixing, or other satisfactory methods until the moisture content is within the range specified.

6.1.5 After each layer has been placed, mixed, and spread evenly, it shall be thoroughly compacted by the Contractor to a relative compaction of at least 90 percent. Relative compaction is defined as the ratio (expressed in percent) of the in-place dry density of the compacted fill to the maximum laboratory dry density as determined in accordance with ASTM D 1557. Compaction shall be continuous over the entire area, and compaction equipment shall make sufficient passes so that the specified minimum relative compaction has been achieved throughout the entire fill.

6.1.6 Where practical, soils having an Expansion Index greater than 50 should be placed at least 3 feet below finish pad grade and should be compacted at a moisture content generally 2 to 4 percent greater than the optimum moisture content for the material.

6.1.7 Properly compacted *soil* fill shall extend to the design surface of fill slopes. To achieve proper compaction, it is recommended that fill slopes be over-built by at least 3 feet and then cut to the design grade. This procedure is considered preferable to track-walking of slopes, as described in the following paragraph.

6.1.8 As an alternative to over-building of slopes, slope faces may be back-rolled with a heavy-duty loaded sheepsfoot or vibratory roller at maximum 4-foot fill height intervals. Upon completion, slopes should then be track-walked with a D-8 dozer or similar equipment, such that a dozer track covers all slope surfaces at least twice.

6.2 *Soil-rock* fill, as defined in Paragraph 3.1.2, shall be placed by the Contractor in accordance with the following recommendations:

6.2.1 Rocks larger than 12 inches but less than 4 feet in maximum dimension may be incorporated into the compacted *soil* fill, but shall be limited to the area measured 15 feet minimum horizontally from the slope face and 5 feet below finish grade or 3 feet below the deepest utility, whichever is deeper.

6.2.2 Rocks or rock fragments up to 4 feet in maximum dimension may either be individually placed or placed in windrows. Under certain conditions, rocks or rock fragments up to 10 feet in maximum dimension may be placed using similar methods. The acceptability of placing rock materials greater than 4 feet in maximum dimension shall be evaluated during grading as specific cases arise and shall be approved by the Consultant prior to placement.

6.2.3 For individual placement, sufficient space shall be provided between rocks to allow for passage of compaction equipment.

6.2.4 For windrow placement, the rocks should be placed in trenches excavated in properly compacted *soil* fill. Trenches should be approximately 5 feet wide and 4 feet deep in maximum dimension. The voids around and beneath rocks should be filled with approved granular soil having a Sand Equivalent of 30 or greater and should be compacted by flooding. Windrows may also be placed utilizing an "open-face" method in lieu of the trench procedure, however, this method should first be approved by the Consultant.

6.2.5 Windrows should generally be parallel to each other and may be placed either parallel to or perpendicular to the face of the slope depending on the site geometry. The minimum horizontal spacing for windrows shall be 12 feet center-to-center with a 5-foot stagger or offset from lower courses to next overlying course. The minimum vertical spacing between windrow courses shall be 2 feet from the top of a lower windrow to the bottom of the next higher windrow.

6.2.6 Rock placement, fill placement and flooding of approved granular soil in the windrows should be continuously observed by the Consultant.

6.3 *Rock* fills, as defined in Section 3.1.3, shall be placed by the Contractor in accordance with the following recommendations:

6.3.1 The base of the *rock* fill shall be placed on a sloping surface (minimum slope of 2 percent). The surface shall slope toward suitable subdrainage outlet facilities. The *rock* fills shall be provided with subdrains during construction so that a hydrostatic pressure buildup does not develop. The subdrains shall be permanently connected to controlled drainage facilities to control post-construction infiltration of water.

6.3.2 *Rock* fills shall be placed in lifts not exceeding 3 feet. Placement shall be by rock trucks traversing previously placed lifts and dumping at the edge of the currently placed lift. Spreading of the *rock* fill shall be by dozer to facilitate *seating* of the rock. The *rock* fill shall be watered heavily during placement. Watering shall consist of water trucks traversing in front of the current rock lift face and spraying water continuously during rock placement. Compaction equipment with compactive energy comparable to or greater than that of a 20-ton steel vibratory roller or other compaction equipment providing suitable energy to achieve the required compaction or deflection as recommended in Paragraph 6.3.3 shall be utilized. The number of passes to be made should be determined as described in Paragraph 6.3.3. Once a *rock* fill lift has been covered with *soil* fill, no additional *rock* fill lifts will be permitted over the *soil* fill.

6.3.3 Plate bearing tests, in accordance with ASTM D 1196, may be performed in both the compacted *soil* fill and in the *rock* fill to aid in determining the required minimum number of passes of the compaction equipment. If performed, a minimum of three plate bearing tests should be performed in the properly compacted *soil* fill (minimum relative compaction of 90 percent). Plate bearing tests shall then be performed on areas of *rock* fill having two passes, four passes and six passes of the compaction equipment, respectively. The number of passes required for the *rock* fill shall be determined by comparing the results of the plate bearing tests for the *soil* fill and the *rock* fill and by evaluating the deflection variation with number of passes. The required number of passes of the compaction equipment will be performed as necessary until the plate bearing deflections are equal to or less than that determined for the properly compacted *soil* fill. In no case will the required number of passes be less than two.

6.3.4 A representative of the Consultant should be present during *rock* fill operations to observe that the minimum number of "passes" have been obtained, that water is being properly applied and that specified procedures are being followed. The actual number of plate bearing tests will be determined by the Consultant during grading.

6.3.5 Test pits shall be excavated by the Contractor so that the Consultant can state that, in their opinion, sufficient water is present and that voids between large rocks are properly filled with smaller rock material. In-place density testing will not be required in the *rock* fills.

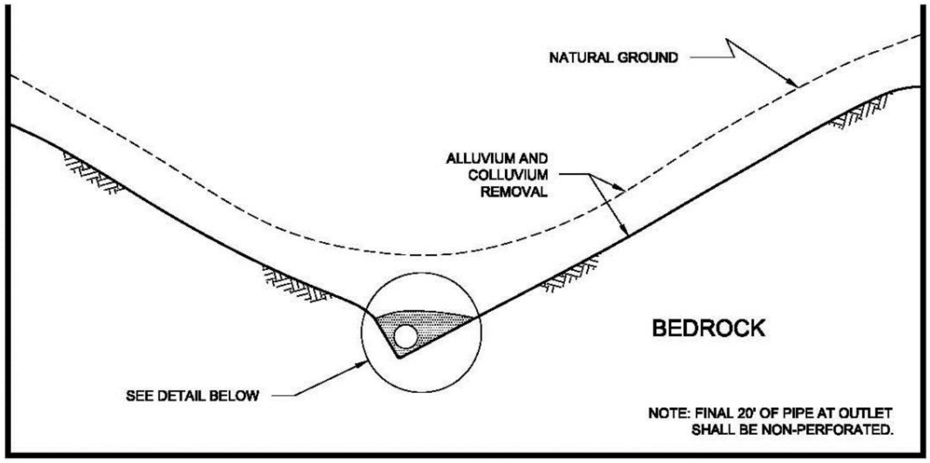
6.3.6 To reduce the potential for "piping" of fines into the *rock* fill from overlying *soil* fill material, a 2-foot layer of graded filter material shall be placed above the uppermost lift of *rock* fill. The need to place graded filter material below the *rock* should be determined by the Consultant prior to commencing grading. The gradation of the graded filter material will be determined at the time the *rock* fill is being excavated. Materials typical of the *rock* fill should be submitted to the Consultant in a timely manner, to allow design of the graded filter prior to the commencement of *rock* fill placement.

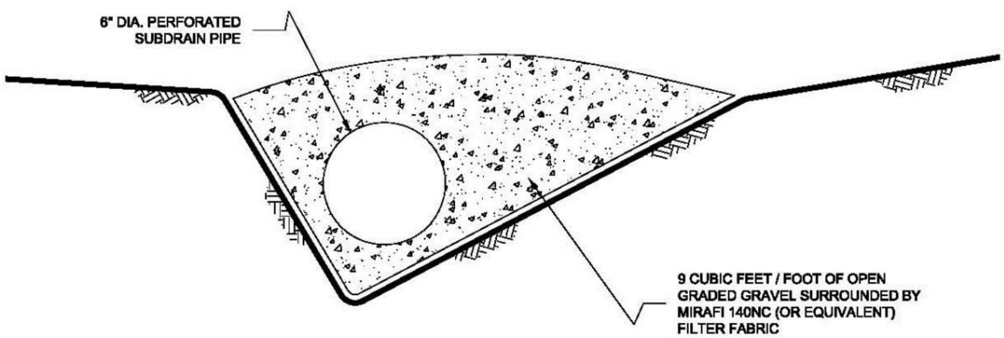
6.3.7 *Rock* fill placement should be continuously observed during placement by the Consultant.

## 7. SUBDRAINS

7.1 The geologic units on the site may have permeability characteristics and/or fracture systems that could be susceptible under certain conditions to seepage. The use of canyon subdrains may be necessary to mitigate the potential for adverse impacts associated with seepage conditions. Canyon subdrains with lengths in excess of 500 feet or extensions of existing offsite subdrains should use 8-inch-diameter pipes. Canyon subdrains less than 500 feet in length should use 6-inch-diameter pipes.

TYPICAL CANYON DRAIN DETAIL




**NOTES:**

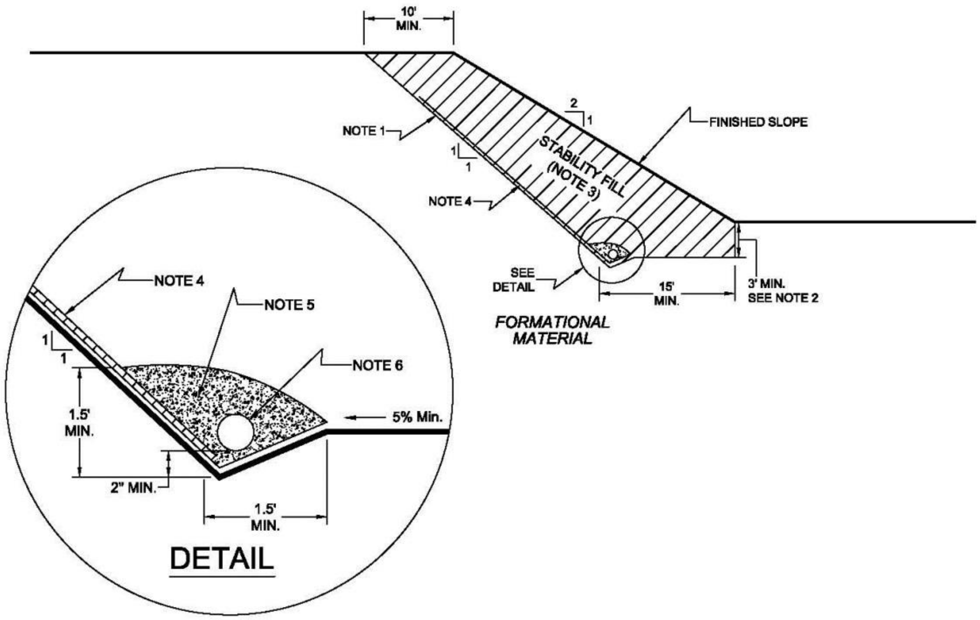
1......8-INCH DIAMETER, SCHEDULE 80 PVC PERFORATED PIPE FOR FILLS IN EXCESS OF 100-FEET IN DEPTH OR A PIPE LENGTH OF LONGER THAN 500 FEET.

2......6-INCH DIAMETER, SCHEDULE 40 PVC PERFORATED PIPE FOR FILLS LESS THAN 100-FEET IN DEPTH OR A PIPE LENGTH SHORTER THAN 500 FEET.

**NO SCALE**

7.2 Slope drains within stability fill keyways should use 4-inch-diameter (or lager) pipes.

TYPICAL STABILITY FILL DETAIL




NOTES:

1.....EXCAVATE BACKCUT AT 1:1 INCLINATION (UNLESS OTHERWISE NOTED).

2.....BASE OF STABILITY FILL TO BE 3 FEET INTO FORMATIONAL MATERIAL, SLOPING A MINIMUM 5% INTO SLOPE.

3.....STABILITY FILL TO BE COMPOSED OF PROPERLY COMPACTED GRANULAR SOIL.

4.....CHIMNEY DRAINS TO BE APPROVED PREFABRICATED CHIMNEY DRAIN PANELS (MIRADRAIN G200N OR EQUIVALENT) SPACED APPROXIMATELY 20 FEET CENTER TO CENTER AND 4 FEET WIDE. CLOSER SPACING MAY BE REQUIRED IF SEEPAGE IS ENCOUNTERED.

5.....FILTER MATERIAL TO BE 3/4-INCH, OPEN-GRADED CRUSHED ROCK ENCLOSED IN APPROVED FILTER FABRIC (MIRAFI 140NC).

6.....COLLECTOR PIPE TO BE 4-INCH MINIMUM DIAMETER, PERFORATED, THICK-WALLED PVC SCHEDULE 40 OR EQUIVALENT, AND SLOPED TO DRAIN AT 1 PERCENT MINIMUM TO APPROVED OUTLET.

NO SCALE

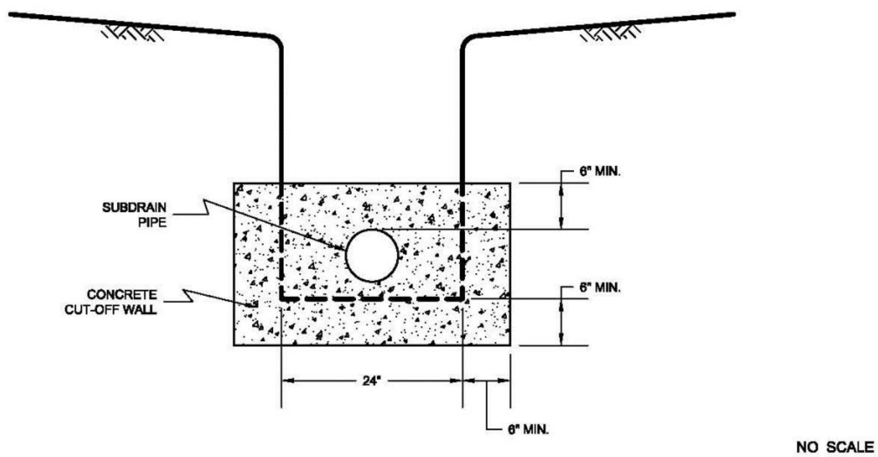
7.3 The actual subdrain locations will be evaluated in the field during the remedial grading operations. Additional drains may be necessary depending on the conditions observed and the requirements of the local regulatory agencies. Appropriate subdrain outlets should be evaluated prior to finalizing 40-scale grading plans.

7.4 *Rock* fill or *soil-rock* fill areas may require subdrains along their down-slope perimeters to mitigate the potential for buildup of water from construction or landscape irrigation. The subdrains should be at least 6-inch-diameter pipes encapsulated in gravel and filter fabric. *Rock* fill drains should be constructed using the same requirements as canyon subdrains.

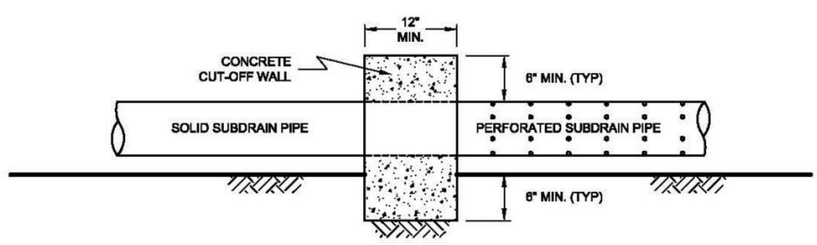
7.5 Prior to outletting, the final 20-foot segment of a subdrain that will not be extended during future development should consist of non-perforated drainpipe. At the non-perforated/ perforated interface, a seepage cutoff wall should be constructed on the downslope side of the pipe.

TYPICAL CUT OFF WALL DETAIL

FRONT VIEW

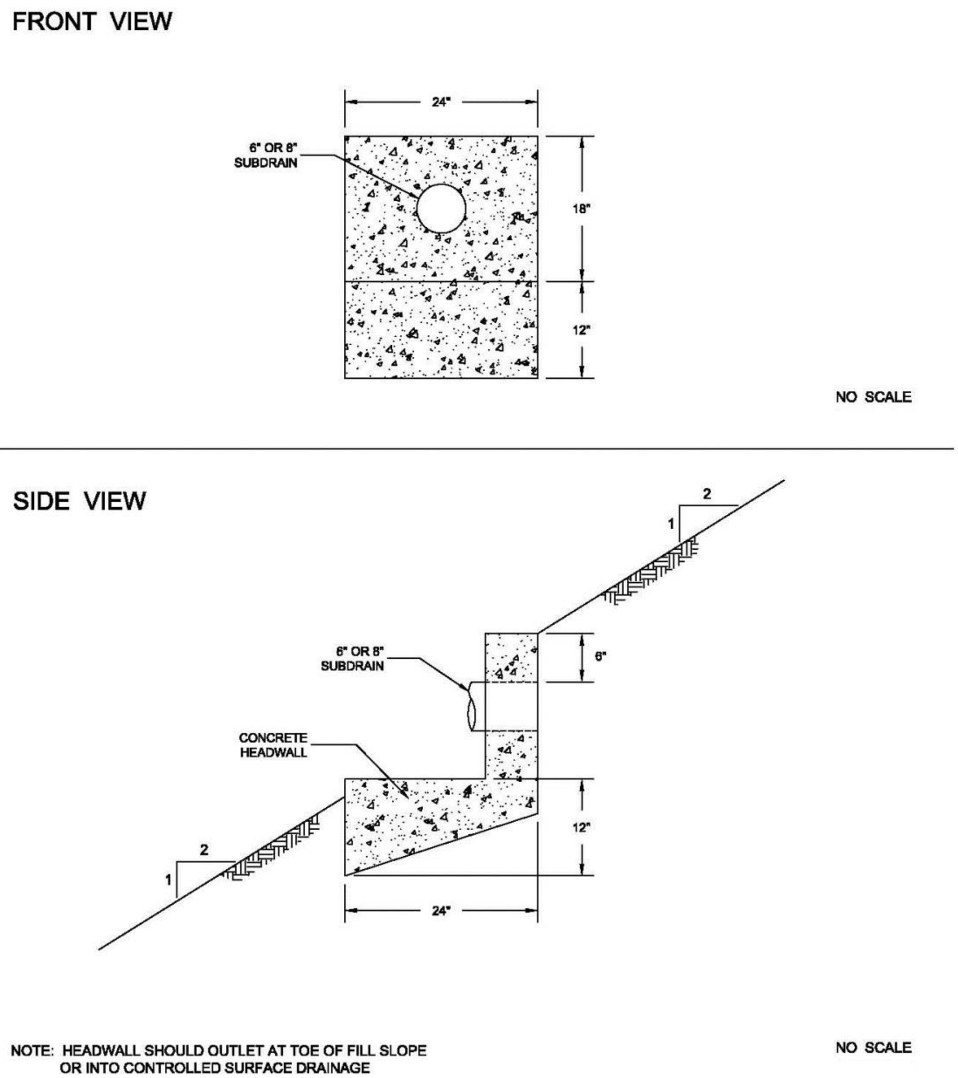



SIDE VIEW




7.6 Subdrains that discharge into a natural drainage course or open space area should be provided with a permanent headwall structure.

TYPICAL HEADWALL DETAIL




7.7 The final grading plans should show the location of the proposed subdrains. After completion of remedial excavations and subdrain installation, the project civil engineer should survey the drain locations and prepare an "as-built" map showing the drain locations. The final outlet and connection locations should be determined during grading operations. Subdrains that will be extended on adjacent projects after grading can be placed on formational material and a vertical riser should be placed at the end of the subdrain. The grading contractor should consider videoing the subdrains shortly after burial to check proper installation and functionality. The contractor is responsible for the performance of the drains.

## 8. OBSERVATION AND TESTING

8.1 The Consultant shall be the Owner's representative to observe and perform tests during clearing, grubbing, filling, and compaction operations. In general, no more than 2 feet in vertical elevation of *soil* or *soil-rock* fill should be placed without at least one field density test being performed within that interval. In addition, a minimum of one field density test should be performed for every 2,000 cubic yards of *soil* or *soil-rock* fill placed and compacted.

8.2 The Consultant should perform a sufficient distribution of field density tests of the compacted *soil* or *soil-rock* fill to provide a basis for expressing an opinion whether the fill material is compacted as specified. Density tests shall be performed in the compacted materials below any disturbed surface. When these tests indicate that the density of any layer of fill or portion thereof is below that specified, the particular layer or areas represented by the test shall be reworked until the specified density has been achieved.

8.3 During placement of *rock* fill, the Consultant should observe that the minimum number of passes have been obtained per the criteria discussed in Section 6.3.3. The Consultant should request the excavation of observation pits and may perform plate bearing tests on the placed *rock* fills. The observation pits will be excavated to provide a basis for expressing an opinion as to whether the *rock* fill is properly seated and sufficient moisture has been applied to the material. When observations indicate that a layer of *rock* fill or any portion thereof is below that specified, the affected layer or area shall be reworked until the *rock* fill has been adequately seated and sufficient moisture applied.

8.4 A settlement monitoring program designed by the Consultant may be conducted in areas of *rock* fill placement. The specific design of the monitoring program shall be as recommended in the Conclusions and Recommendations section of the project Geotechnical Report or in the final report of testing and observation services performed during grading.

8.5 We should observe the placement of subdrains, to check that the drainage devices have been placed and constructed in substantial conformance with project specifications.

8.6 Testing procedures shall conform to the following Standards as appropriate:

### 8.6.1 Soil and Soil-Rock Fills:

8.6.1.1 Field Density Test, ASTM D 1556, *Density of Soil In-Place By the Sand-Cone Method.*

8.6.1.2 Field Density Test, Nuclear Method, ASTM D 6938, *Density of Soil and Soil-Aggregate In-Place by Nuclear Methods (Shallow Depth).*

8.6.1.3 Laboratory Compaction Test, ASTM D 1557, *Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10-Pound Hammer and 18-Inch Drop.*

8.6.1.4. Expansion Index Test, ASTM D 4829, *Expansion Index Test*.

## 9. PROTECTION OF WORK

9.1 During construction, the Contractor shall properly grade all excavated surfaces to provide positive drainage and prevent ponding of water. Drainage of surface water shall be controlled to avoid damage to adjoining properties or to finished work on the site. The Contractor shall take remedial measures to prevent erosion of freshly graded areas until such time as permanent drainage and erosion control features have been installed. Areas subjected to erosion or sedimentation shall be properly prepared in accordance with the Specifications prior to placing additional fill or structures.

9.2 After completion of grading as observed and tested by the Consultant, no further excavation or filling shall be conducted except in conjunction with the services of the Consultant.

## 10. CERTIFICATIONS AND FINAL REPORTS

10.1 Upon completion of the work, Contractor shall furnish Owner a certification by the Civil Engineer stating that the lots and/or building pads are graded to within 0.1 foot vertically of elevations shown on the grading plan and that all tops and toes of slopes are within 0.5 foot horizontally of the positions shown on the grading plans. After installation of a section of subdrain, the project Civil Engineer should survey its location and prepare an *as-built* plan of the subdrain location. The project Civil Engineer should verify the proper outlet for the subdrains and the Contractor should ensure that the drain system is free of obstructions.

10.2 The Owner is responsible for furnishing a final as-graded soil and geologic report satisfactory to the appropriate governing or accepting agencies. The as-graded report should be prepared and signed by a California licensed Civil Engineer experienced in geotechnical engineering and by a California Certified Engineering Geologist, indicating that the geotechnical aspects of the grading were performed in substantial conformance with the Specifications or approved changes to the Specifications.

# LIST OF REFERENCES

California Geological Survey (2009), *Tsunami Inundation Map For Emergency Planning, State of California ~ County of San Diego, Point Loma Quadrangle,* Scale 1:24,000;

Department of Water Resources, Division of Safety of Dams (DSOD), *California Dam Break Inundation Maps*, http://fmds.water.ca.gov/maps/damim/;

FEMA (2012), *Flood Insurance Rate Map (FIRM) Map Number 06073C1616G*, http://www.fema.gov, accessed February 7, 2020;

Kennedy, M. P., and Tan, S. S. (2008), *Geologic Map of the San Diego 30' x 60' Quadrangle, California*, USGS Regional Geologic Map Series, 1:100,000 Scale, Map No. 3;

Todd, Victoria R., *Preliminary Geologic Map of the El Cajon 30'x60' Quadrangle, California*, 2004;

USGS (2016), *Quaternary Fault and Fold Database of the United States:* U.S. Geological Survey website, http://earthquakes,usgs.gov/hazards/qfaults, accessed March 2020;

Unpublished reports, aerial photographs, and maps on file with Geocon Incorporated.

# ATTACHMENT 15

# STORMWATER INTAKE FORM FOR ALL PERMIT APPLICATIONS

# Storm Water Intake Form for All Permit Applications

This form must be completed in its entirety and accompany all permit applications. Please reference the City's BMP Design Manual for more detailed guidance in completing this form. Requirements for all Development Projects are also discussed within the City's Jurisdictional Runoff Management Plan, and Storm Water Ordinance (13.42). The purpose of this form is to establish the Storm water Quality Management Plan (SWQMP) requirements applicable to the project.

| **Step 1: Project Identification** |
|---|
| Applicant Name: Tricia Estrada with Palm Tree Investments |
| Project Address: 8732 Prospect Ave, Santee, California 92071 |
| APN(s): 383-112-26 Project ID: TPM 2020-1 |
| **Step 2: Project Determination (Standard or Priority Development Project)** |
| Is the project part of another Priority Development Project (PDP)? ☐ Yes ☒ No<br>If yes, a PDP SWQMP is required. **Go to Step 3.** |
| The project is (select one): ☒New Development ☐ Redevelopment[1] |
| The total proposed newly created or replaced impervious area is: 14,275 ft2 |
| The total existing (pre-project) impervious area is: 4,700 ft2 |
| The total area disturbed by the project is: 37,026 ft2 |
| If the total area disturbed by the project is one acre (43,560 sq. ft.) or more OR the project is part of a larger common plan of development (e.g., a building permit within a previously approved subdivision) disturbing one acre or more, a Waste Discharger Identification (WDID) number must be obtained from the State Water Resources Control Board. WDID: # Will be provided at construction docs for grading permit issuance. Not req'd for this discretionary review. |
| Is the project in any of the following categories, (a) through (f)? [2] |
| (a) New development projects that create 10,000 square feet or more of impervious surfaces (collectively over the entire project site). This includes commercial, industrial, residential, mixed-use, and public development projects on public or private land.<br>☒Yes ☐No |
| (b) Redevelopment projects that create and/or replace 5,000 square feet or more of impervious surface (collectively over the entire project site on an existing site of 10,000 square feet or more of impervious surfaces). This includes commercial, industrial, residential, mixed-use, and public development projects on public or private land.<br>☐Yes ☒No |

[1] Redevelopment is defined as: The creation, addition, and or replacement of impervious surface on an already developed site. Examples include the expansion of a building footprint, road widening, the addition to or replacement of a structure. Replacement of impervious surfaces includes any activity where impervious material(s) are removed, exposing underlying soil during construction. Redevelopment does not include routine maintenance activities, such as trenching and resurfacing associated with utility work; pavement grinding; resurfacing existing roadways, sidewalks, pedestrian ramps, or bike lanes on existing roads; and routine replacement of damaged pavement, such as pothole repair.

[2] Applicants should note that any development project that will create and/or replace 10,000 square feet or more of impervious surface (collectively over the entire project site) is considered a new development.

| Step 2: (continued) |
|---|
| (c) New and redevelopment projects that create and/or replace 5,000 square feet or more of impervious surface (collectively over the entire project site), and support one or more of the following uses:<br>Restaurants. This category is defined as a facility that sells prepared foods and drinks for consumption, including stationary lunch counters and refreshment stands selling prepared foods and drinks for immediate consumption (Standard Industrial Classification (SIC) code 5812).<br>(ii) Hillside development projects. This category includes development on any natural slope that is twenty-five percent or greater.<br>(iii) Parking lots. This category is defined as a land area or facility for the temporary parking or storage of motor vehicles used personally, for business, or for commerce.<br>(iv) Streets, roads, highways, freeways, and driveways. This category is defined as any paved impervious surface used for the transportation of automobiles, trucks, motorcycles, and other vehicles.<br>☐ Yes ☒ No |
| (d) New or redevelopment projects that create and/or replace 2,500 square feet or more of impervious surface (collectively over the entire project site), and discharging directly to an Environmentally Sensitive Area (ESA). "Discharging directly to" includes flow that is conveyed overland a distance of 200 feet or less from the project to the ESA, or conveyed in a pipe or open channel any distance as an isolated flow from the project to the ESA (i.e. not commingled with flows from adjacent lands).<br>Note: ESAs are areas that include but are not limited to all Clean Water Act Section 303(d) impaired water bodies; areas designated as Areas of Special Biological Significance by the State Water Board and San Diego Water Board; State Water Quality Protected Areas; water bodies designated with the RARE beneficial use by the State Water Board and San Diego Water Board; and any other equivalent environmentally sensitive areas which have been identified by the Copermittees. See BMP Design Manual Section 1.4.2 for additional guidance.<br>☐ Yes ☒ No |
| (e) New development projects, or redevelopment projects that create and/or replace 5,000 square feet or more of impervious surface, that support one or more of the following uses:<br>(i) Automotive repair shops. This category is defined as a facility that is categorized in any one of the following SIC codes: 5013, 5014, 5541, 7532-7534, or 7536-7539.<br>(ii) (ii) Retail gasoline outlets (RGOs). This category includes RGOs that meet the following criteria: (a) 5,000 square feet or more or (b) a projected Average Daily Traffic (ADT) of 100 or more vehicles per day.<br>☐ Yes ☒ No |
| (f) New or redevelopment projects that result in the disturbance of one or more acres of land and are expected to generate pollutants post construction.<br>Note: See BMP Design Manual Section 1.4.2 for additional guidance.<br>☐ Yes ☒ No |
| Does the project meet the definition of one or more of the Priority Development Project categories (a) through (f) listed above?<br>☒ Yes – the project is a Priority Development Project (PDP).<br>☐ No – the project is not a Priority Development Project (Standard Project).<br>*Further guidance may be found in Chapter 1 and Table 1-2 of the BMP Design Manual.* |

## Step 2: (continued)

<u>The following is for redevelopment PDPs only:</u>

The area of existing (pre-project) impervious area at the project site is: 4,700 ft2 (A)
The total proposed newly created or replaced impervious area is: 14,275 ft2 (B)
Percent impervious surface created or replaced (B/A)*100: 303%

The percent impervious surface created or replaced is (select one based on the above calculation):

☐less than or equal to fifty percent (50%) – ***only newly created or replaced impervious areas are considered a PDP and subject to storm water requirements.***

OR

☒greater than fifty percent (50%) – ***the entire project site is considered a PDP and subject to storm water requirements.***

## Step 3: Storm Water Quality Management Plan Requirements

Is the project a Standard Project, Priority Development Project (PDP), or exception to PDP definitions?

To answer this item, complete the Project Type Determination Checklist on Pages 2 and 3 of this form, and see PDP exemption information below. *For further guidance, see Section 1.4 of the BMP Design Manual in its entirety.*

| | |
|---|---|
| ☐Standard Project: | Standard Project requirements apply, including Standard Project SWQMP. **Complete Standard Project SWQMP**. |
| ☒PDP: | Standard and PDP requirements apply, including PDP SWQMP. **Go to Step 5 and Prepare a PDP SWQMP** |
| ☐PDP Exemption: | **Go to Step 4.** |

## Step 4: Exemption to PDP definitions

Is the project exempt from PDP definitions based on:

☐Projects that are only new or retrofit paved sidewalks, bicycle lanes, or trails that meet the following criteria:

(i) Designed and constructed to direct storm water runoff to adjacent vegetated areas, or other non-erodible permeable areas; OR

(ii) Designed and constructed to be hydraulically disconnected from paved streets or roads [i.e., runoff from the new improvement does not drain directly onto paved streets or roads]; OR

(iii) Designed and constructed with permeable pavements or surfaces in accordance with County of San Diego Guidance on Green Infrastructure;

If the project is exempt per the above condition, then SDP requirements apply, AND any additional requirements specific to the type of project. Note: City concurrence with any exemption is required. **Go to Step 7 and Prepare a SDP SWQMP**.

## Step 4: (continued)

If the project is claiming exemption under another condition, provide discussion / justification that demonstrates that the project is NOT a development project (i.e.: interior remodel only) and provide backup documentation if applicable. *Reference Section 1.3 of the BMP Design Manual.* Note: City concurrence with any exemption is required.

N/A

**Go to Step 7 and Prepare SDP SWQMP.**

## Step 5: Hydromodificaiton Control (PDPs only)

Do hydromodification control requirements apply?

☒ Yes – Structural BMPs required for pollutant control (see Chapter 5), AND hydromodification control (see Chapter 6). **Go to Step 6.**

☐ No – Structural BMPs required for pollutant control. EXEMPT from hydromodification control (see Chapter 1.6)*. **Go to Step 7 and Prepare PDP SWQMP.**

* Justification for hydromodification exemption is required. Documentation must include drainage maps, photos, citations, and written explanation. This documentation will be included within the PDP SWQMP, Attachment 2.

## Step 6: Critical Coarse Sediment (PDPs only)

Does protection of critical coarse sediment yield areas apply based on review of the WMAA Potential Critical Coarse Sediment Yield Area Map? See Section 6.2 of the BMP Design Manual for guidance.

☐ Yes – Management measures are required for the avoidance or protection of critical coarse sediment yield areas (see Chapter 6). **Go to Step 7 and Prepare PDP SWQMP.**

☒ No – Management measures are not required.* **Go to Step 7 and Prepare PDP SWQMP**

* If no management measures are required, provide brief discussion / justification demonstrating non-applicability.

| |
|---|
| Proposed project is not within critical course sediment yield areas. |

## Step 7: Certification

Applicant Certification: I have read and understand that the City of Santee has adopted minimum requirements for managing urban runoff, including storm water, from construction and land development activities, as described in the BMP Design Manual. **I certify that this intake form has been completed to the best of my ability and accurately reflects the project being proposed. I also understand that non-compliance with the City's Storm Water Ordinance and/or Grading Ordinance may result in enforcement by the City, including fines, cease and desist orders, or other actions as determined by the City's Enforcement Response Plan.**

| | |
|---|---|
| Signature of Applicant: Tricia Estrada ______________ | Date: 11/09/24 |
| Printed Name: Tricia Estrada 10/23/2024 | |

# ATTACHMENT 16

# PRIORITY DEVELOPMENT PROJECT
# WATER QUALITY MANAGEMENT PLAN

# CITY OF SANTEE

**PRIORITY DEVELOPMENT PROJECT (PDP)**

## STORM WATER QUALITY MANAGEMENT PLAN (SWQMP)

**FOR**
**PALM TREE INVESTMENTS**
**PERMIT APPLICATION NUMBER:**

**8732 Prospect Ave**
**Santee, CA 92071**

**ASSESSOR'S PARCEL NUMBER(S):**
**383-112-26-00**
**ENGINEER OF WORK:**
**HydroLAND Development Consulting**
**Ricardo Alzaga, RCE #69120**


________________________________________

**[INSERT CIVIL ENGINEER'S NAME AND PE NUMBER HERE, PROVIDE WET SIGNATURE AND STAMP ABOVE LINE]**

PREPARED FOR:

Palm Tree Investments, LLC
P.O. Box 9713
Rancho Santa Fe, CA 92067
(858) 354-2885

PDP SWQMP PREPARED BY:

HydroLAND Development Consulting
P.O. Box 2431
San Marcos, CA 92079-2431
(760) 979-8588

DATE OF SWQMP:
September 24, 2024

PLANS PREPARED BY:
The McKinley Associates, Inc.
1818 First Ave, Suite 200
San Diego, CA 92101
(619) 238-1134

PDP SWQMP Template Date: February 2016
PDP SWQMP Preparation Date: September 24, 2024

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# TABLE OF CONTENTS

## ACRONYMS

| | |
|---|---|
| APN | Assessor's Parcel Number |
| BMP | Best Management Practice |
| HMP | Hydromodification Management Plan |
| HSG | Hydrologic Soil Group |
| MS4 | Municipal Separate Storm Sewer System |
| N/A | Not Applicable |
| NRCS | Natural Resources Conservation Service |
| PDP | Priority Development Project |
| PE | Professional Engineer |
| SC | Source Control |
| SD | Site Design |
| SDRWQCB | San Diego Regional Water Quality Control Board |
| SIC | Standard Industrial Classification |
| SWQMP | Storm Water Quality Management Plan |

# SWQMP PREPARER'S
# CERTIFICATION PAGE

**Project Name: [Insert Project Name]**
**Permit Application Number: [Insert Permit Application Number]**

**PREPARER'S CERTIFICATION**

I hereby declare that I am the Engineer in Responsible Charge of design of storm water best management practices (BMPs) for this project, and that I have exercised responsible charge over the design of the BMPs as defined in Section 6703 of the Business and Professions Code, and that the design is consistent with the PDP requirements of the City of Santee BMP Design Manual, which is a design manual for compliance with local County of San Diego and regional MS4 Permit (California Regional Water Quality Control Board San Diego Region Order No. R9-2015-0100) requirements for storm water management.

I have read and understand that the [City Engineer] has adopted minimum requirements for managing urban runoff, including storm water, from land development activities, as described in the BMP Design Manual. I certify that this PDP SWQMP has been completed to the best of my ability and accurately reflects the project being proposed and the applicable BMPs proposed to minimize the potentially negative impacts of this project's land development activities on water quality. I understand and acknowledge that the plan check review of this PDP SWQMP by the [City Engineer] is confined to a review and does not relieve me, as the Engineer in Responsible Charge of design of storm water BMPs for this project, of my responsibilities for project design.

PE NO. 69120, EXP 6/30/26

Engineer of Work's Signature, PE Number & Expiration Date

Ricardo Alzaga

Print Name

HydroLAND Development Consulting

Company

September 24, 2024

Date

Engineer's Seal:

No. 69120
Exp. 6/30/26

PDP SWQMP Template Date: February 2016
PDP SWQMP Preparation Date: September 24, 2024

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# SWQMP PROJECT OWNER'S
# CERTIFICATION PAGE

**Project Name: Palm Tree Investments, LLC (4-Lot Subdivision)**
**Permit Application Number: TPM 2020-1**

**PROJECT OWNER'S CERTIFICATION**

This PDP SWQMP has been prepared for Palm Tree Investments, LLC by HydroLAND Development Consulting. The PDP SWQMP is intended to comply with the PDP requirements of the City of Santee BMP Design Manual, which is a design manual for compliance with local County of San Diego and regional MS4 Permit (California Regional Water Quality Control Board San Diego Region Order No. R9-2015-0100) requirements for storm water management.

The undersigned, while it owns the subject property, is responsible for the implementation of the provisions of this plan. Once the undersigned transfers its interests in the property, its successor-in-interest shall bear the aforementioned responsibility to implement the best management practices (BMPs) described within this plan, including ensuring on-going operation and maintenance of structural BMPs. A signed copy of this document shall be available on the subject property into perpetuity.

Tricia Sulpizio Estrada
Project Owner's Signature

Tricia Estrada
Print Name

Palm Tree Investments, LLC
Company

11/9/24
Date

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# SUBMITTAL RECORD

Use this Table to keep a record of submittals of this PDP SWQMP. Each time the PDP SWQMP is re-submitted, provide the date and status of the project. In column 4 summarize the changes that have been made or indicate if response to plan check comments is included. When applicable, insert response to plan check comments behind this page.

| Submittal Number | Date | Project Status | Summary of Changes |
|---|---|---|---|
| 1 | 06-19-2020 | ☑ Preliminary Design / Planning/ CEQA<br>☐ Final Design | Initial Submittal |
| 2 | 04-09-2021 | ☑ Preliminary Design / Planning/ CEQA<br>☐ Final Design | Proposed Tree Wells for Lots 3 & 4, (2 per lot) |
| 3 | 10-15-2021 | ☑ Preliminary Design / Planning/ CEQA<br>☐ Final Design | Added Prospect Ave Treatment BMP |
| 4 | 05-23-2022 | ☐ Preliminary Design / Planning/ CEQA<br>☐ Final Design | Revised driveway (concrete dwy with crown @ center); Added Grasscrete adjacent to driveway, with drain pipes; Realigned Prospect Ave flows to discharge at property's northeast corner; Added cobblestone rip rap at property's northeast corner; Added D-25 concrete ditch along property's westerly property line; Showing ultimate improvements for Prospect Ave frontage. |
| 5 | 03-18-2024 | ☑ Preliminary Design / Planning/ CEQA<br>☐ Final Design | Site redesigned. Previous access to site was from Our Way. New design proposes access from Prospect Ave. Our Way access is completely eliminated. Tree wells of 2 per lot still in effect for treatment of pollutants. New driveway will drain into a Biofiltration BMP for treatment of pollutants. Proposed Prospect Ave impervious area will remain to be treated with a Biofiltration BMP. |
| 6 | 09-24-2024 | ☑ Preliminary Design / Planning/ CEQA<br>Final Design | Site redesigned. Previously, all four lots had 2 tree wells per lot. In this revision, only Lots 3 & 4 (northerly parcels) will have 2 tree wells per lot. Lots 1 & 2 (southerly parcels) will drain onto Biofiltration BMP #1, the BMP proposed east of Lot 4's home. In BMP #1, Lots 1 & 2, the main driveway entry, and each private driveway, will be treated, as well as the 100-yr storm retained with a controlled release to ensure 100-year post-development flows do not exceed 100-year pre-development flows. |

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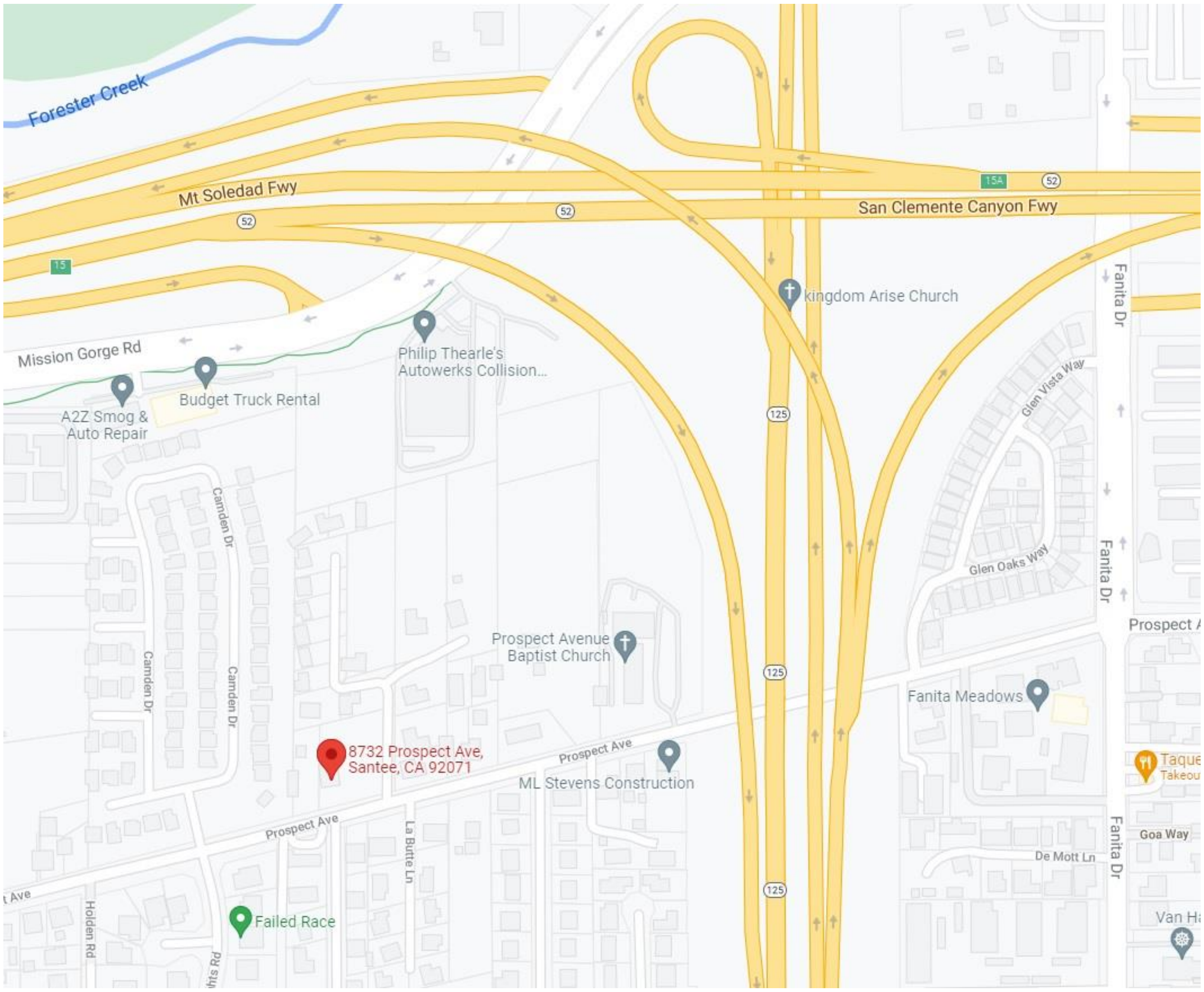
# PROJECT VICINITY MAP

**Project Name: Palm Tree Investments**
**Permit Application Number: TPM 2020-1**



| **Applicability of Permanent, Post-Construction Storm Water BMP Requirements**<br>**(Storm Water Intake Form for all Development Permit Applications)** | | | **Form I-1**<br>Model BMP Design Manual<br>[August 31, 2015] |
|---|---|---|---|
| **Project Identification** | | | |
| Project Name: Palm Tree Investments | | | |
| Permit Application Number: TPM 2020-1 | | | Date: 9-24-2024 |
| Project Address: 8732 Prospect Ave, Santee, CA 92071 | | | |
| **Determination of Requirements** | | | |
| The purpose of this form is to identify permanent, post-construction requirements that apply to the project. This form serves as a short summary of applicable requirements, in some cases referencing separate forms that will serve as the backup for the determination of requirements.<br><br>Answer each step below, starting with Step 1 and progressing through each step until reaching "Stop". **Upon reaching a Stop, do not complete further Steps beyond the Stop.**<br><br>Refer to BMP Design Manual sections and/or separate forms referenced in each step below. | | | |
| **Step** | **Answer** | **Progression** | |
| **Step 1:** Is the project a "development project"?<br>See Section 1.3 of the BMP Design Manual for guidance. | ☑ Yes | Go to Step 2. | |
| | ☐ No | Stop.<br>Permanent BMP requirements do not apply. No SWQMP will be required. Provide discussion below. | |
| Discussion / justification if the project is not a "development project" (e.g., the project includes *only* interior remodels within an existing building): | | | |
| **Step 2:** Is the project a Standard Project, Priority Development Project (PDP), or exception to PDP definitions?<br>To answer this item, see Section 1.4 of the BMP Design Manual *in its entirety* for guidance, AND complete Form I-2, Project Type Determination. | ☐ Standard Project | Stop.<br>Only Standard Project requirements apply, including Standard Project SWQMP. | |
| | ☑ PDP | Standard and PDP requirements apply, including PDP SWQMP.<br>Go to Step 3. | |
| | ☐ Exception to PDP definitions | Stop.<br>Standard Project requirements apply, and any additional requirements specific to the type of project. Provide discussion and list any additional requirements below. Prepare Standard Project SWQMP. | |

| Form I-1 Page 2, Form Template Date: August 31, 2015 | | |
|---|---|---|
| **[Step 2 Continued from Page 1]** Discussion / justification, and additional requirements for exceptions to PDP definitions, if applicable: | | |
| **Step 3 (PDPs only).** Is the project subject to earlier PDP requirements due to a prior lawful approval?<br>See Section 1.10 of the BMP Design Manual for guidance. | ☐ Yes | Consult the [City Engineer] to determine requirements. Provide discussion and identify requirements below.<br>Go to Step 4. |
| | ☑ No | BMP Design Manual PDP requirements apply.<br>Go to Step 4. |
| Discussion / justification of prior lawful approval, and identify requirements (*not required if prior lawful approval does not apply*): | | |
| **Step 4 (PDPs only).** Do hydromodification control requirements apply?<br>See Section 1.6 of the BMP Design Manual for guidance. | ☑ Yes | PDP structural BMPs required for pollutant control (Chapter 5) and hydromodification control (Chapter 6).<br>Go to Step 5. |
| | ☐ No | Stop.<br>PDP structural BMPs required for pollutant control (Chapter 5) only.<br>Provide brief discussion of exemption to hydromodification control below. |
| Discussion / justification if hydromodification control requirements do not apply:<br><br>A Biofiltration BMP is proposed for pollutant control of the proposed A.C. and sidewalk for the widening of Prospect Ave. Said BMP is designed per the guidelines for the County of San Diego on Green Infrastructure, January 2019. | | |
| **Step 5 (PDPs subject to hydromodification control requirements only).** Does protection of critical coarse sediment yield areas apply based on review of WMAA Potential Critical Coarse Sediment Yield Area Map?<br>See Section 6.2 of the BMP Design Manual for guidance. | ☐ Yes | Management measures required for protection of critical coarse sediment yield areas (Chapter 6.2).<br>Stop. |
| | ☑ No | Management measures not required for protection of critical coarse sediment yield areas.<br>Provide brief discussion below.<br>Stop. |

<table>
<tr><th colspan="4">Priority Determination Form</th><th>Form I-2<br>Model BMP Design Manual<br>[August 31, 2015]</th></tr>
<tr><td colspan="5">Project Information</td></tr>
<tr><td colspan="5">Project Name: Palm Tree Investments</td></tr>
<tr><td colspan="4">Permit Application Number: TPM 2020-1</td><td>Date: 9-24-2024</td></tr>
<tr><td colspan="5">Project Address: 8732 Prospect Ave, Santee, CA 92071</td></tr>
<tr><td colspan="5">Project Type Determination: Standard Project or Priority Development Project (PDP)</td></tr>
<tr><td colspan="5">The project is (select one): ☑ New Development ☐ Redevelopment</td></tr>
<tr><td colspan="5">The total proposed newly created or replaced impervious area is: _14,275___ ft$^2$ (__0.327___) acres</td></tr>
<tr><td colspan="5">Is the project in any of the following categories, (a) through (f)?</td></tr>
<tr><td>Yes<br>☑</td><td>No<br>☐</td><td>(a)</td><td colspan="2">New development projects that create 10,000 square feet or more of impervious surfaces (collectively over the entire project site). This includes commercial, industrial, residential, mixed-use, and public development projects on public or private land.</td></tr>
<tr><td>Yes<br>☐</td><td>No<br>☑</td><td>(b)</td><td colspan="2">Redevelopment projects that create and/or replace 5,000 square feet or more of impervious surface (collectively over the entire project site on an existing site of 10,000 square feet or more of impervious surfaces). This includes commercial, industrial, residential, mixed-use, and public development projects on public or private land.</td></tr>
<tr><td>Yes<br>☐</td><td>No<br>☑</td><td>(c)</td><td colspan="2">New and redevelopment projects that create and/or replace 5,000 square feet or more of impervious surface (collectively over the entire project site), and support one or more of the following uses:<br>(i) Restaurants. This category is defined as a facility that sells prepared foods and drinks for consumption, including stationary lunch counters and refreshment stands selling prepared foods and drinks for immediate consumption (Standard Industrial Classification (SIC) code 5812).<br>(ii) Hillside development projects. This category includes development on any natural slope that is twenty-five percent or greater.<br>(iii) Parking lots. This category is defined as a land area or facility for the temporary parking or storage of motor vehicles used personally, for business, or for commerce.<br>(iv) Streets, roads, highways, freeways, and driveways. This category is defined as any paved impervious surface used for the transportation of automobiles, trucks, motorcycles, and other vehicles.</td></tr>
</table>

| Form I-2 Page 2, Form Template Date: August 31, 2015 | | | |
|---|---|---|---|
| Yes ☐ | No ☑ | (d) | New or redevelopment projects that create and/or replace 2,500 square feet or more of impervious surface (collectively over the entire project site), and discharging directly to an Environmentally Sensitive Area (ESA). "Discharging directly to" includes flow that is conveyed overland a distance of 200 feet or less from the project to the ESA, or conveyed in a pipe or open channel any distance as an isolated flow from the project to the ESA (i.e. not commingled with flows from adjacent lands).<br>*Note: ESAs are areas that include but are not limited to all Clean Water Act Section 303(d) impaired water bodies; areas designated as Areas of Special Biological Significance by the State Water Board and San Diego Water Board; State Water Quality Protected Areas; water bodies designated with the RARE beneficial use by the State Water Board and San Diego Water Board; and any other equivalent environmentally sensitive areas which have been identified by the Copermittees. See BMP Design Manual Section 1.4.2 for additional guidance.* |
| Yes ☐ | No ☑ | (e) | New development projects, or redevelopment projects that create and/or replace 5,000 square feet or more of impervious surface, that support one or more of the following uses:<br>(i) Automotive repair shops. This category is defined as a facility that is categorized in any one of the following SIC codes: 5013, 5014, 5541, 7532-7534, or 7536-7539.<br>(ii) Retail gasoline outlets (RGOs). This category includes RGOs that meet the following criteria: (a) 5,000 square feet or more or (b) a projected Average Daily Traffic (ADT) of 100 or more vehicles per day. |
| Yes ☐ | No ☑ | (f) | New or redevelopment projects that result in the disturbance of one or more acres of land and are expected to generate pollutants post construction.<br>*Note: See BMP Design Manual Section 1.4.2 for additional guidance.* |
| Does the project meet the definition of one or more of the Priority Development Project categories (a) through (f) listed above?<br>☐ No – the project is not a Priority Development Project (Standard Project).<br>☑ Yes – the project is a Priority Development Project (PDP). | | | |
| The following is for redevelopment PDPs only:<br><br>The area of existing (pre-project) impervious area at the project site is: __4,700__ ft² (A)<br>The total proposed newly created or replaced impervious area is __14,275___ ft² (B)<br>Percent impervious surface created or replaced (B/A)*100: __303__%<br>The percent impervious surface created or replaced is (select one based on the above calculation):<br>☐ less than or equal to fifty percent (50%) – only new impervious areas are considered PDP<br>OR<br>☑ greater than fifty percent (50%) – the entire project site is a PDP | | | |

| Site Design Checklist For PDPs | **Form I-3B (PDPs)** Model BMP Design Manual [August 31, 2015] |
|---|---|
| **Project Summary Information** | |
| Project Name | Palm Tree Investments |
| Project Address | 8732 Prospect Ave<br>Santee, CA 92071 |
| Assessor's Parcel Number(s) (APN(s)) | 383-112-26-00 |
| Permit Application Number | TPM 2020-1 |
| Project Hydrologic Unit | Select One:<br>☐ Santa Margarita 902<br>☐ San Luis Rey 903<br>☐ Carlsbad 904<br>☐ San Dieguito 905<br>☐ Penasquitos 906<br>☑ San Diego 907<br>☐ Pueblo San Diego 908<br>☐ Sweetwater 909<br>☐ Otay 910<br>☐ Tijuana 911 |
| Project Watershed<br>(Complete Hydrologic Unit, Area, and Subarea Name with Numeric Identifier) | San Diego River 907, 907.12 |
| Parcel Area<br>(total area of Assessor's Parcel(s) associated with the project) | 0.85 Acres ( 37,026 Square Feet) |
| Area to be Disturbed by the Project<br>(Project Area) | 0.85 Acres ( 37,026 Square Feet) |
| Project Proposed Impervious Area<br>(subset of Project Area) | 0.327 Acres ( 14,275 Square Feet) |
| Project Proposed Pervious Area<br>(subset of Project Area) | 0.37 Acres ( 16,116 Square Feet) |
| Note: Proposed Impervious Area + Proposed Pervious Area = Area to be Disturbed by the Project. This may be less than the Parcel Area. | |

| Form I-3B Page 2 of 10, Form Template Date: August 31, 2015 |
|---|
| **Description of Existing Site Condition** |
| Current Status of the Site (select all that apply):<br>☑ Existing development<br>☐ Previously graded but not built out<br>☐ Demolition completed without new construction<br>☐ Agricultural or other non-impervious use<br>☐ Vacant, undeveloped/natural<br><br>Description / Additional Information:<br>**The site consist of one single family residence, with the remaining land sheet graded.** |
| Existing Land Cover Includes (select all that apply):<br>☐ Vegetative Cover<br>☑ Non-Vegetated Pervious Areas<br>☐ Impervious Areas<br><br>Description / Additional Information:<br>**Other than the existing single-family residence, the entire area within the property fence is sheet graded. Meaning, it grows weeds during the winter and dries out during the summer.** |
| Underlying Soil belongs to Hydrologic Soil Group (select all that apply):<br>☐ NRCS Type A<br>☐ NRCS Type B<br>☐ NRCS Type C<br>☑ NRCS Type D |
| Approximate Depth to Groundwater (GW): Soils engineer identified clay, no groundwater depths.<br>☐ GW Depth < 5 feet<br>☐ 5 feet < GW Depth < 10 feet<br>☐ 10 feet < GW Depth < 20 feet<br>☑ GW Depth > 20 feet |

Existing Natural Hydrologic Features (select all that apply):

☐ Watercourses

☐ Seeps

☐ Springs

☐ Wetlands

☑ None

Description / Additional Information:

**The lay of the land is from southwest to northeast. The roof drains onto the property and flows northeasterly. The remainder of the site is sheet graded. The frontage of the project, Prospect Ave, also drains toward/onto the site.**

| Form I-3B Page 3 of 10, Form Template Date: August 31, 2015 |
|---|
| **Description of Existing Site Drainage Patterns** |
| How is storm water runoff conveyed from the site? At a minimum, this description should answer:<br><br>(1) whether existing drainage conveyance is natural or urban;<br><br>(2) Is runoff from offsite conveyed through the site? if yes, quantify all offsite drainage areas, design flows, and locations where offsite flows enter the project site, and summarize how such flows are conveyed through the site;<br><br>(3) Provide details regarding existing project site drainage conveyance network, including any existing storm drains, concrete channels, swales, detention facilities, storm water treatment facilities, natural or constructed channels; and<br><br>(4) Identify all discharge locations from the existing project site along with a summary of conveyance system size and capacity for each of the discharge locations. Provide summary of the pre-project drainage areas and design flows to each of the existing runoff discharge locations.<br><br>Describe existing site drainage patterns:<br><br>The lay of the land is from southwest to northeast, with one existing home situated on the southwesterly corner of the parcel. The highpoint is on the southwest corner of the property with an elevation of 366 ft, and the low point is on the northeast corner of the property with an elevation of 351 ft. The land slopes gently, approximately 5%, toward the northeast.<br><br>The site is self-tributary, the westerly parcel (APN 383-112-27) appears to drain toward the project's northwesterly corner, but also has obstructions whereby it's possible the adjacent parcel does not drain onto the site. Regardless, to be safe, this project will assume a portion of the flows to enter the site and flow along the northerly property line and toward the project's northeasterly corner. Moreover, per the hydrology study from the farther west single family tract development (Drainage Study for Prospect Fields, dated October 27, 2016) the westerly home's flows appear to be collected and drained via said tract's concrete drainage ditch. Lastly, flows from Prospect Ave traverse Prospect and then traverse Our Way along its westerly side and then surface flows toward the project's northeasterly corner. |

| Form I-3B Page 4 of 10, Form Template Date: August 31, 2015 |
|---|
| **Description of Proposed Site Development** |

Project Description / Proposed Land Use and/or Activities:

The entire site will remain self-tributary. The project proposes to demolish the existing home and subdivide into four (4) parcels to construct new single-family residences, with a single shared private driveway accessing from Prospect Ave.

Each of the four parcels will be graded to be generally flat, with 1% (min.) swales around each home to convey overland flows.

Parcels 1 and 2 (southerly parcels) will drain northward toward the front yard and onto the concrete V-Ditch gutter in the middle of the inverted drive aisle. Parcels 1 and 2 will then confluence with the driveway flows (main driveway entry from Prospect Ave (north-south alignment), drive aisle connecting to each of the 4 private driveways (east-west alignment), and each of the 4 private driveways). Then, said confluence flows will flow eastward toward the Biofiltration BMP #1 proposed on the east side of the house on Parcel 4. Then, ultimately discharge at the project's northeasterly corner (Point of Compliance (POC) 1, via the discharge pipes within BMP #1 that will be connected to the retaining wall and outletting onto the rock pad east of the wall. The rock pad will be 1% toward the north and will allow flows to leave the project at non-erosive velocities onto the existing asphalt.

Parcels three (3) and four (4) (northerly parcels) will drain northward toward the rear yards and into tree wells – 2 tree wells per parcel, 1 per each half. Per the County of San Diego's BMP Design Manual, September 2020, Appendix I, Significant Site Design BMP (SSD-BMP), tree wells can be used for both pollutant control and hydromodification. Therefore, tree wells for parcels 3 and 4 are designed per said Manual. The tree wells, however, are not designed for the 100 year flows. The 100 year flows will flow over the landscaped slopes at the rear of the yards and down a rip rap apron onto a concrete D-25 ditch. From there, flows will flow easterly onto a rip rap apron pad at the project's northeasterly corner, POC 1.

All onsite flows, along with the potential flows from the neighboring westerly parcel, will outlet at the project's northeasterly corner, POC 1. Parcels 3 and 4 will be treated by the tree wells. For Parcels 1 and 2, and the driveways, a Biofiltration BMP will treat the initial flows (85$^{th}$ percentile Design Capture Volume (DCV)).

The Biofiltration BMP will be sized to capture, treat, then release the DCV flows, with a perforated pipe at the base of the BMP along with a low-flow orifice to control post-development outlet flows so they match, or are less than, the existing flows. Therefore, to ensure post-development flows are less than pre-development flows, a riser pipe with a 4.6 inch orifice will be installed to ensure total discharge flows will be equal to, or less than, pre-development flows. Moreover, the BMP surface is designed to retain the 100 year flow volume which will also slowly drain via the riser pipe orifice. In other words, all flows will discharge via the BMP discharge pipes so that post-development flows never exceed pre-development flows. In short, existing 100-year flows equal 0.92 cfs and mitigated 100-year flows also equal 0.92 cfs (0.69 cfs via the 4.6 inch orifice and 0.23 cfs via the low-flow perforated pipe at the bottom of the basin.

Since the Prospect Ave flows do not traverse the site, said flows will continue to drain from Prospect Ave, down Our Way, easterly of the project's improvements, to POC 1. Due to the widening of Prospect Ave, a Biofiltration Treatment BMP #2 is proposed, per the County of San Diego Guidance on Green Infrastructure, January 2019. It will be sized to treat the proposed A.C. and concrete sidewalk due to the required street widening improvements. The flows from Prospect Ave will be captured, first by a Biofiltration BMP (see SWQMP for details) for the 85% percentile flows, and second by a curb inlet to capture the 100-year flows. The BMP #2 will connect to the curb inlet via the perforated pipe at the bottom of the Treatment BMP. These systems are proposed on the north side of Prospect Ave, immediately west of Our Way. The flows will then be piped via an 8" PVC pipe from the curb inlet to the project's northeasterly corner, POC 1, between the proposed site and Our Way.

List/describe proposed impervious features of the project (e.g., buildings, roadways, parking lots, courtyards, athletic courts, other impervious features):

The project proposes to demolish the existing home and construct four (4) new single-family residential parcels. Additionally, Prospect Ave will be widened to its ultimate width and it will include a Biofiltration Treatment BMP and curb inlet that will be placed in their ultimate location.

List/describe proposed pervious features of the project (e.g., landscape areas):

Each parcel, other than the rooftops, will be landscaped and have two (2) tree wells per parcel 3 & 4 to treat the pollutants of the 85% percentile flows. The individual driveways will consist of pervious pavers and will drain onto the main driveway after the minor flows saturate the voids under the pervious pavers.

Does the project include grading and changes to site topography?
☑ Yes
☐ No
Description / Additional Information:

Each of the four parcels will be graded to be generally flat, with 1% (min.) swales around each home to convey overland flows. The two southerly parcels (Parcels 1 & 2) will drain into the inverted driveway and flow onto a Biofiltration BMP proposed on the east side of Parcel 4's home. Parcels 3 & 4 will have two (2) tree wells each to treat the pollutants of the 85% percentile flows. The two northerly parcels (Parcels 3 & 4) will drain into their respective tree wells and then onto a concrete ditch paralleling the northerly property line and will then flow to the northeast corner of the site, where the existing site confluences.

| Form I-3B Page 5 of 10, Form Template Date: August 31, 2015 |
| --- |
| **Description of Proposed Site Drainage Patterns** |
| |

Does the project include changes to site drainage (e.g., installation of new storm water conveyance systems)?

☑ Yes
☐ No

If yes, provide details regarding the proposed project site drainage conveyance network, including storm drains, concrete channels, swales, detention facilities, storm water treatment facilities, natural or constructed channels, and the method for conveying offsite flows through or around the proposed project site. Identify all discharge locations from the proposed project site along with a summary of the conveyance system size and capacity for each of the discharge locations. Provide a summary of pre- and post-project drainage areas and design flows to each of the runoff discharge locations. Reference the drainage study for detailed calculations.

Describe proposed site drainage patterns:

The entire site will remain self-tributary. The project proposes to demolish the existing home and subdivide into four (4) parcels to construct new single-family residences, with a single shared private driveway accessing from Prospect Ave.

Each of the four parcels will be graded to be generally flat, with 1% (min.) swales around each home to convey overland flows.

Parcels 1 and 2 (southerly parcels) will drain northward toward the front yard and onto the concrete V-Ditch gutter in the middle of the inverted drive aisle. Parcels 1 and 2 will then confluence with the driveway flows (main driveway entry from Prospect Ave (north-south alignment), drive aisle connecting to each of the 4 private driveways (east-west alignment), and each of the 4 private driveways). Then, said confluence flows will flow eastward toward the Biofiltration BMP #1 proposed on the east side of the house on Parcel 4. Then, ultimately discharge at the project's northeasterly corner (Point of Compliance (POC) 1, via the discharge pipes within BMP #1 that will be connected to the retaining wall and outletting onto the rock pad east of the wall. The rock pad will be 1% toward the north and will allow flows to leave the project at non-erosive velocities onto the existing asphalt.

Parcels three (3) and four (4) (northerly parcels) will drain northward toward the rear yards and into tree wells – 2 tree wells per parcel, 1 per each half. Per the County of San Diego's BMP Design Manual, September 2020, Appendix I, Significant Site Design BMP (SSD-BMP), tree wells can be used for both pollutant control and hydromodification. Therefore, tree wells for parcels 3 and 4 are designed per said Manual. The tree wells, however, are not designed for the 100 year flows. The 100 year flows will flow over the landscaped slopes at the rear of the yards and down a rip rap apron onto a concrete D-25 ditch. From there, flows will flow easterly onto a rip rap apron pad at the project's northeasterly corner, POC 1.

All onsite flows, along with the potential flows from the neighboring westerly parcel, will outlet at the project's northeasterly corner, POC 1. Parcels 3 and 4 will be treated by the tree wells. For Parcels 1 and 2, and the driveways, a Biofiltration BMP will treat the initial flows ($85^{th}$ percentile Design Capture Volume (DCV)).

The Biofiltration BMP will be sized to capture, treat, then release the DCV flows, with a perforated pipe at the base of the BMP along with a low-flow orifice to control post-development outlet flows so they match, or are less than, the existing flows. Therefore, to ensure post-development flows are less than pre-development flows, a riser pipe with a 4.6 inch orifice will be installed to ensure total discharge flows will be equal to, or less than, pre-development flows. Moreover, the BMP surface is designed to retain the 100 year flow volume which will also slowly drain via the riser pipe orifice. In other words, all flows will discharge via the BMP discharge pipes so that post-development flows never exceed pre-development flows. In short, existing 100-year flows equal 0.92 cfs and mitigated 100-year flows also equal 0.92 cfs (0.69 cfs via the 4.6 inch orifice and 0.23 cfs via the low-flow perforated pipe at the bottom of the basin.

**Form I-3B Page 6 of 10, Form Template Date: August 31, 2015**

Identify whether any of the following features, activities, and/or pollutant source areas will be present (select all that apply):

☐ On-site storm drain inlets

☐ Interior floor drains and elevator shaft sump pumps

☑ Interior parking garages

☑ Need for future indoor & structural pest control

☑ Landscape/Outdoor Pesticide Use

☐ Pools, spas, ponds, decorative fountains, and other water features

☐ Food service

☐ Refuse areas

☐ Industrial processes

☐ Outdoor storage of equipment or materials

☐ Vehicle and Equipment Cleaning

☐ Vehicle/Equipment Repair and Maintenance

☐ Fuel Dispensing Areas

☐ Loading Docks

☑ Fire Sprinkler Test Water

☑ Miscellaneous Drain or Wash Water

☐ Plazas, sidewalks, and parking lots

Description / Additional Information:

There are no additional activities proposed for this site.

**Identification and Narrative of Receiving Water and Pollutants of Concern**

Describe flow path of storm water from the project site discharge location(s), through urban storm conveyance systems as applicable, to receiving creeks, rivers, and lagoons as applicable, and ultimate discharge to the Pacific Ocean (or bay, lagoon, lake or reservoir, as applicable): The site currently, and ultimately, drains north underneath I-52, then into Forester Creek. From there it drains westerly into Hollis Lake, then onto the San Diego River. The SD River then parallels Father Junipero Serra Trail, then Mission Gorge Rd. From there, the SD River continues westerly, and south of the recently demolished stadium. The SD River continues westerly, paralleling I-8, until it discharges into the Pacific Ocean.

List any 303(d) impaired water bodies within the path of storm water from the project site to the Pacific Ocean (or bay, lagoon, lake or reservoir, as applicable), identify the pollutant(s)/stressor(s) causing impairment, and identify any TMDLs and/or Highest Priority Pollutants from the WQIP for the impaired water bodies:

| 303(d) Impaired Water Body | Pollutant(s)/Stressor(s) | TMDLs / WQIP Highest Priority Pollutant |
|---|---|---|
| San Diego River | Enterococcus, Coliform, Low Dissolved Oxygen | Indicator Bacteria |
| | | |
| | | |

**Identification of Project Site Pollutants***

***Identification of project site pollutants is only required if flow-thru treatment BMPs are implemented onsite in lieu of retention or biofiltration BMPs (note the project must also participate in an alternative compliance program unless prior lawful approval to meet earlier PDP requirements is demonstrated)**

Identify pollutants expected from the project site based on all proposed use(s) of the site (see BMP Design Manual Appendix B.6):

| Pollutant | Not Applicable to the Project Site | Expected from the Project Site | Also a Receiving Water Pollutant of Concern |
|---|---|---|---|
| Sediment | | ☑ | ☑ |
| Nutrients | | ☑ | ☑ |
| Heavy Metals | | | |
| Organic Compounds | | | |
| Trash & Debris | | ☑ | ☑ |
| Oxygen Demanding Substances | | | |
| Oil & Grease | | ☑ | ☑ |
| Bacteria & Viruses | | ☑ | ☑ |
| Pesticides | | ☑ | ☑ |

| Form I-3B Page 8 of 10, Form Template Date: August 31, 2015 |
|---|
| **Hydromodification Management Requirements** |
| Do hydromodification management requirements apply (see Section 1.6 of the BMP Design Manual)?<br><br>☐ Yes, hydromodification management flow control structural BMPs required.<br>☐ No, the project will discharge runoff directly to existing underground storm drains discharging directly to water storage reservoirs, lakes, enclosed embayments, or the Pacific Ocean.<br>☐ No, the project will discharge runoff directly to conveyance channels whose bed and bank are concrete-lined all the way from the point of discharge to water storage reservoirs, lakes, enclosed embayments, or the Pacific Ocean.<br>☐ No, the project will discharge runoff directly to an area identified as appropriate for an exemption by the WMAA for the watershed in which the project resides.<br>☑No, other. Please read description below.<br><br>Description / Additional Information (to be provided if a 'No' answer has been selected above):<br><br>Project will drain into three (3) separate BMP's. 1) Per the County of San Diego Guidance on Green Infrastructure, January 2019, the project will discharge into a Biofiltration BMP and collect and treat the surface flows for the proposed A.C. and sidewalk within the project's Prospect Ave frontage. 2) Lots 1 thru 4 will have two tree wells each which will be installed without drain outlets, per County of San Diego's BMP Design Manual, Significant Site Design BMP (SSD-BMP) Tool. 3) The increased driveway, due to redesigned access from Prospect Ave, will drain entirely into a biofiltration BMP proposed easterly of Parcel 4's home. Moreover, as a result of much lower flows draining to this point, sizing for hydromodification purposes provides negative volumes instead of positive volumes; hence, no sizing for hydromodification purposes is needed. |
| **Critical Coarse Sediment Yield Areas***<br>***This Section only required if hydromodification management requirements apply** |

Based on the maps provided within the WMAA, do potential critical coarse sediment yield areas exist within the project drainage boundaries?

☐ Yes
☑ No, no critical coarse sediment yield areas to be protected based on WMAA maps

If yes, have any of the optional analyses presented in Section 6.2 of the BMP Design Manual been performed?

☐ 6.2.1 Verification of Geomorphic Landscape Units (GLUs) Onsite

☐ 6.2.2 Downstream Systems Sensitivity to Coarse Sediment

☐ 6.2.3 Optional Additional Analysis of Potential Critical Coarse Sediment Yield Areas Onsite

☐ No optional analyses performed, the project will avoid critical coarse sediment yield areas identified based on WMAA maps

If optional analyses were performed, what is the final result?

☐ No critical coarse sediment yield areas to be protected based on verification of GLUs onsite

☐ Critical coarse sediment yield areas exist but additional analysis has determined that protection is not required. Documentation attached in Attachment 2.b of the SWQMP.

☐ Critical coarse sediment yield areas exist and require protection. The project will implement management measures described in Sections 6.2.4 and 6.2.5 as applicable, and the areas are identified on the SWQMP Exhibit.

Discussion / Additional Information:

| Form I-3B Page 9 of 10, Form Template Date: August 31, 2015 |
| --- |
| **Flow Control for Post-Project Runoff***<br>***This Section only required if hydromodification management requirements apply** |
| List and describe point(s) of compliance (POCs) for flow control for hydromodification management (see Section 6.3.1). For each POC, provide a POC identification name or number correlating to the project's HMP Exhibit and a receiving channel identification name or number correlating to the project's HMP Exhibit.<br><br>POC #1: Northeast corner of parcel. |
| Has a geomorphic assessment been performed for the receiving channel(s)?<br><br>☑ No, the low flow threshold is 0.1Q2 (default low flow threshold)<br><br>☐ Yes, the result is the low flow threshold is 0.1Q2<br><br>☐ Yes, the result is the low flow threshold is 0.3Q2<br><br>☐ Yes, the result is the low flow threshold is 0.5Q2<br><br>If a geomorphic assessment has been performed, provide title, date, and preparer:<br><br>Discussion / Additional Information: (optional) |

| Form I-3B Page 10 of 10, Form Template Date: August 31, 2015 |
| --- |
| **Other Site Requirements and Constraints** |
| When applicable, list other site requirements or constraints that will influence storm water management design, such as zoning requirements including setbacks and open space, or local codes governing minimum street width, sidewalk construction, allowable pavement types, and drainage requirements.<br><br>N/A |
| **Optional Additional Information or Continuation of Previous Sections As Needed** |
| This space provided for additional information or continuation of information from previous sections as needed. |

<table>
<tr><td colspan="4">Source Control BMP Checklist<br>for All Development Projects<br>(Standard Projects and Priority Development Projects)</td><td>Form I-4<br>Model BMP Design Manual<br>[August 31, 2015]</td></tr>
<tr><td colspan="5">Project Identification</td></tr>
<tr><td colspan="5">Project Name Palm Tree Investments</td></tr>
<tr><td colspan="5">Permit Application Number: TPM 2020-1</td></tr>
<tr><td colspan="5">Source Control BMPs</td></tr>
<tr><td colspan="5">All development projects must implement source control BMPs SC-1 through SC-6 where applicable and feasible. See Chapter 4 and Appendix E of the Model BMP Design Manual for information to implement source control BMPs shown in this checklist.<br><br>Answer each category below pursuant to the following.<ul><li>"Yes" means the project will implement the source control BMP as described in Chapter 4 and/or Appendix E of the Model BMP Design Manual. Discussion / justification is not required.</li><li>"No" means the BMP is applicable to the project but it is not feasible to implement. Discussion / justification must be provided.</li><li>"N/A" means the BMP is not applicable at the project site because the project does not include the feature that is addressed by the BMP (e.g., the project has no outdoor materials storage areas). Discussion / justification may be provided.</li></ul></td></tr>
<tr><td colspan="2">Source Control Requirement</td><td colspan="3">Applied?</td></tr>
<tr><td colspan="2">SC-1 Prevention of Illicit Discharges into the MS4</td><td>☑ Yes</td><td>☐ No</td><td>☐ N/A</td></tr>
<tr><td colspan="5">Discussion / justification if SC-1 not implemented: Ultimate improvements for Prospect Ave will be built. A biofiltration bmp and curb inlet will also be placed in their ultimate location. The biofiltration bmp will treat the 85 percentile flows and the curb inlet will capture 100% of the 100-year flows.</td></tr>
<tr><td colspan="2">SC-2 Storm Drain Stenciling or Signage</td><td>☑ Yes</td><td>☐ No</td><td>☐ N/A</td></tr>
<tr><td colspan="5">Discussion / justification if SC-2 not implemented:</td></tr>
<tr><td colspan="2">SC-3 Protect Outdoor Materials Storage Areas from Rainfall, Run-On, Runoff, and Wind Dispersal</td><td>☐ Yes</td><td>☐ No</td><td>☑ N/A</td></tr>
<tr><td colspan="5">Discussion / justification if SC-3 not implemented:<br>These are detached residential units. Storage areas are anticipated to be either indoors or in a shed.</td></tr>
<tr><td colspan="2">SC-4 Protect Materials Stored in Outdoor Work Areas from Rainfall, Run-On, Runoff, and Wind Dispersal</td><td>☐ Yes</td><td>☐ No</td><td>☑ N/A</td></tr>
<tr><td colspan="5">Discussion / justification if SC-4 not implemented:<br>These are detached residential units. Outdoor work areas are not anticipated.</td></tr>
</table>

| Form I-4 Page 2 of 2, Form Template Date: August 31, 2015 | | | |
|---|---|---|---|
| **Source Control Requirement** | **Applied?** | | |
| **SC-5** Protect Trash Storage Areas from Rainfall, Run-On, Runoff, and Wind Dispersal | ☑ Yes | ☐ No | ☐ N/A |
| Discussion / justification if SC-5 not implemented: | | | |
| **SC-6** Additional BMPs Based on Potential Sources of Runoff Pollutants (must answer for each source listed below) | | | |
| ☐ On-site storm drain inlets | ☐ Yes | ☐ No | ☑ N/A |
| ☐ Interior floor drains and elevator shaft sump pumps | ☐ Yes | ☐ No | ☑ N/A |
| ☑ Interior parking garages | ☑ Yes | ☐ No | ☐ N/A |
| ☑ Need for future indoor & structural pest control | ☑ Yes | ☐ No | ☐ N/A |
| ☑ Landscape/Outdoor Pesticide Use | ☑ Yes | ☐ No | ☐ N/A |
| ☐ Pools, spas, ponds, decorative fountains, and other water features | ☐ Yes | ☐ No | ☑ N/A |
| ☐ Food service | ☐ Yes | ☐ No | ☑ N/A |
| ☐ Refuse areas | ☐ Yes | ☐ No | ☑ N/A |
| ☐ Industrial processes | ☐ Yes | ☐ No | ☑ N/A |
| ☐ Outdoor storage of equipment or materials | ☐ Yes | ☐ No | ☑ N/A |
| ☐ Vehicle and Equipment Cleaning | ☐ Yes | ☐ No | ☑ N/A |
| ☐ Vehicle/Equipment Repair and Maintenance | ☐ Yes | ☐ No | ☑ N/A |
| ☐ Fuel Dispensing Areas | ☐ Yes | ☐ No | ☑ N/A |
| ☐ Loading Docks | ☐ Yes | ☐ No | ☑ N/A |
| ☑ Fire Sprinkler Test Water | ☑ Yes | ☐ No | ☐ N/A |
| ☑ Miscellaneous Drain or Wash Water | ☑ Yes | ☐ No | ☑ N/A |
| ☐ Plazas, sidewalks, and parking lots | ☐ Yes | ☐ No | ☑ N/A |

Discussion / justification if SC-6 not implemented. Clearly identify which sources of runoff pollutants are discussed. Justification must be provided for all "No" answers shown above.

All “no” and “n/a” responses are due to this being a 4-lot subdivision for detached single family residences. However, the concrete driveway, along with Parcels 1 & 2 (southerly parcels), will drain onto an inverted drive aisle with a 3’ wide concrete ribbon gutter in the middle of the drive aisle. The driveway/drive aisle flows will then flow easterly and onto the proposed biofiltration bmp proposed on Parcel 4.

| Site Design BMP Checklist for All Development Projects (Standard Projects and Priority Development Projects) | | | | Form I-5 Model BMP Design Manual [August 31, 2015] |
|---|---|---|---|---|
| **Project Identification** | | | | |
| Project Name: Palm Tree Investments | | | | |
| Permit Application Number: TPM 2020-1 | | | | |
| **Site Design BMPs** | | | | |
| All development projects must implement site design BMPs SD-1 through SD-8 where applicable and feasible. See Chapter 4 and Appendix E of the Model BMP Design Manual for information to implement site design BMPs shown in this checklist.<br><br>Answer each category below pursuant to the following.<br>• "Yes" means the project will implement the site design BMP as described in Chapter 4 and/or Appendix E of the Model BMP Design Manual. Discussion / justification is not required.<br>• "No" means the BMP is applicable to the project but it is not feasible to implement. Discussion / justification must be provided.<br>• "N/A" means the BMP is not applicable at the project site because the project does not include the feature that is addressed by the BMP (e.g., the project site has no existing natural areas to conserve). Discussion / justification may be provided. | | | | |
| **Site Design Requirement** | | **Applied?** | | |
| **SD-1** Maintain Natural Drainage Pathways and Hydrologic Features | | ☑ Yes | ☐ No | ☐ N/A |
| Discussion / justification if SD-1 not implemented: | | | | |
| **SD-2** Conserve Natural Areas, Soils, and Vegetation | | ☐ Yes | ☑ No | ☐ N/A |
| Discussion / justification if SD-2 not implemented:<br>Site is currently native soil with little to no vegetation. Landscape and trees will be installed. | | | | |
| **SD-3** Minimize Impervious Area | | ☑ Yes | ☐ No | ☐ N/A |
| Discussion / justification if SD-3 not implemented: | | | | |
| **SD-4** Minimize Soil Compaction | | ☑Yes | ☐ No | ☐ N/A |
| Discussion / justification if SD-4 not implemented:<br>Soil compaction in the landscape area will be compacted in such a way to ensure/promote infiltration, especially for the tree wells. | | | | |
| **SD-5** Impervious Area Dispersion (IAD) | | ☐ Yes | ☑ No | ☐ N/A |
| Discussion / justification if SD-5 not implemented:<br>Previous design proposed curb cuts to allow Our Way to flow onto IAD. However, due to redesign and Our Way no longer being utilized to access site, and because Our Way is not proposed to being widened, only a landscape area adjacent to Parcel 1 and portion of Parcel 4 is proposed. | | | | |

| Form I-5 Page 2 of 2, Form Template Date: August 31, 2015 | | | |
|---|---|---|---|
| **Site Design Requirement** | **Applied?** | | |
| **SD-6** Runoff Collection | ☑ Yes | ☐ No | ☐ N/A |
| Discussion / justification if SD-6 not implemented: | | | |
| **SD-7** Landscaping with Native or Drought Tolerant Species | ☑ Yes | ☐ No | ☐ N/A |
| Discussion / justification if SD-7 not implemented: | | | |
| **SD-8** Harvesting and Using Precipitation | ☑ Yes | ☐ No | ☐ N/A |
| Discussion / justification if SD-8 not implemented:<br>Flows from each of the parcels will be directed to tree wells (2 tree wells per parcel). Rain barrels were considered but not selected due to small lots, high cost, and residents removing them sometime after move-in. | | | |

| Summary of PDP Structural BMPs | **Form I-6 (PDPs)**<br>Model BMP Design Manual<br>[August 31, 2015] |
|---|---|
| **Project Identification** | |
| Project Name: Palm Tree Investments | |
| Permit Application Number: TPM 2020-1 | |
| **PDP Structural BMPs** | |
| All PDPs must implement structural BMPs for storm water pollutant control (see Chapter 5 of the BMP Design Manual). Selection of PDP structural BMPs for storm water pollutant control must be based on the selection process described in Chapter 5. PDPs subject to hydromodification management requirements must also implement structural BMPs for flow control for hydromodification management (see Chapter 6 of the BMP Design Manual). Both storm water pollutant control and flow control for hydromodification management can be achieved within the same structural BMP(s).<br><br>PDP structural BMPs must be verified by the local jurisdiction at the completion of construction. This may include requiring the project owner or project owner's representative and engineer of record to certify construction of the structural BMPs (see Section 1.12 of the BMP Design Manual). PDP structural BMPs must be maintained into perpetuity, and the local jurisdiction must confirm the maintenance (see Section 7 of the BMP Design Manual).<br><br>Use this form to provide narrative description of the general strategy for structural BMP implementation at the project site in the box below. Then complete the PDP structural BMP summary information sheet (page 3 of this form) for each structural BMP within the project (copy the BMP summary information page as many times as needed to provide summary information for each individual structural BMP). | |

Describe the general strategy for structural BMP implementation at the site. This information must describe how the steps for selecting and designing storm water pollutant control BMPs presented in Section 5.1 of the BMP Design Manual were followed, and the results (type of BMPs selected). For projects requiring hydromodification flow control BMPs, indicate whether pollutant control and flow control BMPs are integrated or separate.

For the Onsite:

Source Control, Site Design, Pollutant Control, and Hydromodification are addressed.
For source control, each property owner will be provided with literature on how to maintain their property and minimize/eliminate pollutant sources.

Parcels 1 and 2 (southerly parcels) will drain northward toward the front yard and onto the concrete V-Ditch gutter in the middle of the inverted drive aisle. Parcels 1 and 2 will then confluence with the driveway flows (main driveway entry from Prospect Ave (north-south alignment), drive aisle connecting to each of the 4 private driveways (east-west alignment), and each of the 4 private driveways). Then, said confluence flows will flow eastward toward the Biofiltration BMP #1 proposed on the east side of the house on Parcel 4. Then, ultimately discharge at the project's northeasterly corner (Point of Compliance (POC) 1, via the discharge pipes within BMP #1 that will be connected to the retaining wall and outletting onto the rock pad east of the wall. The rock pad will be 1% toward the north and will allow flows to leave the project at non-erosive velocities onto the existing asphalt.

Parcels 3 & 4 (northerly parcels) will also drain into their respective tree wells. If the tree wells get saturated due to a major storm, the overland flows will then drain onto a spillway on the sides of the slopes adjacent to the northerly property line. At the toe of slope, a concrete D-25 ditch will convey flows from parcels 3 & 4 toward the northeast corner of the project.

Per the County of San Diego's BMP Design Manual (Sept. '20), BMP SD-A (Significant Side Design BMP), tree wells are allowed to be used for pollutant control and hydromodification, with the design requirement that it not have an outlet pipe. Therefore, it was calculated that each parcel would have two (2) tree wells to meet the treatment requirements.

Due to the redesign of the access now being proposed from Prospect Ave, all impervious driveways, as well as Lots 1 & 2, will drain onto Parcel 4 and into a Biofiltration BMP for treatment of the 85$^{th}$ percentile design capture volume.

Dispersion areas were considered in-lieu of vegetated swales adjacent to Parcels 1 & 4, paralleling Our Way, but they proved insufficient due to very limited space. Therefore, the vegetated swale is used to increase green landscape, enhance the visual aesthetics of Our Way, and promote water/vegetation interaction to the maximum extent practicable.

For Offsite Flows

Due to the ultimate widening of Prospect Ave, a Biofiltration Treatment BMP is proposed, per the County of San Diego Guidance on Green Infrastructure, January 2019. It is sized to treat the area tributary from Prospect Ave. The flows from Prospect Ave will be captured, first by a Biofiltration BMP for the 85% percentile flows, and second by a curb inlet to capture 100% of the 100-year flows. The 5-ft curb inlet opening has a maximum capacity of 2.2 cfs, and the calculated flows at this point are calculated to be 0.65 cfs.

Additionally, if incoming flows exceed the infiltration rate of the BMP and saturates the BMP, flows will saturate the BMP and simply pond until it rises enough to flow into the gutter, via the curb cuts, and flow into the curb inlet immediately adjacent to the Biofiltration BMP. Additionally, a 6” diameter cleanout port will be provided at the upstream end of the Biofiltration BMP for maintenance purposes in case the 3” PVC perforated pipe needs flushing out. The 3” PVC will connect to the curb inlet at the bottom of the BMP/Basin. Flows will then flow into an 8” PVC pipe that will parallel Our Way and the project’s easterly property line. The pipe will traverse beneath a vegetated swale adjacent to Parcel 1 and a portion of Parcel 4. The pipe will outlet onto a concrete apron with cobbles embedded into it. This apron will serve to dissipate the pipe outlet flows to non-erosive velocities as it approaches the project’s northeasterly corner, where the site’s overland flows flow to in the existing condition.

(Continue on page 2 as necessary.)

| Form I-6 Page 2 of X, Form Template Date: August 31, 2015 |
| --- |
| **(Page reserved for continuation of description of general strategy for structural BMP implementation at the site)** |
| (Continued from page 1) |

| Form I-6 Page 3 of X (Copy as many as needed) , Form Template Date: August 31, 2015 | |
|---|---|
| **Structural BMP Summary Information**<br>**(Copy this page as needed to provide information for each individual proposed structural BMP)** | |
| Structural BMP ID No. 1 | |
| Construction Plan Sheet No.: TBD at construction docs sub'tl. This report is for discretionary review. | |
| Type of structural BMP:<br>☐ Retention by harvest and use (HU-1)<br>☐ Retention by infiltration basin (INF-1)<br>☐ Retention by bioretention (INF-2)<br>☐ Retention by permeable pavement (INF-3)<br>☐ Partial retention by biofiltration with partial retention (PR-1)<br>☑ Biofiltration (BF-1)<br>☐ Biofiltration with Nutrient Sensitive Media Design (BF-2)<br>☐ Proprietary Biofiltration (BF-3) meeting all requirements of Appendix F<br>☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below)<br>☐ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below)<br>☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below)<br>☐ Detention pond or vault for hydromodification management<br>☐ Other (describe in discussion section below) | |
| Purpose:<br>☐ Pollutant control only<br>☐ Hydromodification control only<br>☑ Combined pollutant control and hydromodification control<br>☐ Pre-treatment/forebay for another structural BMP<br>☐ Other (describe in discussion section below) | |
| Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification forms if required by the [City Engineer] (See Section 1.12 of the BMP Design Manual) | Project owner |
| Who will be the final owner of this BMP? | Project owner(s) (onsite bmp's) |
| Who will maintain this BMP into perpetuity? | Project owner(s) (onsite bmp's) |
| What is the funding mechanism for maintenance? | Project owner |

| Form I-6 Page 4 of X (Copy as many as needed) , Form Template Date: August 31, 2015 |
|---|
| Structural BMP ID No. TBD |
| Construction Plan Sheet No. TBD |
| Discussion (as needed):<br><br>A 20’x60’ Biofiltration System was sloped walls is calculated/sized to meet the 85% percentile Design Capture Volume requirement for the proposed driveways and Lots 1 & 2. This BMP will have a low flow orifice that will outlet through the adjacent wall and onto the proposed rip rap apron. A mid-flow orifice via a riser pipe will outlet the 100-year flows, not to exceed existing flow rates. Additionally, the BMP is designed to detain the 100-year volume and be control-released as noted. |

| Form I-6 Page 3 of X (Copy as many as needed) , Form Template Date: August 31, 2015 | |
|---|---|
| **Structural BMP Summary Information**<br>**(Copy this page as needed to provide information for each individual proposed structural BMP)** | |
| Structural BMP ID No. 2 | |
| Construction Plan Sheet No.: TBD at construction docs sub'tl. This report is for discretionary review. | |
| Type of structural BMP:<br>☐ Retention by harvest and use (HU-1)<br>☐ Retention by infiltration basin (INF-1)<br>☐ Retention by bioretention (INF-2)<br>☐ Retention by permeable pavement (INF-3)<br>☐ Partial retention by biofiltration with partial retention (PR-1)<br>☑ Biofiltration (BF-1)<br>☐ Biofiltration with Nutrient Sensitive Media Design (BF-2)<br>☐ Proprietary Biofiltration (BF-3) meeting all requirements of Appendix F<br>☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below)<br>☐ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below)<br>☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below)<br>☐ Detention pond or vault for hydromodification management<br>☐ Other (describe in discussion section below) | |
| Purpose:<br>☑ Pollutant control only<br>☐ Hydromodification control only<br>☐ Combined pollutant control and hydromodification control<br>☐ Pre-treatment/forebay for another structural BMP<br>☐ Other (describe in discussion section below) | |
| Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification forms if required by the [City Engineer] (See Section 1.12 of the BMP Design Manual) | Project owner |
| Who will be the final owner of this BMP? | City of Santee |
| Who will maintain this BMP into perpetuity? | City of Santee |
| What is the funding mechanism for maintenance? | City of Santee |

| Form I-6 Page 4 of X (Copy as many as needed) , Form Template Date: August 31, 2015 |
| --- |
| Structural BMP ID No. TBD |
| Construction Plan Sheet No. TBD |
| Discussion (as needed):<br><br>A 4.5’x16’ Biofiltration System was calculated/sized to meet the 85% percentile Design Capture Volume requirement for the proposed A.C. roadway (Prospect Ave). This BMP will drain into the proposed 5’ curb inlet adjacent to said BMP. All drainage herein will drain via an 8” PVC pipe to the project’s northeasterly corner, where existing site drainage confluences. |

# ATTACHMENT 1
# BACKUP FOR PDP POLLUTANT CONTROL BMPS

*This is the cover sheet for Attachment 1.*

**Indicate which Items are Included behind this cover sheet:**

| **Attachment Sequence** | **Contents** | **Checklist** |
|---|---|---|
| Attachment 1a | DMA Exhibit (Required)<br><br>See DMA Exhibit Checklist on the back of this Attachment cover sheet. | ☑ Included |
| Attachment 1b | Tabular Summary of DMAs Showing DMA ID matching DMA Exhibit, DMA Area, and DMA Type (Required)*<br><br>*Provide table in this Attachment OR on DMA Exhibit in Attachment 1a | ☑ Included on DMA Exhibit in Attachment 1a<br>☐ Included as Attachment 1b, separate from DMA Exhibit |
| Attachment 1c | Form I-7, Harvest and Use Feasibility Screening Checklist (Required unless the entire project will use infiltration BMPs)<br><br>Refer to Appendix B.3-1 of the BMP Design Manual to complete Form I-7. | ☑ Included<br>☐ Not included because the entire project will use infiltration BMPs . Moreover, rain barrels were considered but not selected due to small lots, high cost, and residents removing them sometime after move-in. |
| Attachment 1d | Form I-8, Categorization of Infiltration Feasibility Condition (Required unless the project will use harvest and use BMPs)<br><br>Refer to Appendices C and D of the BMP Design Manual to complete Form I-8. | ☑ Included<br>☐ Not included because the entire project will use harvest and use BMPs. Moreover, rain barrels were considered but not selected due to small lots, high cost, and residents removing them sometime after move-in. |
| Attachment 1e | Pollutant Control BMP Design Worksheets / Calculations (Required)<br><br>Refer to Appendices B and E of the BMP Design Manual for structural pollutant control BMP design guidelines | ☑ Included |

*Use this checklist to ensure the required information has been included on the DMA Exhibit:*

The DMA Exhibit must identify:

- ☑ Underlying hydrologic soil group
  - Per the County of San Diego Hydrology Manual, Soil Hydrologic Groups, the site is situated within Soil Type D. Moreover, per GEOCON Inc, the site consists of clay approximately 5' thick. Therefore, soil type D is used.
- ☑ Approximate depth to groundwater
  - Groundwater not found (per GEOCON Inc.)
- ☑ Existing natural hydrologic features (watercourses, seeps, springs, wetlands)
  - Site has a gradual slope toward the northeast and overland flows sheet flow toward the parcel's northeast corner, toward, and onto, Our Way.
- ☑ Critical coarse sediment yield areas to be protected
  - Per the Potential Critical Course Sediment Yield Areas for the Regional San Diego County Watersheds (Exhibit Date: Sept. 8, 2014, by Geosyntec and Rick Engineering), there are no critical coarse sediment yield areas to be protected.
- ☑ Existing topography and impervious areas
  - Existing topo – See DMA Exhibit
  - Existing home
  - Approximately 150 sf of AC driveway adjacent to Prospect Ave
  - Approximately 35 sf of concrete driveway adjacent to Prospect Ave
- ☑ Existing and proposed site drainage network and connections to drainage offsite
  - See Post-Development Hydrology Map
- ☑ Proposed demolition
  - See Pre-Development Hydrology Map
- ☑ Proposed grading
  - See DMA Exhibit
- ☑ Proposed impervious features
  - Roof tops
  - Road widening on Prospect Ave
  - Sidewalk on Prospect Ave
  - Main driveway

☑ Proposed design features and surface treatments used to minimize imperviousness

- See DMA Exhibit

☑ Drainage management area (DMA) boundaries, DMA ID numbers, and DMA areas (square footage or acreage), and DMA type (i.e., drains to BMP, self-retaining, or self-mitigating)

- See DMA Exhibit

☑ Potential pollutant source areas and corresponding required source controls (see Chapter 4, Appendix E.1, and Form I-3B)

☑ Structural BMPs (identify location, type of BMP, and size/detail)

- See DMA Exhibit

# ATTACHMENT 2
# BACKUP FOR PDP HYDROMODIFICATION CONTROL MEASURES

*This is the cover sheet for Attachment 2.*

☑ Mark this box if this attachment is empty because the project is exempt from PDP hydromodification management requirements.

**Indicate which Items are Included behind this cover sheet:**

| **Attachment Sequence** | **Contents** | **Checklist** |
|---|---|---|
| Attachment 2a | Hydromodification Management Exhibit (Required) | ☐ Included<br><br>See Hydromodification Management Exhibit Checklist on the back of this Attachment cover sheet. |
| Attachment 2b | Management of Critical Coarse Sediment Yield Areas (WMAA Exhibit is required, additional analyses are optional)<br><br>See Section 6.2 of the BMP Design Manual. | ☐ Exhibit showing project drainage boundaries marked on WMAA Critical Coarse Sediment Yield Area Map (Required)<br><br>Optional analyses for Critical Coarse Sediment Yield Area Determination<br>☐ 6.2.1 Verification of Geomorphic Landscape Units Onsite<br>☐ 6.2.2 Downstream Systems Sensitivity to Coarse Sediment<br>☐ 6.2.3 Optional Additional Analysis of Potential Critical Coarse Sediment Yield Areas Onsite |
| Attachment 2c | Geomorphic Assessment of Receiving Channels (Optional)<br>See Section 6.3.4 of the BMP Design Manual. | ☐ Not performed<br>☐ Included<br>☐ Submitted as separate stand-alone document |
| Attachment 2d | Flow Control Facility Design, including Structural BMP Drawdown Calculations and Overflow Design Summary (Required)<br>See Chapter 6 and Appendix G of the BMP Design Manual | ☐ Included<br>☐ Submitted as separate stand-alone document |
| Attachment 2e | Vector Control Plan (Required when structural BMPs will not drain in 96 hours) | ☐ Included<br>☐ Not required because BMPs will drain in less than 96 hours |

***Use this checklist to ensure the required information has been included on the Hydromodification Management Exhibit:***

The Hydromodification Management Exhibit must identify:

- ☐ Underlying hydrologic soil group
- ☐ Approximate depth to groundwater
- ☐ Existing natural hydrologic features (watercourses, seeps, springs, wetlands)
- ☐ Critical coarse sediment yield areas to be protected
- ☐ Existing topography
- ☐ Existing and proposed site drainage network and connections to drainage offsite
- ☐ Proposed grading
- ☐ Proposed impervious features
- ☐ Proposed design features and surface treatments used to minimize imperviousness
- ☐ Point(s) of Compliance (POC) for Hydromodification Management
- ☐ Existing and proposed drainage boundary and drainage area to each POC (when necessary, create separate exhibits for pre-development and post-project conditions)
- ☐ Structural BMPs for hydromodification management (identify location, type of BMP, and size/detail)

# ATTACHMENT 3
# Structural BMP Maintenance Information

*This is the cover sheet for Attachment 3.*

**Indicate which Items are Included behind this cover sheet:**

| **Attachment Sequence** | **Contents** | **Checklist** |
|---|---|---|
| Attachment 3a | Structural BMP Maintenance Thresholds and Actions (Required) | ☐ Included<br><br>See Structural BMP Maintenance Information Checklist on the back of this Attachment cover sheet. |
| Attachment 3b | Draft Maintenance Agreement (when applicable) | ☐ Included<br>☑ Not Applicable at this time. |

***Use this checklist to ensure the required information has been included in the Structural BMP Maintenance Information Attachment:***

- ☐ **Preliminary Design / Planning / CEQA level submittal:**

  Attachment 3a must identify:

  - ☐ Typical maintenance indicators and actions for proposed structural BMP(s) based on Section 7.7 of the BMP Design Manual

  Attachment 3b is not required for preliminary design / planning / CEQA level submittal.

- ☐ **Final Design level submittal:**

  Attachment 3a must identify:

  - ☐ Specific maintenance indicators and actions for proposed structural BMP(s). This shall be based on Section 7.7 of the BMP Design Manual and enhanced to reflect actual proposed components of the structural BMP(s)
  - ☐ How to access the structural BMP(s) to inspect and perform maintenance
  - ☐ Features that are provided to facilitate inspection (e.g., observation ports, cleanouts, silt posts, or other features that allow the inspector to view necessary components of the structural BMP and compare to maintenance thresholds)
  - ☐ Manufacturer and part number for proprietary parts of structural BMP(s) when applicable
  - ☐ Maintenance thresholds specific to the structural BMP(s), with a location-specific frame of reference (e.g., level of accumulated materials that triggers removal of the materials, to be identified based on viewing marks on silt posts or measured with a survey rod with respect to a fixed benchmark within the BMP)
  - ☐ Recommended equipment to perform maintenance
  - ☐ When applicable, necessary special training or certification requirements for inspection and maintenance personnel such as confined space entry or hazardous waste management

  Attachment 3b: For private entity operation and maintenance, Attachment 3b shall include a draft maintenance agreement in the local jurisdiction's standard format (PDP applicant to contact the [City Engineer] to obtain the current maintenance agreement forms).

## ATTACHMENT 4
## Copy of Plan Sheets Showing Permanent Storm Water BMPs

This is the cover sheet for Attachment 4.

**Use this checklist to ensure the required information has been included on the plans:**

**The plans must identify:**

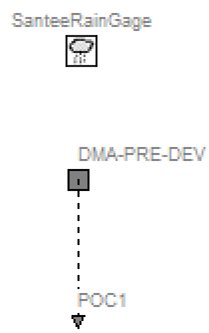
- ☐ Structural BMP(s) with ID numbers matching Form I-6 Summary of PDP Structural BMPs
- ☐ The grading and drainage design shown on the plans must be consistent with the delineation of DMAs shown on the DMA exhibit
- ☐ Details and specifications for construction of structural BMP(s)
- ☐ Signage indicating the location and boundary of structural BMP(s) as required by the [City Engineer]
- ☐ How to access the structural BMP(s) to inspect and perform maintenance
- ☐ Features that are provided to facilitate inspection (e.g., observation ports, cleanouts, silt posts, or other features that allow the inspector to view necessary components of the structural BMP and compare to maintenance thresholds)
- ☐ Manufacturer and part number for proprietary parts of structural BMP(s) when applicable
- ☐ Maintenance thresholds specific to the structural BMP(s), with a location-specific frame of reference (e.g., level of accumulated materials that triggers removal of the materials, to be identified based on viewing marks on silt posts or measured with a survey rod with respect to a fixed benchmark within the BMP)
- ☐ Recommended equipment to perform maintenance
- ☐ When applicable, necessary special training or certification requirements for inspection and maintenance personnel such as confined space entry or hazardous waste management
- ☐ Include landscaping plan sheets showing vegetation requirements for vegetated structural BMP(s)
- ☐ All BMPs must be fully dimensioned on the plans
- ☐ When proprietary BMPs are used, site-specific cross section with outflow, inflow, and model number shall be provided. Photocopies of general brochures are not acceptable.

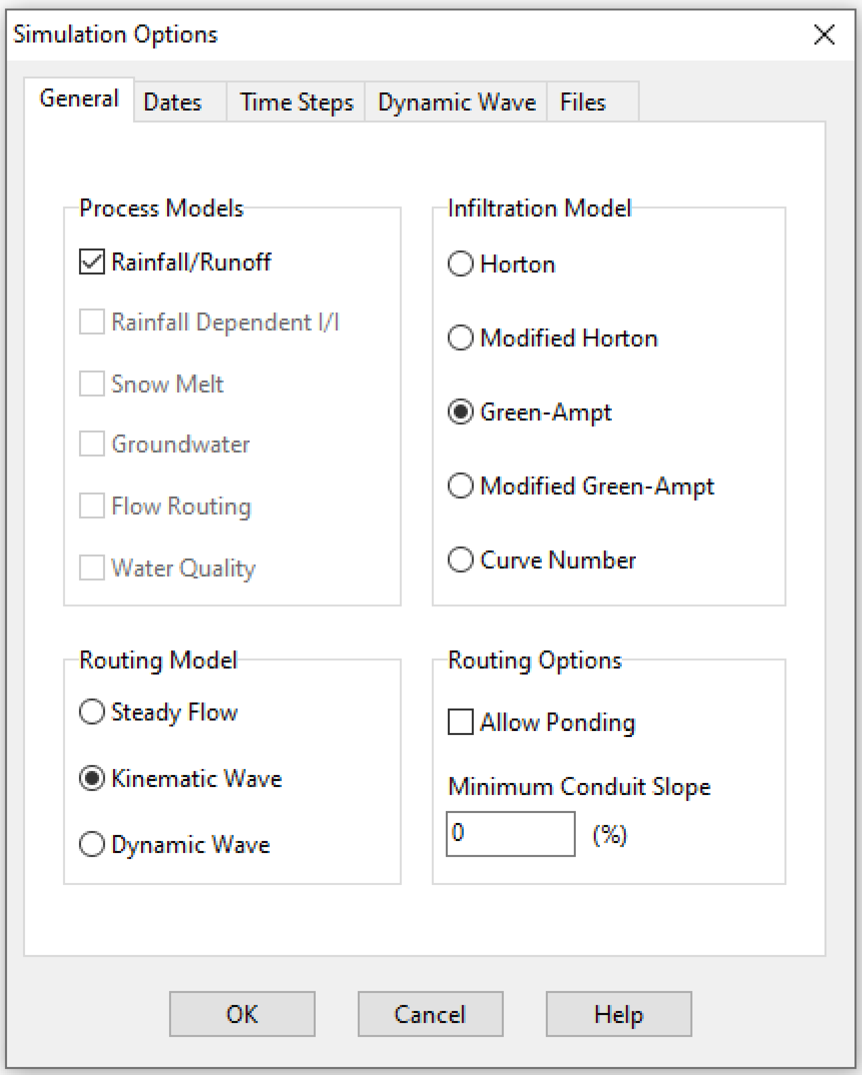
# ATTACHMENT 17

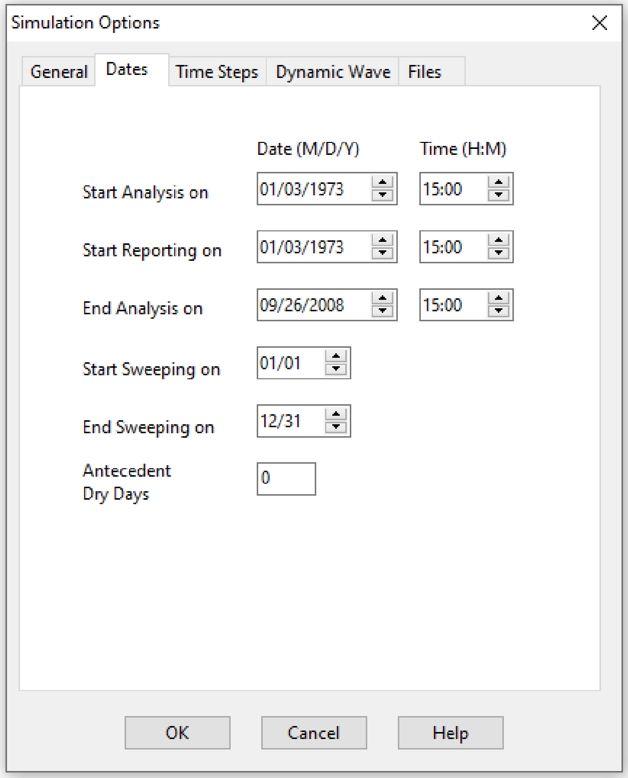
# SWMM  PARAMETERS & OUTPUTS

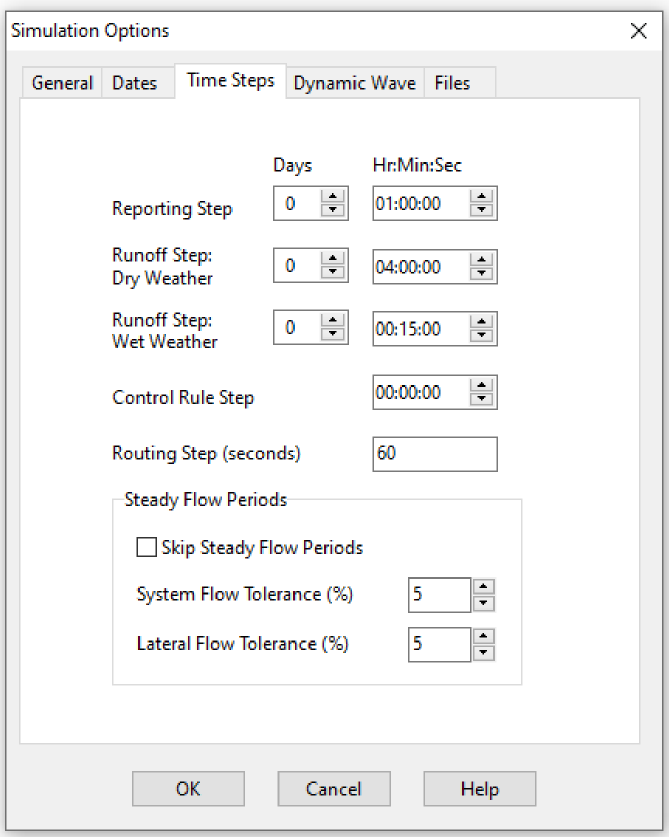
# SWMM PARAMETERS & OUTPUTS

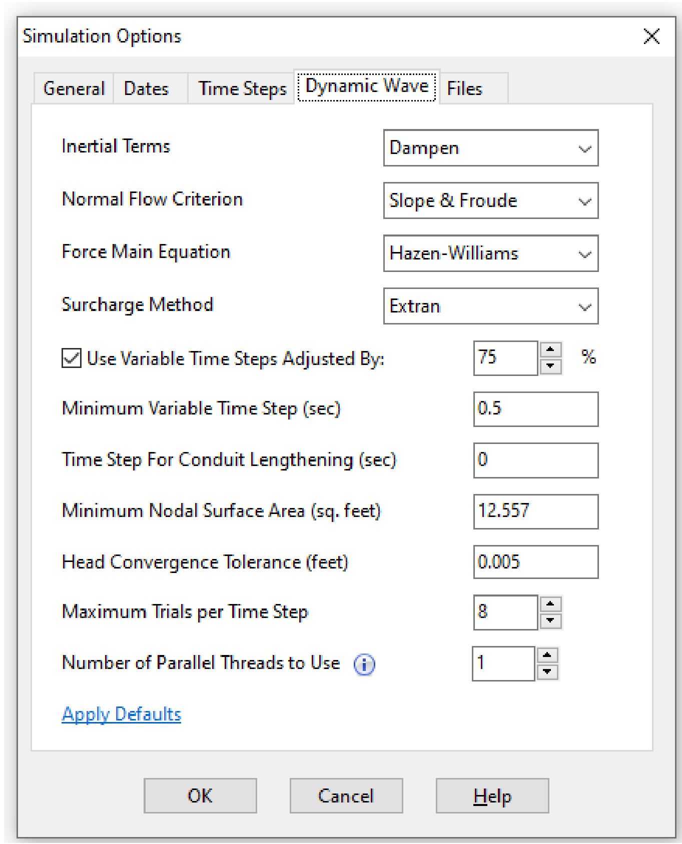
## Existing Condition

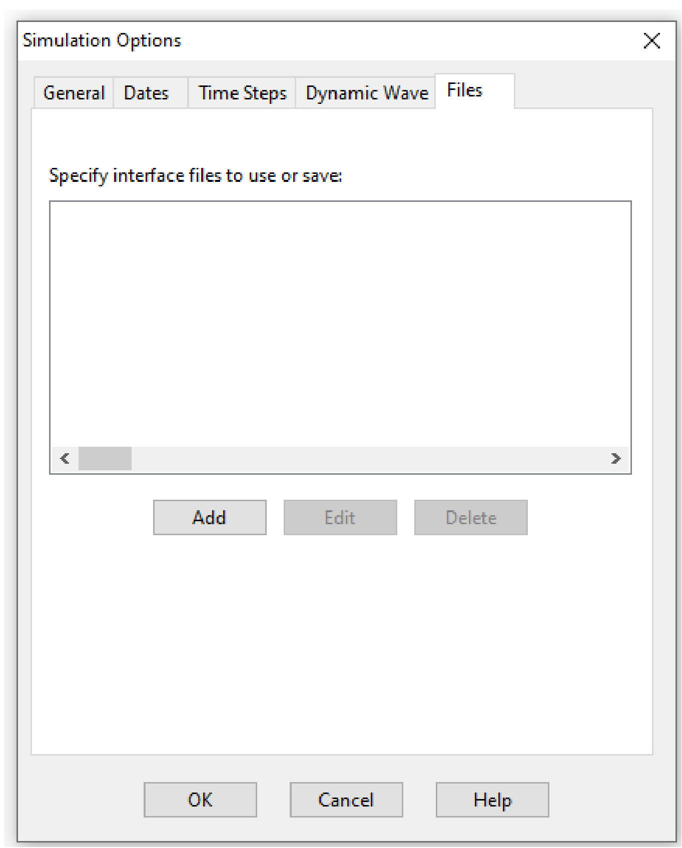


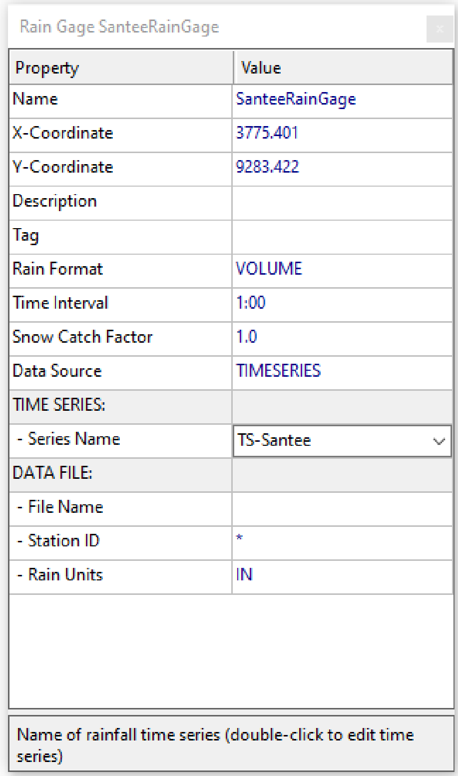

Simulation Options
General
Dates
Time Steps
Dynamic Wave
Files
Date (M/D/Y)
Time (H:M)
Start Analysis on
01/03/1973
15:00
Start Reporting on
01/03/1973
15:00
End Analysis on
09/26/2008
15:00
Start Sweeping on
01/01
End Sweeping on
12/31
Antecedent Dry Days
0
OK
Cancel
Help

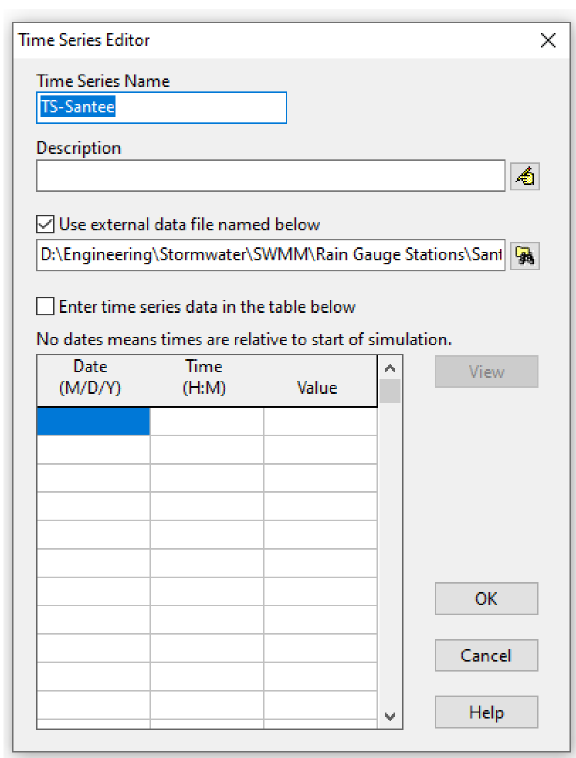

Simulation Options
General
Dates
Time Steps
Dynamic Wave
Files
Days
Hr:Min:Sec
Reporting Step
0
01:00:00
Runoff Step: Dry Weather
0
04:00:00
Runoff Step: Wet Weather
0
00:15:00
Control Rule Step
00:00:00
Routing Step (seconds)
60
Steady Flow Periods
Skip Steady Flow Periods
System Flow Tolerance (%)
5
Lateral Flow Tolerance (%)
5
OK
Cancel
Help

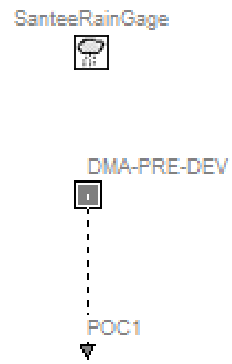

Simulation Options
General
Dates
Time Steps
Dynamic Wave
Files
Inertial Terms
Dampen
Normal Flow Criterion
Slope & Froude
Force Main Equation
Hazen-Williams
Surcharge Method
Extran
Use Variable Time Steps Adjusted By:
75
%
Minimum Variable Time Step (sec)
0.5
Time Step For Conduit Lengthening (sec)
0
Minimum Nodal Surface Area (sq. feet)
12.557
Head Convergence Tolerance (feet)
0.005
Maximum Trials per Time Step
8
Number of Parallel Threads to Use
1
Apply Defaults
OK
Cancel
Help


Simulation Options
General
Dates
Time Steps
Dynamic Wave
Files
Specify interface files to use or save:
Add
Edit
Delete
OK
Cancel
Help

# Rain Gage


Rain Gage SanteeRainGage
Property
Value
Name
SanteeRainGage
X-Coordinate
3775.401
Y-Coordinate
9283.422
Description
Tag
Rain Format
VOLUME
Time Interval
1:00
Snow Catch Factor
1.0
Data Source
TIMESERIES
TIME SERIES:
- Series Name
TS-Santee
DATA FILE:
- File Name
- Station ID
*
- Rain Units
IN
Name of rainfall time series (double-click to edit time series)

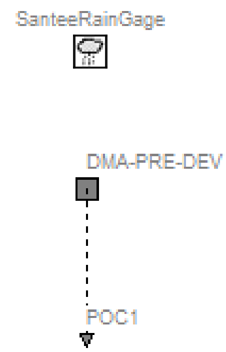

Time Series Editor
Time Series Name
TS-Santee
Description
Use external data file named below
D:\Engineering\Stormwater\SWMM\Rain Gauge Stations\Sant
Enter time series data in the table below
No dates means times are relative to start of simulation.
Date (M/D/Y)
Time (H:M)
Value
View
OK
Cancel
Help

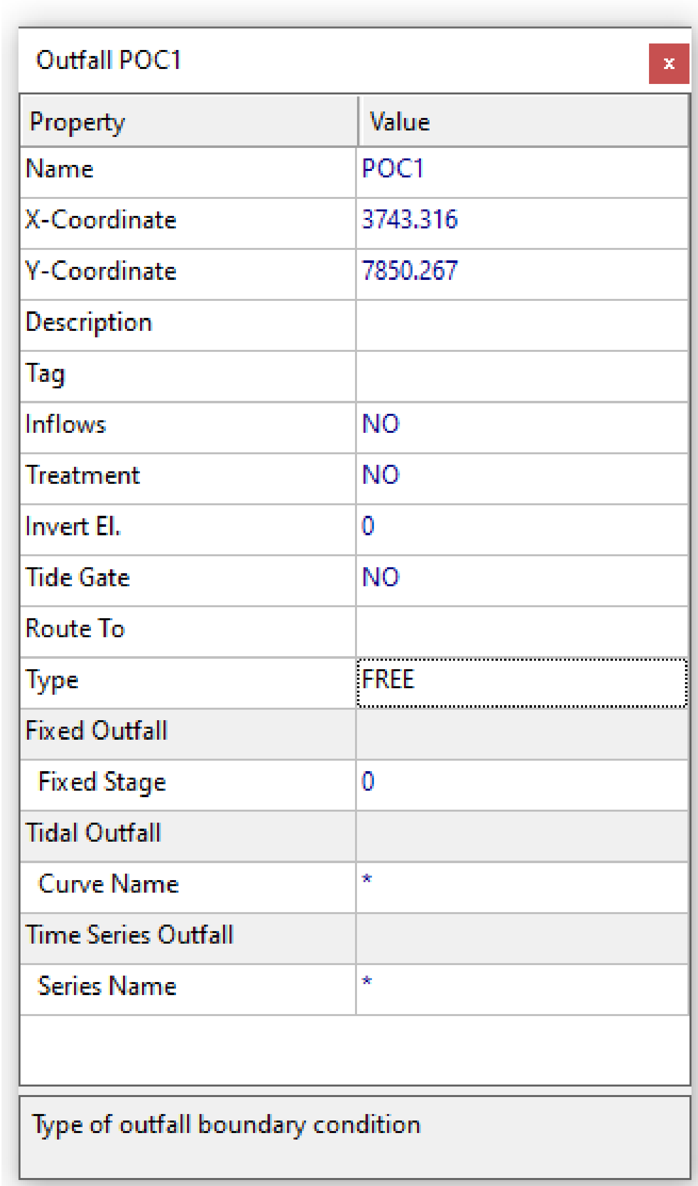



Subcatchment DMA-PRE-DEV

| Property | Value |
|---|---|
| Name | DMA-PRE-DEV |
| X-Coordinate | 3743.316 |
| Y-Coordinate | 8609.626 |
| Description | |
| Tag | |
| Rain Gage | SanteeRainGage |
| Outlet | POC1 |
| Area | 0.412 |
| Width | 150 |
| % Slope | 6.0 |
| % Imperv | 19 |
| N-Imperv | 0.012 |
| N-Perv | 0.15 |
| Dstore-Imperv | 0.05 |
| Dstore-Perv | 0.1 |
| %Zero-Imperv | 25 |
| Subarea Routing | OUTLET |
| Percent Routed | 100 |

Percent of impervious area (%)

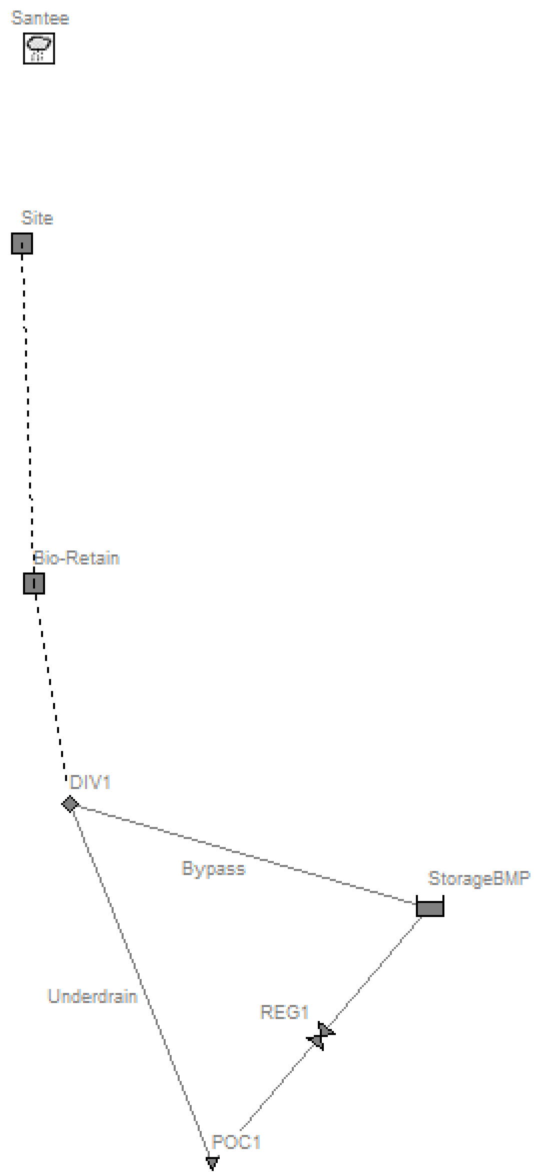




Outfall POC1

| Property | Value |
|---|---|
| Name | POC1 |
| X-Coordinate | 3743.316 |
| Y-Coordinate | 7850.267 |
| Description | |
| Tag | |
| Inflows | NO |
| Treatment | NO |
| Invert El. | 0 |
| Tide Gate | NO |
| Route To | |
| Type | FREE |
| Fixed Outfall | |
| Fixed Stage | 0 |
| Tidal Outfall | |
| Curve Name | * |
| Time Series Outfall | |
| Series Name | * |

Type of outfall boundary condition

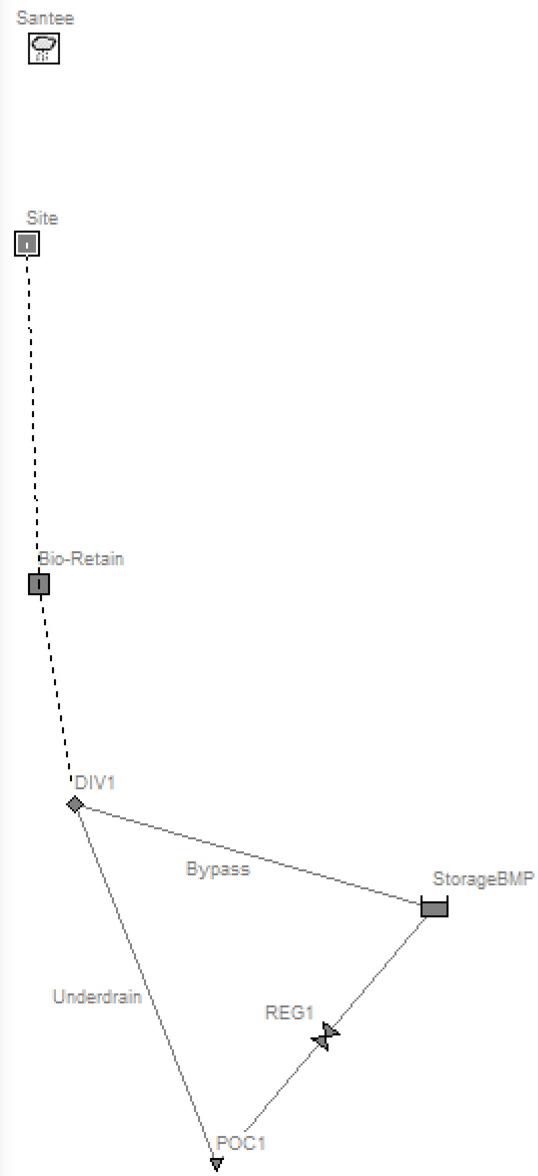
# Proposed Condition



Subcatchment Site

| Property | Value |
|---|---|
| Name | Site |
| X-Coordinate | 5005.107 |
| Y-Coordinate | 7967.314 |
| Description | |
| Tag | |
| Rain Gage | Santee |
| Outlet | Bio-Retain |
| Area | 0.412 |
| Width | 26 |
| % Slope | 1 |
| % Imperv | 50 |
| N-Imperv | 0.012 |
| N-Perv | 0.15 |
| Dstore-Imperv | 0.05 |
| Dstore-Perv | 0.1 |
| %Zero-Imperv | 25 |
| Subarea Routing | OUTLET |
| Percent Routed | 100 |
| Infiltration Data | GREEN_AMPT |
| Groundwater | NO |
| Snow Pack | |
| LID Controls | 0 |
| Land Uses | 0 |
| Initial Buildup | NONE |
| Curb Length | 0 |
| N-Perv Pattern | |
| Dstore Pattern | |
| Infil. Pattern | |

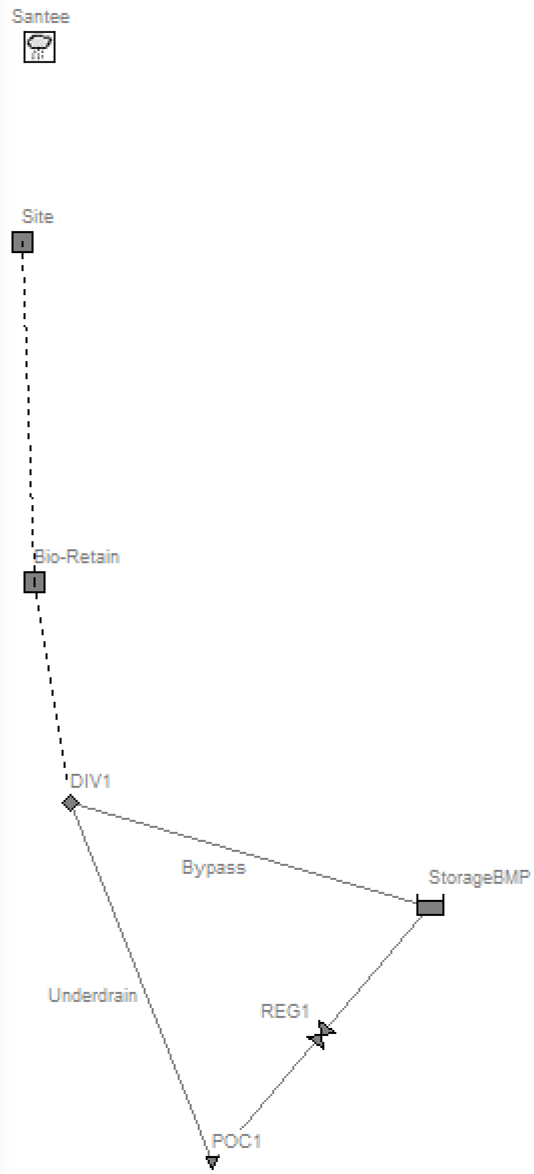
Percent of impervious area (%)



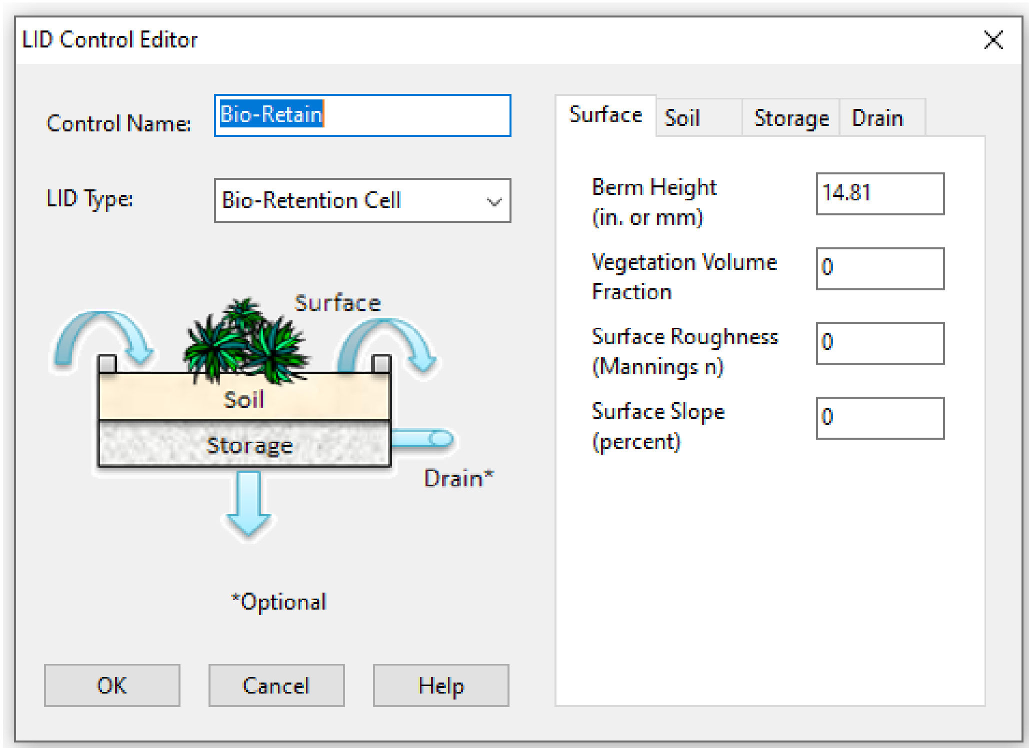
Subcatchment Bio-Retain

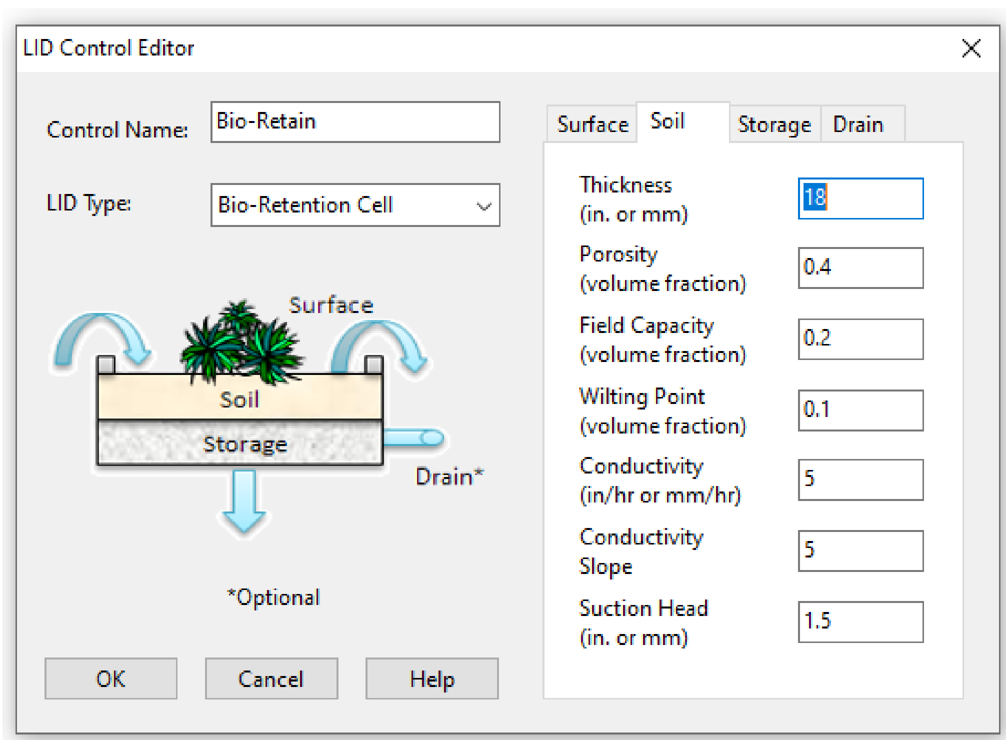
| Property | Value |
|---|---|
| Name | Bio-Retain |
| X-Coordinate | 5069.519 |
| Y-Coordinate | 6149.733 |
| Description | |
| Tag | |
| Rain Gage | Santee |
| Outlet | DIV1 |
| Area | 0.027 |
| Width | 20 |
| % Slope | 1 |
| % Imperv | 0 |
| N-Imperv | 0.012 |
| N-Perv | 0.15 |
| Dstore-Imperv | 0.05 |
| Dstore-Perv | 0.1 |
| %Zero-Imperv | 25 |
| Subarea Routing | OUTLET |
| Percent Routed | 100 |
| Infiltration Data | GREEN_AMPT |
| Groundwater | NO |
| Snow Pack | |
| LID Controls | 1 |
| Land Uses | 0 |
| Initial Buildup | NONE |
| Curb Length | 0 |
| N-Perv Pattern | |
| Dstore Pattern | |
| Infil. Pattern | |

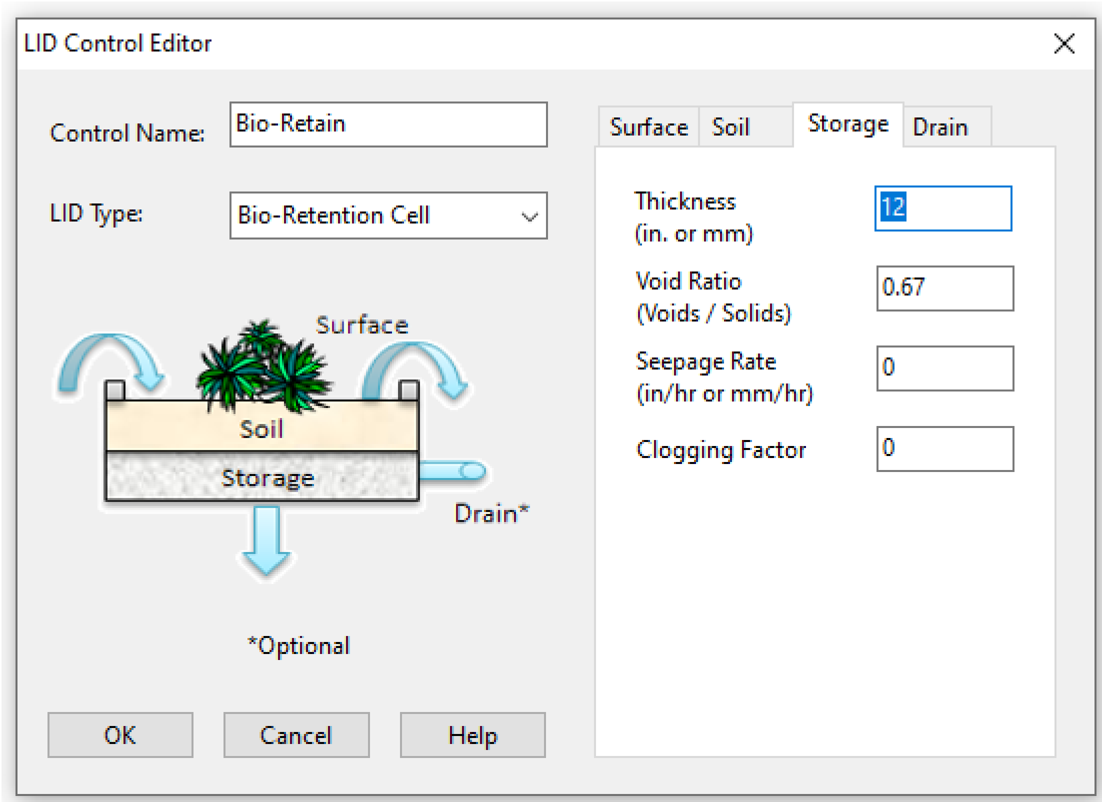
Percent of impervious area (%)

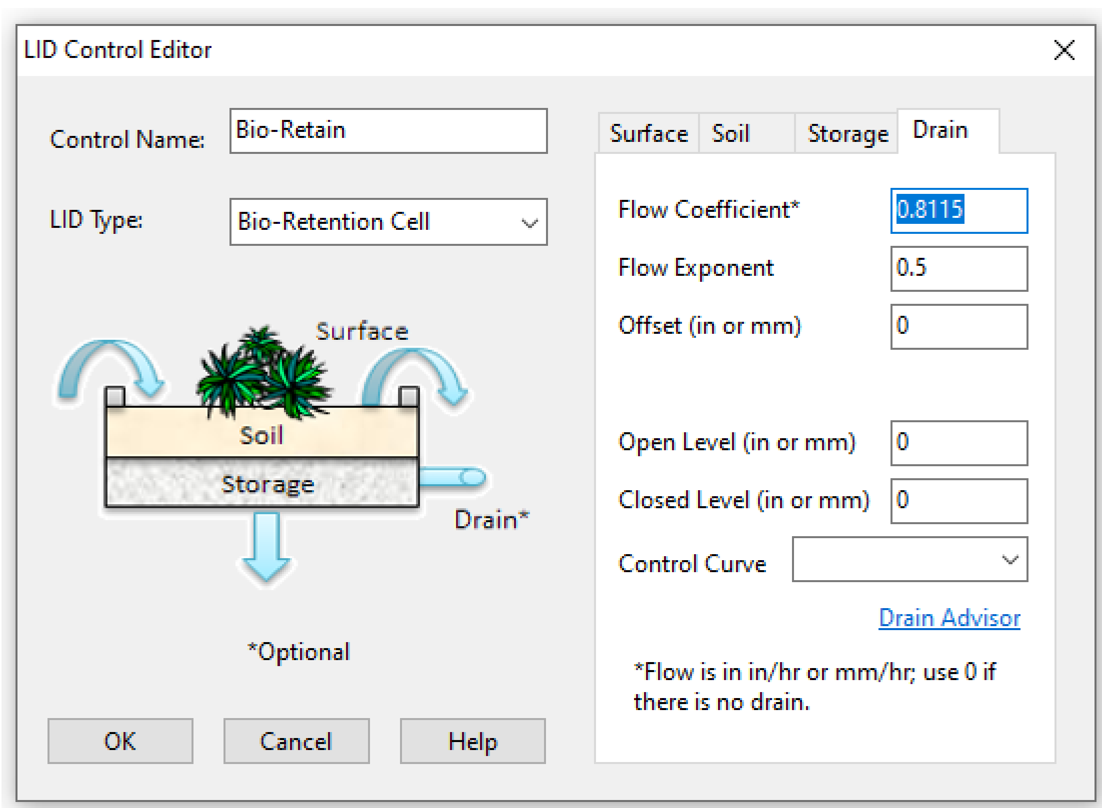


# LID Controls

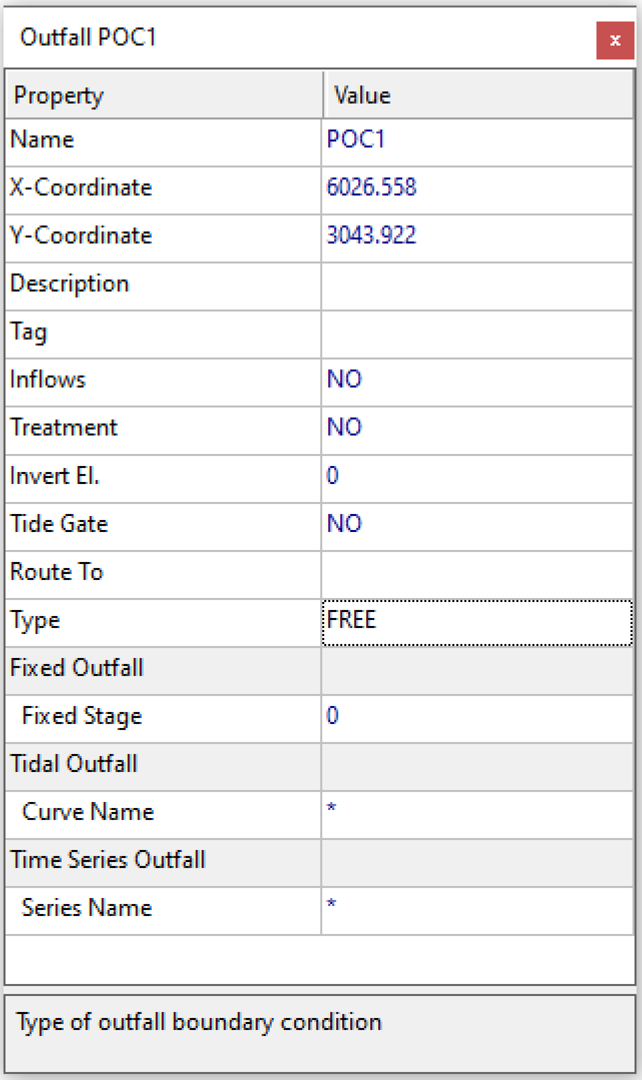



LID Control Editor
Control Name:
Bio-Retain
LID Type:
Bio-Retention Cell
Surface
Soil
Storage
Drain
Thickness
(in. or mm)
12
Void Ratio
(Voids / Solids)
0.67
Seepage Rate
(in/hr or mm/hr)
0
Clogging Factor
0
Surface
Soil
Storage
Drain*
*Optional
OK
Cancel
Help


LID Control Editor
Control Name:
Bio-Retain
LID Type:
Bio-Retention Cell
Surface
Soil
Storage
Drain
Flow Coefficient*
0.8115
Flow Exponent
0.5
Offset (in or mm)
0
Open Level (in or mm)
0
Closed Level (in or mm)
0
Control Curve
Drain Advisor
*Flow is in in/hr or mm/hr; use 0 if there is no drain.
Surface
Soil
Storage
Drain*
*Optional
OK
Cancel
Help

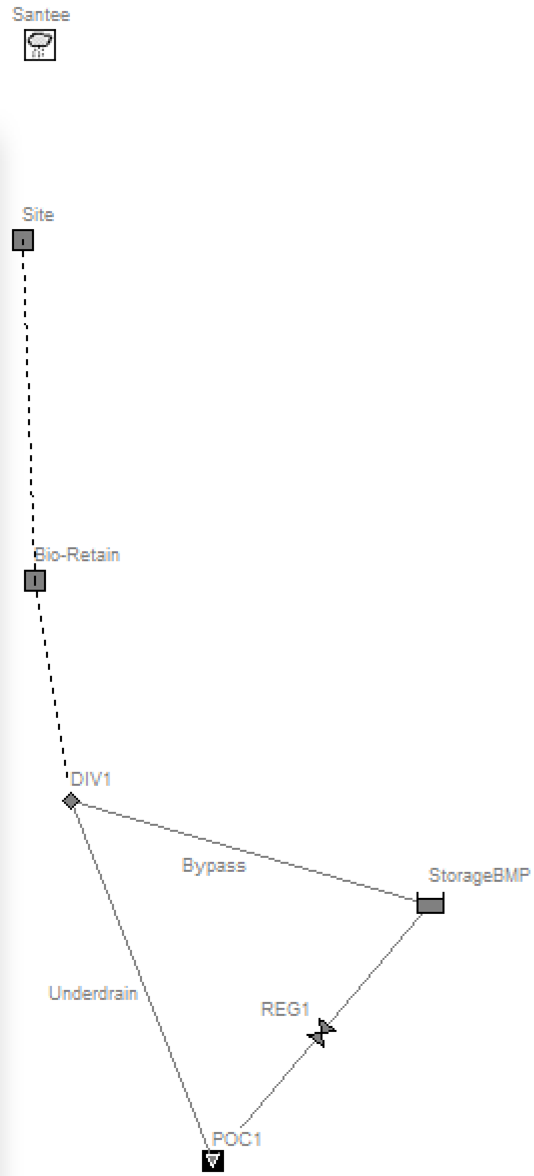
# POC 1



Outfall POC1

| Property | Value |
|---|---|
| Name | POC1 |
| X-Coordinate | 6026.558 |
| Y-Coordinate | 3043.922 |
| Description | |
| Tag | |
| Inflows | NO |
| Treatment | NO |
| Invert El. | 0 |
| Tide Gate | NO |
| Route To | |
| Type | FREE |
| Fixed Outfall | |
| Fixed Stage | 0 |
| Tidal Outfall | |
| Curve Name | * |
| Time Series Outfall | |
| Series Name | * |

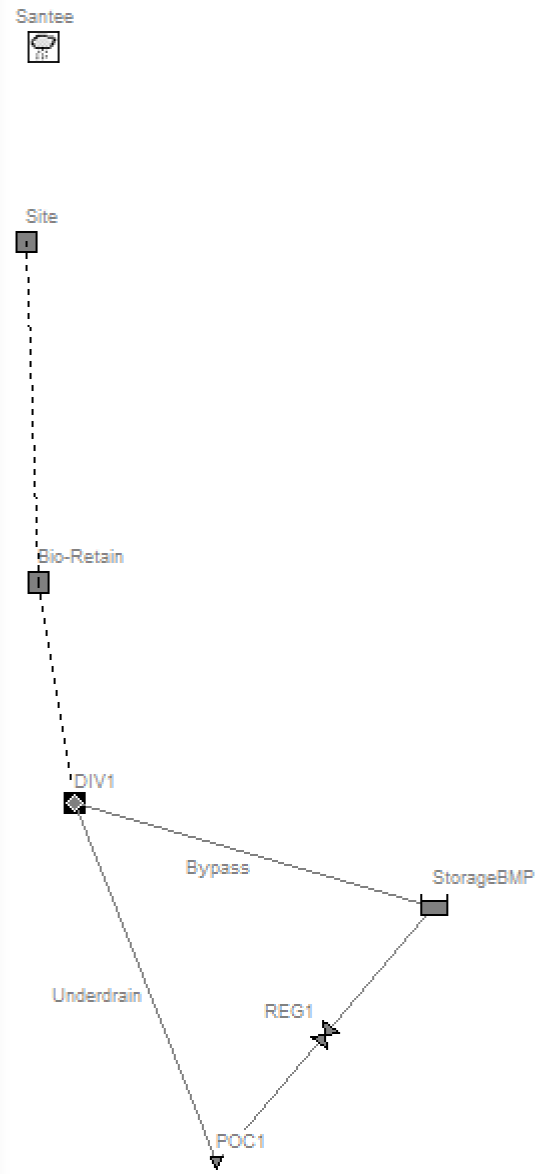
Type of outfall boundary condition

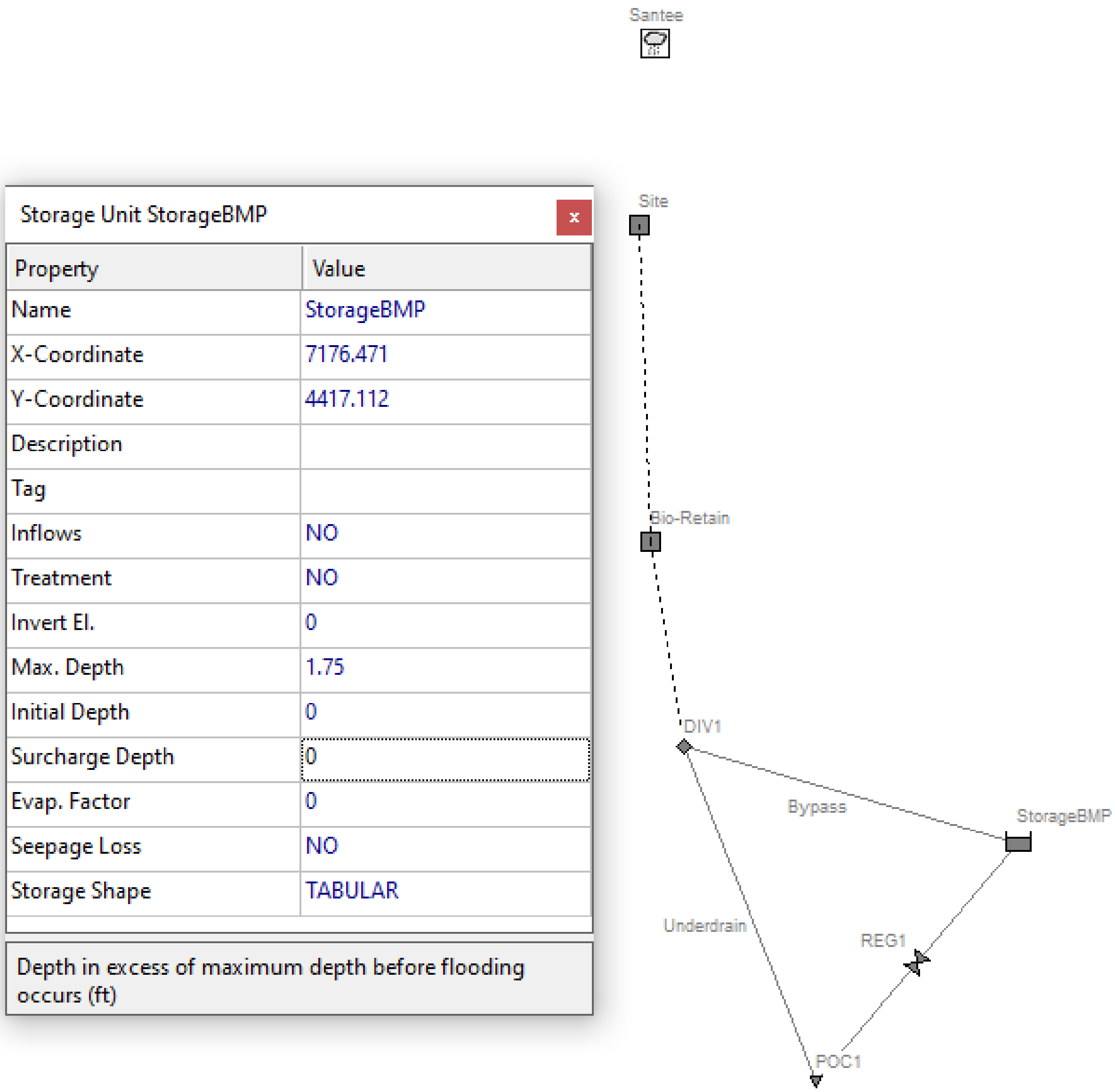


Divider DIV1

| Property | Value |
|---|---|
| Name | DIV1 |
| X-Coordinate | 5262.032 |
| Y-Coordinate | 4973.262 |
| Description | |
| Tag | |
| Inflows | NO |
| Treatment | NO |
| Invert El. | 0 |
| Max. Depth | 0 |
| Initial Depth | 0 |
| Surcharge Depth | 0 |
| Ponded Area | 0 |
| Diverted Link | Bypass |
| Type | CUTOFF |
| Cutoff Divider | |
| Cutoff Flow | 0.022 |
| Tabular Divider | |
| Curve Name | * |
| Weir Divider | |
| Min. Flow | 0 |
| Max. Depth | 0 |
| Coefficient | 0 |

Depth in excess of maximum depth before flooding occurs (ft)






Storage Unit StorageBMP

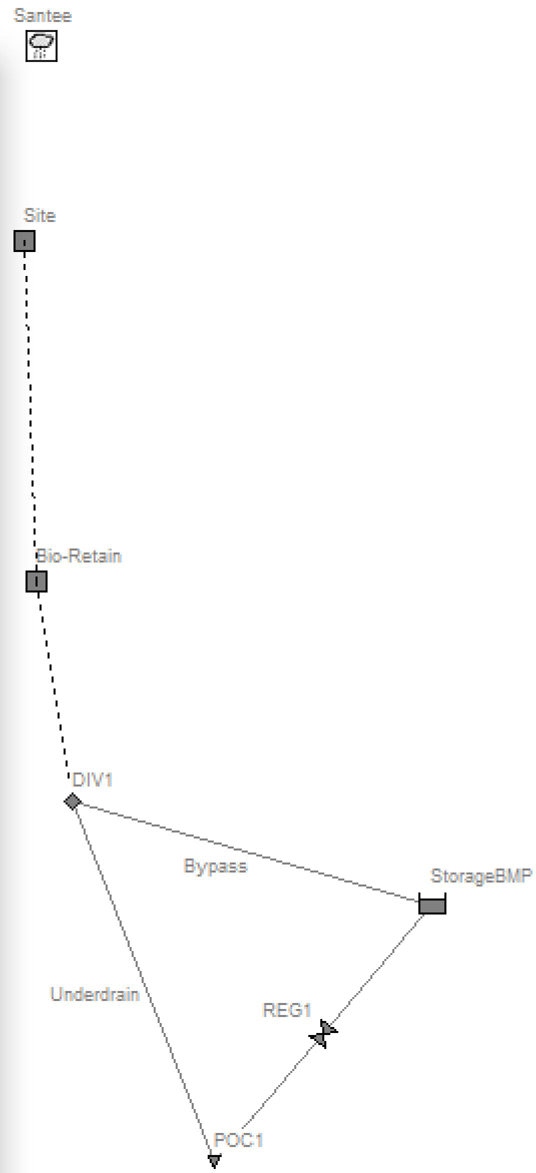
| Property | Value |
|---|---|
| Name | StorageBMP |
| X-Coordinate | 7176.471 |
| Y-Coordinate | 4417.112 |
| Description | |
| Tag | |
| Inflows | NO |
| Treatment | NO |
| Invert El. | 0 |
| Max. Depth | 1.75 |
| Initial Depth | 0 |
| Surcharge Depth | 0 |
| Evap. Factor | 0 |
| Seepage Loss | NO |
| Storage Shape | TABULAR |

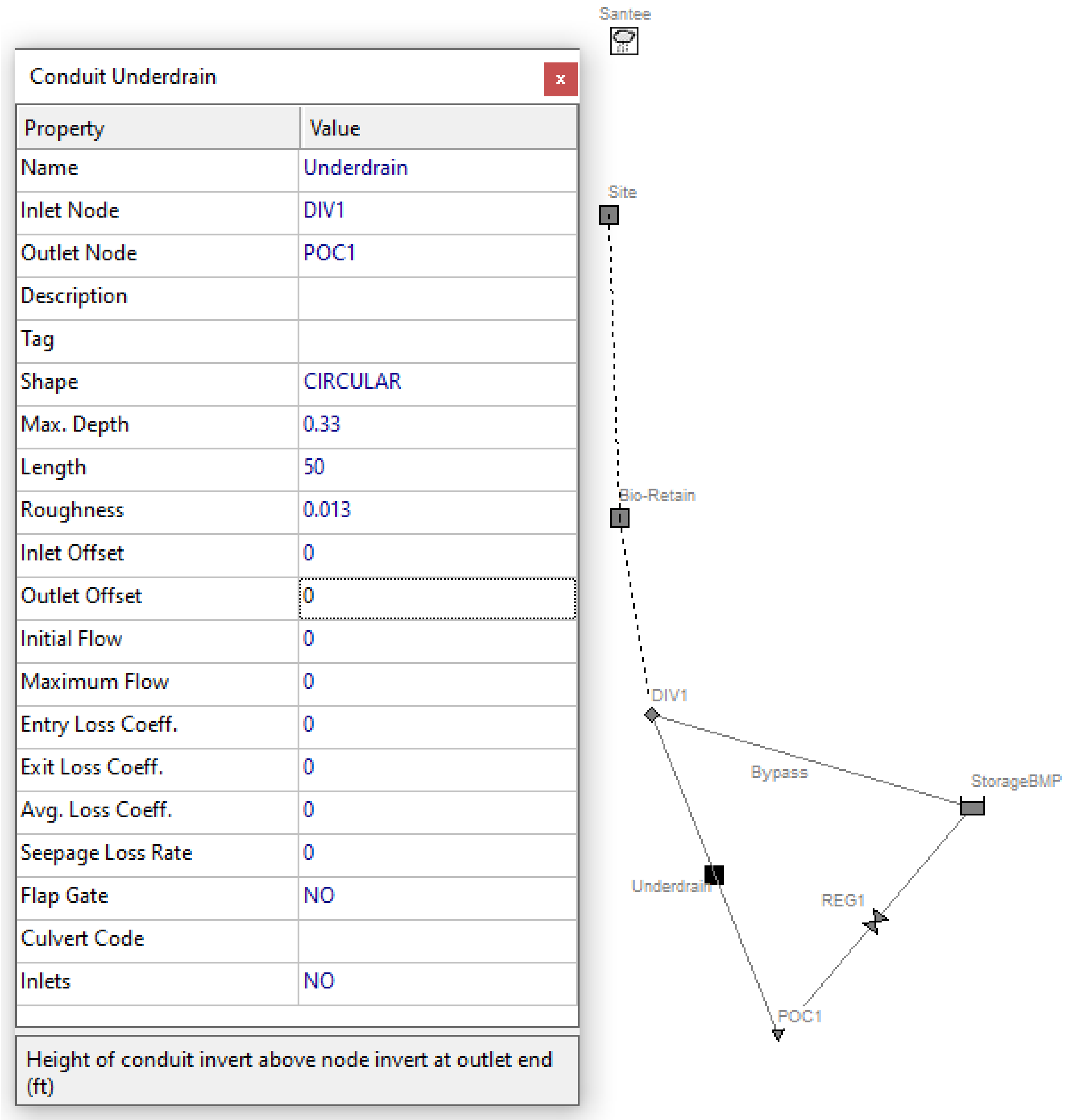
Depth in excess of maximum depth before flooding occurs (ft)

Conduit Bypass

| Property | Value |
|---|---|
| Name | Bypass |
| Inlet Node | DIV1 |
| Outlet Node | StorageBMP |
| Description | |
| Tag | |
| Shape | DUMMY |
| Max. Depth | 0 |
| Length | 111 |
| Roughness | 0.01 |
| Inlet Offset | 0 |
| Outlet Offset | 0 |
| Initial Flow | 0 |
| Maximum Flow | 0 |
| Entry Loss Coeff. | 0 |
| Exit Loss Coeff. | 0 |
| Avg. Loss Coeff. | 0 |
| Seepage Loss Rate | 0 |
| Flap Gate | NO |
| Culvert Code | |
| Inlets | NO |

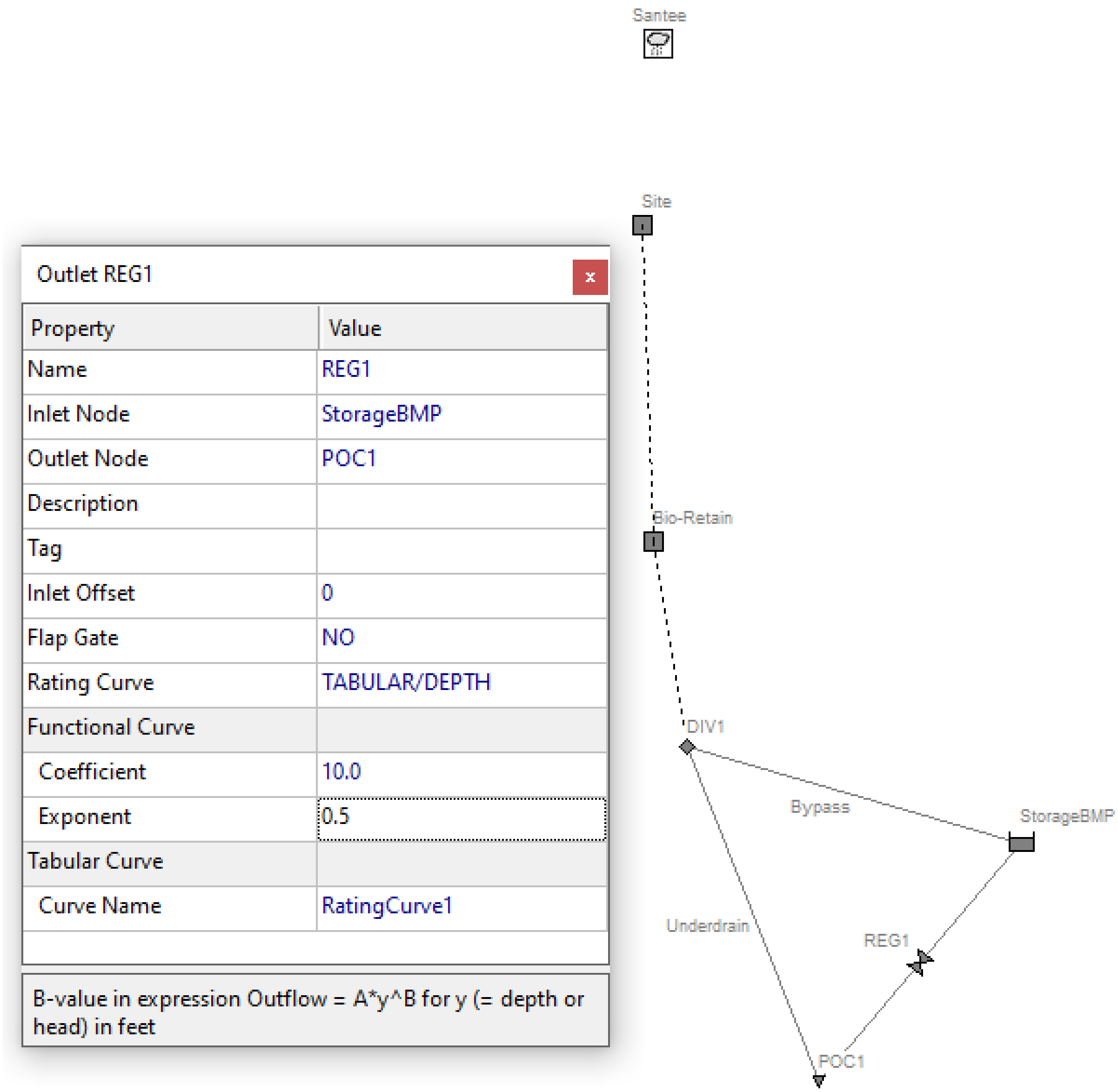
Height of conduit invert above node invert at outlet end (ft)



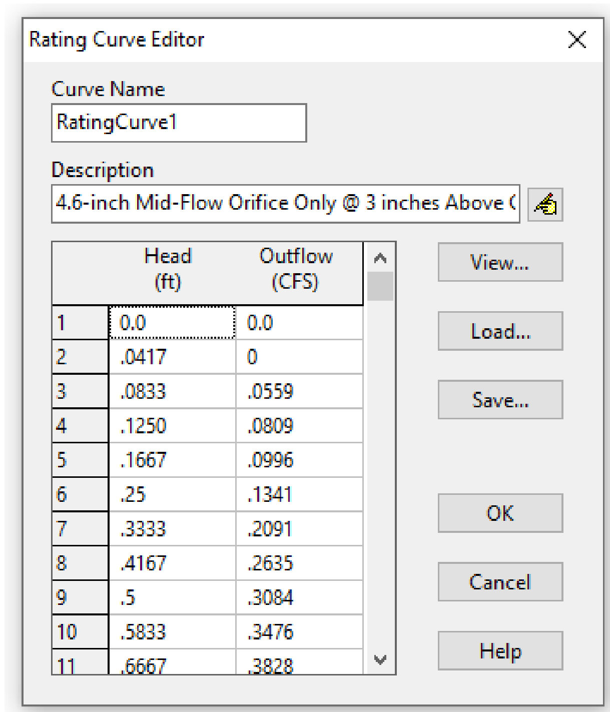

Conduit Underdrain

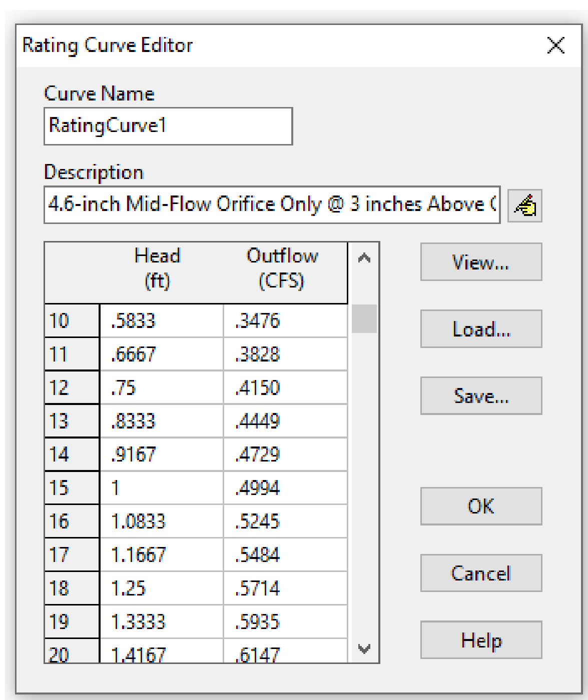
| Property | Value |
|---|---|
| Name | Underdrain |
| Inlet Node | DIV1 |
| Outlet Node | POC1 |
| Description | |
| Tag | |
| Shape | CIRCULAR |
| Max. Depth | 0.33 |
| Length | 50 |
| Roughness | 0.013 |
| Inlet Offset | 0 |
| Outlet Offset | 0 |
| Initial Flow | 0 |
| Maximum Flow | 0 |
| Entry Loss Coeff. | 0 |
| Exit Loss Coeff. | 0 |
| Avg. Loss Coeff. | 0 |
| Seepage Loss Rate | 0 |
| Flap Gate | NO |
| Culvert Code | |
| Inlets | NO |

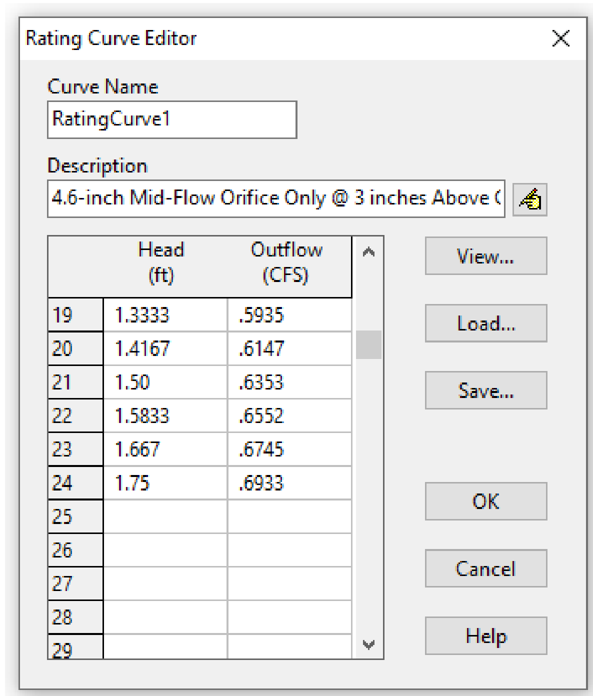
Height of conduit invert above node invert at outlet end (ft)

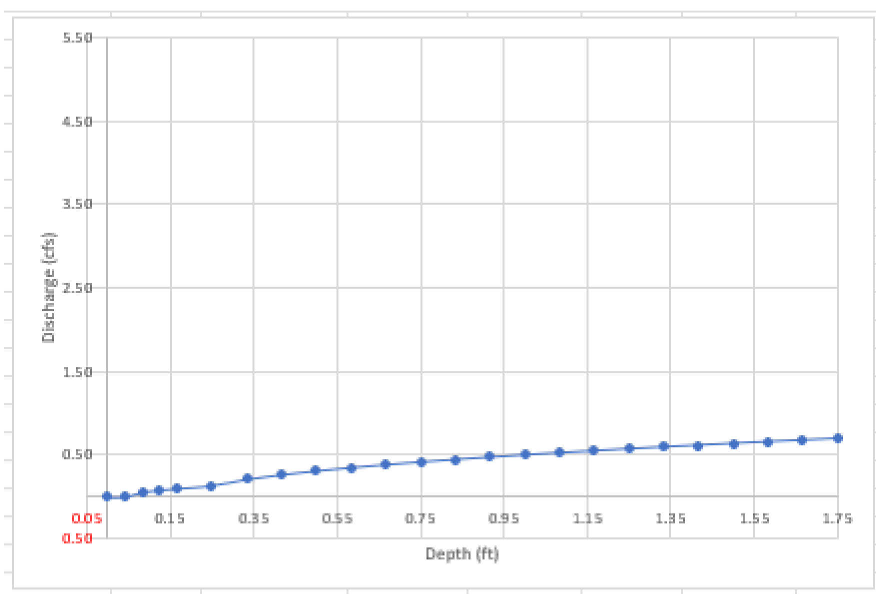

Santee
Site
Bio-Retain
DIV1
Bypass
StorageBMP
Underdrain
REG1
POC1
Outlet REG1
Property
Value
Name
REG1
Inlet Node
StorageBMP
Outlet Node
POC1
Description
Tag
Inlet Offset
0
Flap Gate
NO
Rating Curve
TABULAR/DEPTH
Functional Curve
Coefficient
10.0
Exponent
0.5
Tabular Curve
Curve Name
RatingCurve1
B-value in expression Outflow = A*y^B for y (= depth or head) in feet

# Rating Curve




Rating Curve Editor
Curve Name
RatingCurve1
Description
4.6-inch Mid-Flow Orifice Only @ 3 inches Above (
Head (ft)
Outflow (CFS)
19 1.3333 .5935
20 1.4167 .6147
21 1.50 .6353
22 1.5833 .6552
23 1.667 .6745
24 1.75 .6933
25
26
27
28
29
View...
Load...
Save...
OK
Cancel
Help


5.50
4.50
3.50
2.50
1.50
0.50
0.50
Discharge (cfs)
0.05
0.15
0.35
0.55
0.75
0.95
1.15
1.35
1.55
1.75
Depth (ft)

## SWMM Model Flow Coefficient Calculation

| PARAMETER | ABBREV. | Bio-Retention Cell LID BMP | |
|---|---|---|---|
| Ponding Depth | PD | 24 | in |
| Bioretention Soil Layer | S | 18 | in |
| Gravel Layer | G | 6 | in |
| TOTAL | | 4.0 | ft |
| | | 48 | in |
| Orifice Coefficient | $c_g$ | 0.6 | -- |
| Low Flow Orifice Diameter | D | 0.75 | in |
| Drain exponent | n | 0.5 | -- |
| Flow Rate (volumetric) | Q | 0.029 | cfs |
| Ponding Depth Surface Area | $A_{PD}$ | 200 | $ft^2$ |
| Bioretention Surface Area | $A_S, A_G$ | 200 | $ft^2$ |
| | $A_S, A_G$ | 0.0046 | ac |
| Porosity of Bioretention Soil | n | 0.40 | - |
| Flow Rate (per unit area) | q | 15.891 | in/hr |
| Effective Ponding Depth | $PD_{eff}$ | 24.00 | in |
| Flow Coefficient | C | 2.3028 | -- |
| Ponding Depth @ $V_{WQ, required}$ | $PD_{orificeFL}$ | 3 | in |
| Cutoff Flow | $Q_{cutoff}$ | 0.0220 | cfs |

### Determine the Drain Time and Flow Coeff (SWMM Method)

| | | | |
|---|---|---|---|
| Surface area of Basin | A-LID= | 200.00 | sq ft |
| Depth of Basin | D=HT= | 36.00 | inch |
| Porosity of Sand-mix | n= | 0.40 | |
| Dia of Sub-Drain | d= | 0.75 | inch |
| Discharge coefficient | Co= | 0.60 | |
| Location of Drain Center | h= | 1.00 | inch |
| Drain Time Calculated | T= | 5.14 | hour |
| SWMM Flow Coefficient | C= | 2.30 | inch^.5/hr |

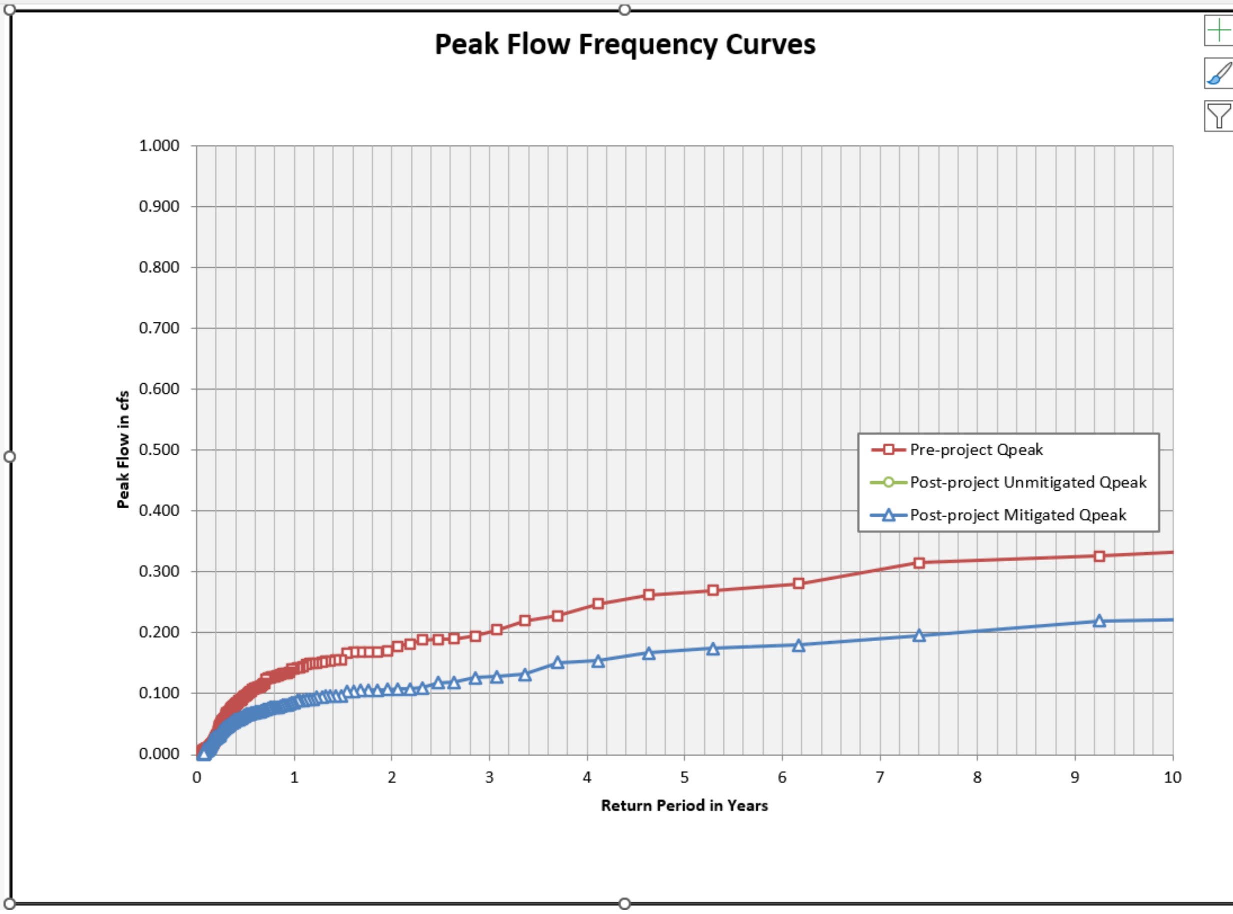
$$T = \frac{2nA(D-h)^{1/2}}{C_o a \sqrt{2g}} / 3600\ (hr)$$

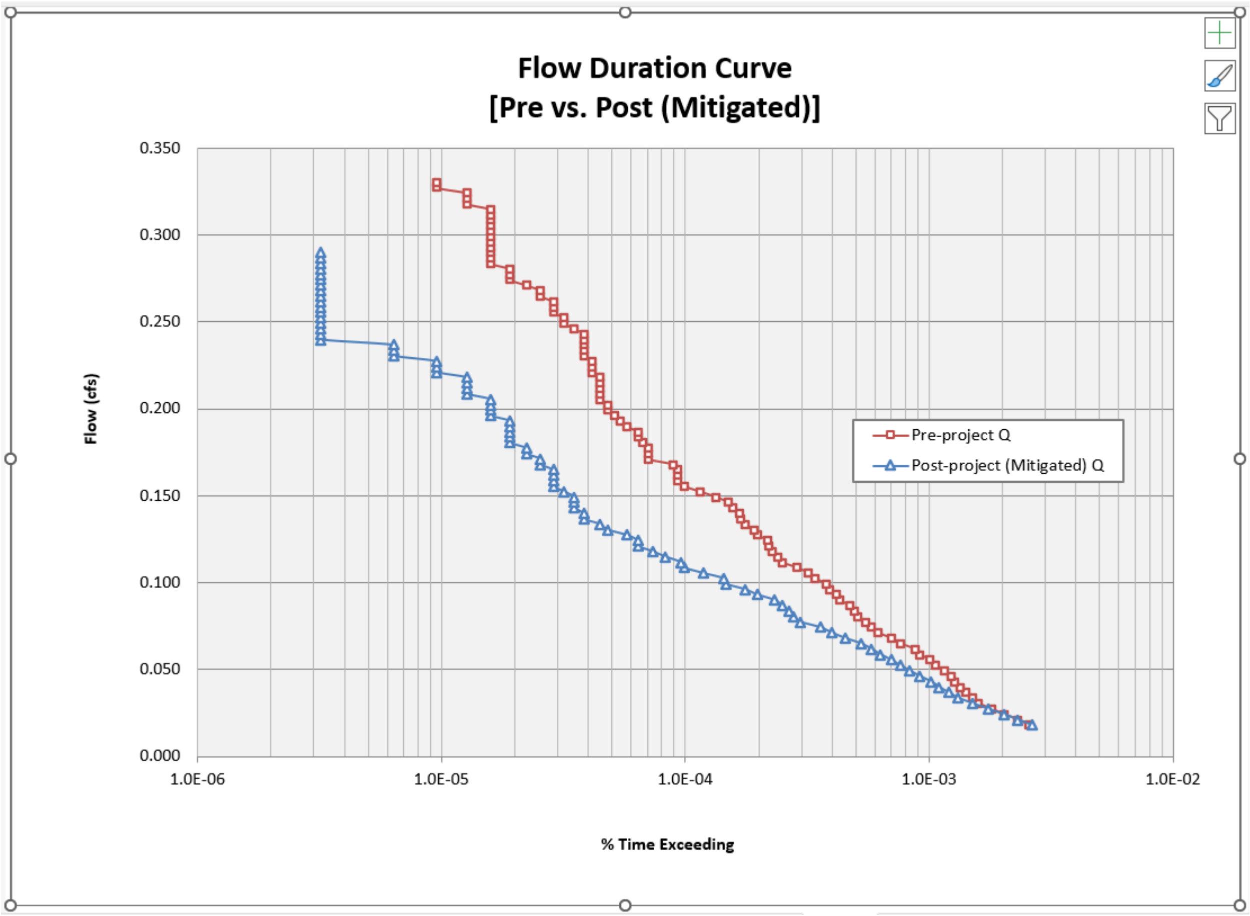
$$C\ (inch^{0.5}/hr) = C_o \frac{a}{nA}\sqrt{2g} \times 12^{0.5} \times 3600 = \frac{2(D-h)^{1/2}}{T}\ inch^{0.5}/hour$$

## Peak Flow Frequency Summary

| Return Period | Pre-project Qpeak (cfs) | Post-project - Unmitigated Q (cfs) | Post-project - Mitigated Q (cfs) |
|---|---|---|---|
| LF = 0.1xQ2 | 0.018 | #VALUE! | 0.011 |
| 2-year | 0.179 | #VALUE! | 0.110 |
| 5-year | 0.288 | #VALUE! | 0.161 |
| 10-year | 0.330 | #VALUE! | 0.230 |

POST-UNMITIGATED DESGIN
IS NOT AN OPTION CALC'D





Flow Duration Curve
[Pre vs. Post (Mitigated)]
0.350
0.300
0.250
0.200
0.150
0.100
0.050
0.000
Flow (cfs)
1.0E-06
1.0E-05
1.0E-04
1.0E-03
1.0E-02
% Time Exceeding
Pre-project Q
Post-project (Mitigated) Q

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Low-flow Threshold:** | 10% | | | | | | |
| **0.1xQ2 (Pre):** | 0.018 | cfs | | | | | |
| **Q10 (Pre):** | 0.330 | cfs | | | | | |
| **Ordinate #:** | 100 | | | | | | |
| **Incremental Q (Pre):** | 0.00313 | cfs | | | | | |
| **Total Hourly Data:** | 313200 | hours | | | | **The proposed BMP:** | PASSED |

| Interval | Pre-project Flow (cfs) | Pre-project Hours | Pre-project % Time Exceeding | Post-project Hours | Post-project % Time Exceeding | Percentage | Pass/Fail |
|---|---|---|---|---|---|---|---|
| 0 | 0.018 | 800 | 2.55E-03 | 826 | 2.64E-03 | 103% | Pass |
| 1 | 0.021 | 724 | 2.31E-03 | 725 | 2.31E-03 | 100% | Pass |
| 2 | 0.024 | 633 | 2.02E-03 | 632 | 2.02E-03 | 100% | Pass |
| 3 | 0.027 | 563 | 1.80E-03 | 545 | 1.74E-03 | 97% | Pass |
| 4 | 0.030 | 498 | 1.59E-03 | 472 | 1.51E-03 | 95% | Pass |
| 5 | 0.034 | 473 | 1.51E-03 | 412 | 1.32E-03 | 87% | Pass |
| 6 | 0.037 | 441 | 1.41E-03 | 376 | 1.20E-03 | 85% | Pass |
| 7 | 0.040 | 420 | 1.34E-03 | 344 | 1.10E-03 | 82% | Pass |
| 8 | 0.043 | 396 | 1.26E-03 | 319 | 1.02E-03 | 81% | Pass |
| 9 | 0.046 | 385 | 1.23E-03 | 287 | 9.16E-04 | 75% | Pass |
| 10 | 0.049 | 362 | 1.16E-03 | 261 | 8.33E-04 | 72% | Pass |
| 11 | 0.052 | 333 | 1.06E-03 | 238 | 7.60E-04 | 71% | Pass |
| 12 | 0.055 | 316 | 1.01E-03 | 219 | 6.99E-04 | 69% | Pass |
| 13 | 0.059 | 287 | 9.16E-04 | 198 | 6.32E-04 | 69% | Pass |
| 14 | 0.062 | 273 | 8.72E-04 | 182 | 5.81E-04 | 67% | Pass |
| 15 | 0.065 | 240 | 7.66E-04 | 165 | 5.27E-04 | 69% | Pass |
| 16 | 0.068 | 220 | 7.02E-04 | 142 | 4.53E-04 | 65% | Pass |
| 17 | 0.071 | 193 | 6.16E-04 | 125 | 3.99E-04 | 65% | Pass |
| 18 | 0.074 | 182 | 5.81E-04 | 112 | 3.58E-04 | 62% | Pass |
| 19 | 0.077 | 172 | 5.49E-04 | 93 | 2.97E-04 | 54% | Pass |
| 20 | 0.080 | 159 | 5.08E-04 | 87 | 2.78E-04 | 55% | Pass |
| 21 | 0.084 | 154 | 4.92E-04 | 83 | 2.65E-04 | 54% | Pass |
| 22 | 0.087 | 148 | 4.73E-04 | 78 | 2.49E-04 | 53% | Pass |
| 23 | 0.090 | 135 | 4.31E-04 | 73 | 2.33E-04 | 54% | Pass |
| 24 | 0.093 | 131 | 4.18E-04 | 62 | 1.98E-04 | 47% | Pass |
| 25 | 0.096 | 122 | 3.90E-04 | 55 | 1.76E-04 | 45% | Pass |
| 26 | 0.099 | 118 | 3.77E-04 | 46 | 1.47E-04 | 39% | Pass |
| 27 | 0.102 | 107 | 3.42E-04 | 45 | 1.44E-04 | 42% | Pass |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 28 | 0.105 | 100 | 3.19E-04 | 37 | 1.18E-04 | 37% | Pass |
| 29 | 0.109 | 90 | 2.87E-04 | 31 | 9.90E-05 | 34% | Pass |
| 30 | 0.112 | 78 | 2.49E-04 | 30 | 9.58E-05 | 38% | Pass |
| 31 | 0.115 | 75 | 2.39E-04 | 26 | 8.30E-05 | 35% | Pass |
| 32 | 0.118 | 71 | 2.27E-04 | 23 | 7.34E-05 | 32% | Pass |
| 33 | 0.121 | 69 | 2.20E-04 | 20 | 6.39E-05 | 29% | Pass |
| 34 | 0.124 | 68 | 2.17E-04 | 20 | 6.39E-05 | 29% | Pass |
| 35 | 0.127 | 62 | 1.98E-04 | 18 | 5.75E-05 | 29% | Pass |
| 36 | 0.130 | 60 | 1.92E-04 | 15 | 4.79E-05 | 25% | Pass |
| 37 | 0.134 | 55 | 1.76E-04 | 14 | 4.47E-05 | 25% | Pass |
| 38 | 0.137 | 53 | 1.69E-04 | 12 | 3.83E-05 | 23% | Pass |
| 39 | 0.140 | 52 | 1.66E-04 | 12 | 3.83E-05 | 23% | Pass |
| 40 | 0.143 | 49 | 1.56E-04 | 11 | 3.51E-05 | 22% | Pass |
| 41 | 0.146 | 47 | 1.50E-04 | 11 | 3.51E-05 | 23% | Pass |
| 42 | 0.149 | 42 | 1.34E-04 | 11 | 3.51E-05 | 26% | Pass |
| 43 | 0.152 | 36 | 1.15E-04 | 10 | 3.19E-05 | 28% | Pass |
| 44 | 0.155 | 31 | 9.90E-05 | 9 | 2.87E-05 | 29% | Pass |
| 45 | 0.159 | 29 | 9.26E-05 | 9 | 2.87E-05 | 31% | Pass |
| 46 | 0.162 | 29 | 9.26E-05 | 9 | 2.87E-05 | 31% | Pass |
| 47 | 0.165 | 29 | 9.26E-05 | 9 | 2.87E-05 | 31% | Pass |
| 48 | 0.168 | 28 | 8.94E-05 | 8 | 2.55E-05 | 29% | Pass |
| 49 | 0.171 | 22 | 7.02E-05 | 8 | 2.55E-05 | 36% | Pass |
| 50 | 0.174 | 22 | 7.02E-05 | 7 | 2.23E-05 | 32% | Pass |
| 51 | 0.177 | 22 | 7.02E-05 | 7 | 2.23E-05 | 32% | Pass |
| 52 | 0.180 | 21 | 6.70E-05 | 6 | 1.92E-05 | 29% | Pass |
| 53 | 0.184 | 20 | 6.39E-05 | 6 | 1.92E-05 | 30% | Pass |
| 54 | 0.187 | 20 | 6.39E-05 | 6 | 1.92E-05 | 30% | Pass |
| 55 | 0.190 | 18 | 5.75E-05 | 6 | 1.92E-05 | 33% | Pass |
| 56 | 0.193 | 17 | 5.43E-05 | 6 | 1.92E-05 | 35% | Pass |
| 57 | 0.196 | 16 | 5.11E-05 | 5 | 1.60E-05 | 31% | Pass |
| 58 | 0.199 | 15 | 4.79E-05 | 5 | 1.60E-05 | 33% | Pass |
| 59 | 0.202 | 15 | 4.79E-05 | 5 | 1.60E-05 | 33% | Pass |
| 60 | 0.205 | 14 | 4.47E-05 | 5 | 1.60E-05 | 36% | Pass |
| 61 | 0.209 | 14 | 4.47E-05 | 4 | 1.28E-05 | 29% | Pass |
| 62 | 0.212 | 14 | 4.47E-05 | 4 | 1.28E-05 | 29% | Pass |
| 63 | 0.215 | 14 | 4.47E-05 | 4 | 1.28E-05 | 29% | Pass |
| 64 | 0.218 | 14 | 4.47E-05 | 4 | 1.28E-05 | 29% | Pass |
| 65 | 0.221 | 13 | 4.15E-05 | 3 | 9.58E-06 | 23% | Pass |
| 66 | 0.224 | 13 | 4.15E-05 | 3 | 9.58E-06 | 23% | Pass |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 67 | 0.227 | 13 | 4.15E-05 | 3 | 9.58E-06 | 23% | Pass |
| 68 | 0.230 | 12 | 3.83E-05 | 2 | 6.39E-06 | 17% | Pass |
| 69 | 0.234 | 12 | 3.83E-05 | 2 | 6.39E-06 | 17% | Pass |
| 70 | 0.237 | 12 | 3.83E-05 | 2 | 6.39E-06 | 17% | Pass |
| 71 | 0.240 | 12 | 3.83E-05 | 1 | 3.19E-06 | 8% | Pass |
| 72 | 0.243 | 12 | 3.83E-05 | 1 | 3.19E-06 | 8% | Pass |
| 73 | 0.246 | 11 | 3.51E-05 | 1 | 3.19E-06 | 9% | Pass |
| 74 | 0.249 | 10 | 3.19E-05 | 1 | 3.19E-06 | 10% | Pass |
| 75 | 0.252 | 10 | 3.19E-05 | 1 | 3.19E-06 | 10% | Pass |
| 76 | 0.255 | 9 | 2.87E-05 | 1 | 3.19E-06 | 11% | Pass |
| 77 | 0.259 | 9 | 2.87E-05 | 1 | 3.19E-06 | 11% | Pass |
| 78 | 0.262 | 9 | 2.87E-05 | 1 | 3.19E-06 | 11% | Pass |
| 79 | 0.265 | 8 | 2.55E-05 | 1 | 3.19E-06 | 13% | Pass |
| 80 | 0.268 | 8 | 2.55E-05 | 1 | 3.19E-06 | 13% | Pass |
| 81 | 0.271 | 7 | 2.23E-05 | 1 | 3.19E-06 | 14% | Pass |
| 82 | 0.274 | 6 | 1.92E-05 | 1 | 3.19E-06 | 17% | Pass |
| 83 | 0.277 | 6 | 1.92E-05 | 1 | 3.19E-06 | 17% | Pass |
| 84 | 0.280 | 6 | 1.92E-05 | 1 | 3.19E-06 | 17% | Pass |
| 85 | 0.284 | 5 | 1.60E-05 | 1 | 3.19E-06 | 20% | Pass |
| 86 | 0.287 | 5 | 1.60E-05 | 1 | 3.19E-06 | 20% | Pass |
| 87 | 0.290 | 5 | 1.60E-05 | 1 | 3.19E-06 | 20% | Pass |
| 88 | 0.293 | 5 | 1.60E-05 | 0 | 0.00E+00 | 0% | Pass |
| 89 | 0.296 | 5 | 1.60E-05 | 0 | 0.00E+00 | 0% | Pass |
| 90 | 0.299 | 5 | 1.60E-05 | 0 | 0.00E+00 | 0% | Pass |
| 91 | 0.302 | 5 | 1.60E-05 | 0 | 0.00E+00 | 0% | Pass |
| 92 | 0.305 | 5 | 1.60E-05 | 0 | 0.00E+00 | 0% | Pass |
| 93 | 0.309 | 5 | 1.60E-05 | 0 | 0.00E+00 | 0% | Pass |
| 94 | 0.312 | 5 | 1.60E-05 | 0 | 0.00E+00 | 0% | Pass |
| 95 | 0.315 | 5 | 1.60E-05 | 0 | 0.00E+00 | 0% | Pass |
| 96 | 0.318 | 4 | 1.28E-05 | 0 | 0.00E+00 | 0% | Pass |
| 97 | 0.321 | 4 | 1.28E-05 | 0 | 0.00E+00 | 0% | Pass |
| 98 | 0.324 | 4 | 1.28E-05 | 0 | 0.00E+00 | 0% | Pass |
| 99 | 0.327 | 3 | 9.58E-06 | 0 | 0.00E+00 | 0% | Pass |
| 100 | 0.330 | 3 | 9.58E-06 | 0 | 0.00E+00 | 0% | Pass |