MACLEOD AND ASSOCIATES, INC.
CIVIL ENGINEERING • LAND SURVEYING

January 29, 2026

PRELIMINARY DRAINAGE ANALYSIS FOR
PRIVATE ROAD AND 5 LOT SUBDIVISION
1815 CORDILLERAS ROAD
UNINCORPORATED SAN MATEO COUNTY, CA

ASSUMPTIONS AND CONDITIONS

1. Use Rational Method: Q = CIA
2. Use 10-year storm frequency.
3. Use NOAA Atlas14 Point Precipitation Frequency Estimates (See attached table)

   Tc = 10 minutes I-10 = 2.18 in/hr.
   Tc = 60 minutes I-10 = 0.867 in/hr.

4. "C" Values (see attached Table)

   C = 0.90 for impervious surfaces
   C = 0.40 for pervious surfaces

5. Assume vacant lot for pre-development calculations.

6. Assume 35% of each lot will be covered with an impervious surface.

7. See attached "Preliminary Calculations for Detention Pipes and Biotreatment Areas" for detention and biotreatment area sizing.

PRE-DEVELOPMENT RUNOFF:

(See attached Pre-development Hydrology Map)

Basin 1 = 1.834 ac.
Q1 = (0.40) (2.18) (1.834)
= 1.60 cfs

This basin drains to Cordilleras Road.

POST-DEVELOPMENT RUNOFF:

(See attached Post-development Hydrology Map)

Basin 1 = 1.730 ac.
Impervious Area = 0.729 ac.
Pervious area = 1.001 ac.

Q1 = (0.90) (2.18) (0.729) + (0.40) (2.18) (1.001)
= 2.30 cfs

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This basin will be detained and ultimately drains to Cordilleras Road via a detention system with an orifice to meter the flow.

Basin 2 = 0.104 ac.
Impervious Area = 0.036 ac.
Pervious area = 0.068 ac.

Q2 = (0.90) (2.18) (0.036) + (0.40) (2.18) (0.068)
= 0.36 cfs

This basin will be released to Cordilleras Road.

DETENTION VOLUME CALCULATIONS:

Detention volume calculations will be based on 10-year storm for a one-hour duration.

Total Project Area = 79,890 s.f. = 1.834 ac.
Private Road Area = 5,820 s.f. = 0.134 ac.
Total Net Lot Area = 74,070 s.f. = 1.700 ac.

Assume 35% of the net lot area and all of the private road area will be covered with an impervious surface.

Qpre = (0.4) (0.867) (1.834)
= 0.63 cfs

Qpost = (0.90) (0.867)[(1.700)(0.35) + 0.134] + (0.40) (0.867) (1.700)(0.65)
= 0.95 cfs

Qincrease = Qpost – Qpre
= 0.95 – 0.63
= 0.32 cfs

Detention volume required = (1.2) 0.32 cfs x 60 sec./min. x 60 min.
= 1,382 ft^3

Utilize the 6” ponding depth in the biotreatment areas and the void ratio of 35% in the 18” of rock material. (See Civil Plans Detail B/T-5 for detention system design)

Total Biotreatment area = BMP 1 area + BMP 2 area
= 980 + 500 = 1,480 s.f.

Maximum detention system capacity:
V(max) = (1,480 ft^2) (0.50’) + (1,480 ft^2) (1.50’) (0.35)
= 1,517 ft^3 > 1,480 ft^3 OK

ORIFICE DISCHARGE:

Qmax out = Q1pre -Q2post
= 1.60 – 0.13
= 1.47 cfs

$Q = A\ (0.60)\ \sqrt{(2)(g)(h)}$ g = 32.2 ft/sec/sec h = 4.5'

$A = Q / 0.60\ \sqrt{(2)(g)(h)}$

$A = 1.47 / (0.60)\ \sqrt{(2)\ (32.2)\ (4.5)}$

A = 0.1439 s.f. or 20.72 in. sq.

$A = \pi(r)^2$

$r = \sqrt{A/\pi}$

$r = \sqrt{20.72/\pi} = 2.57$ inches

Diameter = (2) (2.57") = 5.14"

Use 5" dia orifice

DETENTION DRAWDOWN:

The detention system volume is 1,429 ft³ and is metered via an orifice to have a discharge rate of 1.43 cfs. The evacuation rate of a full detention system is calculated as:

(1,429 ft³) / [(1.43 cf/s)(3,600s)] = 0.3 hours < 72 hours OK

Runoff Coefficient (C) Fact Sheet

What is It?

The runoff coefficient (C) is a dimensionless coefficient relating the amount of runoff to the amount of precipitation received. It is a larger value for areas with low infiltration and high runoff (pavement, steep gradient), and lower for permeable, well vegetated areas (forest, flat land).

Why is It Important?

It is important for flood control channel construction and for possible flood zone hazard delineation. A high runoff coefficient (C) value may indicate flash flooding areas during storms as water moves fast overland on its way to a river channel or a valley floor.

How is It Measured?

It is measured by determining the soil type, gradient, permeability and land use. The values are taken from the table below. The larger values correspond to higher runoff and lower infiltration.

Land Use	C	Land Use	C
Business:		***Lawns:***	
Downtown areas	0.70 - 0.95	Sandy soil, flat, 2%	0.05 - 0.10
Neighborhood areas	0.50 - 0.70	Sandy soil, avg., 2-7%	0.10 - 0.15
		Sandy soil, steep, 7%	0.15 - 0.20
		Heavy soil, flat, 2%	0.13 - 0.17
		Heavy soil, avg., 2-7%	0.18 - 0.22
		Heavy soil, steep, 7%	0.25 - 0.35
Residential:		***Agricultural land:***	
		Bare packed soil	
		*Smooth	0.30 - 0.60
		*Rough	0.20 - 0.50
		Cultivated rows	
Single-family areas	0.30 - 0.50	*Heavy soil, no crop	0.30 - 0.60
Multi units, detached	0.40 - 0.60	*Heavy soil, with crop	0.20 - 0.50
Munti units, attached	0.60 - 0.75	*Sandy soil, no crop	0.20 - 0.40
Suburban	0.25 - 0.40	*Sandy soil, with crop	0.10 - 0.25
		Pasture	
		*Heavy soil	0.15 - 0.45
		*Sandy soil	0.05 - 0.25
		Woodlands	0.05 - 0.25

Industrial: Light areas Heavy areas	 0.50 - 0.80 0.60 - 0.90	*Streets:* Asphaltic Concrete Brick	 0.70 - 0.95 0.80 - 0.95 0.70 - 0.85
Parks, cemeteries	0.10 - 0.25	Unimproved areas	0.10 - 0.30
Playgrounds	0.20 - 0.35	Drives and walks	0.75 - 0.85
Railroad yard areas	0.20 - 0.40	Roofs	0.75 - 0.95

Note: The designer must use judgment to select the appropriate "C" value within the range. Generally, larger areas with permeable soils, flat slopes and dense vegetation should have the lowest "C" values. Smaller areas with dense soils, moderate to steep slopes, and sparse vegetation should assigned the highest "C" values.

http://water.me.vccs.edu/courses/CIV246/table2b.htm accessed 11/19/09

NOAA Atlas 14, Volume 6, Version 2
Location name: Redwood City, California, USA*
Latitude: 37.4742°, Longitude: -122.2635°
Elevation: 162 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	1.72 (1.51-1.98)	2.10 (1.85-2.42)	2.62 (2.29-3.02)	3.05 (2.64-3.55)	3.65 (3.05-4.40)	4.13 (3.37-5.10)	4.62 (3.67-5.87)	5.14 (3.97-6.73)	5.88 (4.33-8.04)	6.47 (4.60-9.19)
10-min	1.24 (1.09-1.42)	1.51 (1.33-1.73)	1.88 (1.64-2.17)	2.18 (1.90-2.54)	2.62 (2.19-3.16)	2.96 (2.42-3.65)	3.31 (2.63-4.20)	3.68 (2.84-4.82)	4.21 (3.11-5.77)	4.63 (3.29-6.59)
15-min	0.996 (0.872-1.14)	1.22 (1.07-1.40)	1.51 (1.32-1.75)	1.76 (1.53-2.05)	2.11 (1.76-2.55)	2.38 (1.95-2.94)	2.67 (2.12-3.39)	2.97 (2.29-3.89)	3.40 (2.50-4.65)	3.74 (2.66-5.31)
30-min	0.692 (0.608-0.796)	0.846 (0.744-0.974)	1.05 (0.922-1.22)	1.23 (1.06-1.43)	1.47 (1.23-1.77)	1.66 (1.36-2.05)	1.86 (1.48-2.36)	2.07 (1.60-2.71)	2.36 (1.74-3.24)	2.60 (1.85-3.70)
60-min	0.489 (0.430-0.562)	0.599 (0.525-0.689)	0.745 (0.652-0.860)	0.867 (0.752-1.01)	1.04 (0.868-1.25)	1.17 (0.958-1.45)	1.31 (1.04-1.67)	1.46 (1.13-1.91)	1.67 (1.23-2.29)	1.84 (1.31-2.61)
2-hr	0.357 (0.314-0.410)	0.434 (0.381-0.499)	0.537 (0.470-0.619)	0.622 (0.540-0.725)	0.742 (0.620-0.896)	0.836 (0.683-1.03)	0.934 (0.743-1.19)	1.04 (0.801-1.36)	1.18 (0.873-1.62)	1.30 (0.924-1.85)
3-hr	0.299 (0.263-0.344)	0.363 (0.319-0.418)	0.450 (0.394-0.520)	0.522 (0.453-0.608)	0.623 (0.521-0.752)	0.702 (0.574-0.868)	0.784 (0.624-0.996)	0.872 (0.672-1.14)	0.994 (0.733-1.36)	1.09 (0.775-1.55)
6-hr	0.213 (0.187-0.245)	0.261 (0.229-0.300)	0.324 (0.284-0.375)	0.378 (0.327-0.440)	0.452 (0.378-0.546)	0.511 (0.417-0.632)	0.572 (0.455-0.726)	0.637 (0.491-0.834)	0.727 (0.536-0.996)	0.800 (0.568-1.14)
12-hr	0.138 (0.122-0.159)	0.172 (0.151-0.199)	0.218 (0.191-0.252)	0.256 (0.222-0.299)	0.310 (0.259-0.375)	0.352 (0.288-0.436)	0.397 (0.316-0.504)	0.444 (0.342-0.581)	0.509 (0.376-0.698)	0.562 (0.399-0.799)
24-hr	0.085 (0.078-0.094)	0.108 (0.098-0.120)	0.138 (0.126-0.155)	0.164 (0.148-0.185)	0.200 (0.176-0.231)	0.228 (0.197-0.269)	0.258 (0.218-0.310)	0.289 (0.239-0.357)	0.333 (0.266-0.426)	0.368 (0.285-0.485)
2-day	0.054 (0.049-0.060)	0.068 (0.062-0.076)	0.088 (0.080-0.098)	0.104 (0.094-0.117)	0.126 (0.111-0.146)	0.144 (0.125-0.170)	0.162 (0.138-0.196)	0.182 (0.150-0.224)	0.209 (0.167-0.267)	0.230 (0.178-0.303)
3-day	0.041 (0.038-0.046)	0.053 (0.048-0.059)	0.067 (0.061-0.075)	0.079 (0.072-0.090)	0.096 (0.085-0.112)	0.110 (0.095-0.129)	0.124 (0.105-0.149)	0.138 (0.114-0.170)	0.158 (0.126-0.202)	0.174 (0.135-0.229)
4-day	0.035 (0.032-0.039)	0.044 (0.040-0.049)	0.056 (0.051-0.063)	0.066 (0.060-0.074)	0.080 (0.070-0.093)	0.091 (0.079-0.107)	0.102 (0.086-0.123)	0.114 (0.094-0.141)	0.130 (0.104-0.166)	0.143 (0.111-0.189)
7-day	0.025 (0.022-0.027)	0.031 (0.028-0.035)	0.040 (0.036-0.044)	0.047 (0.042-0.053)	0.056 (0.050-0.065)	0.064 (0.055-0.075)	0.072 (0.061-0.086)	0.080 (0.066-0.098)	0.091 (0.073-0.116)	0.100 (0.077-0.132)
10-day	0.019 (0.018-0.022)	0.024 (0.022-0.027)	0.031 (0.028-0.035)	0.037 (0.033-0.041)	0.044 (0.039-0.051)	0.050 (0.043-0.059)	0.056 (0.047-0.067)	0.062 (0.051-0.077)	0.071 (0.056-0.090)	0.077 (0.060-0.102)
20-day	0.012 (0.011-0.014)	0.016 (0.014-0.018)	0.020 (0.018-0.022)	0.024 (0.021-0.027)	0.028 (0.025-0.033)	0.032 (0.027-0.038)	0.035 (0.030-0.043)	0.039 (0.032-0.048)	0.044 (0.035-0.056)	0.047 (0.037-0.063)
30-day	0.010 (0.009-0.011)	0.012 (0.011-0.014)	0.016 (0.015-0.018)	0.019 (0.017-0.021)	0.022 (0.020-0.026)	0.025 (0.022-0.030)	0.028 (0.023-0.033)	0.030 (0.025-0.037)	0.034 (0.027-0.043)	0.036 (0.028-0.048)
45-day	0.008 (0.007-0.009)	0.010 (0.009-0.011)	0.013 (0.012-0.015)	0.015 (0.014-0.017)	0.018 (0.016-0.021)	0.020 (0.017-0.024)	0.022 (0.019-0.027)	0.024 (0.020-0.030)	0.027 (0.021-0.034)	0.028 (0.022-0.038)
60-day	0.007 (0.006-0.008)	0.009 (0.008-0.010)	0.012 (0.011-0.013)	0.014 (0.012-0.015)	0.016 (0.014-0.019)	0.018 (0.015-0.021)	0.019 (0.016-0.023)	0.021 (0.017-0.026)	0.023 (0.018-0.030)	0.024 (0.019-0.032)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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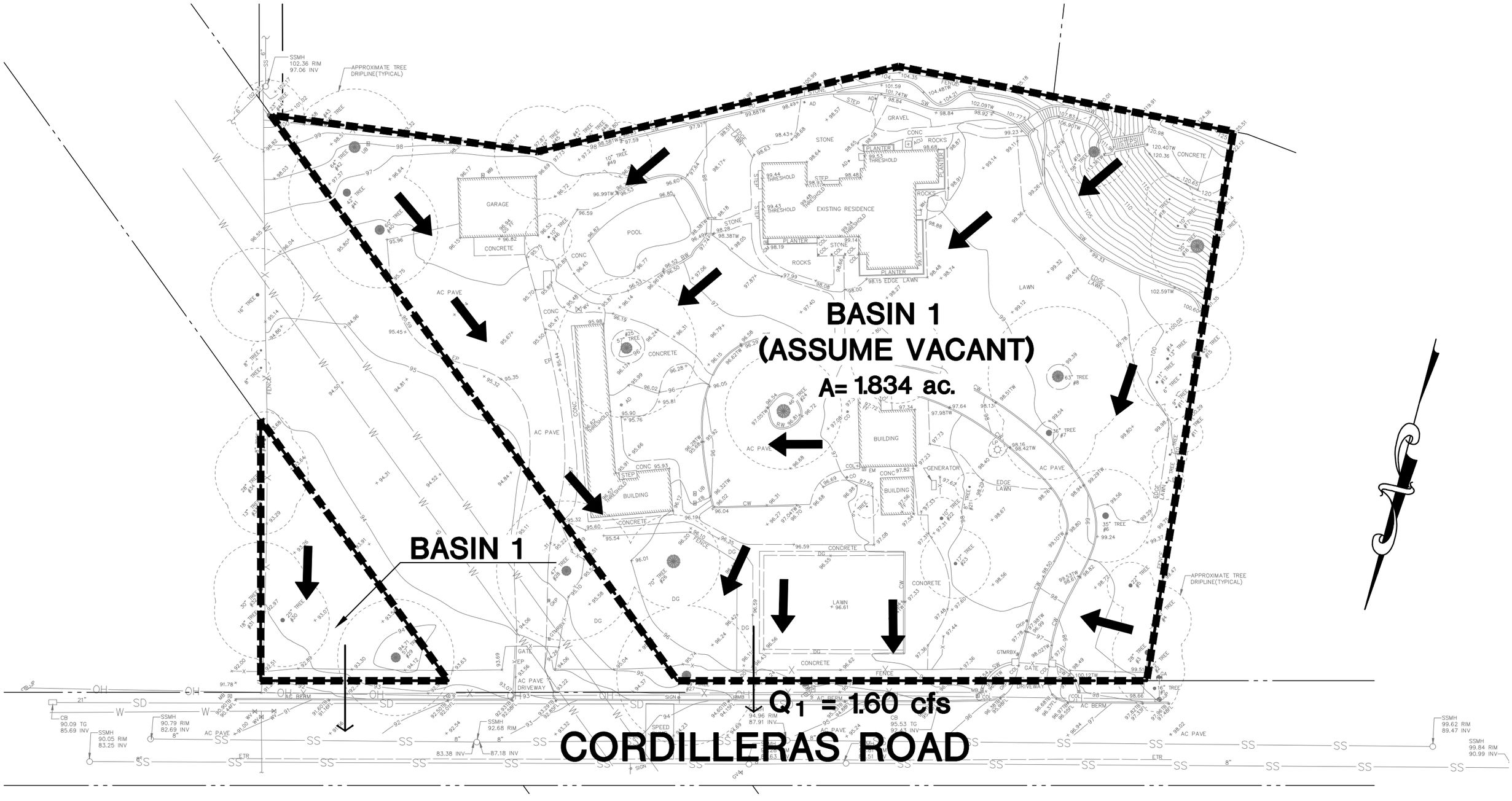
PF graphical



LEGEND

BASIN OVERFLOW EXIT POINT

DRAINAGE DIRECTION

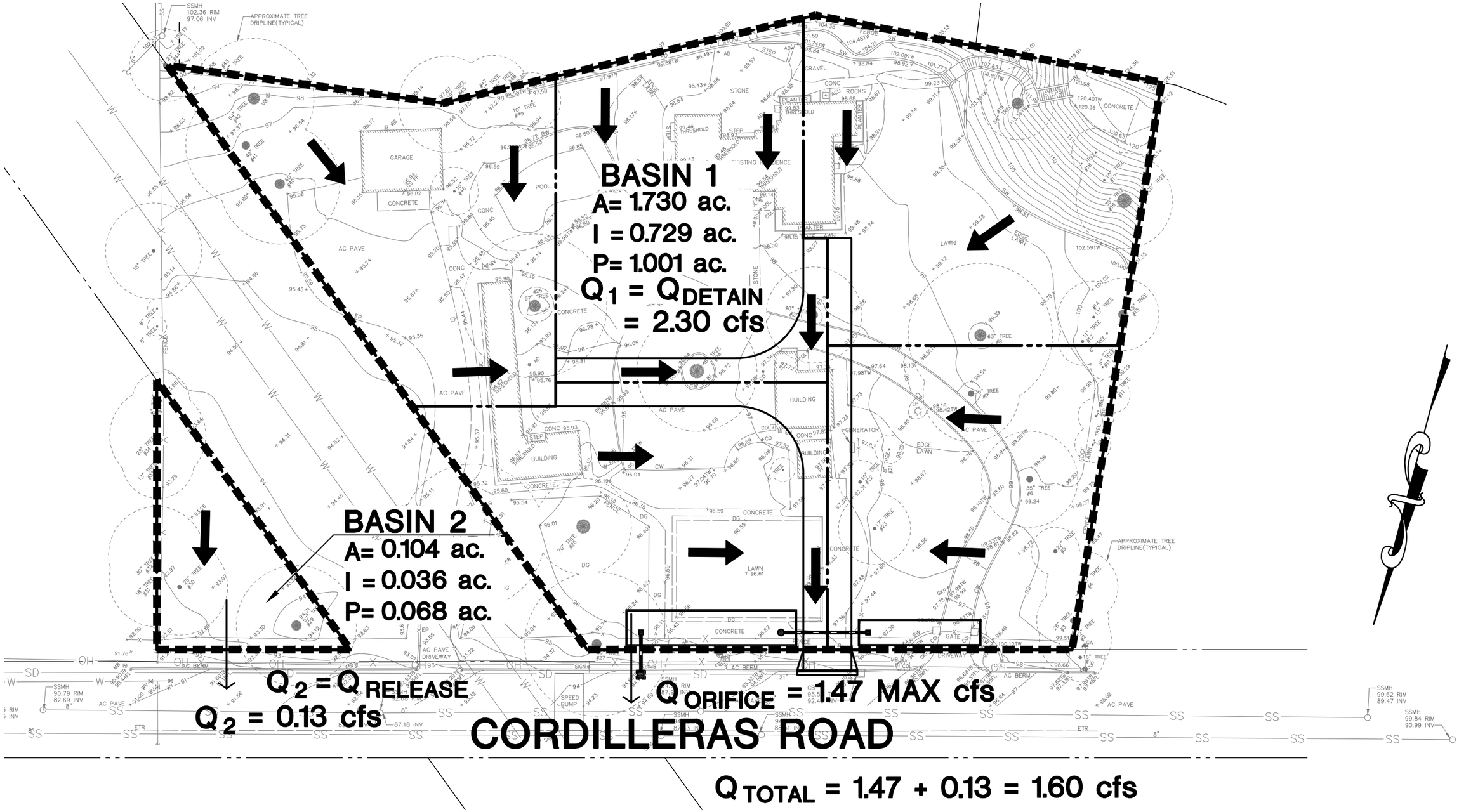
PRE-DEVELOPMENT HYDROLOGY MAP

1815 CORDILLERAS ROAD

UNINCORPORATED SAN MATEO COUNTY

SCALE : NONE

DATE: OCTOBER, 2025



LEGEND

BASIN OVERFLOW EXIT POINT

DRAINAGE DIRECTION

POST-DEVELOPMENT HYDROLOGY MAP

1815 CORDILLERAS ROAD

UNINCORPORATED
SAN MATEO COUNTY

SCALE : NONE

DATE: OCTOBER, 2025

January 29, 2026
Job No. 5705-24

PRELIMINARY CALCULATIONS FOR DETENTION PIPES AND BIOTREATMENT AREAS
1815 CORDILLERAS DRIVE
SAN MATEO COUNTY, CA

	Net Lot Area (sq. ft.)	Qpre (cfs)	(P) Imp. Area (sq. ft)	(P) Perv. Area (sq. ft.)	Qpost (cfs)	Qincrease (cfs)	Required Detention Volume (ft^3)	Biotreatment Area Required (sq. ft)	Biotreatment Area Provided (sq. ft)	6" Ponding Volume (ft^3)	1.50' Drainrock Volume (ft^3)	Detention Volume Provided (ft^3)
Lot 1	14,300	0.11	5,005	9,295	0.16	0.05	215	237	--	--	--	--
Lot 2	13,156	0.10	4,605	8,551	0.15	0.05	198	218	--	--	--	--
Lot 4	17,123	0.14	5,993	11,130	0.20	0.06	258	284	--	--	--	--
Private Road	5,820	0.05	5,820	0	0.10	0.06	250	233	--	--	--	--
SUB TOTAL	50,399	0.40	21,423	28,976	0.61	0.21	921	973	**980**	490	515	**1005**
Lot 3	16,622	0.13	5,818	10,804	0.19	0.06	250	276	--	--	20	20
Lot 5	12,869	0.10	4,504	8,365	0.15	0.04	194	214	--	--	21	21
SUB TOTAL	29,491	0.23	10,322	19,169	0.34	0.10	444	490	**500**	250	263	**513**

Assumptions and Condtions:

1. Use Rational Method: Q=CiA
2. Use 10-year storm frequency.
3. Use NOAA Atlas14 Point Precipitation Frequency Estimates

Tc = 10 minutes
i-60 = 0.867 in/hr.

4. Detention Volume is calculated using Qincrease and a 10-year storm event for a one-hour duration with a factor of saftey of 1.2

4. “C” Values (see attached Table)

C = 0.40 for pervious surfaces
C = 0.90 for impervious surfaces

5. Assume lots are undeveloped for Qpre calculations

6. Assume 35% of each lot will be covered with an impervious surface

7. Biotreatment Area must be 4% of the impervious surface area and & 0.4% of the pervious surface area per C.3 Stormwater

MacLEOD AND ASSOCIATES, INC.
CIVIL ENGINEERING • LAND SURVEYING

STORM DRAIN SYSTEM STUDY

FOR

1815 CORDILLERAS ROAD
UNINCORPORATED SAN MATEO COUNTY, CALIFORNIA

JANUARY 29, 2026

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The purpose of this study is to analyze the existing storm drain system consisting of two 18" diameter plastic pipes that run along Cordilleras Road and ultimately discharge into Cordilleras Creek via a 36" diameter RCP (reinforced concrete pipe) as shown on the improvement plans titled "Reconstruction of Cordilleras Road" dated July, 1989. The lines to be analyzed are the 18" diameter plastic pipe that begins at a catch basin located at the middle of the project site (Line 1 as shown on the "Drainage Basin Map" exhibit) and the 36" diameter RCP pipe that discharges into Cordilleras Creek (Line 2 on the "Drainage Basin Map" exhibit).

Drainage Basin and Pipe Capacity Calculations:

To calculate the runoff that enters the storm drain system the following assumptions and conditions will be used.

Assumptions And Conditions

1. Use Rational Method: Q = CIA

2. Use 100-year storm frequency.

3. The time of concentration will be calculated using a formula provided for calculating the flow of 100-year storms from the "Town of Atherton – Drainage Criteria 1/2/13"

4. Use NOAA Atlas14 Point Precipitation Frequency Estimates (See attached table)

    Tc = 15 minutes I-100 = 2.67 in/hr.

4. "C" Values (see attached Table)

    Basin 1 C = 0.25 (Low density suburban residential)
    Basin 2 C = 0.40 (Medium density single family area)
    Basin 3 C = 0.90 (Roadway)

Time of Concentration:

As noted above, a formula used in 100-year storm calculations for projects in the Town of Atherton will be used to calculate the time of concentration. Basin 1 of the attached "Drainage Basin Map" will be used in these calculations.

$TC = 10 + 0.0078 (L^{3/2} / H^{1/2})^{0.77}$

L = the maximum length of travel, in feet.
H = the difference in elevation along the effective slope line, in feet.
Tc = the time of concentration, in minutes.

L = 1,230'
H = 440 – 150 = 290 feet'

Therefore:
$TC = 10 + 0.0078 (1{,}230^{3/2} / 290^{1/2})^{0.77}$
TC = 13.26 min.

Intensity
The time of concentration was calculated at 13.26 minutes. It is not possible to interpolate between intensity values so the intensity from a 100-year storm with a 15-minute time of concentration will be used.

Therefore, per the attached NOAA intensity table:
I = 2.67 in/hr

Basin Flow
The runoff from Basin 1 will be received by Line 1. The runoff is calculated as:

Q1 = CiA
= (0.25)(2.67)(15.5)
= 10.35 cfs

Additional runoff from Basins 2 and 3 will be received by Line 2.

Q2 = (0.40)(2.67)(4.9)
= 5.23 cfs

Q3 = (0.90)(2.67)(1.0)
= 2.40 cfs

Pipe Capacity:
Manning's equation will be used to calculate the capacity of the existing storm drain pipes.

Line 1: 18" diameter plastic pipe, slope = 0.0187

At full capacity, $Q(full) = [1.49 A R^{2/3} S^{1/2}] / n$
Where A = (3.1415) (0.75) (0.75) = 1.767 sq. ft.
R = r / 2 = 0.75 / 2 = 0.375
n = 0.012

So, $Q = [(1.49) (1.767) (0.375)^{2/3} (0.0187)^{1/2}] / 0.012$
= 15.60 cfs

Line 2: 36" diameter reinforced concrete pipe, slope = 0.01

At full capacity, $Q(full) = [1.49 A R^{2/3} S^{1/2}] / n$
Where A = (3.1415) (1.50) (1.50) = 7.069 sq. ft.
R = r / 2 = 1.50 / 2 = 0.75
n = 0.013

So, $Q = [(1.49)\ (7.069)\ (0.75)^{2/3}\ (0.01)^{1/2}] / 0.013$
$= 66.88$ cfs

Proposed Project Runoff Calculations:

The increase in runoff generated from the proposed project will be calculated and added to the basin runoff calculations above to check if the existing storm drain pipes will have adequate flow capacity after the project is completed.

The area of the project site is 1.834 acres. A runoff coefficient of 0.25 (low density suburban) will be used for the pre-development calculations. A runoff coefficient of 0.4 (medium density single-family area) will be used for the post-development calculation. Due to County Drainage requirements the increase in runoff will be detained and there will be no increase in site runoff from pre-development to post-development conditions. However, this calculation conservatively assumes the increase in runoff will not be detained.

Qpre = (0.25)(2.67)(1.834)
= 1.22 cfs

Qpost = (0.40)(2.67)(1.834)
= 1.96 cfs

Qincrease = 1.96 – 1.22
= 0.74 cfs

Post-Development Pipe Capacity Calculations:

The runoff that flows into Line 1 is generated by Basin 1 and the increase in flow from the proposed project. Therefore, the runoff in Line 1 is calculated as:

Q = 10.35 + 0.74 = 11.09 cfs.

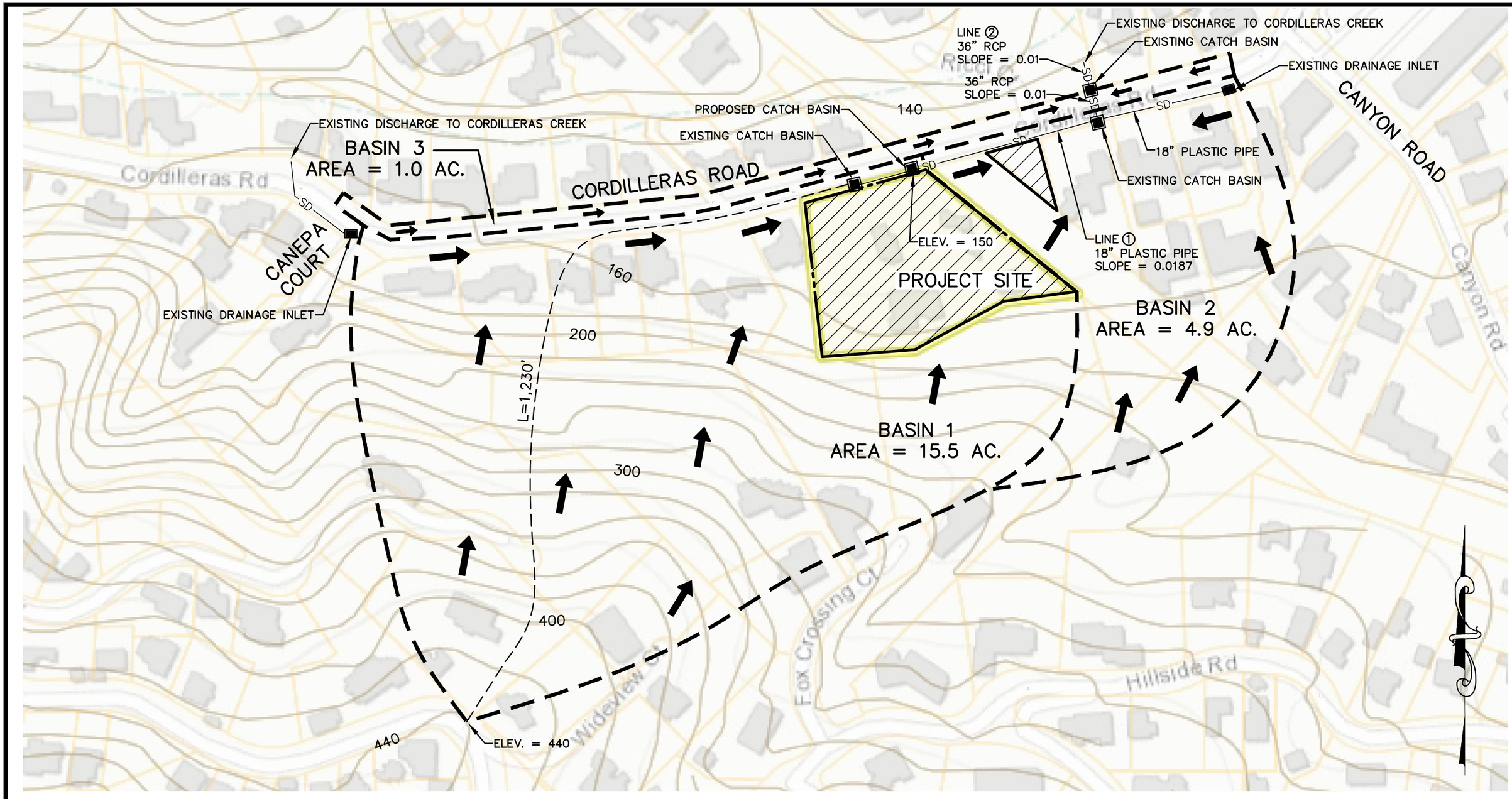
The capacity of Line 1, calculated above, is 15.60 cfs. Line 1 has adequate capacity to handle the additional runoff generated by the proposed project.

The runoff that flows into Line 2 is generated by Basins 1, 2, and 3 and the increase in flow from the proposed project. Therefore, the runoff in Line 3 is calculated as:

Q = 10.35 + 5.23 + 2.40 + 0.74 = 18.72 cfs.

The capacity of Line 2, calculated above, is 66.88 cfs. Line 2 has adequate capacity to handle the additional runoff generated by the proposed project.

Conclusion:
The existing storm drain system has adequate capacity to handle any additional runoff generated by the proposed development at 1815 Cordilleras Road.



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DRAINAGE BASIN MAP

STORM DRAIN SYSTEM STUDY

1815 CORDILLERAS ROAD

UNINCORPORATED SAN MATEO COUNTY CALIFORNIA

PREPARED FOR: EDENBRIDGE HOMES	
DRAWN BY: DJK	DESIGNED BY: ---
CHECKED BY: DGM	DATE: 01/29/26
SCALE: 1"=150'	DRAWING NO. 5705–SD BASIN

NOAA Atlas 14, Volume 6, Version 2
Location name: Redwood City, California, USA*
Latitude: 37.4742°, Longitude: -122.2635°
Elevation: 162 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

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NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	1.72 (1.51-1.98)	2.10 (1.85-2.42)	2.62 (2.29-3.02)	3.05 (2.64-3.55)	3.65 (3.05-4.40)	4.13 (3.37-5.10)	4.62 (3.67-5.87)	5.14 (3.97-6.73)	5.88 (4.33-8.04)	6.47 (4.60-9.19)
10-min	1.24 (1.09-1.42)	1.51 (1.33-1.73)	1.88 (1.64-2.17)	2.18 (1.90-2.54)	2.62 (2.19-3.16)	2.96 (2.42-3.65)	3.31 (2.63-4.20)	3.68 (2.84-4.82)	4.21 (3.11-5.77)	4.63 (3.29-6.59)
15-min	0.996 (0.872-1.14)	1.22 (1.07-1.40)	1.51 (1.32-1.75)	1.76 (1.53-2.05)	2.11 (1.76-2.55)	2.38 (1.95-2.94)	2.67 (2.12-3.39)	2.97 (2.29-3.89)	3.40 (2.50-4.65)	3.74 (2.66-5.31)
30-min	0.692 (0.608-0.796)	0.846 (0.744-0.974)	1.05 (0.922-1.22)	1.23 (1.06-1.43)	1.47 (1.23-1.77)	1.66 (1.36-2.05)	1.86 (1.48-2.36)	2.07 (1.60-2.71)	2.36 (1.74-3.24)	2.60 (1.85-3.70)
60-min	0.489 (0.430-0.562)	0.599 (0.525-0.689)	0.745 (0.652-0.860)	0.867 (0.752-1.01)	1.04 (0.868-1.25)	1.17 (0.958-1.45)	1.31 (1.04-1.67)	1.46 (1.13-1.91)	1.67 (1.23-2.29)	1.84 (1.31-2.61)
2-hr	0.357 (0.314-0.410)	0.434 (0.381-0.499)	0.537 (0.470-0.619)	0.622 (0.540-0.725)	0.742 (0.620-0.896)	0.836 (0.683-1.03)	0.934 (0.743-1.19)	1.04 (0.801-1.36)	1.18 (0.873-1.62)	1.30 (0.924-1.85)
3-hr	0.299 (0.263-0.344)	0.363 (0.319-0.418)	0.450 (0.394-0.520)	0.522 (0.453-0.608)	0.623 (0.521-0.752)	0.702 (0.574-0.868)	0.784 (0.624-0.996)	0.872 (0.672-1.14)	0.994 (0.733-1.36)	1.09 (0.775-1.55)
6-hr	0.213 (0.187-0.245)	0.261 (0.229-0.300)	0.324 (0.284-0.375)	0.378 (0.327-0.440)	0.452 (0.378-0.546)	0.511 (0.417-0.632)	0.572 (0.455-0.726)	0.637 (0.491-0.834)	0.727 (0.536-0.996)	0.800 (0.568-1.14)
12-hr	0.138 (0.122-0.159)	0.172 (0.151-0.199)	0.218 (0.191-0.252)	0.256 (0.222-0.299)	0.310 (0.259-0.375)	0.352 (0.288-0.436)	0.397 (0.316-0.504)	0.444 (0.342-0.581)	0.509 (0.376-0.698)	0.562 (0.399-0.799)
24-hr	0.085 (0.078-0.094)	0.108 (0.098-0.120)	0.138 (0.126-0.155)	0.164 (0.148-0.185)	0.200 (0.176-0.231)	0.228 (0.197-0.269)	0.258 (0.218-0.310)	0.289 (0.239-0.357)	0.333 (0.266-0.426)	0.368 (0.285-0.485)
2-day	0.054 (0.049-0.060)	0.068 (0.062-0.076)	0.088 (0.080-0.098)	0.104 (0.094-0.117)	0.126 (0.111-0.146)	0.144 (0.125-0.170)	0.162 (0.138-0.196)	0.182 (0.150-0.224)	0.209 (0.167-0.267)	0.230 (0.178-0.303)
3-day	0.041 (0.038-0.046)	0.053 (0.048-0.059)	0.067 (0.061-0.075)	0.079 (0.072-0.090)	0.096 (0.085-0.112)	0.110 (0.095-0.129)	0.124 (0.105-0.149)	0.138 (0.114-0.170)	0.158 (0.126-0.202)	0.174 (0.135-0.229)
4-day	0.035 (0.032-0.039)	0.044 (0.040-0.049)	0.056 (0.051-0.063)	0.066 (0.060-0.074)	0.080 (0.070-0.093)	0.091 (0.079-0.107)	0.102 (0.086-0.123)	0.114 (0.094-0.141)	0.130 (0.104-0.166)	0.143 (0.111-0.189)
7-day	0.025 (0.022-0.027)	0.031 (0.028-0.035)	0.040 (0.036-0.044)	0.047 (0.042-0.053)	0.056 (0.050-0.065)	0.064 (0.055-0.075)	0.072 (0.061-0.086)	0.080 (0.066-0.098)	0.091 (0.073-0.116)	0.100 (0.077-0.132)
10-day	0.019 (0.018-0.022)	0.024 (0.022-0.027)	0.031 (0.028-0.035)	0.037 (0.033-0.041)	0.044 (0.039-0.051)	0.050 (0.043-0.059)	0.056 (0.047-0.067)	0.062 (0.051-0.077)	0.071 (0.056-0.090)	0.077 (0.060-0.102)
20-day	0.012 (0.011-0.014)	0.016 (0.014-0.018)	0.020 (0.018-0.022)	0.024 (0.021-0.027)	0.028 (0.025-0.033)	0.032 (0.027-0.038)	0.035 (0.030-0.043)	0.039 (0.032-0.048)	0.044 (0.035-0.056)	0.047 (0.037-0.063)
30-day	0.010 (0.009-0.011)	0.012 (0.011-0.014)	0.016 (0.015-0.018)	0.019 (0.017-0.021)	0.022 (0.020-0.026)	0.025 (0.022-0.030)	0.028 (0.023-0.033)	0.030 (0.025-0.037)	0.034 (0.027-0.043)	0.036 (0.028-0.048)
45-day	0.008 (0.007-0.009)	0.010 (0.009-0.011)	0.013 (0.012-0.015)	0.015 (0.014-0.017)	0.018 (0.016-0.021)	0.020 (0.017-0.024)	0.022 (0.019-0.027)	0.024 (0.020-0.030)	0.027 (0.021-0.034)	0.028 (0.022-0.038)
60-day	0.007 (0.006-0.008)	0.009 (0.008-0.010)	0.012 (0.011-0.013)	0.014 (0.012-0.015)	0.016 (0.014-0.019)	0.018 (0.015-0.021)	0.019 (0.016-0.023)	0.021 (0.017-0.026)	0.023 (0.018-0.030)	0.024 (0.019-0.032)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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PF graphical

Runoff Coefficient (C) Fact Sheet

What is It?

The runoff coefficient (C) is a dimensionless coefficient relating the amount of runoff to the amount of precipitation received. It is a larger value for areas with low infiltration and high runoff (pavement, steep gradient), and lower for permeable, well vegetated areas (forest, flat land).

Why is It Important?

It is important for flood control channel construction and for possible flood zone hazard delineation. A high runoff coefficient (C) value may indicate flash flooding areas during storms as water moves fast overland on its way to a river channel or a valley floor.

How is It Measured?

It is measured by determining the soil type, gradient, permeability and land use. The values are taken from the table below. The larger values correspond to higher runoff and lower infiltration.

Land Use	C	Land Use	C
Business:		***Lawns:***	
Downtown areas	0.70 - 0.95	Sandy soil, flat, 2%	0.05 - 0.10
Neighborhood areas	0.50 - 0.70	Sandy soil, avg., 2-7%	0.10 - 0.15
		Sandy soil, steep, 7%	0.15 - 0.20
		Heavy soil, flat, 2%	0.13 - 0.17
		Heavy soil, avg., 2-7%	0.18 - 0.22
		Heavy soil, steep, 7%	0.25 - 0.35
Residential:		***Agricultural land:***	
		Bare packed soil	
		*Smooth	0.30 - 0.60
		*Rough	0.20 - 0.50
		Cultivated rows	
Single-family areas	0.30 - 0.50	*Heavy soil, no crop	0.30 - 0.60
Multi units, detached	0.40 - 0.60	*Heavy soil, with crop	0.20 - 0.50
Munti units, attached	0.60 - 0.75	*Sandy soil, no crop	0.20 - 0.40
Suburban	0.25 - 0.40	*Sandy soil, with crop	0.10 - 0.25
		Pasture	
		*Heavy soil	0.15 - 0.45
		*Sandy soil	0.05 - 0.25
		Woodlands	0.05 - 0.25

Industrial: Light areas Heavy areas	 0.50 - 0.80 0.60 - 0.90	*Streets:* Asphaltic Concrete Brick	 0.70 - 0.95 0.80 - 0.95 0.70 - 0.85
Parks, cemeteries	0.10 - 0.25	Unimproved areas	0.10 - 0.30
Playgrounds	0.20 - 0.35	Drives and walks	0.75 - 0.85
Railroad yard areas	0.20 - 0.40	Roofs	0.75 - 0.95

Note: The designer must use judgment to select the appropriate "C" value within the range. Generally, larger areas with permeable soils, flat slopes and dense vegetation should have the lowest "C" values. Smaller areas with dense soils, moderate to steep slopes, and sparse vegetation should assigned the highest "C" values.

http://water.me.vccs.edu/courses/CIV246/table2b.htm accessed 11/19/09