PRELIMINARY
DRAINAGE STUDY

FOR

Del Prado
2329 CENTRE CITY PARKWAY
ESCONDIDO, CALIFORNIA

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BY:

_____

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PN: 11015
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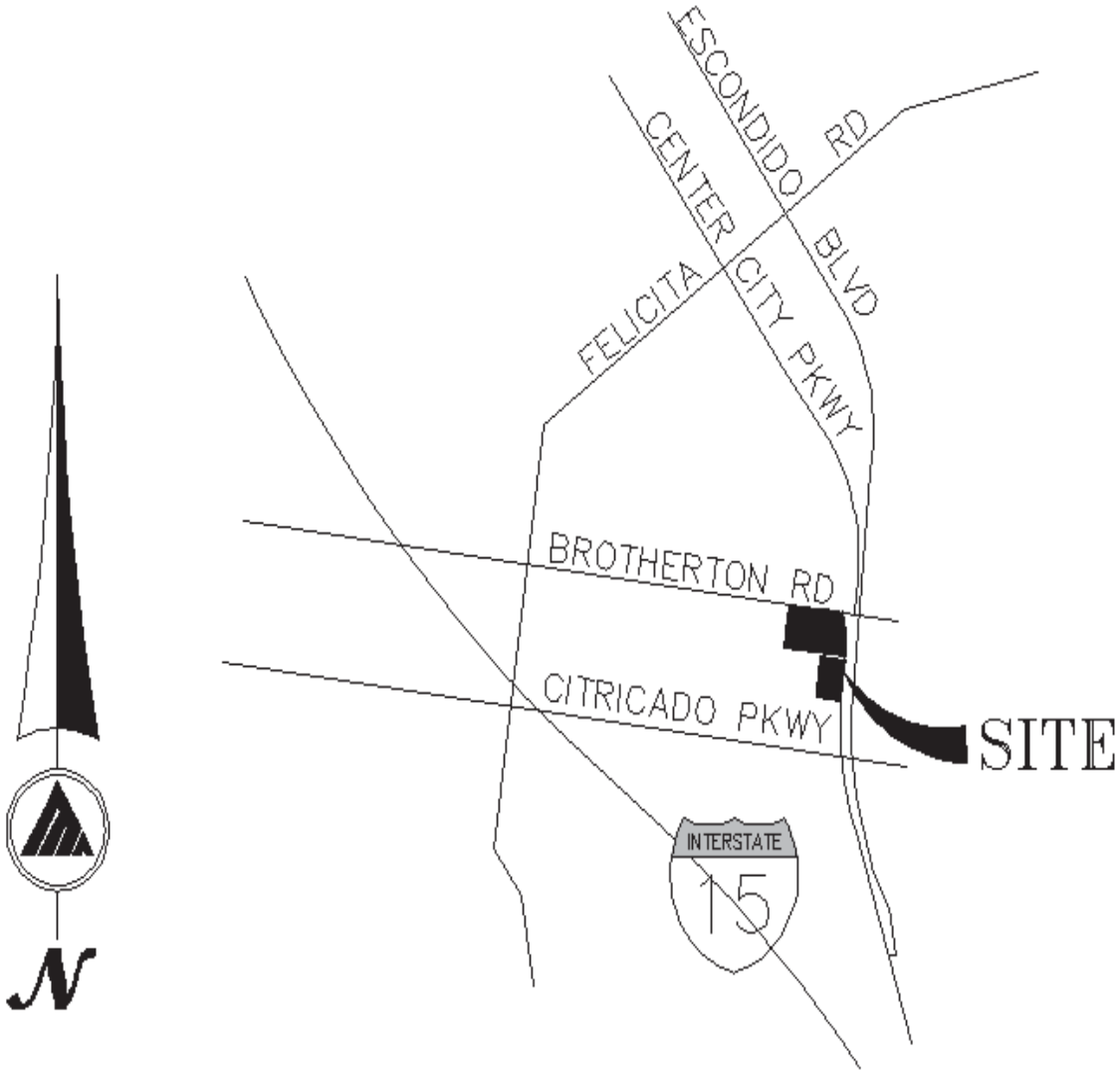
DEL PRADO

CITY OF ESCONDIDO, CALIFORNIA



VICINITY MAP

NTS

CURRENT CONDITION

PROJECT SITE
Brotherton Rd
Brotherton Rd
Brotherton Rd
Brotherton Rd
Brotherton Rd
Brotherton Rd
Nicolo Ct
S Centre City Pkwy
Centre City Parkway
S Escondido Blvd
Map
Traffic

INTRODUCTION:

The Project is located in the City of Escondido, on the southwestern corner of Brotherton Road and South Centre City Parkway (Frontage Road). The proposed project is a 2-lots (one in north and one south) multi-family subdivision of property located on an approximately 4.8 acre +/- acre site. The proposed development will be composed of 113 condominium units (81 units on north and 32 units on south), recreation area and onsite parking throughout the site.

According to the NRCS Website Survey, the site situated in hydrologic soil group C and D. A drainage study was performed to evaluate the needs and effects of the runoff from the property. This summarizes the findings of the study.

METHODOLOGY:

The method used herein to determine discharge quantities is the Rational Method as described in the City of Escondido Drainage Design Standards. Per the city drainage standards, for areas less than 0.5 square miles, a 50-year storm frequency event was used to determine runoff quantities.

Pre and post development hydrology maps are located in the back of this report as Exhibit 'A-1' and Exhibit 'B' respectively. The included maps outline the sub-basins, flow paths and concentration points for runoff discharging from the site area. All applicable tables and charts referenced from the manual are included herein.

CURRENT CONDITIONS:

The site is bordered to the east by S Centre City Parkway, to the west by single family homes and SDG&E sub station, to the south by commercial developments and to the north by Brotherton Road.

The site is currently undeveloped and covered mainly by grasses and medium size trees and small portion is impervious area that used to be parking lot and building.

Basin "1" sheet flows east-southerly onto S. Centre City Parkway with an average slope of 2.5% and ultimately drains into an existing grate inlet located on southeasterly corner of the Basin "1" on S. Centre City Parkway.

Basin "2" sheet flows east-southerly onto S. Centre City Parkway with an average slope of 3% into an existing curb inlet located at Basin "2" frontage on S. Center City Parkway.

There is no stormwater drainage onto the site from the surrounding areas. There are brow ditches around the site that collect the offsite runoff and route them into an existing storm drain system located south side of the project site.

10 minute minimum time of concentration was used for calculations per City of Escondido standards.

See Appendix A and A-1 for exhibits showing the drainage areas

Table A– Offsite Runoff

Basin	Area (Ac)	Q_{50} (CFS)
3	40.3	60.5

Table B– Pre Condition

Basin	Area (Ac)	Q_{50} (CFS)
1	3.4	5.2
2	1.5	1.8

PROPOSED CONDITIONS:

The proposed on-site development drainage will consist of 2 major drainage basins located on the north and south portions of the project site. Basin 1 is the largest of the drainage basins located on the north portion of the site which will drain via street gutters and proposed storm drain system towards a proposed treatment basin that is located in the middle part of the project site. After treatment and retention of excess flow the onsite drainage flow will be conveyed via the proposed storm drain system to the existing offsite storm drain system and ultimately into Escondido Creek.

Basin 2 will consist of multiple sub-basins that will drain via street gutter and proposed storm drain system towards a series of treatment basins. After treatment and retention of excess flow the onsite drainage flow will be conveyed via the proposed storm drain system to the existing offsite storm drain system and then into Escondido Creek.

A small portion of the site will drain directly onto S. Center City Parkway from the proposed onsite perimeter landscaping which will then drain into the grate inlet and the curb inlet located on southeast corner of the basin 1 and southeast corner of the basin 2, respectively then into an existing storm drain system and ultimately onto Escondido Creek.

10 minute minimum time of concentration was used for calculations per City of Escondido standards.

The following C factors were used:

High Density Residential: 0.70 for what soil type(s)?

Landscaped Area: ???

Table C – BASIN 1– POST CONDITION

Basin	Area (Ac)	Q_{50} (CFS)
1A	3.3	8.4
1B	0.16	0.2
CP#1	**3.4**	**8.6**

Table D – BASIN 2– POST CONDITION

Basin	Area (Ac)	Q_{50} (CFS)
2A	0.42	1.0
2B	0.37	0.9
2C	0.58	1.3
2D	0.13	0.3
CP#2	**1.5**	**3.5**

See Appendix B for calculations and exhibit.

CONCLUSIONS:

A comparison of the on-site runoff from the existing condition to the proposed conditions shows an increase in runoff because the proposed development adds impervious surfaces.

As previously mentioned, the runoff from the proposed development has been minimized by the use of water quality treatment facilities located before the off-site discharge points which consist of biofiltration basins. The water quality treatment basins also act as retention basins. The retention of water during biofiltration treatment of stormwater will have the beneficial side effect of helping to reduce the amount of flow exiting the site.

On-site condition

Summary Table D

Basin	Area (Ac) Pre	Q_{50} (CFS) Pre	Area (Ac) Post	Q50 (CFS) Post
CP#1	3.4	5.2	3.4	8.6
CP #2	1.5	1.8	1.5	3.5

APPENDIX A
EXISTING CONDITIONS CALCULATIONS

San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2005 Version 7.5

Rational method hydrology program based on
San Diego County Flood Control Division 2003 hydrology manual
Rational Hydrology Study Date: 07/14/15

Pre-Developement Drainage Study
PN 11015
Basin 1
50 Year Event

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

Program License Serial Number 4065

Rational hydrology study storm event year is 50.0
English (in-lb) input data Units used

Map data precipitation entered:
6 hour, precipitation(inches) = 2.800
24 hour precipitation(inches) = 5.500
P6/P24 = 50.9%
San Diego hydrology manual 'C' values used

++

Process from Point/Station 1.010 to Point/Station 1.020
**** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.540
Decimal fraction soil group D = 0.460
[LOW DENSITY RESIDENTIAL]
(1.0 DU/A or Less)
Impervious value, Ai = 0.100
Sub-Area C Value = 0.383
Initial subarea total flow distance = 100.000(Ft.)
Highest elevation = 629.000(Ft.)
Lowest elevation = 627.600(Ft.)

```
      Elevation difference =    1.400(Ft.) Slope =  1.400 %
      USER ENTRY OF INITIAL AREA TIME OF CONCENTRATION
      Time of Concentration =  10.00 minutes
      Rainfall intensity (I) =      4.718(In/Hr) for a    50.0 year storm
      Effective runoff coefficient used for area (Q=KCIA) is C = 0.383
      Subarea runoff =      0.121(CFS)
      Total initial stream area =        0.067(Ac.)


      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Process from Point/Station        1.020 to Point/Station
1.030
      **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
      ____________________________________________________________________
___
      Estimated mean flow rate at midpoint of channel =      2.711(CFS)
      Depth of flow =   0.222(Ft.), Average velocity =   2.499(Ft/s)
            ******* Irregular Channel Data ***********
      ------------------------------------------------------------------
      Information entered for subchannel number 1 :
      Point number      'X' coordinate     'Y' coordinate
            1              0.00              1.00
            2              4.00              0.00
            3              8.00              0.00
            4             12.00              1.00
      Manning's 'N' friction factor =   0.035
      ------------------------------------------------------------------
      Sub-Channel flow  =      2.711(CFS)
        '     '   flow top width =      5.776(Ft.)
        '     '    velocity=    2.499(Ft/s)
        '     '   area =      1.085(Sq.Ft)
        '     '   Froude number =     1.016

      Upstream point elevation =   627.600(Ft.)
      Downstream point elevation =   612.700(Ft.)
      Flow length =   457.000(Ft.)
      Travel time  =    3.05 min.
      Time of concentration =   13.05 min.
      Depth of flow =   0.222(Ft.)
      Average velocity =   2.499(Ft/s)
      Total irregular channel flow =     2.711(CFS)
      Irregular channel normal depth above invert elev. =   0.222(Ft.)
      Average velocity of channel(s) =   2.499(Ft/s)
       Adding area flow to channel
      Decimal fraction soil group A = 0.000
      Decimal fraction soil group B = 0.000
      Decimal fraction soil group C = 0.540
      Decimal fraction soil group D = 0.460
      [LOW DENSITY RESIDENTIAL                    ]
      (1.0 DU/A or Less       )
      Impervious value, Ai = 0.100
      Sub-Area C Value = 0.383
      Rainfall intensity =      3.974(In/Hr) for a    50.0 year storm
```

```
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.383  CA =      1.316
Subarea runoff =      5.110(CFS) for      3.370(Ac.)
Total runoff =      5.231(CFS)    Total area =       3.437(Ac.)
Depth of flow =   0.321(Ft.), Average velocity =   3.084(Ft/s)
End of computations, total study area =           3.437 (Ac.)
```

San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2005 Version 7.5

Rational method hydrology program based on
San Diego County Flood Control Division 2003 hydrology manual
Rational Hydrology Study Date: 07/14/15

Pre-Developement Drainage Study
PN 11015
Basin 2
50 Year

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

Program License Serial Number 4065

Rational hydrology study storm event year is 50.0
English (in-lb) input data Units used

Map data precipitation entered:
6 hour, precipitation(inches) = 2.800
24 hour precipitation(inches) = 5.500
P6/P24 = 50.9%
San Diego hydrology manual 'C' values used

++

Process from Point/Station 2.010 to Point/Station 2.020
**** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.540
Decimal fraction soil group D = 0.460
[UNDISTURBED NATURAL TERRAIN]
(Permanent Open Space)
Impervious value, Ai = 0.000
Sub-Area C Value = 0.323
Initial subarea total flow distance = 100.000(Ft.)
Highest elevation = 615.000(Ft.)
Lowest elevation = 613.300(Ft.)

```
      Elevation difference =    1.700(Ft.) Slope =  1.700 %
      INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
      The maximum overland flow distance is 85.00 (Ft)
      for the top area slope value of   1.70 %, in a development type of
       Permanent Open Space
      In Accordance With Table 3-2
      Initial Area Time of Concentration =  10.90 minutes
       (for slope value of   2.00 %)
      The initial area total distance of  100.00 (Ft.) entered leaves a
      remaining distance of   15.00 (Ft.)
      Using Figure 3-4, the travel time for this distance is   0.30
minutes
      for a distance of  15.00 (Ft.) and a slope of  1.70 %
      with an elevation difference of   0.26(Ft.) from the end of the top
area
      Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
       =    0.302 Minutes
      Tt=[(11.9*0.0028^3)/(  0.26)]^.385=  0.30
      Total initial area Ti =  10.90 minutes from Table 3-2 plus
        0.30 minutes from the Figure 3-4 formula =  11.20 minutes
      Rainfall intensity (I) =      4.385(In/Hr) for a    50.0 year storm
      Effective runoff coefficient used for area (Q=KCIA) is C = 0.323
      Subarea runoff =      0.156(CFS)
      Total initial stream area =        0.110(Ac.)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      Process from Point/Station        2.020 to Point/Station
2.030
      **** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
      ____________________________________________________________________
___
      Estimated mean flow rate at midpoint of channel =      1.014(CFS)
      Depth of flow =   0.156(Ft.), Average velocity =   1.442(Ft/s)
            ******* Irregular Channel Data ***********
      ------------------------------------------------------------------
      Information entered for subchannel number 1 :
      Point number      'X' coordinate     'Y' coordinate
           1              0.00              1.00
           2              4.00              0.00
           3              8.00              0.00
           4             13.00              2.00
      Manning's 'N' friction factor =   0.035
      ------------------------------------------------------------------
      Sub-Channel flow  =      1.014(CFS)
        '     '   flow top width =      5.015(Ft.)
        '     '    velocity=    1.442(Ft/s)
        '     '   area =      0.704(Sq.Ft)
        '     '   Froude number =     0.678

      Upstream point elevation =   613.300(Ft.)
      Downstream point elevation =   608.300(Ft.)
      Flow length =   312.000(Ft.)
```

```
Travel time  =    3.61 min.
Time of concentration =   14.81 min.
Depth of flow =   0.156(Ft.)
Average velocity =   1.442(Ft/s)
Total irregular channel flow =     1.014(CFS)
Irregular channel normal depth above invert elev. =   0.156(Ft.)
Average velocity of channel(s) =   1.442(Ft/s)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.540
Decimal fraction soil group D = 0.460
[UNDISTURBED NATURAL TERRAIN                ]
(Permanent Open Space   )
Impervious value, Ai = 0.000
Sub-Area C Value = 0.323
Rainfall intensity =      3.662(In/Hr) for a    50.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.323  CA =      0.486
Subarea runoff =      1.625(CFS) for      1.395(Ac.)
Total runoff =      1.780(CFS)    Total area =       1.505(Ac.)
Depth of flow =   0.216(Ft.), Average velocity =   1.750(Ft/s)
End of computations, total study area =           1.505 (Ac.)
```

San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2005 Version 7.5

Rational method hydrology program based on
San Diego County Flood Control Division 2003 hydrology manual
Rational Hydrology Study Date: 07/07/15

Offsite Analysis
PN 11015
Basin 3
50 Year Event

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

Program License Serial Number 4065

Rational hydrology study storm event year is 50.0
English (in-lb) input data Units used

Map data precipitation entered:
6 hour, precipitation(inches) = 2.800
24 hour precipitation(inches) = 5.500
P6/P24 = 50.9%
San Diego hydrology manual 'C' values used

++

Process from Point/Station 3.010 to Point/Station 3.020
**** 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]
(14.5 DU/A or Less)
Impervious value, Ai = 0.500
Sub-Area C Value = 0.630
Initial subarea total flow distance = 169.000(Ft.)
Highest elevation = 670.000(Ft.)
Lowest elevation = 668.300(Ft.)

```
      Elevation difference =    1.700(Ft.) Slope =  1.006 %
      Top of Initial Area Slope adjusted by User to  0.010 %
      Bottom of Initial Area Slope adjusted by User to  0.010 %
      INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
      The maximum overland flow distance is 50.00 (Ft)
      for the top area slope value of   0.01 %, in a development type of
       14.5 DU/A or Less
      In Accordance With Table 3-2
      Initial Area Time of Concentration =   8.20 minutes
       (for slope value of   0.50 %)
      The initial area total distance of  169.00 (Ft.) entered leaves a
      remaining distance of  119.00 (Ft.)
      Using Figure 3-4, the travel time for this distance is  10.73
minutes
      for a distance of 119.00 (Ft.) and a slope of  0.01 %
      with an elevation difference of   0.01(Ft.) from the end of the top
area
      Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
       =   10.734 Minutes
      Tt=[(11.9*0.0225^3)/(  0.01)]^.385= 10.73
      Total initial area Ti =   8.20 minutes from Table 3-2 plus
       10.73 minutes from the Figure 3-4 formula =  18.93 minutes
      Rainfall intensity (I) =      3.125(In/Hr) for a    50.0 year storm
      Effective runoff coefficient used for area (Q=KCIA) is C = 0.630
      Subarea runoff =      0.866(CFS)
      Total initial stream area =        0.440(Ac.)


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      Process from Point/Station        3.020 to Point/Station
3.030
      **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
      ____________________________________________________________________
___
      Top of street segment elevation =   668.300(Ft.)
      End of street segment elevation =   624.000(Ft.)
      Length of street segment  =  2300.000(Ft.)
      Height of curb above gutter flowline  =    6.0(In.)
      Width of half street (curb to crown)  =  22.000(Ft.)
      Distance from crown to crossfall grade break  =  20.500(Ft.)
      Slope from gutter to grade break (v/hz) =   0.020
      Slope from grade break to crown (v/hz)  =   0.020
      Street flow is on [2] side(s) of the street
      Distance from curb to property line  =  10.000(Ft.)
      Slope from curb to property line (v/hz) =   0.020
      Gutter width =   1.500(Ft.)
      Gutter hike from flowline =  1.500(In.)
       Manning's N in gutter =  0.0180
       Manning's N from gutter to grade break =  0.0180
       Manning's N from grade break to crown =  0.0180
      Estimated mean flow rate at midpoint of street =     30.569(CFS)
      Depth of flow =   0.489(Ft.), Average velocity =   3.863(Ft/s)
      Streetflow hydraulics at midpoint of street travel:
```

```
      Halfstreet flow width =  19.711(Ft.)
      Flow velocity =   3.86(Ft/s)
      Travel time =    9.92 min.     TC =   28.86  min.
       Adding area flow to street
      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                 ]
      (14.5 DU/A or Less      )
      Impervious value, Ai = 0.500
      Sub-Area C Value = 0.630
      Rainfall intensity =      2.382(In/Hr) for a    50.0 year storm
      Effective runoff coefficient used for total area
      (Q=KCIA) is C = 0.630  CA =     25.389
      Subarea runoff =     59.600(CFS) for     39.860(Ac.)
      Total runoff =     60.466(CFS)    Total area =      40.300(Ac.)
      Street flow at end of street =     60.466(CFS)
      Half street flow at end of street =     30.233(CFS)
      Warning: depth of flow exceeds top of curb
      Note:  depth of flow exceeds top of street crown.
      Distance that curb overflow reaches into property =   10.00(Ft.)
      Flow width (from curb towards crown)=  22.000(Ft.)


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      Process from Point/Station        3.030 to Point/Station
3.040
      **** IMPROVED CHANNEL TRAVEL TIME ****
      ____________________________________________________________________
___
      Covered channel
      Upstream point elevation =   624.000(Ft.)
      Downstream point elevation =   612.000(Ft.)
      Channel length thru subarea  =   310.000(Ft.)
      Channel base width     =    3.000(Ft.)
      Slope or 'Z' of left channel bank =   2.000
      Slope or 'Z' of right channel bank =   2.000
      Manning's 'N'    = 0.018
      Maximum depth of channel  =    2.000(Ft.)
      Flow(q) thru subarea =     60.466(CFS)
      Depth of flow =   0.986(Ft.), Average velocity =  12.333(Ft/s)
      Channel flow top width =    6.944(Ft.)
      Flow Velocity =   12.33(Ft/s)
      Travel time  =    0.42 min.
      Time of concentration =   29.28 min.
      Critical depth =      1.641(Ft.)


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      Process from Point/Station        1.040 to Point/Station
1.050
```

**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 609.000(Ft.)
Downstream point/station elevation = 608.000(Ft.)
Pipe length = 220.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 60.466(CFS)
Nearest computed pipe diameter = 42.00(In.)
Calculated individual pipe flow = 60.466(CFS)
Normal flow depth in pipe = 30.89(In.)
Flow top width inside pipe = 37.05(In.)
Critical Depth = 29.24(In.)
Pipe flow velocity = 7.97(Ft/s)
Travel time through pipe = 0.46 min.
Time of concentration (TC) = 29.74 min.
End of computations, total study area = 40.300 (Ac.)

APPENDIX B
POST CONDITIONS CALCULATIONS

San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2005 Version 7.5

Rational method hydrology program based on
San Diego County Flood Control Division 2003 hydrology manual
Rational Hydrology Study Date: 07/14/15

POST DEVELOPMENT ANALYSIS FOR DEL PRADO
PN 11015
Basin 1a
50 YEAR STORM

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

Program License Serial Number 4065

Rational hydrology study storm event year is 50.0
English (in-lb) input data Units used

Map data precipitation entered:
6 hour, precipitation(inches) = 2.800
24 hour precipitation(inches) = 5.500
P6/P24 = 50.9%
San Diego hydrology manual 'C' values used

++

Process from Point/Station 1.010 to Point/Station 1.020
**** 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
[HIGH DENSITY RESIDENTIAL]
(24.0 DU/A or Less)
Impervious value, Ai = 0.650
Sub-Area C Value = 0.710
Initial subarea total flow distance = 103.000(Ft.)
Highest elevation = 626.000(Ft.)
Lowest elevation = 624.900(Ft.)

```
      Elevation difference =    1.100(Ft.) Slope =  1.068 %
      INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
      The maximum overland flow distance is 65.00 (Ft)
      for the top area slope value of   1.07 %, in a development type of
       24.0 DU/A or Less
      In Accordance With Table 3-2
      Initial Area Time of Concentration =   9.50 minutes
       (for slope value of   1.00 %)
      The initial area total distance of  103.00 (Ft.) entered leaves a
      remaining distance of   38.00 (Ft.)
      Using Figure 3-4, the travel time for this distance is   0.74
minutes
      for a distance of  38.00 (Ft.) and a slope of  1.07 %
      with an elevation difference of   0.41(Ft.) from the end of the top
area
      Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
       =    0.738 Minutes
      Tt=[(11.9*0.0072^3)/(  0.41)]^.385=  0.74
      Total initial area Ti =   9.50 minutes from Table 3-2 plus
        0.74 minutes from the Figure 3-4 formula =  10.24 minutes
      Rainfall intensity (I) =      4.647(In/Hr) for a    50.0 year storm
      Effective runoff coefficient used for area (Q=KCIA) is C = 0.710
      Subarea runoff =      0.495(CFS)
      Total initial stream area =        0.150(Ac.)


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      Process from Point/Station        1.020 to Point/Station
1.030
      **** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
      ------------------------------------------------------------------
---
      Top of street segment elevation =   624.900(Ft.)
      End of street segment elevation =   622.000(Ft.)
      Length of street segment  =   432.000(Ft.)
      Height of curb above gutter flowline  =    6.0(In.)
      Width of half street (curb to crown)  =  18.000(Ft.)
      Distance from crown to crossfall grade break  =  16.500(Ft.)
      Slope from gutter to grade break (v/hz) =   0.020
      Slope from grade break to crown (v/hz)  =   0.020
      Street flow is on [2] side(s) of the street
      Distance from curb to property line  =  10.000(Ft.)
      Slope from curb to property line (v/hz) =   0.020
      Gutter width =   1.500(Ft.)
      Gutter hike from flowline =  1.500(In.)
       Manning's N in gutter =  0.0150
       Manning's N from gutter to grade break =  0.0180
       Manning's N from grade break to crown =  0.0180
      Estimated mean flow rate at midpoint of street =      4.563(CFS)
      Depth of flow =   0.323(Ft.), Average velocity =   1.658(Ft/s)
      Streetflow hydraulics at midpoint of street travel:
      Halfstreet flow width =  11.421(Ft.)
      Flow velocity =   1.66(Ft/s)
```

```
Travel time =    4.34 min.     TC =   14.58  min.
 Adding area flow to street
User specified 'C' value of 0.700 given for subarea
Rainfall intensity =      3.699(In/Hr) for a    50.0 year storm
Effective runoff coefficient used for total area
(Q=KCIA) is C = 0.700  CA =      2.289
Subarea runoff =      7.973(CFS) for      3.120(Ac.)
Total runoff =      8.468(CFS)    Total area =       3.270(Ac.)
Street flow at end of street =      8.468(CFS)
Half street flow at end of street =      4.234(CFS)
Depth of flow =   0.387(Ft.), Average velocity =   1.921(Ft/s)
Flow width (from curb towards crown)=  14.604(Ft.)
End of computations, total study area =           3.270 (Ac.)
```

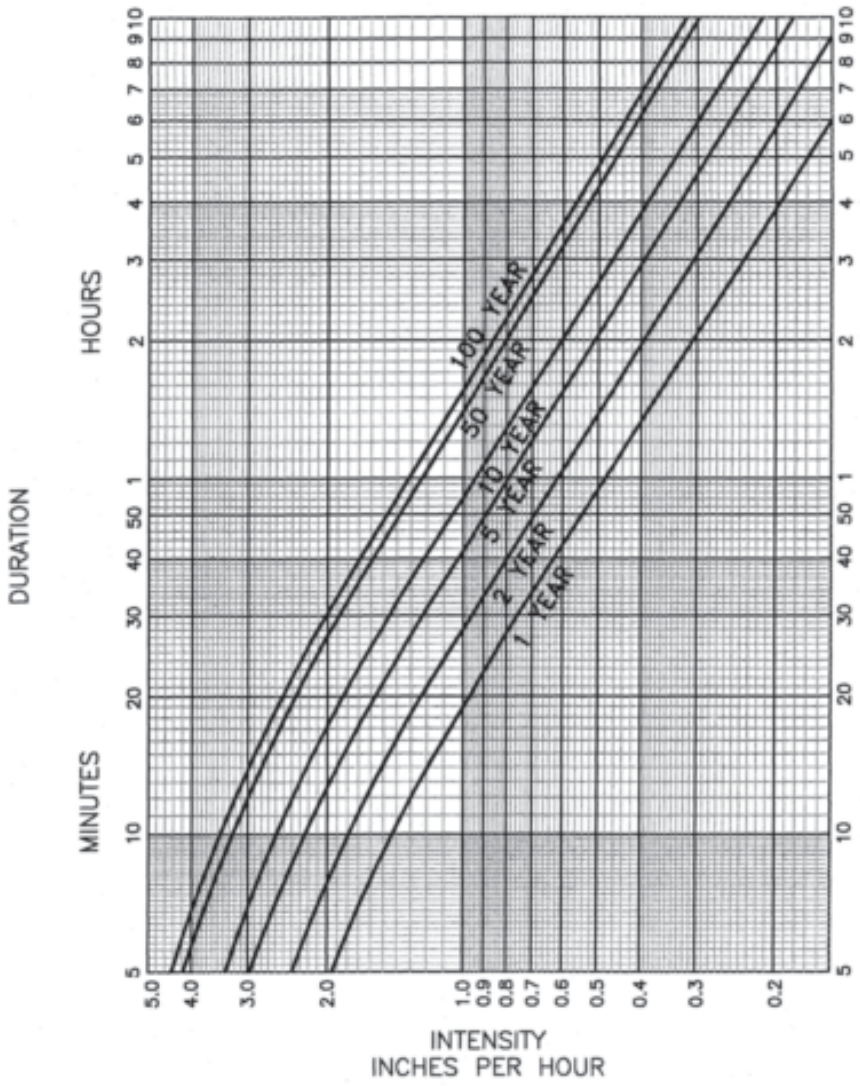
BASIN-1B

Proposed Conditions Hydrology									
BASIN ID	**AREA**	**C**	**CA**	**Change in elevation**	**Longest Runoff length**	**T_c**	**I_{50}**	**Q_{50}**	**Cummulative Q_{50},**
	(ac.)			ft	ft	(10 min.)	(in/hr)	(cfs)	(cfs)
Basin 1B	0.16	0.35	0.06	5	200	**10.0**	**3.30**	**0.18**	0.18

BASIN-2 (A-D)

Proposed Conditions Hydrology									
BASIN ID	**AREA**	**C**	**CA**	**Change in elevation**	**Longest Runoff length**	**T_c**	**I_{50}**	**Q_{50}**	**Cummulative Q_{50},**
	(ac.)			ft	ft	(10 min.)	(in/hr)	(cfs)	(cfs)
Basin 2A	0.42	0.70	0.29	3	175	**10.0**	**3.30**	**0.97**	0.97
Basin 2B	0.37	0.70	0.26	3	225	**10.0**	**3.30**	**0.85**	1.82
Basin 2C	0.58	0.70	0.41	3	220	**10.0**	**3.30**	**1.34**	3.16
Basin 2D	0.13	0.70	0.09	1	130	**10.0**	**3.30**	**0.30**	3.46
Total Flow from Site	1.50							**3.5**	3.5

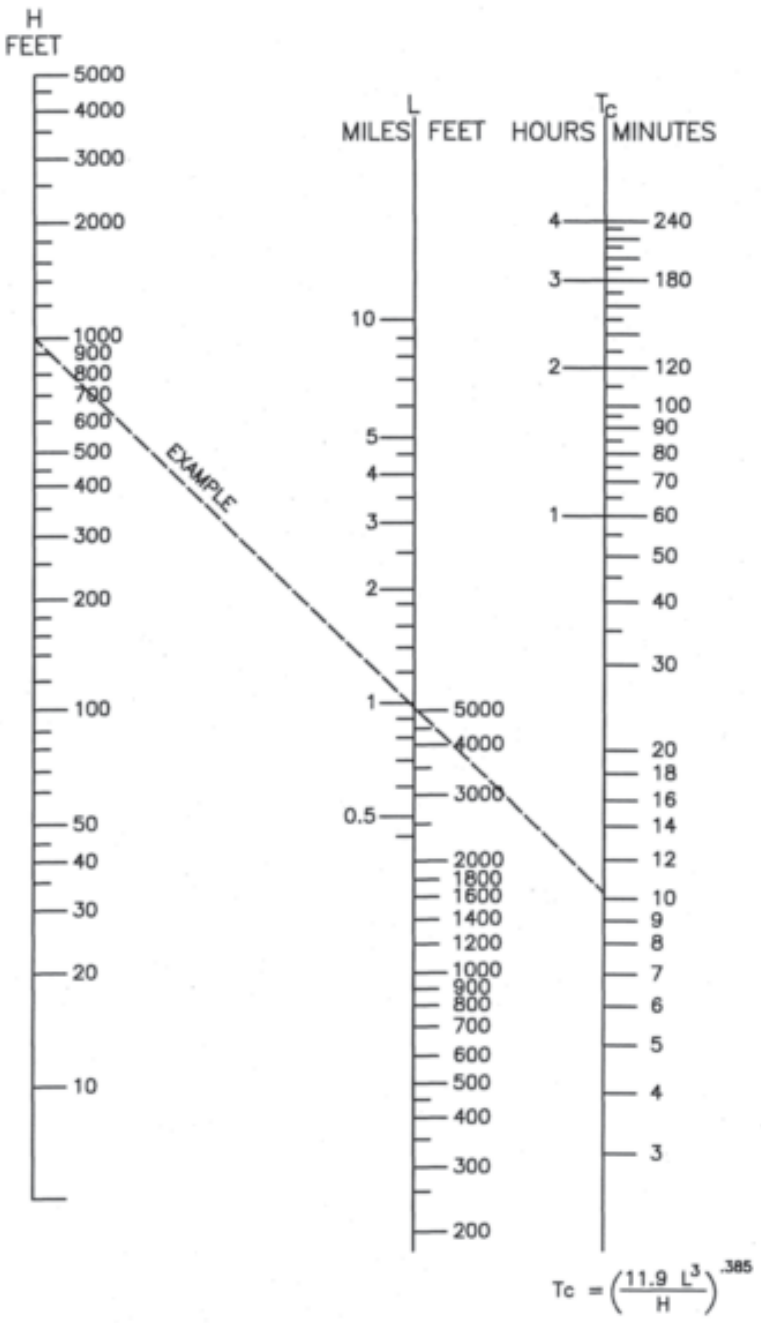
APPENDIX C
TABLES AND FIGURES FROM CITY OF ESCONDIDO DRAINAGE AND COUNTY OF SAN DIEGO STANDARDS



ESCONDIDO RUNOFF COEFFICIENTS

PARKS, GOLF COURSES, CEMETERIES	0.25
UNDEVELOPED LAND, OPEN SPACE	0.35
RURAL – OVER 1/2 ACRE LOTS	0.45
SINGLE FAMILY	0.55
MOBILE HOME	0.65
MULTIPLE UNITS	0.70
COMMERCIAL	0.85
INDUSTRIAL	0.95

APPROVED: DIRECTOR OF ENGINEERING SERVICES	DATE: 5/6/09	CITY OF ESCONDIDO DEPARTMENT OF ENGINEERING SERVICES	SCALE: NOT TO SCALE
REVISED	APPROVED	RUNNOFF INTENSITY DURATION CURVE	FIGURE NO. 1



NOTE:

THIS CHART SHALL BE USED FOR ALL BASINS WITHIN THE CITY OF ESCONDIDO LESS 0.5 SQUARE MILE. THE MINIMUM Tc TO BE USED IS 10 MINUTES

Tc = TIME OF CONCENTRATION (HOURS)
L = LENGTH OF DRAINAGE COURSE (MILES)
H = DIFFERENCE IN ELEVATION FROM FURTHER MOST POINT OF DESIGN (FEET)

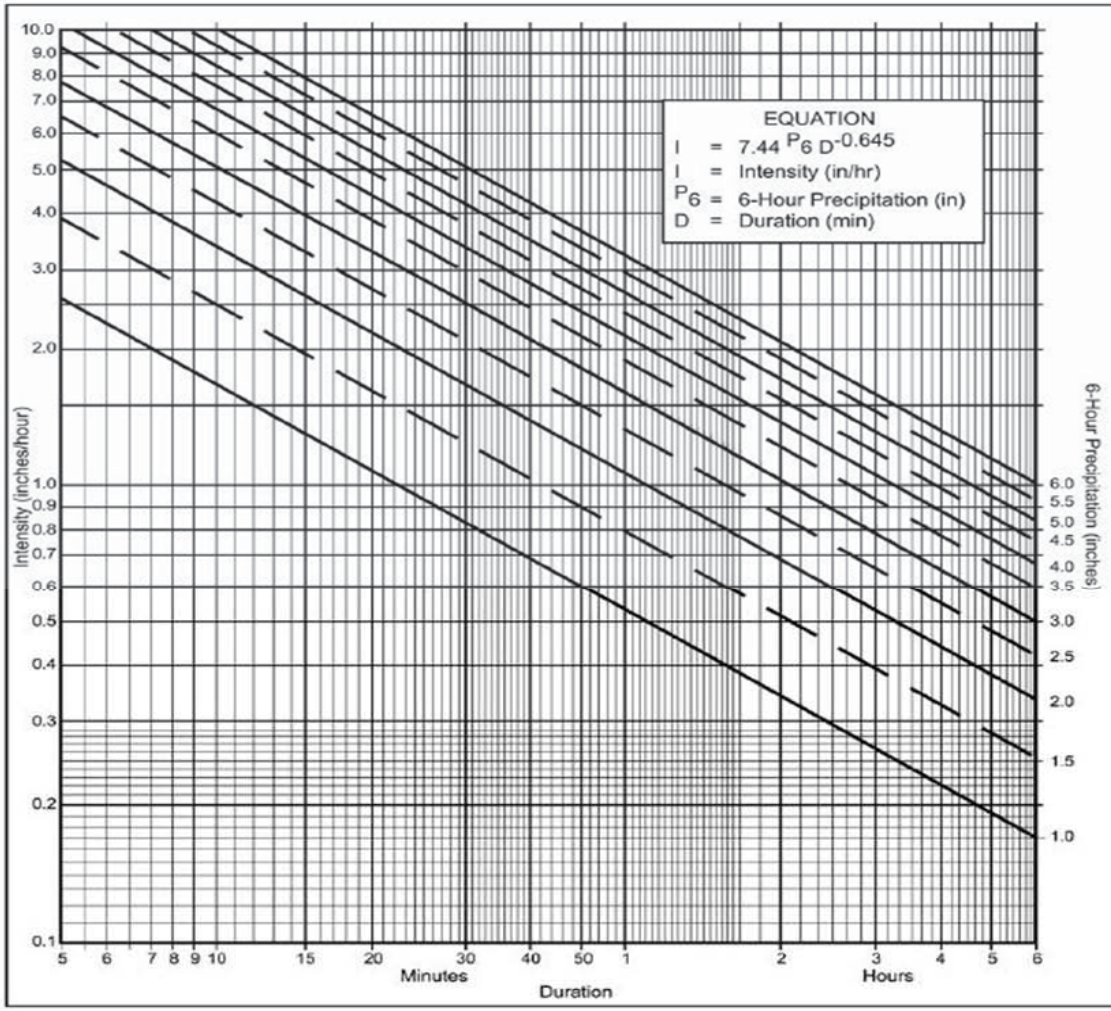
APPROVED: DIRECTOR OF ENGINEERING SERVICES — DATE: 5/6/09	CITY OF ESCONDIDO DEPARTMENT OF ENGINEERING SERVICES	SCALE: NOT TO SCALE
REVISED / APPROVED	RUNOFF TIME CHART	FIGURE NO. 2

Table 3-1
RUNOFF COEFFICIENTS FOR URBAN AREAS

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

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

I:\\I\\



Directions for Application:

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

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

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

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

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

Application Form:

(a) Selected frequency _____ year

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

(c) Adjusted P_6(2) = _____ in.

(d) t_x = _____ min.

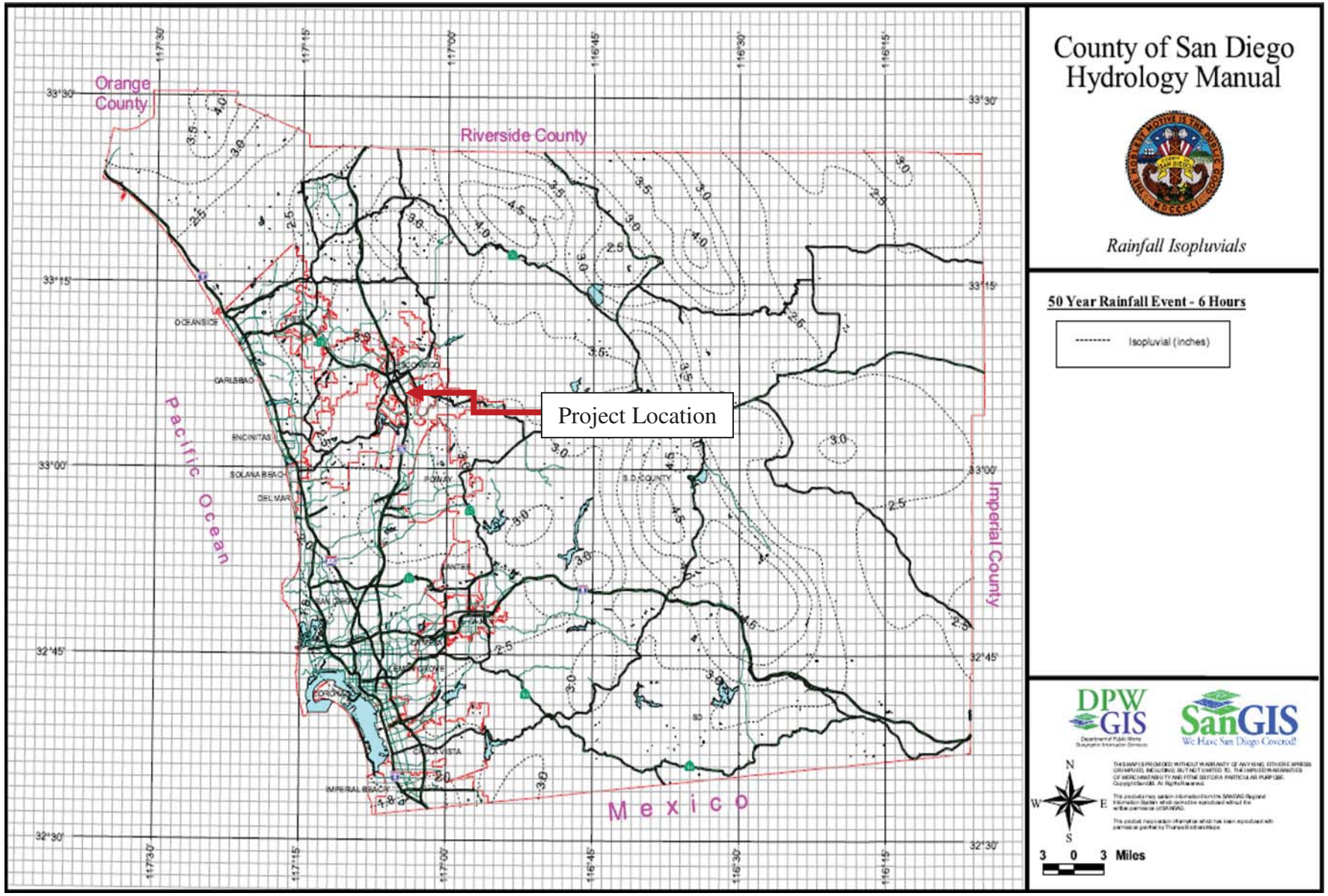
(e) I = _____ in./hr.

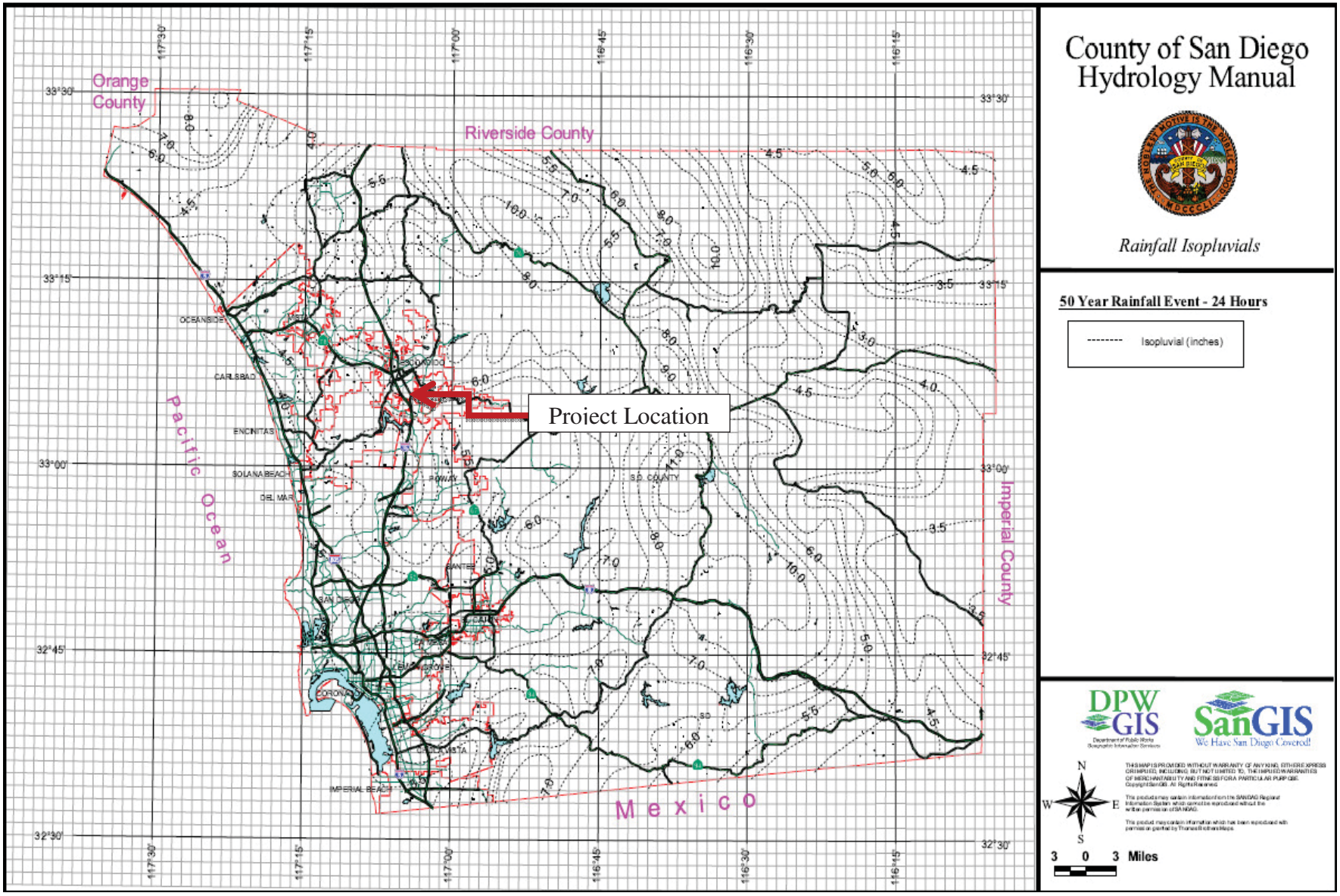
Note: This chart replaces the Intensity-Duration-Frequency curves used since 1965.

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

Intensity-Duration Design Chart - Template

FIGURE 3-1


County of San Diego
Hydrology Manual
Rainfall Isopluvials
50 Year Rainfall Event - 6 Hours
Isopluvial (inches)
Orange County
Riverside County
Imperial County
Pacific Ocean
Mexico
Project Location
OCEANSIDE
CARLSBAD
ENCINITAS
SOLANA BEACH
DEL MAR
SAN DIEGO
CHULA VISTA
IMPERIAL BEACH
CORONADO
S.D. COUNTY
DPW GIS
SanGIS
We Have San Diego Covered!
N
W
E
S
3 0 3 Miles


Orange County
Riverside County
Pacific Ocean
Imperial County
Mexico
Project Location
OCEANSIDE
CARLSBAD
ENCINITAS
SOLANA BEACH
DEL MAR
SAN DIEGO
CORONADO
IMPERIAL BEACH
CHULA VISTA
SD COUNTY
County of San Diego
Hydrology Manual
Rainfall Isopluvials
50 Year Rainfall Event - 24 Hours
Isopluvial (inches)
DPW GIS
SanGIS
We Have San Diego Covered!
N
S
E
W
3 0 3 Miles

APPENDIX D
NRCS HYDROLOGIC SOILS GROUP DATA

MAP LEGEND

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

Soils

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

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

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

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

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

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
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 8, Sep 17, 2014

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

Date(s) aerial images were photographed: May 3, 2010—Jun 19, 2010

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

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — San Diego County Area, California (CA638)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
BIC	Bonsall sandy loam, 2 to 9 percent slopes	D	2.2	39.1%
RaB	Ramona sandy loam, 2 to 5 percent slopes	C	3.4	60.8%
RaC	Ramona sandy loam, 5 to 9 percent slopes	C	0.0	0.0%
Totals for Area of Interest			**5.7**	**100.0%**

Description

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

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

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

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

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

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

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

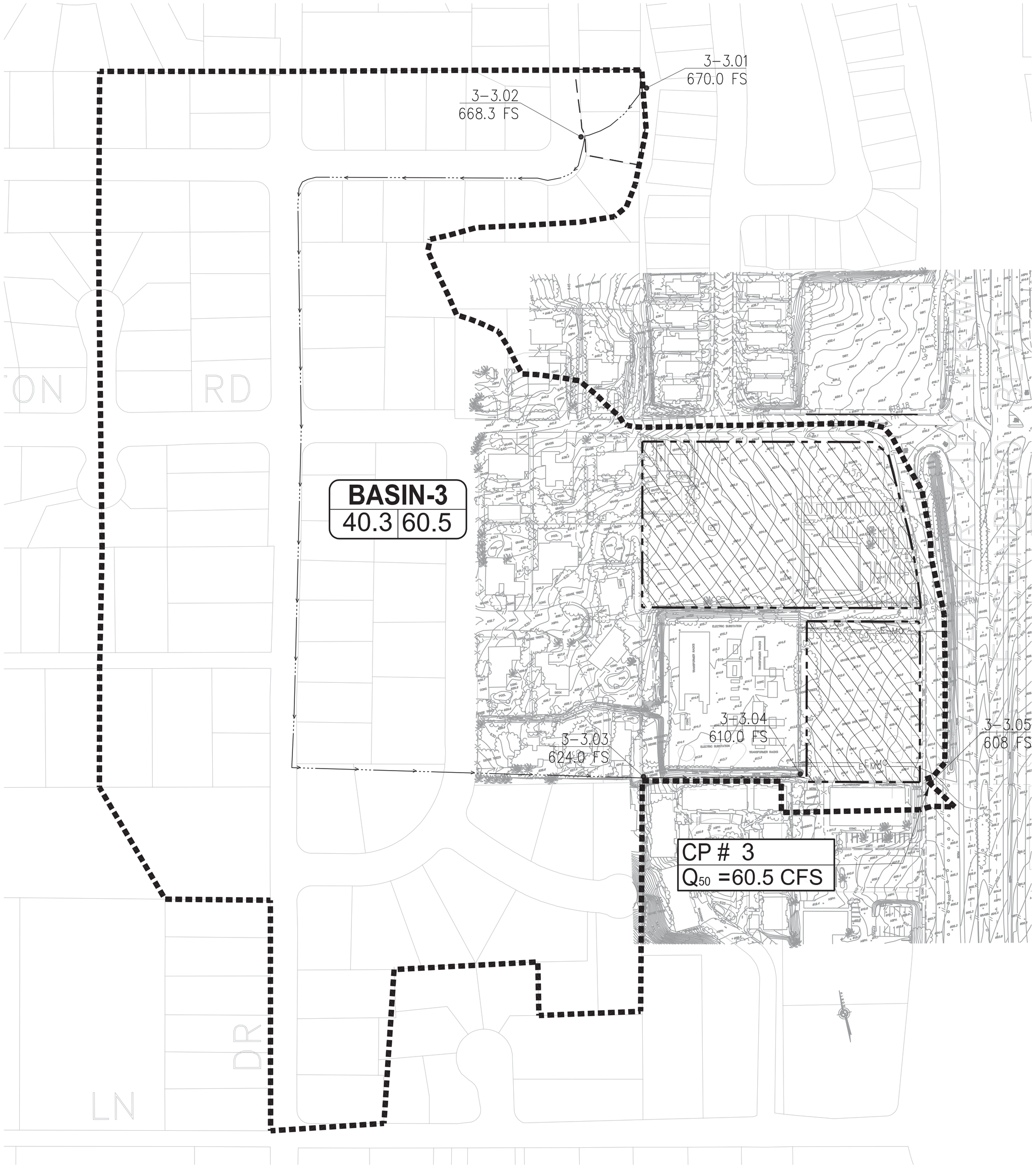
Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: *None Specified*

Tie-break Rule: Higher

EXHIBIT A



LEGEND

SYMBOL	DESCRIPTION
BASIN-3 / AC | Q	BASIN DESIGNATION BASIN AREA (AC), DISCHARGE (CFS)
CP # 3 / Q_{50} =96.8 CFS	50-YEAR DISCHARGE
	EXCLUDED ONSITE-PROJECT AREA
	OFFSITE-BASIN
	FLOW PATH
3-3.01 / 670.0 FS	NODE DESIGNATED NUMBER FINISH SURFACE ELEVATION

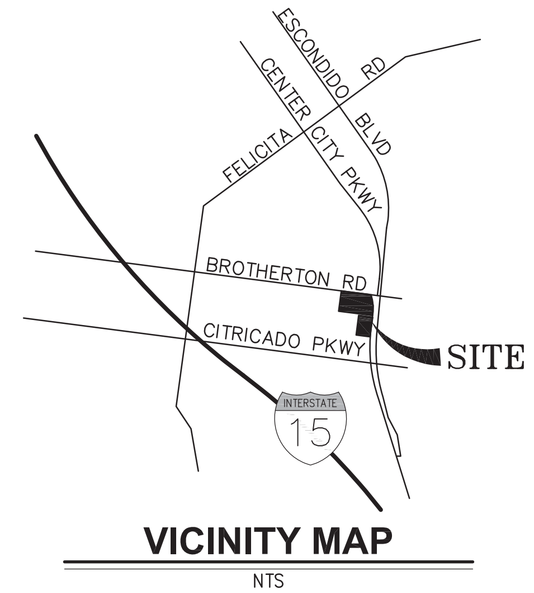
N

0 50 100 200

SCALE IN FEET
GRAPHIC SCALE
1"=100'

DEL PRADO SITE

CITY OF ESCONDIDO, CALIFORNIA



VICINITY MAP

NTS

EXHIBIT 'A'

PRE-DEVELOPMENT HYDROLOGY MAP FOR OFFSITE WOODY'S SITE, CITY OF ESCONDIDO CA

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MASSON & ASSOCIATES, INC.

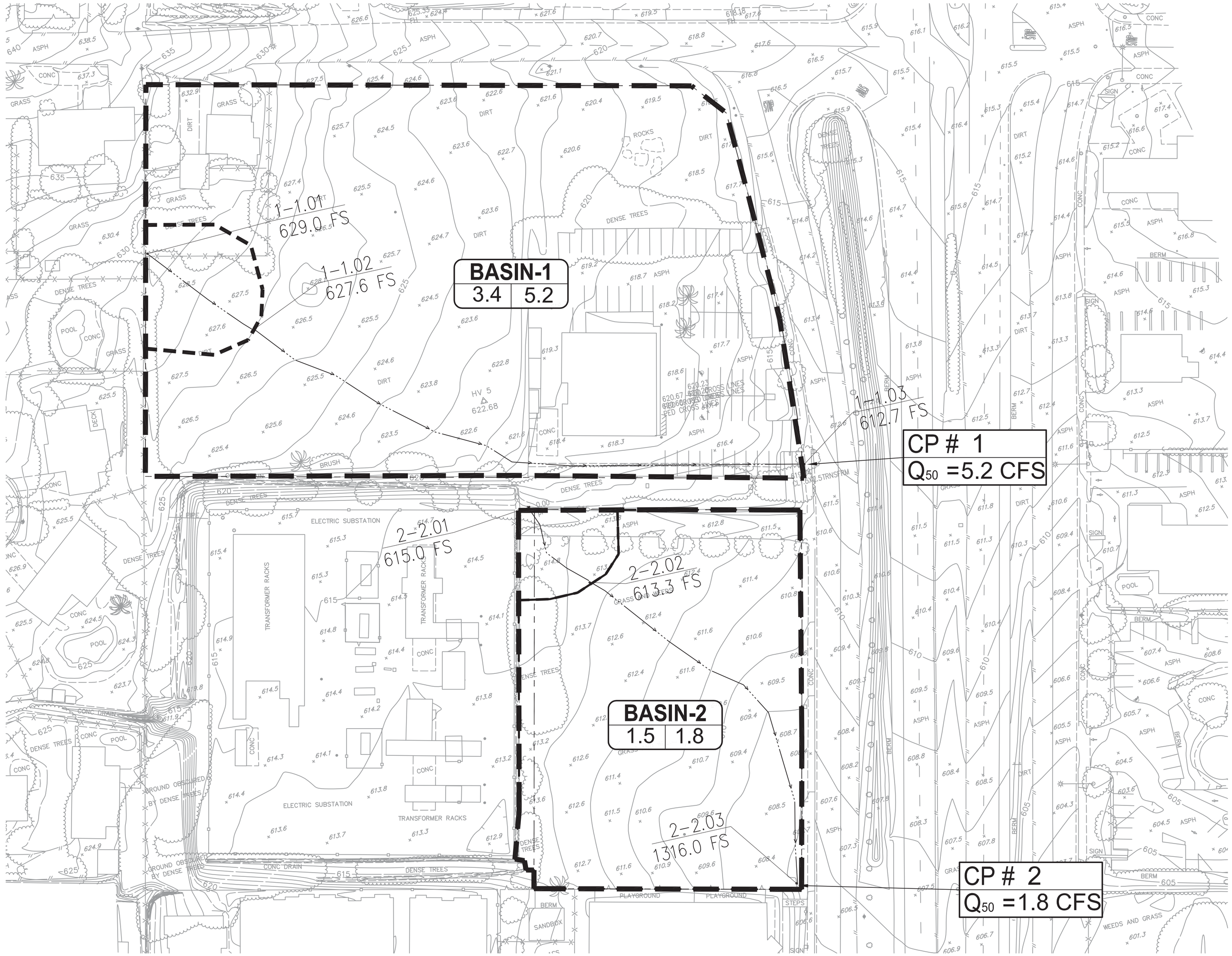
200 East Washington Ave., Suite 200
Escondido, CA 92025
P. 760.741.3570
F. 760.741.1786

25185 Madison Avenue
Suite A
Murrieta, CA 92562

www.masson-assoc.com

DATE: Jul 21, 15 3:45pm by:mfatin FILE:I:\11\11015\PROD\Reports\Hydrology\11015-Pre-Development-Offsite.dwg

EXHIBIT A-1

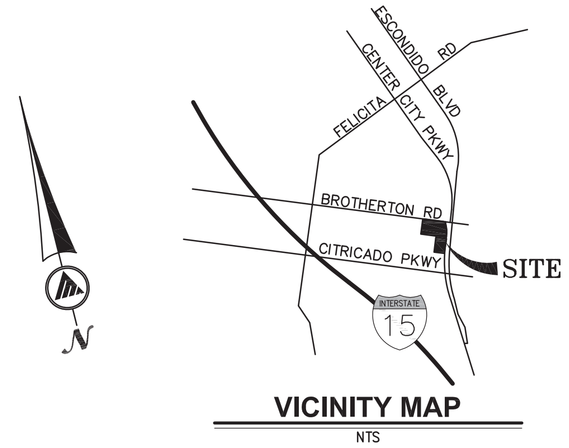


LEGEND

SYMBOL	DESCRIPTION
BASIN-1 / AC | CFS	BASIN DESIGNATION
	BASIN AREA (AC), DISCHARGE (CFS)
CP # 1 / Q_{50} = 5.2 cfs	CONCENTRATION POINT NUMBER
	50-YEAR DISCHARGE
	BASIN BOUNDARY
	SUB-BASIN BOUNDARY
	FLOW PATH
	PROPERTY LINE

DEL PRADO'S SITE

CITY OF ESCONDIDO, CALIFORNIA



VICINITY MAP

NTS

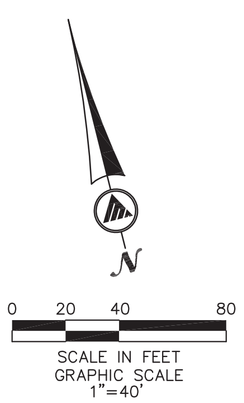


EXHIBIT 'A-1'

PRE-DEVELOPMENT HYDROLOGY MAP
DEL PRADO, CITY OF ESCONDIDO CA

MASSON & ASSOCIATES, INC.

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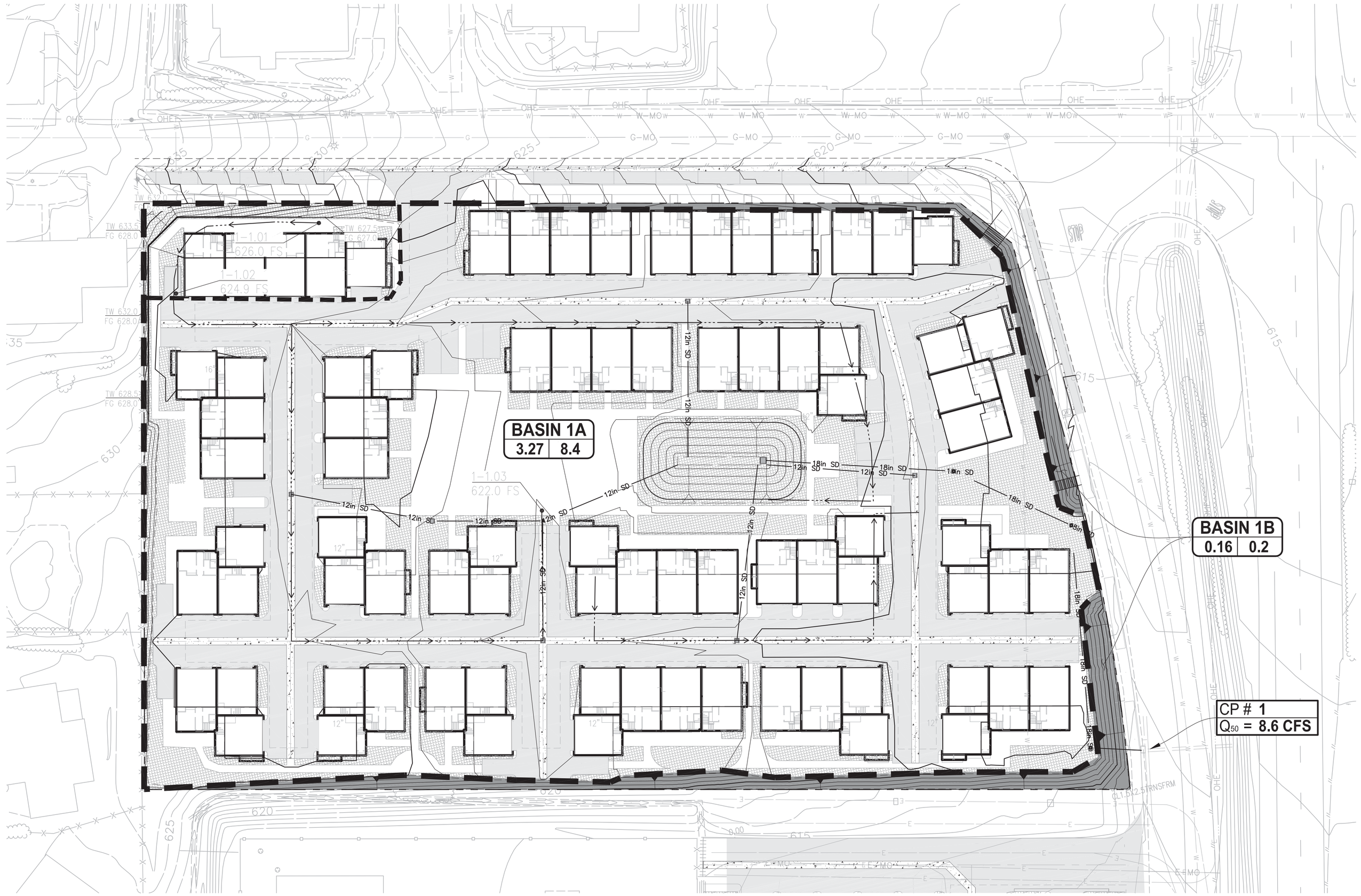
Escondido, CA 92025
P. 760.741.3570
F. 760.741.1786

25185 Madison Avenue
Suite A
Murrieta, CA 92562

www.masson-assoc.com

DATE: Jul 13, 15 1:33pm by:mfatini FILE:I:\11\11015\PR00\Reports\Hydrology\11015-Pre-Development-Hydrology.dwg

EXHIBIT B

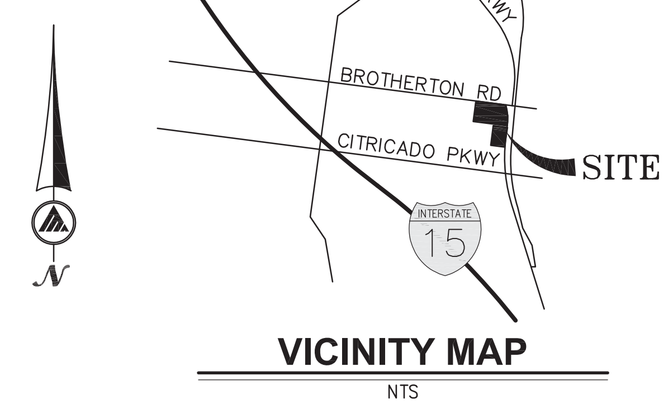


LEGEND

SYMBOL	DESCRIPTION
BASIN 1 / AC | Q	BASIN DESIGNATION BASIN AREA (AC) & RUNOFF (CFS)
CP # / Q_{50} =	CONCENTRATION POINT NUMBER 50-YEAR DISCHARGE
	BASIN BOUNDARY
	SUB-BASIN BOUNDARY
	FLOW PATH
	PROPERTY LINE
	SELF-TREATED AREA DRAINS INTO EXISTING STORM DRAIN

DEL PRADO SITE

CITY OF ESCONDIDO, CALIFORNIA



VICINITY MAP

NTS

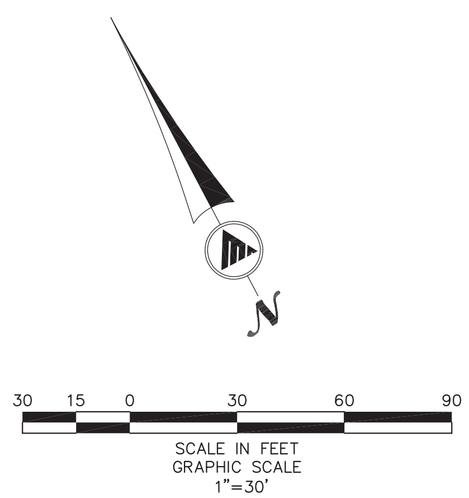


EXHIBIT 'B' - NORTH

POST-DEVELOPMENT HYDROLOGY MAP
DEL PRADO, CITY OF ESCONDIDO CA

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FILE:I:\11\11015\PROD\Reports\Hydrology\11015-POST-Development-Hydrology-MF-North.dwg

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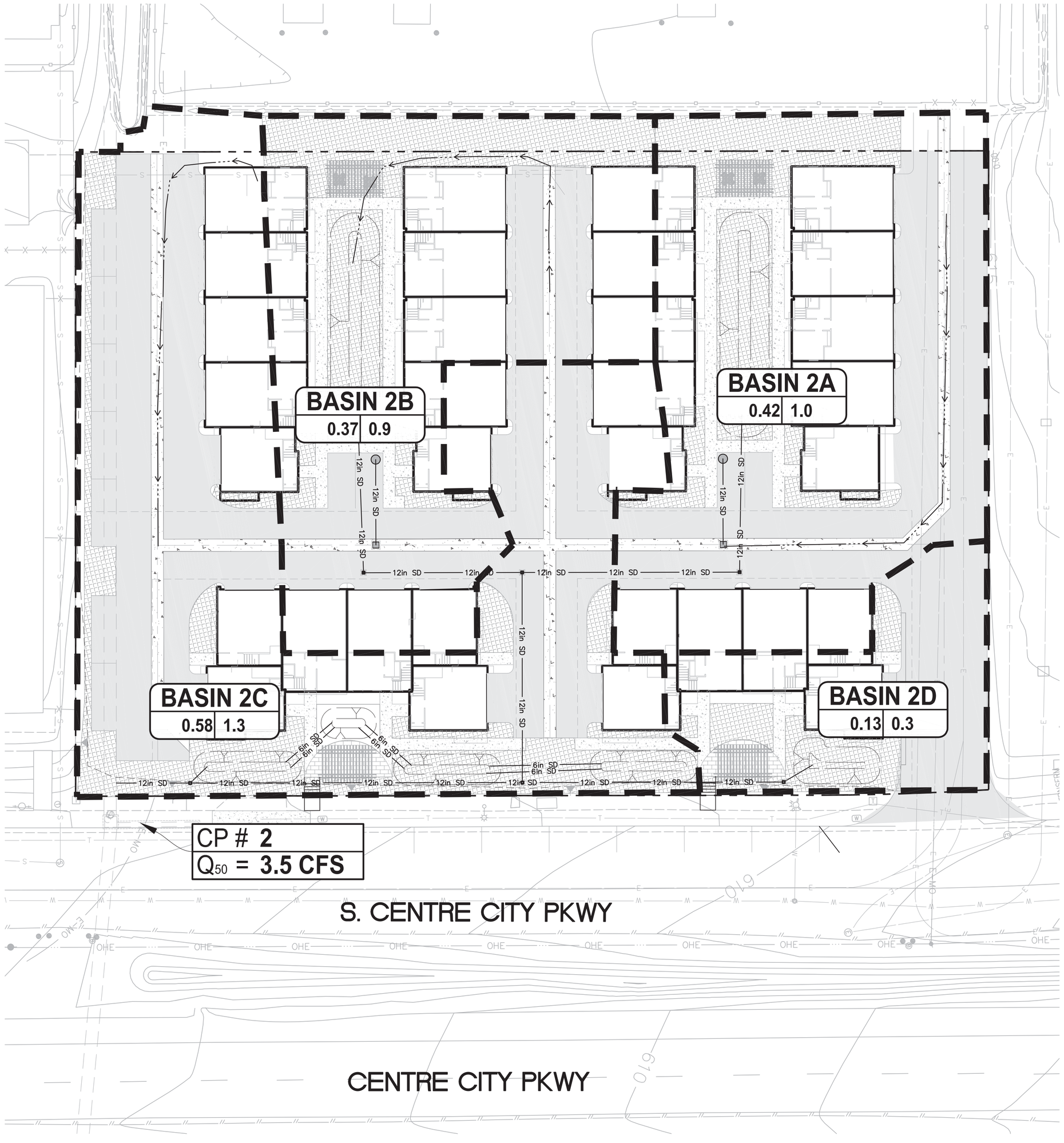
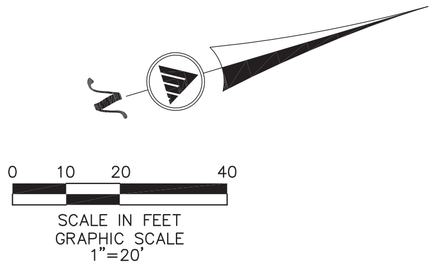


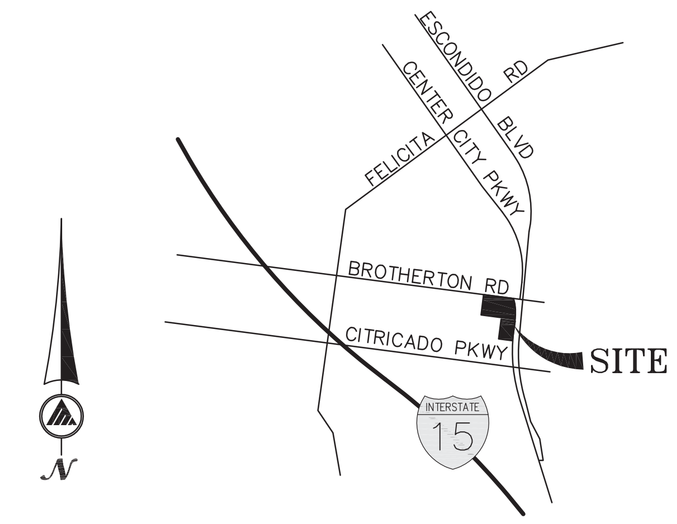


LEGEND

SYMBOL	DESCRIPTION
BASIN / CA | CFS	BASIN DESIGNATION
	BASIN AREA (AC) & RUNOFF (CFS)
CP # 2 / Q_{50} = 3.4 CFS	CONCENTRATION POINT NUMBER
	50-YEAR DISCHARGE
	BASIN BOUNDARY
	FLOW PATH
	PROPERTY LINE

DEL PRADO SITE

CITY OF ESCONDIDO, CALIFORNIA



VICINITY MAP

NTS

EXHIBIT 'B' - SOUTH

POST-DEVELOPMENT HYDROLOGY MAP
DEL PRADO, CITY OF ESCONDIDO CA

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CITY OF ESCONDIDO, CA

Priority Development Project (PDP)
Storm Water Quality Management Plan (SWQMP)
For
Del Prado
Permit Application Number: SUB15-0022/23

Preparation Date: January 29, 2016

2329 Center City Parkway, Escondido, CA 92025

Assessor's Parcel Number: 238-130-11, 26, 27

Prepared for:
Touchtone Communities
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Priority Development Project (PDP)

Date of SWQMP:
January 29, 2016

Prepared by:
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The selection, sizing, and preliminary design of stormwater treatment and other control measures in this plan have been prepared under the direction of the following Registered Civil Engineer and meet the requirements of Regional Water Quality Control Board Order R9-2013-0001 as amended by Order R9-2015-0001 and R9-2015-0100 and subsequent amendments.

1-29-2016

Bruce A. Tait, RCE # 32247 — Date

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PRIORITY DESIGN PROJECT (PDP) SWQMP PROJECT OWNER'S CERTIFICATION PAGE

Project Name: Del Prado
Permit Application Number: SUB15-0022/23

PROJECT OWNER'S CERTIFICATION

This PDP Project SWQMP has been prepared for **Touchstone Communities** by Masson & Associates Inc.. The PDP Project SWQMP is intended to comply with the PDP Project requirements of the City of Escondido BMP Design Manual, which is a design manual for compliance with local City of Escondido and regional MS4 Permit (California Regional Water Quality Control Board San Diego Region Order No. R9-2013-0001, as amended by Order No. R9-2015-0001) 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. A signed copy of this document shall be available on the subject property into perpetuity.

_____
Project Owner's Signature

_____
Print Name

_____
Company

_____
Date

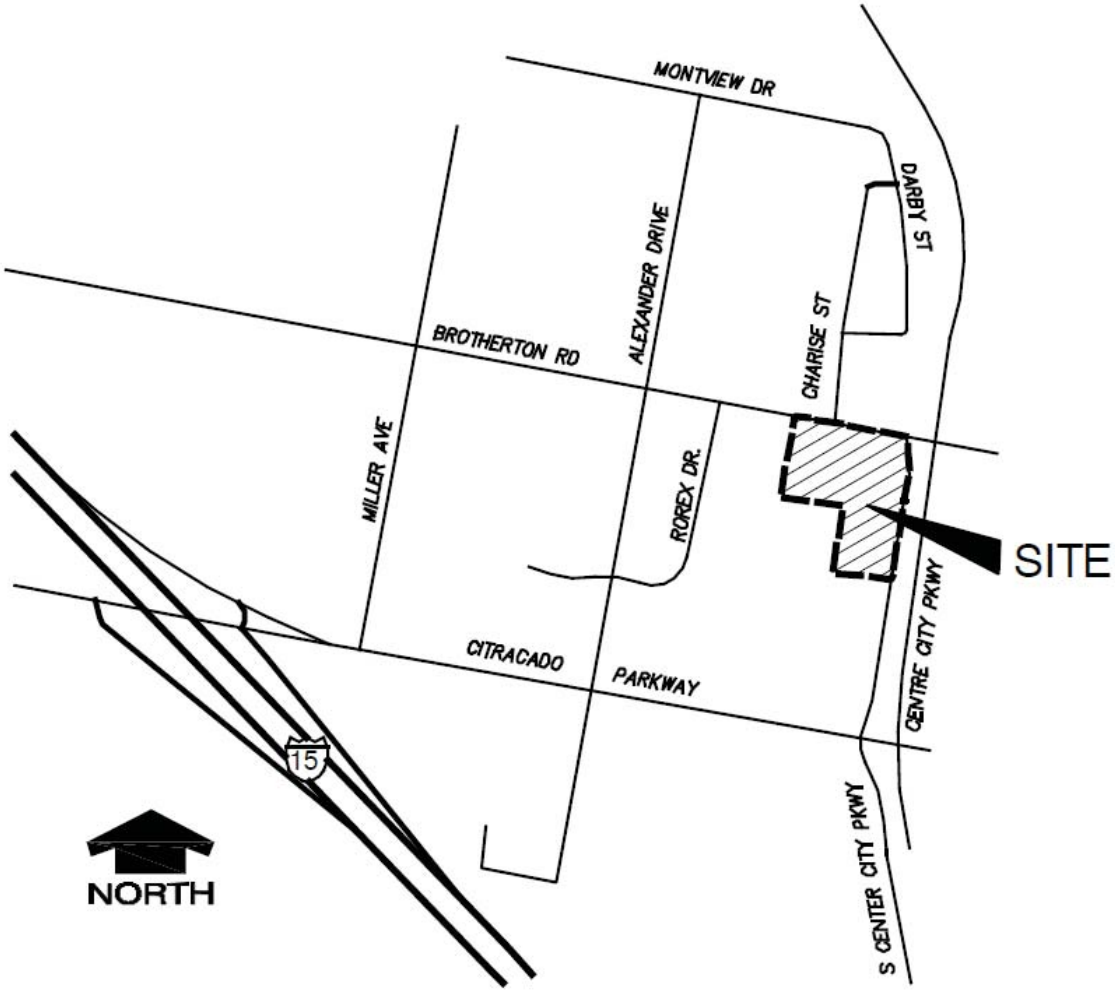
SUBMITTAL RECORD

Use this Table to keep a record of submittals of this Standard Project SWQMP. Each time the PDP Project 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 plancheck comments is included. When applicable, insert response to plancheck comments behind this page.

Submittal Number	Date	Project Status	Summary of Changes
1	1-29-2016	Preliminary Design / Planning/ CEQA Final Design	Initial Submittal
2		Preliminary Design / Planning/ CEQA Final Design	
3		Preliminary Design / Planning/ CEQA Final Design	
4		Preliminary Design / Planning/ CEQA Final Design	

PROJECT VICINITY MAP

Project Name: Del Prado
Permit Application Number: SUB15-0022/23



VICINITY MAP

NOT TO SCALE

Applicability of Permanent, Post-Construction Storm Water BMP Requirements (Storm Water Intake Form for all Development Permit Applications)	Form I-1

Project Identification

Project Name: Del Prado

Permit Application Number: SUB15-0022/23 | Date: 1-29-16

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.

Answer each step below, starting with Step 1 and progressing through each step until reaching "Stop". Refer to the manual sections and/or separate forms referenced in each step below.

Step	Answer	Progression
Step 1: Is the project a "development project"? See Section 1.3 of the manual for guidance.	☒ Yes	Go to Step 2.
	No	Stop. 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, PDP, or exception to PDP definitions? To answer this item, see Section 1.4 of the manual *in its entirety* for guidance, AND complete Form I-2, Project Type Determination.	Standard Project	Stop. Standard Project requirements apply, including Standard Project
	☒ PDP	PDP requirements apply, including PDP SWQMP. Go to Step 3.
	Exception to PDP definitions	Stop. Standard Project requirements apply. Provide discussion and list any additional requirements below. Prepare Standard Project SWQMP.

Discussion / justification, and additional requirements for exceptions to PDP definitions, if applicable:

Form I-1 Page 2 of 2		
Step	**Answer**	**Progression**
Step 3. Is the project subject to earlier PDP requirements due to a prior lawful approval? See Section 1.10 of the manual for guidance.	Yes	Consult the [City Engineer] to determine requirements. Provide discussion and identify requirements below. Go to Step 4.
	☒ No	BMP Design Manual PDP requirements apply. Go to Step 4.
Discussion / justification of prior lawful approval, and identify requirements (*not required if prior lawful approval does not apply*):		
Step 4. Do hydromodification control requirements apply? See Section 1.6 of the manual for guidance.	☒ Yes	PDP structural BMPs required for pollutant control (Chapter 5) and hydromodification control (Chapter 6). Go to Step 5.
	No	Stop. PDP structural BMPs required for pollutant control (Chapter 5) only. Provide brief discussion of exemption to hydromodification control below.
Discussion / justification if hydromodification control requirements do <u>not</u> apply:		
Step 5. Does protection of critical coarse sediment yield areas apply? See Section 6.2 of the manual for guidance.	Yes	Management measures required for protection of critical coarse sediment yield areas (Chapter 6.2). Stop.
	☒ No	Management measures not required for protection of critical coarse sediment yield areas. Provide brief discussion below. Stop.
Discussion / justification if protection of critical coarse sediment yield areas does <u>not</u> apply: Per Potential Coarse Sediment Yield Area Map on Google Earth		

Project Type Determination Checklist			Form I-2
Project Information			
Project Name: Del Prado			
Permit Application Number: SUB15-0022/23			
Project Type Determination: Standard Project or PDP			
The project is (select one): ☒ New Development Δ Redevelopment			
The total proposed newly created or replaced impervious area is: 167,575ft² (3.85)			
Is the project in any of the following categories, (a) through (f)?			
Yes ☒	No	(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.
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.
Yes ☒	No	(c)	New and redevelopment projects that create 5,000 square feet or more of impervious surface (collectively over the entire project site), and support one or more of the following uses: (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 SIC code 5812). (ii) Hillside development projects. This category includes development on any natural slope that is twenty-five percent or greater. (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. (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.

Form I-2 Page 2 of 2			
Yes	No ☒	(d)	New or redevelopment projects that create 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). 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 SDRWQCB; State Water Quality Protected Areas; water bodies designated with the RARE beneficial use by the State Water Board and SDRWQCB; and any other equivalent environmentally sensitive areas which have been identified by the Copermittees. See manual Section 1.4.2 for additional guidance.
Yes	No ☒	(e)	New development projects that support one or more of the following uses: (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. (ii) Retail gasoline outlets. This category includes retail gasoline outlets that meet the following criteria: (a) 5,000 square feet or more or (b) a projected Average Daily Traffic 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. *Note: See manual Section 1.4.2 for additional guidance.*

Does the project meet the definition of one or more of the PDP categories (a) through (f) listed above?

No – the project is not a PDP (Standard Project).

☒ Yes – the project is a PDP.

The following is for redevelopment PDPs only: Since this is not a Redevelopment Project, we don't need to do this section.

The area of existing (pre-project) impervious area at the project site is:_____ ft² (A)

The total proposed newly created or replaced impervious area is:____ ft² (B) Percent impervious surface created or replaced (A/B)*100:____ %

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

less than or equal to fifty percent (50%) – only new impervious areas are considered PDP

OR

greater than fifty percent (50%) – the entire project site is a PDP

Site Information Checklist For PDPs	Form I-3B (PDPs)
Project Summary Information	
Project Name	Del Prado
Project Address	2329 Center City Parkway, Escondido, CA 92025
Assessor's Parcel Number(s)	238-130-11, 26, 27
Permit Application Number	SUB15-0022/23
Project Watershed (Hydrologic Unit)	Select One: Santa Margarita 902 San Luis Rey 903 Carlsbad 904 ☒ San Dieguito 905 Penasquitos 906 San Diego 907 Pueblo San Diego 908 Sweetwater 909 Otay 910 Tijuana 911
Parcel Area (total area of Assessor's Parcel(s) associated with the project)	±4.8 Acres (207,030 Square Feet)
Area to be disturbed by the project (Project Area)	±4.8 Acres (207,030 Square Feet)
Project Proposed Impervious Area (subset of Project Area)	167,575 Acres (3.85 Square Feet)
Project Proposed Pervious Area (subset of Project Area)	0.91 Acres (39,455 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 9

Description of Existing Site Condition and Drainage Patterns

Current Status of the Site (select all that apply):

☒ Existing development:

Previously graded but not built out

Agricultural or other non-impervious use

☒ Vacant, undeveloped/natural

Description / Additional Information : Small portion of the site on the northeast is impervious area a parking lot and building and one single family house on the northwest which is going to be demolished for the new development.

Existing Land Cover Includes (select all that apply):

☒ Vegetative Cover

☒ Non-Vegetated Pervious Areas

☒ Impervious Areas

Description / Additional Information:

Underlying Soil belongs to Hydrologic Soil Group (select all that apply):

NRCS Type A

NRCS Type B

☒ NRCS Type C

☒ NRCS Type D

Approximate Depth to Groundwater:

Groundwater Depth < 5 feet

5 feet < Groundwater Depth < 10 feet

☒ 10 feet < Groundwater Depth < 20 feet

Groundwater Depth > 20 feet

Existing Natural Hydrologic Features (select all that apply):

☐ Watercourses

☐ Seeps

☐ Springs

☐ Wetlands

☒ None

Description / Additional Information: the entire site will be completely developed and all storm water runoff will drain via street gutters into series of proposed treatments basins and ultimately will drain into the existing 48-inch storm drain system located on South Center City Parkway. The project drains into Kit Carson Creek, Dieguito River and ultimately into the Lake Hodges Reservoir.

Form I-3B Page 3 of 9

Description of Existing Site Topography and Drainage [How is storm water runoff conveyed from the site? At a minimum, this description should answer (1) whether existing drainage conveyance is natural or urban; (2) describe existing constructed storm water conveyance systems, if applicable; and (3) is runoff from offsite conveyed through the site? If so, describe]:

The site is currently undeveloped and covered mainly by non-native grasses and medium size trees and small portion is impervious area (a parking lot and building).

The northern portion of the site (basin 1) drains southeasterly with an average slope of 2.5% into an existing grate inlet located on the southeasterly corner of the Basin 1 on South Centre City Parkway and ultimately drains to the existing 48" storm drain system.

The small portion of the site which is located on the northwest portion of the site drains northeasterly to Brotherton Road and ultimately into an existing inlet located on South Centre City Parkway.

The southern portion of the site (basin 2) drains southeasterly with an average slope of 3% slope into an existing inlet located at Basin 2 frontage on South Centre City Parkway and ultimately drains to the existing 48" storm drain system.

There is no stormwater drainage onto the site from the surrounding areas. There are brow ditches around the site that collect the offsite runoff and route them into an existing storm drain system located on the south side of the project site.

Form I-3B Page 4 of 9

Description of Proposed Site Development and Drainage Patterns

Project Description / Proposed Land Use and/or Activities:

The Project is located in the City of Escondido, on the southwest corner of Brotherton Road and South Centre City Parkway (Frontage Road). The proposed project is a multi-family subdivision of property located on an approximately 4.8 acre +/- acre site. The project is divided into two portions (northern and southern). The proposed development will be composed of 113 condominium units (81 units on the north (basin 1) and 32 units on the south (basin 2)), recreation area and onsite parking throughout the site.

The project is currently located in an area designated PD/MU (Planned Development/Mixed Unit) per City of Escondido General Plan.

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

The proposed development will consist of 113 condominium units (81 units on north and 32 units on south), onsite parking, sidewalks and driveways throughout the site.

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

The proposed pervious area will consist of recreation area, one bioretention basin on the north and 4 bioretention basins on the south portion of the project site, and landscaping between buildings.

Does the project include grading and changes to site topography?

☒ Yes
☐ No

Description / Additional Information:

The site will be cut and filled to provide for the proposed improvements and building pads in north and south project site.

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

☒ Yes
☐ No

Description / Additional Information:
The site will propose retaining walls at the northwest and southeast property line. Most of the site will be developed and will drain via street gutters into series of bioretention basins prior to discharging into the existing storm drain system. The proposed project will not have slopes steeper than 3%, except at perimeter slopes. However the sites will continue to drain to the existing 48-inch storm drain system located at the south east corner of the project site on South Center City Parkway.

Form I-3B Page 5 of 9
Identify whether any of the following features, activities, and/or pollutant source areas will be present (select all that apply): ☒ Onsite 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

Form I-3B Page 6 of 9		
Identification of Receiving Water Pollutants of Concern		
Describe path of storm water from the project site to the Pacific Ocean (or bay, lagoon, lake or reservoir, as applicable): The storm water from the site drains into the Kit Carson Creek, Lake Hodges and ultimately into the San Dieguito river which empties 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 for the impaired water bodies:		
303(d) Impaired Water Body	**Pollutant(s)/Stressor(s)**	**TMDLs**
Lake Hodges	Color, Manganese, Mercury, Nitrogen, Phosphorous, Turbidity, PH	Needed
Kit Carson Creek	Pentachlorophenol (PCP), Total dissolved Solids	Needed
San Dieguito River	Enterococcus Bacteria, Fecal Coliform, Nitrogen, Phosphorus, TDS, Toxicity, Total coliform	Needed

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 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 7 of 9

Hydromodification Management Requirements

Do hydromodification management requirements apply (see Section 1.6 of the manual)?

☒ Yes, hydromodification management flow control structural BMPs required.

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.

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.

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.

Description / Additional Information (to be provided if a 'No' answer has been selected above):

Critical Coarse Sediment Yield Areas*

***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 manual been performed?

6.2.1 Verification of 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 8 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 8 of 9
Flow Control for Post-Project Runoff*   ***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.   BMP 1 – On the North   BMP 2A – On the South   BMP 2B – On the South   BMP 2C – On the South   BMP 2D – On the South
Has a geomorphic assessment been performed for the receiving channel(s)?   ☒ No, the low flow threshold is 0.1Q2 (default low flow threshold)   Yes, the result is the low flow threshold is 0.1Q2   Yes, the result is the low flow threshold is 0.3Q2   Yes, the result is the low flow threshold is 0.5Q2   If a geomorphic assessment has been performed, provide title, date, and preparer: Discussion / Additional Information: (optional)

Form I-3B Page 9 of 9
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. Constraint: Two (2) SDG&E easements and two (2) drainage easements, and electrical lines which can't be disturbed. The high percentage of improved area also makes it difficult to incorporate LID features, however we are utilizing landscaping to maximum practical extent.
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.

Source Control BMP Checklist for All Development Projects (Standard Projects and PDPs)	Form I-4

Project Identification

Project Name: Del Prado

Permit Application Number: SUB15-0022/23

Source Control BMPs

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 manual for information to implement source control BMPs shown in this checklist.

Answer each category below pursuant to the following.

- "Yes" means the project will implement the source control BMP as described in Chapter 4 and/or Appendix E of the manual. Discussion / justification is not required.
- "No" means the BMP is applicable to the project but it is not feasible to implement. Discussion / justification must be provided.
- "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.

Source Control Requirement	Applied?		
SC-1 Prevention of Illicit Discharges into the MS4	☒ Yes	No	N/A
Discussion / justification if SC-1 not implemented:			
SC-2 Storm Drain Stenciling or Signage	☒ Yes	No	N/A
Discussion / justification if SC-2 not implemented:			
SC-3 Protect Outdoor Materials Storage Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	Yes	No	☒ N/A
Discussion / justification if SC-3 not implemented:			
SC-4 Protect Materials Stored in Outdoor Work Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	Yes	No	☒ N/A
Discussion / justification if SC-4 not implemented:			

Form I-4 Page 2 of 2			
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)			
Onsite 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.			

Site Design BMP Checklist for All Development Projects (Standard Projects and PDPs)	Form I-5

Project Identification

Project Name: Del Prado

Permit Application Number: SUB15-0022/23

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 manual for information to implement site design BMPs shown in this checklist.

Answer each category below pursuant to the following.

- "Yes" means the project will implement the site design BMP as described in Chapter 4 and/or Appendix E of the manual. Discussion / justification is not required.
- "No" means the BMP is applicable to the project but it is not feasible to implement. Discussion / justification must be provided.
- "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: All the project site will be graded, but water runoff will be collected at the existing inlet and storm drain system located at southeast corner of the project site on South Center City Parkway.			
SD-2 Conserve Natural Areas, Soils, and Vegetation	Yes	☒ No	N/A
Discussion / justification if SD-2 not implemented: The total project area will be graded and approximately 81% of the proposed site will be impervious.			
SD-3 Minimize Impervious Area	☒Yes	No	N/A
Discussion / justification if SD-3 not implemented: This project is multi-family subdivision of 113 condominium units with 81% of the area being impervious, but large landscaping areas will be incorporated into the site.			
SD-4 Minimize Soil Compaction	☒Yes	No	N/A
Discussion / justification if SD-4 not implemented: The 81% of the site will be impervious. Majority of the pervious area will be used for storm water treatment purpose which the compaction of the soil will be minimized for higher infiltration.			

Form I-5 Page 2 of 2			
Site Design Requirement	**Applied?**		
SD-5 Impervious Area Dispersion	Yes	No	☒ N/A
Discussion / justification if SD-5 not implemented:			
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: See Form I-7			

Summary of PDP Structural BMPs	Form I-6 (PDPs)
Project Identification	
Project Name: Del Prado	
Permit Application Number: SUB15-0022/23	
PDP Structural BMPs	
All PDPs must implement structural BMPs for storm water pollutant control (see Chapter 5 of the 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 manual). Both storm water pollutant control and flow control for hydromodification management can be achieved within the same structural BMP(s). 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 to certify construction of the structural BMPs (see Section 1.12 of the manual). PDP structural BMPs must be maintained into perpetuity, and the local jurisdiction must confirm the maintenance (see Section 7 of the manual). 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 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. The pollutant control and flow control BMP will be integrated by proposed bioretention basins. Multiple bioretention basins will be constructed on the site to address to treat onsite storm water runoff and detain the existing storm water runoff. The location of the bioretention basins is shown on the BMP exhibits. The bioretention basins have a medium or high rating for removal of all likely pollutants from stormwater.	

Form I-6 Page 3 of X (Copy as many as needed)	
Structural BMP Summary Information **(Copy this page as needed to provide information for each individual proposed structural BMP)**	
Structural BMP ID No.	
Construction Plan Sheet No.	
Type of structural BMP: Retention by harvest and use (HU-1) Retention by infiltration basin (INF-1) ☒ Retention by bioretention (INF-2) Retention by permeable pavement (INF-3) Partial retention by biofiltration with partial retention (PR-1) Biofiltration (BF-1) Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below) 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) Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below) Detention pond or vault for hydromodification management Other (describe in discussion section below)	
Purpose: Pollutant control only Hydromodification control only ☒ Combined pollutant control and hydromodification control Pre-treatment/forebay for another structural BMP 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 manual)	Developer
Who will be the final owner of this BMP?	HOA
Who will maintain this BMP into perpetuity?	HOA
What is the funding mechanism for maintenance?	HOA
Discussion (as needed):	

Harvest and Use Feasibility Checklist	Form I-7

1. Is there a demand for harvested water (check all that apply) at the project site that is reliably present during the wet season?

☐ Toilet and urinal flushing
☐ Landscape irrigation
☒ Other: Not feasible (see the calculations)

The 36 hours demands for toilet and urinal flushing and landscape irrigation are very low during wet season.

2. If there is a demand; estimate the anticipated average wet season demand over a period of 36 hours. Guidance for planning level demand calculations for toilet/urinal flushing and landscape irrigation is provided in Section B.3.2.

3. Calculate the DCV using worksheet B-2.1.

DCV = Refer to Attachment A (cubic feet)

3a. Is the 36 hour demand greater than or equal to the DCV?	3b. Is the 36 hour demand greater than 0.25DCV but less than the full DCV?	3c. Is the 36 hour demand less than 0.25DCV?
Yes / No ⇨ ⇩	Yes / No ⇨ ⇩	☒ Yes ⇩
Harvest and use appears to be feasible. Conduct more detailed evaluation and sizing calculations to confirm that DCV can be used at an adequate rate to meet drawdown criteria.	Harvest and use may be feasible. Conduct more detailed evaluation and sizing calculations to determine feasibility. Harvest and use may only be able to be used for a portion of the site, or (optionally) the storage may need to be upsized to meet long term capture targets while draining in longer than 36 hours.	Harvest and use is considered to be infeasible.

Is harvest and use feasible based on further evaluation?

☐ Yes, refer to Appendix E to select and size harvest and use BMPs.

☒ No, select alternate BMPs.

Categorization of Infiltration Feasibility Condition	Form I-8

Part 1 - Full Infiltration Feasibility Screening Criteria

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.		☒

Provide basis:

The project site is located in hydrologic soil group C and D that are low in infiltration. (refer to attachment B)

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.

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.		

Provide basis:

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.

Form I-8 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.		
Provide basis: Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			
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.		
Provide basis: Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			
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** 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		

*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 Agency/Jurisdictions to substantiate findings

Form I-8 Page 3 of 4

Part 2 – Partial Infiltration vs. No Infiltration Feasibility Screening Criteria

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.		☒

Provide basis:

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.

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.		☒

Provide basis:

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.

Form I-8 Page 4 of 4			
Criteria	Screening Question	**Yes**	**No**
7	**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.		☒
Provide basis: Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.			
8	**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.		☒
Provide basis: Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.			
Part 2 Result*	If all answers from row 1-4 are yes then partial infiltration design is potentially feasible. The feasibility screening category is **Partial Infiltration.** 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.**		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 Agency/Jurisdictions to substantiate findings

Table D.5-1: Suitability Assessment Related Considerations for Infiltration Facility Safety Factors

Consideration	High Concern – 3 points	Medium Concern – 2 points	Low Concern – 1 point
Assessment methods (see explanation below)	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[1] or Use of extensive test pit infiltration measurement methods[2]
Texture Class	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 borings/test pits indicate moderately homogeneous soils	Soil borings/test pits indicate relatively homogeneous soils
Depth to groundwater/ impervious layer	<5 ft below facility bottom	5-15 ft below facility bottom	>15 below facility bottom

Table D.5-2: Design Related Considerations for Infiltration Facility Safety Factors

Consideration	High Concern – 3 points	Medium Concern – 2 points	Low Concern – 1 point
Level of pretreatment/ expected influent sediment loads	Limited pretreatment using gross solids removal devices only, such as hydrodynamic separators, racks and screens AND tributary area includes landscaped areas, steep slopes, high traffic areas, road sanding, or any other areas expected to produce high sediment, trash, or debris loads.	Good pretreatment with BMPs that mitigate coarse sediments such as vegetated swales AND influent sediment loads from the tributary area are expected to be moderate (e.g., low traffic, mild slopes, stabilized pervious areas, etc.). Performance of pretreatment consistent with "pretreatment BMP performance criteria" (50% TSS removal) in Appendix B.6	Excellent pretreatment with BMPs that mitigate fine sediments such as bioretention or media filtration OR sedimentation or facility only treats runoff from relatively clean surfaces, such as rooftops/non-sanded road surfaces. Performance of pretreatment consistent with "flow-thru treatment control BMP performance criteria" (i.e., 80% TSS removal) in Appendix B.6
Redundancy/ resiliency	No "backup" system is provided; the system design does not allow infiltration rates to be restored relatively easily with maintenance	The system has a backup pathway for treated water to discharge if clogging occurs or infiltration rates can be restored via maintenance.	The system has a backup pathway for treated water to discharge if clogging occurs and infiltration rates can be relatively easily restored via maintenance.
Compaction during construction	Construction of facility on a compacted site or increased probability of unintended/ indirect compaction.	Medium probability of unintended/ indirect compaction.	Equipment traffic is effectively restricted from infiltration areas during construction and there is low probability of unintended/ indirect compaction.

Factor of Safety and Design Infiltration Rate Worksheet				Form I-9	
Factor Category		Factor Description	Assigned Weight (w)	Factor Value (v)	Product (p) p = w x v
A	Suitability Assessment	Soil assessment methods	0.25		
		Predominant soil texture	0.25		
		Site soil variability	0.25		
		Depth to groundwater / impervious layer	0.25		
		Suitability Assessment Safety Factor, $S_A = \Sigma p$			
B	Design	Level of pretreatment/ expected sediment loads	0.5		
		Redundancy/resiliency	0.25		
		Compaction during construction	0.25		
		Design Safety Factor, $S_B = \Sigma p$			
Combined Safety Factor, $S_{total} = S_A \times S_B$					
Observed Infiltration Rate, inch/hr, $K_{observed}$ (corrected for test-specific bias)					
Design Infiltration Rate, in/hr, $K_{design} = K_{observed} / S_{total}$					
Supporting Data					
Briefly describe infiltration test and provide reference to test forms: Not Applicable					

Design Capture Volume (DCV)

North Site

Design Capture Volume (DCV)			DMA - 1	
1	85th percentile 24-hr storm depth	d=	0.58	inches
2	Area tributary to BMP (s)	A=	3.3	acres
3	Area Weighted runoff factor	C=	0.9	unitless
4	Rain Barrels volume reduction	TCV=	0	cubic-feet
5	Street trees volume reduction	RCV=	0	cubic-feet
6	Calculator DCV = (3630 x C x d x A) - TCV - RCV	DCV=	6253.0	cubic-feet

South Site

Design Capture Volume (DCV)		DMA - 2A		
1	85th percentile 24-hr storm depth	d=	0.58	inches
2	Area tributary to BMP (s)	A=	0.42	acres
3	Area Weighted runoff factor	C=	0.9	unitless
4	Rain Barrels volume reduction	TCV=	0	cubic-feet
5	Street trees volume reduction	RCV=	0	cubic-feet
6	Calculator DCV = (3630 x C x d x A) - TCV - RCV	DCV=	795.8	cubic-feet

Design Capture Volume (DCV)		DMA - 2B		
1	85th percentile 24-hr storm depth	d=	0.58	inches
2	Area tributary to BMP (s)	A=	0.37	acres
3	Area Weighted runoff factor	C=	0.9	unitless
4	Rain Barrels volume reduction	TCV=	0	cubic-feet
5	Street trees volume reduction	RCV=	0	cubic-feet
6	Calculator DCV = (3630 x C x d x A) - TCV - RCV	DCV=	695.4	cubic-feet

Design Capture Volume (DCV)		DMA - 2C		
1	85th percentile 24-hr storm depth	d=	0.58	inches
2	Area tributary to BMP (s)	A=	0.58	acres
3	Area Weighted runoff factor	C=	0.9	unitless
4	Rain Barrels volume reduction	TCV=	0	cubic-feet
5	Street trees volume reduction	RCV=	0	cubic-feet
6	Calculator DCV = (3630 x C x d x A) - TCV - RCV	DCV=	1099.0	cubic-feet

Design Capture Volume (DCV)		DMA - 2D		
1	85th percentile 24-hr storm depth	d=	0.58	inches
2	Area tributary to BMP (s)	A=	0.13	acres
3	Area Weighted runoff factor	C=	0.9	unitless
4	Rain Barrels volume reduction	TCV=	0	cubic-feet
5	Street trees volume reduction	RCV=	0	cubic-feet
6	Calculator DCV = (3630 x C x d x A) - TCV - RCV	DCV=	250.1	cubic-feet

BMP SIZING

Basin #1

Simple Sizing Method for Biofiltration BMPs		Worksheet B.5-1	
1	Remaining DCV after implementing retention BMPs	6253	cubic-feet
Partial Retention			
2	Infiltration rate from Worksheet D.5-1 if partial infiltration is feasible		in/hr.
3	Allowable drawdown time for aggregate storage below the underdrain	36	hours
4	Depth of runoff that can be infiltrated [Line 2 x Line 3]		inches
5	Aggregate pore space	0.4	in/in
6	Required depth of gravel below the underdrain [Line 4/ Line 5]		inches
7	Assumed surface area of the biofiltration BMP		sq-ft
8	Media retained pore space	0.1	in/in
9	Volume retained by BMP [[Line 4 + (Line 12 x Line 8)]/12] x Line 7		cubic-feet
10	DCV that requires biofiltration [Line 1 – Line 9]	6253	cubic-feet
BMP Parameters			
11	Surface Ponding [6 inch minimum, 12 inch maximum]	60	inches
12	Media Thickness [18 inches minimum]	18	inches
13	Aggregate Storage above underdrain invert (12 inches typical) – use 0 inches for sizing if the aggregate is not over the entire bottom surface area	9	inches
14	Media available pore space	0.2	in/in
15	Media filtration rate to be used for sizing	5	in/hr.
Baseline Calculations			
16	Allowable Routing Time for sizing	6	hours
17	Depth filtered during storm [Line 15 x Line 16]	30	inches
18	Depth of Detention Storage [Line 11 + (Line 12 x Line 14) + (Line 13 x Line 5)]	67.2	inches
19	Total Depth Treated [Line 17 + Line 18]	97.2	inches
Option 1 – Biofilter 1.5 times the DCV			
20	Required biofiltered volume [1.5 x Line 10]	9380	cubic-feet
21	Required Footprint [Line 20/ Line 19] x 12	1158	sq-ft
Option 2 - Store 0.75 of remaining DCV in pores and ponding			
22	Required Storage (surface + pores) Volume [0.75 x Line 10]	4690	cubic-feet
23	Required Footprint [Line 22/ Line 18] x 12	837	sq-ft
Footprint of the BMP			
24	Area draining to the BMP	142408	sq-ft
25	Adjusted Runoff Factor for drainage area (Refer to Appendix B.1 and B.2)	0.9	
26	Minimum BMP Footprint [Line 24 x Line 25 x 0.03]	3845	sq-ft
25	Footprint of the BMP = Maximum(Minimum(Line 21, Line 23), Line 26)	3845	sq-ft

Note: Line 7 is used to estimate the amount of volume retained by the BMP. Update assumed surface area in Line 7 until its equivalent to the required biofiltration footprint (either Line 21 or Line 23)

Basin #2A

Simple Sizing Method for Biofiltration BMPs		Worksheet B.5-1	
1	Remaining DCV after implementing retention BMPs	795.8	cubic-feet
Partial Retention			
2	Infiltration rate from Worksheet D.5-1 if partial infiltration is feasible		in/hr.
3	Allowable drawdown time for aggregate storage below the underdrain	36	hours
4	Depth of runoff that can be infiltrated [Line 2 x Line 3]		inches
5	Aggregate pore space	0.40	in/in
6	Required depth of gravel below the underdrain [Line 4/ Line 5]		inches
7	Assumed surface area of the biofiltration BMP		sq-ft
8	Media retained pore space	0.1	in/in
9	Volume retained by BMP [[Line 4 + (Line 12 x Line 8)]/12] x Line 7		cubic-feet
10	DCV that requires biofiltration [Line 1 – Line 9]	795.8	cubic-feet
BMP Parameters			
11	Surface Ponding [6 inch minimum, 12 inch maximum]	24	inches
12	Media Thickness [18 inches minimum]	18	inches
13	Aggregate Storage above underdrain invert (12 inches typical) – use 0 inches for sizing if the aggregate is not over the entire bottom surface area	9	inches
14	Media available pore space	0.2	in/in
15	Media filtration rate to be used for sizing	5	in/hr.
Baseline Calculations			
16	Allowable Routing Time for sizing	6	hours
17	Depth filtered during storm [Line 15 x Line 16]	30	inches
18	Depth of Detention Storage [Line 11 + (Line 12 x Line 14) + (Line 13 x Line 5)]	31.2	inches
19	Total Depth Treated [Line 17 + Line 18]	61.2	inches
Option 1 – Biofilter 1.5 times the DCV			
20	Required biofiltered volume [1.5 x Line 10]	1194	cubic-feet
21	Required Footprint [Line 20/ Line 19] x 12	234	sq-ft
Option 2 - Store 0.75 of remaining DCV in pores and ponding			
22	Required Storage (surface + pores) Volume [0.75 x Line 10]	597	cubic-feet
23	Required Footprint [Line 22/ Line 18] x 12	230	sq-ft
Footprint of the BMP			
24	Area draining to the BMP	18320	sq-ft
25	Adjusted Runoff Factor for drainage area (Refer to Appendix B.1 and B.2)	0.9	
26	Minimum BMP Footprint [Line 24 x Line 25 x 0.03]	495	sq-ft
25	Footprint of the BMP = Maximum(Minimum(Line 21, Line 23), Line 26)	495	sq-ft

Note: Line 7 is used to estimate the amount of volume retained by the BMP. Update assumed surface area in Line 7 until its equivalent to the required biofiltration footprint (either Line 21 or Line 23)

Basin #2B

Simple Sizing Method for Biofiltration BMPs		Worksheet B.5-1	
1	Remaining DCV after implementing retention BMPs	695.4	cubic-feet
Partial Retention			
2	Infiltration rate from Worksheet D.5-1 if partial infiltration is feasible		in/hr.
3	Allowable drawdown time for aggregate storage below the underdrain	36	hours
4	Depth of runoff that can be infiltrated [Line 2 x Line 3]		inches
5	Aggregate pore space	0.40	in/in
6	Required depth of gravel below the underdrain [Line 4/ Line 5]		inches
7	Assumed surface area of the biofiltration BMP		sq-ft
8	Media retained pore space	0.1	in/in
9	Volume retained by BMP [[Line 4 + (Line 12 x Line 8)]/12] x Line 7		cubic-feet
10	DCV that requires biofiltration [Line 1 – Line 9]	695.4	cubic-feet
BMP Parameters			
11	Surface Ponding [6 inch minimum, 12 inch maximum]	24	inches
12	Media Thickness [18 inches minimum]	18	inches
13	Aggregate Storage above underdrain invert (12 inches typical) – use 0 inches for sizing if the aggregate is not over the entire bottom surface area	9	inches
14	Media available pore space	0.2	in/in
15	Media filtration rate to be used for sizing	5	in/hr.
Baseline Calculations			
16	Allowable Routing Time for sizing	6	hours
17	Depth filtered during storm [Line 15 x Line 16]	30	inches
18	Depth of Detention Storage [Line 11 + (Line 12 x Line 14) + (Line 13 x Line 5)]	31.2	inches
19	Total Depth Treated [Line 17 + Line 18]	61.2	inches
Option 1 – Biofilter 1.5 times the DCV			
20	Required biofiltered volume [1.5 x Line 10]	1043	cubic-feet
21	Required Footprint [Line 20/ Line 19] x 12	205	sq-ft
Option 2 - Store 0.75 of remaining DCV in pores and ponding			
22	Required Storage (surface + pores) Volume [0.75 x Line 10]	522	cubic-feet
23	Required Footprint [Line 22/ Line 18] x 12	201	sq-ft
Footprint of the BMP			
24	Area draining to the BMP	16005	sq-ft
25	Adjusted Runoff Factor for drainage area (Refer to Appendix B.1 and B.2)	0.9	
26	Minimum BMP Footprint [Line 24 x Line 25 x 0.03]	432	sq-ft
25	Footprint of the BMP = Maximum(Minimum(Line 21, Line 23), Line 26)	432	sq-ft

Note: Line 7 is used to estimate the amount of volume retained by the BMP. Update assumed surface area in Line 7 until its equivalent to the required biofiltration footprint (either Line 21 or Line 23)

Basin #2C

Simple Sizing Method for Biofiltration BMPs		Worksheet B.5-1	
1	Remaining DCV after implementing retention BMPs	1099.0	cubic-feet
Partial Retention			
2	Infiltration rate from Worksheet D.5-1 if partial infiltration is feasible		in/hr.
3	Allowable drawdown time for aggregate storage below the underdrain	36	hours
4	Depth of runoff that can be infiltrated [Line 2 x Line 3]		inches
5	Aggregate pore space	0.40	in/in
6	Required depth of gravel below the underdrain [Line 4/ Line 5]		inches
7	Assumed surface area of the biofiltration BMP		sq-ft
8	Media retained pore space	0.1	in/in
9	Volume retained by BMP [[Line 4 + (Line 12 x Line 8)]/12] x Line 7		cubic-feet
10	DCV that requires biofiltration [Line 1 – Line 9]	1099.0	cubic-feet
BMP Parameters			
11	Surface Ponding [6 inch minimum, 12 inch maximum]	18	inches
12	Media Thickness [18 inches minimum]	18	inches
13	Aggregate Storage above underdrain invert (12 inches typical) – use 0 inches for sizing if the aggregate is not over the entire bottom surface area	9	inches
14	Media available pore space	0.2	in/in
15	Media filtration rate to be used for sizing	5	in/hr.
Baseline Calculations			
16	Allowable Routing Time for sizing	6	hours
17	Depth filtered during storm [Line 15 x Line 16]	30	inches
18	Depth of Detention Storage [Line 11 + (Line 12 x Line 14) + (Line 13 x Line 5)]	25.2	inches
19	Total Depth Treated [Line 17 + Line 18]	55.2	inches
Option 1 – Biofilter 1.5 times the DCV			
20	Required biofiltered volume [1.5 x Line 10]	1649	cubic-feet
21	Required Footprint [Line 20/ Line 19] x 12	358	sq-ft
Option 2 - Store 0.75 of remaining DCV in pores and ponding			
22	Required Storage (surface + pores) Volume [0.75 x Line 10]	824	cubic-feet
23	Required Footprint [Line 22/ Line 18] x 12	393	sq-ft
Footprint of the BMP			
24	Area draining to the BMP	25174	sq-ft
25	Adjusted Runoff Factor for drainage area (Refer to Appendix B.1 and B.2)	0.9	
26	Minimum BMP Footprint [Line 24 x Line 25 x 0.03]	680	sq-ft
25	Footprint of the BMP = Maximum(Minimum(Line 21, Line 23), Line 26)	680	sq-ft

Note: Line 7 is used to estimate the amount of volume retained by the BMP. Update assumed surface area in Line 7 until its equivalent to the required biofiltration footprint (either Line 21 or Line 23)

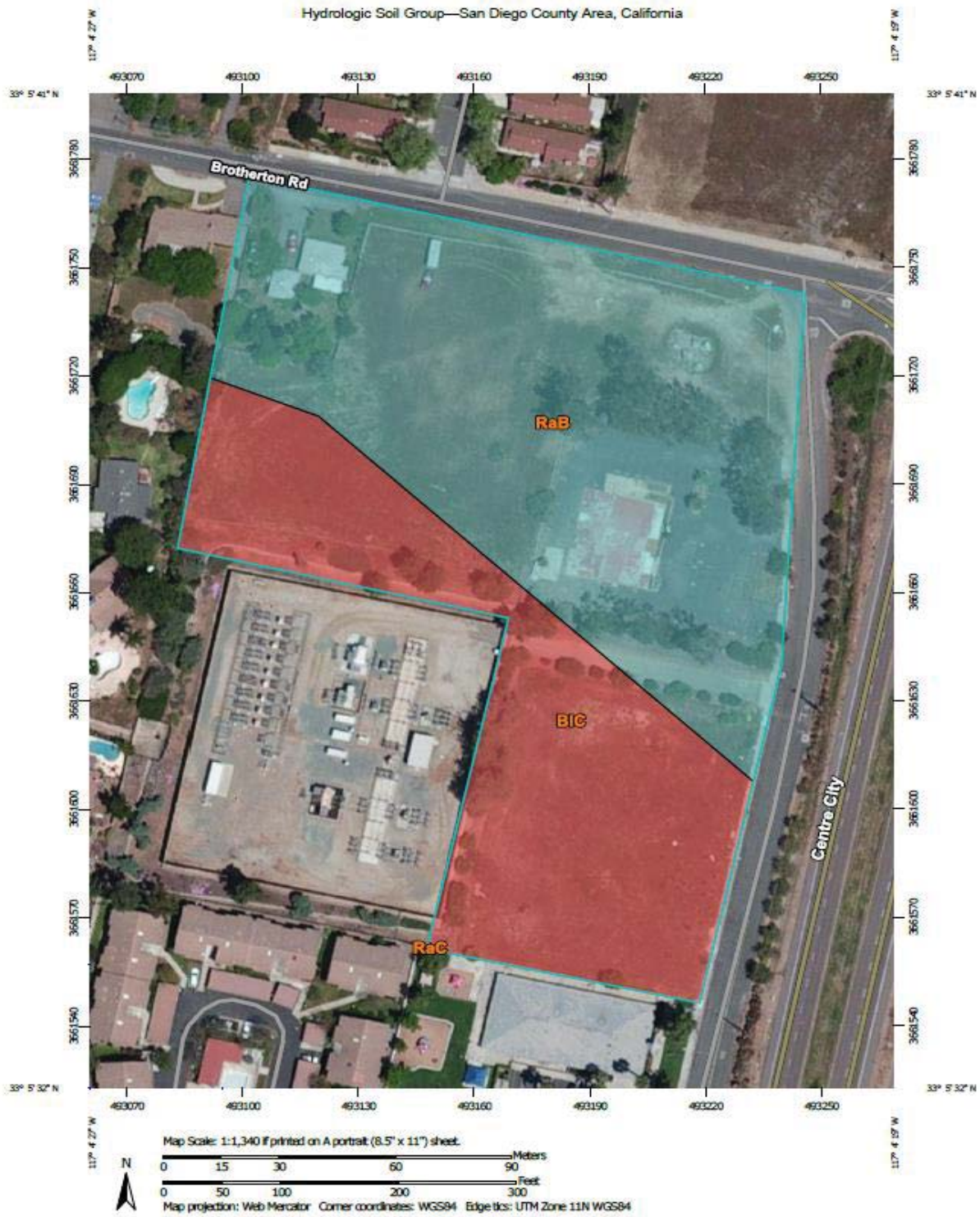
Basin #2D

Simple Sizing Method for Biofiltration BMPs		Worksheet B.5-1	
1	Remaining DCV after implementing retention BMPs	250.1	cubic-feet
Partial Retention			
2	Infiltration rate from Worksheet D.5-1 if partial infiltration is feasible		in/hr.
3	Allowable drawdown time for aggregate storage below the underdrain	36	hours
4	Depth of runoff that can be infiltrated [Line 2 x Line 3]		inches
5	Aggregate pore space	0.40	in/in
6	Required depth of gravel below the underdrain [Line 4/ Line 5]		inches
7	Assumed surface area of the biofiltration BMP		sq-ft
8	Media retained pore space	0.1	in/in
9	Volume retained by BMP [[Line 4 + (Line 12 x Line 8)]/12] x Line 7		cubic-feet
10	DCV that requires biofiltration [Line 1 – Line 9]	250.1	cubic-feet
BMP Parameters			
11	Surface Ponding [6 inch minimum, 12 inch maximum]	24	inches
12	Media Thickness [18 inches minimum]	18	inches
13	Aggregate Storage above underdrain invert (12 inches typical) – use 0 inches for sizing if the aggregate is not over the entire bottom surface area	9	inches
14	Media available pore space	0.2	in/in
15	Media filtration rate to be used for sizing	5	in/hr.
Baseline Calculations			
16	Allowable Routing Time for sizing	6	hours
17	Depth filtered during storm [Line 15 x Line 16]	30	inches
18	Depth of Detention Storage [Line 11 + (Line 12 x Line 14) + (Line 13 x Line 5)]	31.2	inches
19	Total Depth Treated [Line 17 + Line 18]	61.2	inches
Option 1 – Biofilter 1.5 times the DCV			
20	Required biofiltered volume [1.5 x Line 10]	375	cubic-feet
21	Required Footprint [Line 20/ Line 19] x 12	73.6	sq-ft
Option 2 - Store 0.75 of remaining DCV in pores and ponding			
22	Required Storage (surface + pores) Volume [0.75 x Line 10]	187.6	cubic-feet
23	Required Footprint [Line 22/ Line 18] x 12	72.1	sq-ft
Footprint of the BMP			
24	Area draining to the BMP	5737	sq-ft
25	Adjusted Runoff Factor for drainage area (Refer to Appendix B.1 and B.2)	0.9	
26	Minimum BMP Footprint [Line 24 x Line 25 x 0.03]	155	sq-ft
25	Footprint of the BMP = Maximum(Minimum(Line 21, Line 23), Line 26)	155	sq-ft

Note: Line 7 is used to estimate the amount of volume retained by the BMP. Update assumed surface area in Line 7 until its equivalent to the required biofiltration footprint (either Line 21 or Line 23)

ATTACHMENT A

ATTACHMENT B
NRCS HYDROLOGIC SOILS GROUP DATA



MAP LEGEND

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

Soils

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

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

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

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

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

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
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 8, Sep 17, 2014

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

Date(s) aerial images were photographed: May 3, 2010—Jun 19, 2010

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

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — San Diego County Area, California (CA638)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
BIC	Bonsall sandy loam, 2 to 9 percent slopes	D	2.2	39.1%
RaB	Ramona sandy loam, 2 to 5 percent slopes	C	3.4	60.8%
RaC	Ramona sandy loam, 5 to 9 percent slopes	C	0.0	0.0%
Totals for Area of Interest			5.7	100.0%

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: *None Specified*

Tie-break Rule: Higher

85th PERCENTILE 24-HOURS ISOPLUVIAL MAP

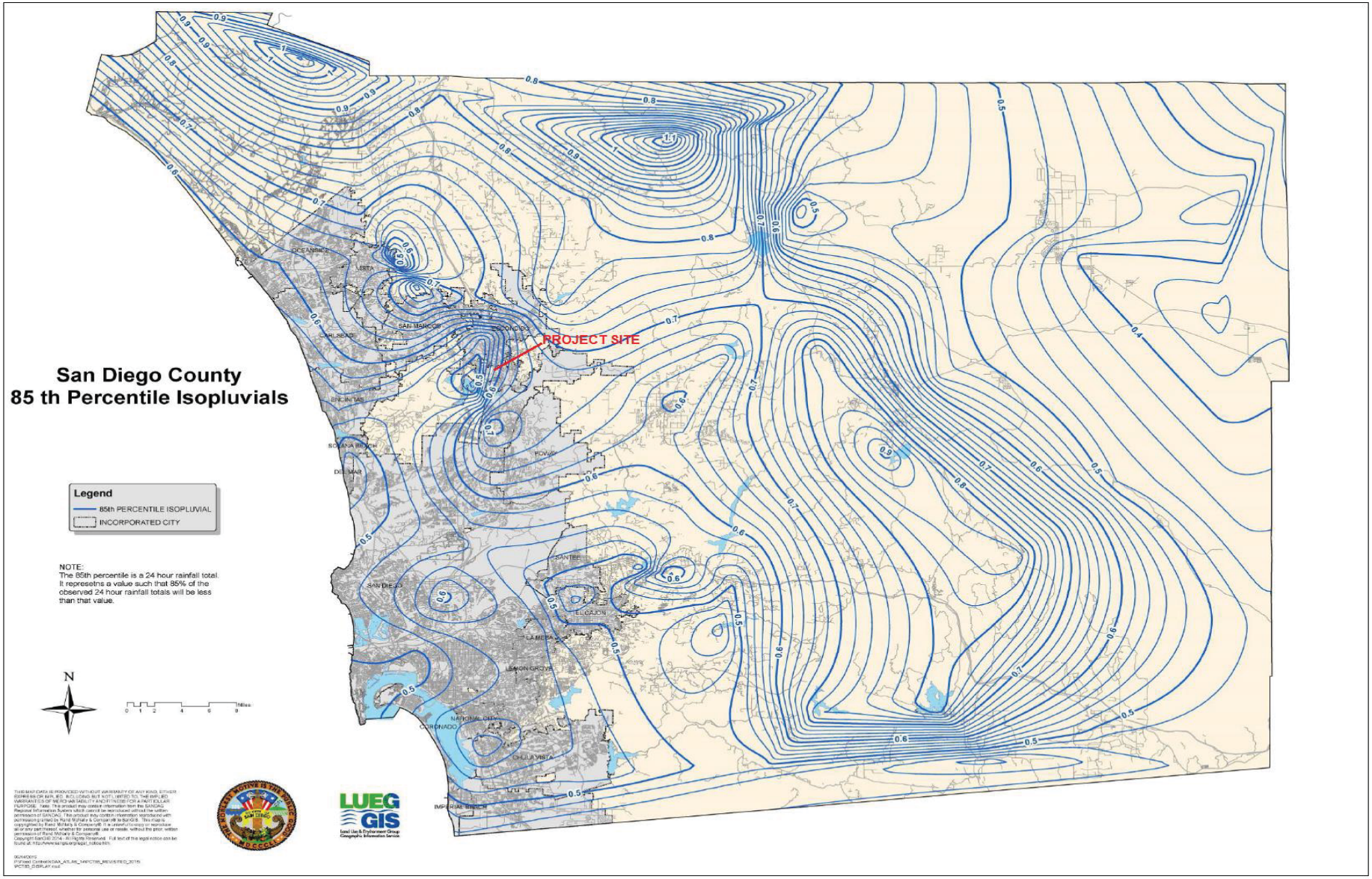


Figure B.1-1: 85th Percentile 24-hour Isopluvial Map

POTENTIAL CRITICAL COARSE SEDIMENT MAP