Received 12/23/2025

# Drainage Analysis

## For the

## 8100 Valentine Avenue Development
## Grupe Investment Company, Inc.
## 8100 Valentine Avenue, Sebastopol CA
## APN 004-510-054

**JN 25213**
**December 12, 2025**

**Prepared for:**
**Grupe Investment Company, Inc.**
**3255 West March Lane, Suite 400**
**Stockton, CA 95219**
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Timothy L. Schram, RCE 67890
My license expires 6/30/2027


**Prepared by:**

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# 1. Drainage Narrative

# 8100 Valentine Avenue
# Drainage Narrative

## Project Description

This project is located at 8100 Valentine Avenue in Sebastopol, California. The overall project site is approximately 2.96 acres. The existing property contains a building, AC driveway, parking, and associated hardscaping and landscaping. See attached **Aerial Photo** and **Existing Conditions Map**. This project proposes grading and drainage improvements for a 20 lot subdivision including 39 new residential units, AC driveway, parking, and associated hardscaping and landscaping.

Existing slopes in the area of the project development range from 0% to 10%. Runoff currently sheet flows radially from the building pad into an existing 18" stormdrain that runs southerly along the easterly property line.

For the proposed development, the design intent is to maintain the natural and existing drainage routing. Pre and post construction conditions are shown on the **Existing Conditions Map** and **Post Construction Hydrology Map**. Drainage will be routed towards proposed bioretention facilities prior to discharging into the existing 18" stormdrain along the easterly property line. Historic drainage patterns will ultimately remain unchanged and release points off the property will not be changed due to the development.

## Methodology

The incremental Rational Method has been used to calculate the 10 and 100 year peak runoff in accordance with the Sonoma County Water Agency (SCWA) Flood Management Design Manual (FMDM, 2020) as shown in the **10-yr & 100-yr Rational Method Drainage Study**. Time of concentration has been appropriately estimated using FMDM, 2020 Table 3-3. Site tributary areas and points of concentration are depicted on attached **Post – Construction Hydrology Map**. Runoff coefficients were calculated using Table C-1 in the FMDM, alongside **Appendix II, Soil Analysis** to determine the land use and soil type of the project site through an impervious fraction for the given drainage area, see attached Table C-1. Inlets have been analyzed with a worse-case scenario to verify capacity during the 10-yr storm event, see attached **Inlet Capacity Calculations**. See attached **100 Year Overland Release Map** for depicted flow routes in the event that the system becomes clogged or over inundated with flow. Autodesk *Hydraulic Toolbox* has been used to calculate normal depth in the proposed drain pipes as presented in **Appendix I, Stormdrain/Swale Analysis**. Proposed system was analyzed using a 10-yr storm event.

Manning's n value used was 0.0120 for the pipe material and 0.0350 for the swale per Table D.2-1 and Table D.2-4 of the FMDM 2020.

## Conclusion

In accordance with the SCWA 2020 Flood Management Design Manual, all drainage facilities are designed to convey, without surcharge, runoff from the 10-yr storm event. The project has been designed to allow for overland release in case of inundation of the stormdrain system. Since the existing conditions of the site are largely developed impervious surfacing, pollutants observed due to the new impervious surfacing will be similar to pre existing conditions. Pollutants will be treated via bioretention vegetation prior to discharging from the site, thereby alleviating the possible impacts of this development.

Based on the design of the treatment and the routing of surface runoff, we do not anticipate any significant impacts to the neighboring properties and to the natural drainage features. The quantity and quality of stormwater discharge will be similar to pre existing conditions at point of release off the project site.

# 2. Aerial Photo


004-510-066
8117
004-510-024
8123
8103
004-510-062
8105
004-510-063
004-510-067
436
004-532-025
Eileen Dr
435
004-533-005
434
004-532-024
433
004-533-004
432
8122
004-510-019
428
004-532-023
429
004-533-003
8116
004-510-018
424
004-532-012
423
409
Eileen Dr
Eileen Dr
004-532-013
8117
004-510-017
23
S
004-510-054
414
004-532
410
406
004-532-016
8123
004-510-01
8129
004-510-015
8090
8080
8070
8060
004-532-022
004-532-020
407
004-510-014
8122
8116
004-510-011
401
004-510-013
Valentine Ave
Valentine Ave
8094
8117
004-521-001
004-522-001
384
004-522-002
383
004-522-017
8123

# 3. Existing Conditions Map

DRAINAGE AREA LEGEND

PROPERTY LINE (℄)

DIRECTION OF FLOW

VALENTINE AVENUE

EXISTING BUILDING

Graphic Scale: 1" = 20'

December 10, 2025

# EXISTING CONDITIONS MAP

VALENTINE AVENUE
8100 Valentine Avenue, Sebastopol, CA
APN 004-510-054

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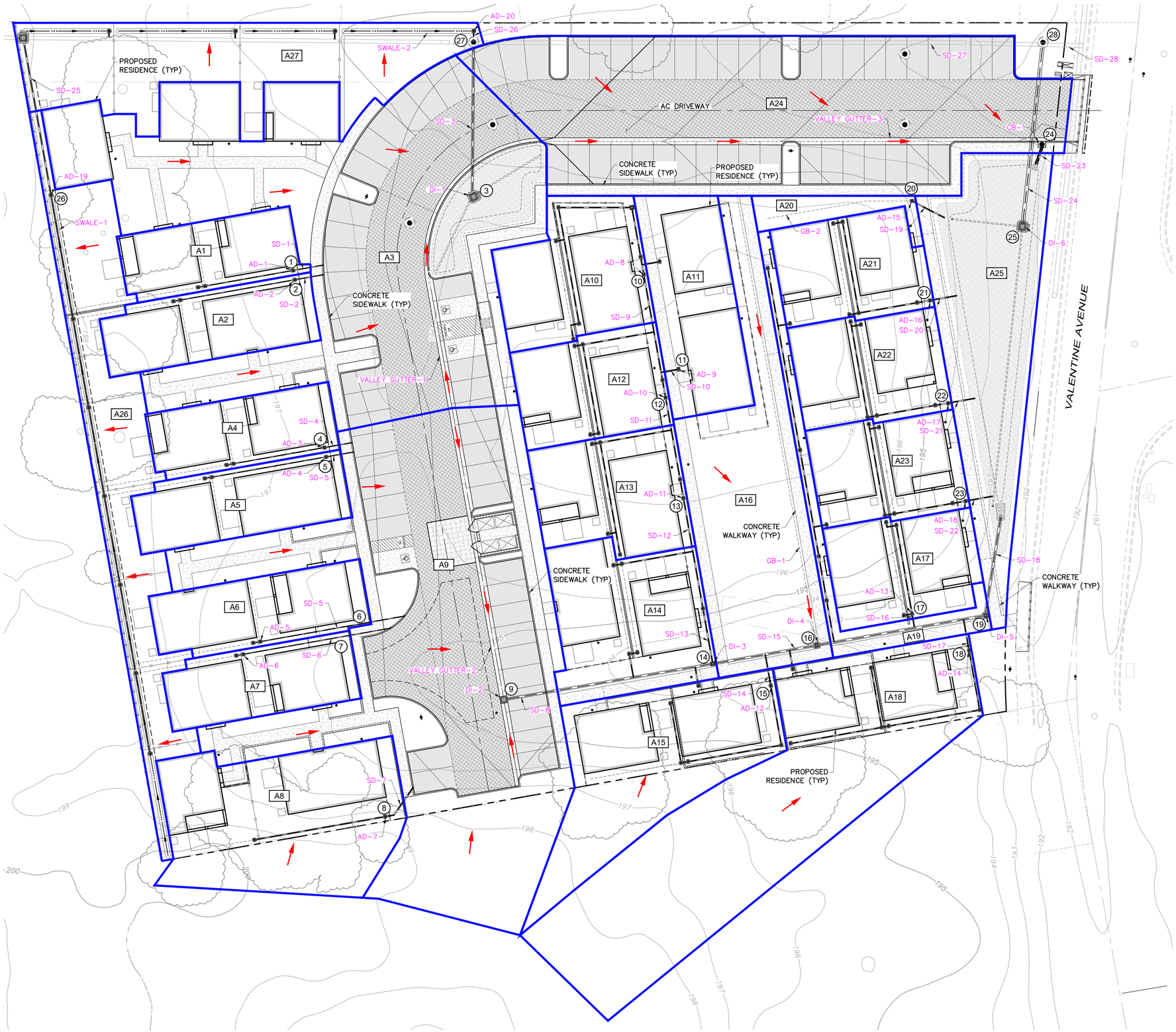
"A Service You Can Count On!"

# 4. Post-Construction Hydrology Map



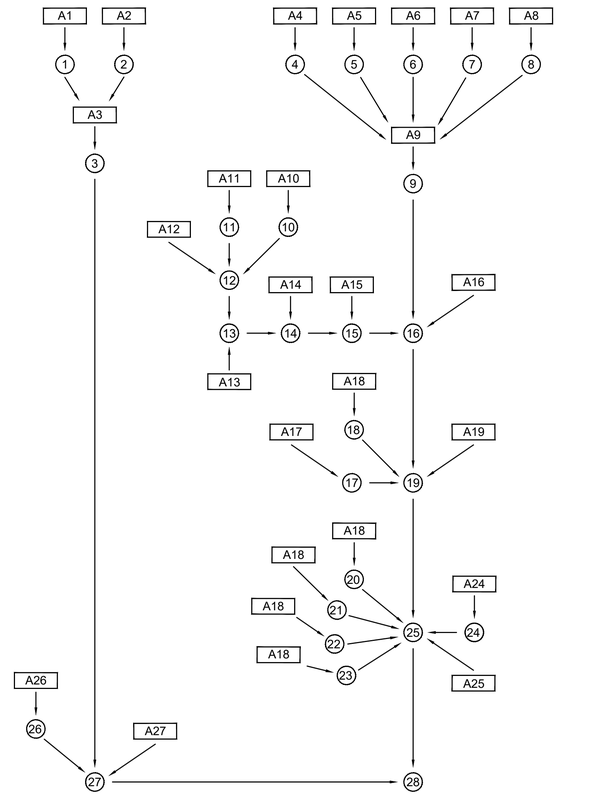

## DRAINAGE AREA LEGEND

| | |
|---|---|
| A1 | DRAINAGE AREA |
| 1 | POINT OF CONCENTRATION |
| ——— | DRAINAGE AREA BOUNDARY |
| – – – | PROPERTY LINE (℄) |
| ← | DIRECTION OF FLOW |

## DRAINAGE AREA TABLE

| | | | | | |
|---|---|---|---|---|---|
| A1 = 0.05 AC (2,147 SF) | A6 = 0.06 AC (2,558 SF) | A11 = 0.07 AC (3,250 SF) | A16 = 0.15 AC (6,666 SF) | A21 = 0.06 AC (2,625 SF) | A26 = 0.13 AC (5,661 SF) |
| A2 = 0.06 AC (2,582 SF) | A7 = 0.05 AC (2,307 SF) | A12 = 0.06 AC (2,714 SF) | A17 = 0.06 AC (2,654 SF) | A22 = 0.06 AC (2,772 SF) | A27 = 0.14 AC (5,934 SF) |
| A3 = 0.43 AC (18,662 SF) | A8 = 0.13 AC (5,718 SF) | A13 = 0.07 AC (2,986 SF) | A18 = 0.25 AC (11,072 SF) | A23 = 0.06 AC (2,646 SF) | |
| A4 = 0.05 AC (2,260 SF) | A9 = 0.44 AC (18,962 SF) | A14 = 0.09 AC (3,926 SF) | A19 = 0.04 AC (1,614 SF) | A24 = 0.34 AC (14,594 SF) | |
| A5 = 0.06 AC (2,583 SF) | A10 = 0.08 AC (3,285 SF) | A15 = 0.12 AC (5,304 SF) | A20 = 0.02 AC (744 SF) | A25 = 0.14 AC (6,271 SF) | |

## DRAINAGE ROUTING




20' 10' 0 10' 20' 40' 60'

Graphic Scale: 1" = 20'

December 10, 2025

# POST CONSTRUCTION HYDROLOGY MAP

VALENTINE AVENUE
8100 Valentine Avenue, Sebastopol, CA
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# 5. 10 and 100 Year Rational Method Drainage Study

# Incremental Rational Method Drainage Study

**10 -Yr Storm Event Post Construction**

**Project:** 25213-Valentine Avenue **Date:** 12/10/2025

| Point of Concentration | Area | Elevation | Distance | Slope | V(ft/s) | Travel Time (min) | Total Time (min) | I | C | A | $A_{total}$ | AC | Sum AC | Q (cfs) | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 year | | | | | | | | | | | | | | | |
| **ON SITE FLOW RATES** | | | | | | | | | | | | | | | |
| 1 | A 1 | - | - | - | - | 7.00 | 7.00 | 3.71 | 0.90 | 0.05 | 0.05 | 0.05 | 0.05 | 0.17 | Total Flow to AD-1, SD-1 |
| 2 | A 2 | - | - | - | - | 7.00 | 7.00 | 3.71 | 0.90 | 0.06 | 0.06 | 0.05 | 0.05 | 0.20 | Total Flow to AD-2, SD-2 |
| 3 | A 3 | - | - | - | - | 10.00 | 10.00 | 3.05 | 0.74 | 0.43 | 0.43 | 0.32 | 0.32 | 0.97 | Overland Flow to Valley Gutter-1, DI-1, SD-3 |
| 3 | | | | | | | 10.00 | Combines POC 1 Through POC 3 | | | | | 0.42 | 1.27 | Total Flow to Valley Gutter-1, DI-1, SD-3 |
| 4 | A 4 | - | - | - | - | 7.00 | 7.00 | 3.71 | 0.90 | 0.05 | 0.05 | 0.05 | 0.05 | 0.17 | Total Flow to AD-3, SD-4 |
| 5 | A 5 | - | - | - | - | 7.00 | 7.00 | 3.71 | 0.90 | 0.06 | 0.06 | 0.05 | 0.05 | 0.20 | Total Flow to AD-4, SD-5 |
| 6 | A 6 | - | - | - | - | 7.00 | 7.00 | 3.71 | 0.90 | 0.06 | 0.06 | 0.05 | 0.05 | 0.20 | Total Flow to AD-5, SD-6 |
| 7 | A 7 | - | - | - | - | 7.00 | 7.00 | 3.71 | 0.90 | 0.05 | 0.05 | 0.05 | 0.05 | 0.17 | Total Flow to AD-6, SD-6 |
| 8 | A 8 | - | - | - | - | 7.00 | 7.00 | 3.71 | 0.90 | 0.13 | 0.13 | 0.12 | 0.12 | 0.43 | Total Flow to AD-7, SD-7 |
| 9 | A 9 | - | - | - | - | 10.00 | 10.00 | 3.05 | 0.74 | 0.44 | 0.44 | 0.33 | 0.33 | 0.99 | Overland Flow to Valley Gutter-2, DI-2, SD-8 |
| 9 | | | | | | | 10.00 | Combines POC 4 Through POC 9 | | | | | 0.64 | 1.95 | Total Flow to Valley Gutter-2, DI-2, SD-8 |
| 10 | A 10 | - | - | - | - | 7.00 | 7.00 | 3.71 | 0.90 | 0.08 | 0.08 | 0.07 | 0.07 | 0.27 | Overland Flow to AD-8, SD-9 |
| 11 | A 11 | - | - | - | - | 7.00 | 7.00 | 3.71 | 0.90 | 0.07 | 0.07 | 0.06 | 0.06 | 0.23 | Overland Flow to AD-9, SD-10 |
| 12 | A 12 | - | - | - | - | 7.00 | 7.00 | 3.71 | 0.90 | 0.06 | 0.06 | 0.05 | 0.05 | 0.20 | Overland Flow to AD-10, SD-11 |
| 12 | | | | | | | 7.00 | Combines POC 10 Through POC 12 | | | | | 0.19 | 0.70 | Total Flow to SD-11 |
| 13 | A 13 | - | - | - | - | 7.00 | 7.00 | 3.71 | 0.90 | 0.07 | 0.07 | 0.06 | 0.06 | 0.23 | Overland Flow to AD-11, SD-12 |
| 13 | | | | | | | 7.00 | Combines POC 10 Through POC 13 | | | | | 0.25 | 0.93 | Total Flow to SD-12 |
| 14 | A 14 | - | - | - | - | 7.00 | 7.00 | 3.71 | 0.90 | 0.09 | 0.09 | 0.08 | 0.08 | 0.30 | Overland Flow to DI-3, SD-13 |
| 14 | | | | | | | 7.00 | Combines POC 10 Through POC 14 | | | | | 0.33 | 1.24 | Total Flow to SD-13 |
| 15 | A 15 | - | - | - | - | 7.00 | 7.00 | 3.71 | 0.90 | 0.12 | 0.12 | 0.11 | 0.11 | 0.40 | Overland Flow to AD-12, SD-14 |
| 16 | | | | | | | 10.00 | Combines POC 4 Through POC 15 | | | | | 1.08 | 3.30 | Total Flow to SD-15 |
| 16 | A 16 | - | - | - | - | 7.00 | 7.00 | 3.71 | 0.50 | 0.15 | 0.15 | 0.08 | 0.08 | 0.28 | Overland Flow to GB-1, DI-4, SD-18 |
| 17 | A 17 | - | - | - | - | 7.00 | 7.00 | 3.71 | 0.90 | 0.06 | 0.06 | 0.05 | 0.05 | 0.20 | Total Flow to AD-13, SD-16 |
| 18 | A 18 | - | - | - | - | 7.00 | 7.00 | 3.71 | 0.90 | 0.25 | 0.25 | 0.23 | 0.23 | 0.83 | Total Flow to AD-14, SD-17 |

| Point of Concentration | Area | Elevation | Distance | Slope | V(ft/s) | Travel Time (min) | Total Time (min) | I | C | A | $A_{total}$ | KAC | Sum KAC | Q (cfs) | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 19 | A 19 | - | - | - | - | 7.00 | 7.00 | 3.71 | 0.90 | 0.04 | 0.04 | 0.04 | 0.04 | 0.13 | Overland Flow to DI-5, SD-18 |
| 19 | | | | | | | 10.00 | Combines POC 4 Through POC 19 | | | | | 1.47 | 4.48 | Total Flow to SD-18 |
| 20 | A 20 | - | - | - | - | 7.00 | 7.00 | 3.71 | 0.90 | 0.02 | 0.02 | 0.02 | 0.02 | 0.07 | Total Flow to GB-2, AD-15, SD-19 |
| 21 | A 21 | - | - | - | - | 7.00 | 7.00 | 3.71 | 0.90 | 0.06 | 0.06 | 0.05 | 0.05 | 0.20 | Total Flow to AD-16, SD-20 |
| 22 | A 22 | - | - | - | - | 7.00 | 7.00 | 3.71 | 0.90 | 0.06 | 0.06 | 0.05 | 0.05 | 0.20 | Total Flow to AD-17, SD-21 |
| 23 | A 23 | - | - | - | - | 7.00 | 7.00 | 3.71 | 0.90 | 0.06 | 0.06 | 0.05 | 0.05 | 0.20 | Total Flow to AD-18, SD-22 |
| 24 | A 24 | - | - | - | - | 7.00 | 7.00 | 3.71 | 0.90 | 0.34 | 0.34 | 0.31 | 0.31 | 1.14 | Total Flow to CB-1, SD-23 |
| 25 | A 25 | - | - | - | - | 7.00 | 7.00 | 3.71 | 0.33 | 0.14 | 0.14 | 0.05 | 0.05 | 0.17 | Overland Flow to DI-6, SD-24 |
| 25 | | | | | | | 10.00 | Combines POC 4 Through POC 15 | | | | | 2.00 | 6.11 | Total Flow to DI-6, SD-24 |
| 26 | A 26 | - | - | - | - | 7.00 | 7.00 | 3.71 | 0.33 | 0.13 | 0.13 | 0.04 | 0.04 | 0.16 | Overland Flow to Swale-1, AD-19, SD-25 |
| 27 | A 27 | - | - | - | - | 7.00 | 7.00 | 3.71 | 0.33 | 0.14 | 0.14 | 0.05 | 0.05 | 0.17 | Overland Flow to Swale-2, AD-20, SD-26 |
| 27 | | | | | | | 7.00 | Combines POC 26 Through POC 27 | | | | | 0.09 | 0.33 | Total Flow to SD-27 |
| 28 | | | | | | | 10.00 | Combines POC 1 Through POC 28 | | | | | 2.51 | 7.65 | Total Flow to SD-28 |

**ON SITE - POST CONSTRUCTION RUNOFF COEFFICIENT**

| DRAINAGE AREA | ACRES | C | t (min) | LAND USE* | SOIL TYPE | AVE SLOPE (%) |
|---|---|---|---|---|---|---|
| A1 | 0.05 | 0.90 | 7.00 | HD | C | 0-2 |
| A2 | 0.06 | 0.90 | 7.00 | HD | C | 0-2 |
| A3 | 0.43 | 0.74 | 10.00 | MD | C | >2-6 |
| A4 | 0.05 | 0.90 | 7.00 | HD | C | 0-2 |
| A5 | 0.06 | 0.90 | 7.00 | HD | C | 0-2 |
| A6 | 0.06 | 0.90 | 7.00 | HD | C | 0-2 |
| A7 | 0.05 | 0.90 | 7.00 | HD | C | 0-2 |
| A8 | 0.13 | 0.90 | 7.00 | HD | C | >2-6 |
| A9 | 0.44 | 0.74 | 10.00 | MD | C | >2-6 |
| A10 | 0.08 | 0.90 | 7.00 | HD | C | 0-2 |
| A11 | 0.07 | 0.90 | 7.00 | HD | C | 0-2 |
| A12 | 0.06 | 0.90 | 7.00 | HD | C | 0-2 |
| A13 | 0.07 | 0.90 | 7.00 | HD | C | 0-2 |
| A14 | 0.09 | 0.90 | 7.00 | HD | C | 0-2 |
| A15 | 0.12 | 0.90 | 7.00 | HD | C | 0-2 |
| A16 | 0.15 | 0.50 | 7.00 | LD | C | 0-2 |
| A17 | 0.06 | 0.90 | 7.00 | HD | C | 0-2 |
| A18 | 0.25 | 0.90 | 7.00 | HD | C | 0-2 |
| A19 | 0.04 | 0.90 | 7.00 | HD | C | 0-2 |
| A20 | 0.02 | 0.90 | 7.00 | HD | C | 0-2 |
| A21 | 0.06 | 0.90 | 7.00 | HD | C | 0-2 |
| A22 | 0.06 | 0.90 | 7.00 | HD | C | 0-2 |
| A23 | 0.06 | 0.90 | 7.00 | HD | C | 0-2 |
| A24 | 0.34 | 0.90 | 7.00 | HD | C | 0-2 |
| A25 | 0.14 | 0.33 | 7.00 | R | C | 0-2 |
| A26 | 0.13 | 0.33 | 7.00 | R | C | 0-2 |
| A27 | 0.14 | 0.33 | 7.00 | R | C | 0-2 |

***Land Use Designation**

HD - High Density
LD - Low Density
MD - Medium Density
MLD - Medium/Low Density
R - Rural
B/C - Business or Commercial
I - Industrial
P - Parks and Recreation
AG - Agricultural or Open Space

Reference Table C-1 of the Sonoma County FMDM, 2020.

**Rainfall Intensity vs Duration**

$$I = 10.84 / t^{0.551}$$

**I** = intensity (in/hour)

**t** = time of concentration (minutes)

# Incremental Rational Method Drainage Study

**100 -Yr Storm Event Post Construction**

**Project:** 25213-Valentine Avenue **Date:** 12/10/2025

| Point of Concentration | Area | Elevation | Distance | Slope | V(ft/s) | Travel Time (min) | Total Time (min) | I | C | A | $A_{total}$ | AC | Sum AC | Q (cfs) | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 100 year | | | | | | | | | | | | | | | |
| **ON SITE FLOW RATES** | | | | | | | | | | | | | | | |
| 1 | A 1 | - | - | - | - | 7.00 | 7.00 | 5.35 | 0.90 | 0.05 | 0.05 | 0.05 | 0.05 | 0.24 | Total Flow to AD-1, SD-1 |
| 2 | A 2 | - | - | - | - | 7.00 | 7.00 | 5.35 | 0.90 | 0.06 | 0.06 | 0.05 | 0.05 | 0.29 | Total Flow to AD-2, SD-2 |
| 3 | A 3 | - | - | - | - | 10.00 | 10.00 | 4.39 | 0.74 | 0.43 | 0.43 | 0.32 | 0.32 | 1.40 | Overland Flow to Valley Gutter-1, DI-1, SD-3 |
| 3 | | | | | | | 10.00 | Combines POC 1 Through POC 3 | | | | | 0.42 | 1.83 | Total Flow to Valley Gutter-1, DI-1, SD-3 |
| 4 | A 4 | - | - | - | - | 7.00 | 7.00 | 5.35 | 0.90 | 0.05 | 0.05 | 0.05 | 0.05 | 0.24 | Total Flow to AD-3, SD-4 |
| 5 | A 5 | - | - | - | - | 7.00 | 7.00 | 5.35 | 0.90 | 0.06 | 0.06 | 0.05 | 0.05 | 0.29 | Total Flow to AD-4, SD-5 |
| 6 | A 6 | - | - | - | - | 7.00 | 7.00 | 5.35 | 0.90 | 0.06 | 0.06 | 0.05 | 0.05 | 0.29 | Total Flow to AD-5, SD-6 |
| 7 | A 7 | - | - | - | - | 7.00 | 7.00 | 5.35 | 0.90 | 0.05 | 0.05 | 0.05 | 0.05 | 0.24 | Total Flow to AD-6, SD-6 |
| 8 | A 8 | - | - | - | - | 7.00 | 7.00 | 5.35 | 0.90 | 0.13 | 0.13 | 0.12 | 0.12 | 0.63 | Total Flow to AD-7, SD-7 |
| 9 | A 9 | - | - | - | - | 10.00 | 10.00 | 4.39 | 0.74 | 0.44 | 0.44 | 0.33 | 0.33 | 1.43 | Overland Flow to Valley Gutter-2, DI-2, SD-8 |
| 9 | | | | | | | 10.00 | Combines POC 4 Through POC 9 | | | | | 0.64 | 2.81 | Total Flow to Valley Gutter-2, DI-2, SD-8 |
| 10 | A 10 | - | - | - | - | 7.00 | 7.00 | 5.35 | 0.90 | 0.08 | 0.08 | 0.07 | 0.07 | 0.38 | Overland Flow to AD-8, SD-9 |
| 11 | A 11 | - | - | - | - | 7.00 | 7.00 | 5.35 | 0.90 | 0.07 | 0.07 | 0.06 | 0.06 | 0.34 | Overland Flow to AD-9, SD-10 |
| 12 | A 12 | - | - | - | - | 7.00 | 7.00 | 5.35 | 0.90 | 0.06 | 0.06 | 0.05 | 0.05 | 0.29 | Overland Flow to AD-10, SD-11 |
| 12 | | | | | | | 7.00 | Combines POC 10 Through POC 12 | | | | | 0.19 | 1.01 | Total Flow to SD-11 |
| 13 | A 13 | - | - | - | - | 7.00 | 7.00 | 5.35 | 0.90 | 0.07 | 0.07 | 0.06 | 0.06 | 0.34 | Overland Flow to AD-11, SD-12 |
| 13 | | | | | | | 7.00 | Combines POC 10 Through POC 13 | | | | | 0.25 | 1.35 | Total Flow to SD-12 |
| 14 | A 14 | - | - | - | - | 7.00 | 7.00 | 5.35 | 0.90 | 0.09 | 0.09 | 0.08 | 0.08 | 0.43 | Overland Flow to DI-3, SD-13 |
| 14 | | | | | | | 7.00 | Combines POC 10 Through POC 14 | | | | | 0.33 | 1.78 | Total Flow to SD-13 |
| 15 | A 15 | - | - | - | - | 7.00 | 7.00 | 5.35 | 0.90 | 0.12 | 0.12 | 0.11 | 0.11 | 0.58 | Overland Flow to AD-12, SD-14 |
| 16 | | | | | | | 10.00 | Combines POC 4 Through POC 15 | | | | | 1.08 | 4.75 | Total Flow to SD-15 |
| 16 | A 16 | - | - | - | - | 7.00 | 7.00 | 5.35 | 0.50 | 0.15 | 0.15 | 0.08 | 0.08 | 0.40 | Overland Flow to GB-1, DI-4, SD-18 |
| 17 | A 17 | - | - | - | - | 7.00 | 7.00 | 5.35 | 0.90 | 0.06 | 0.06 | 0.05 | 0.05 | 0.29 | Total Flow to AD-13, SD-16 |
| 18 | A 18 | - | - | - | - | 7.00 | 7.00 | 5.35 | 0.90 | 0.25 | 0.25 | 0.23 | 0.23 | 1.20 | Total Flow to AD-14, SD-17 |

| Point of Concentration | Area | Elevation | Distance | Slope | V(ft/s) | Travel Time (min) | Total Time (min) | I | C | A | $A_{total}$ | KAC | Sum KAC | Q (cfs) | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 19 | A 19 | - | - | - | - | 7.00 | 7.00 | 5.35 | 0.90 | 0.04 | 0.04 | 0.04 | 0.04 | 0.19 | Overland Flow to DI-5, SD-18 |
| 19 | | | | | | | 10.00 | Combines POC 4 Through POC 19 | | | | | 1.47 | 6.47 | Total Flow to SD-18 |
| 20 | A 20 | - | - | - | - | 7.00 | 7.00 | 5.35 | 0.90 | 0.02 | 0.02 | 0.02 | 0.02 | 0.10 | Total Flow to GB-2, AD-15, SD-19 |
| 21 | A 21 | - | - | - | - | 7.00 | 7.00 | 5.35 | 0.90 | 0.06 | 0.06 | 0.05 | 0.05 | 0.29 | Total Flow to AD-16, SD-20 |
| 22 | A 22 | - | - | - | - | 7.00 | 7.00 | 5.35 | 0.90 | 0.06 | 0.06 | 0.05 | 0.05 | 0.29 | Total Flow to AD-17, SD-21 |
| 23 | A 23 | - | - | - | - | 7.00 | 7.00 | 5.35 | 0.90 | 0.06 | 0.06 | 0.05 | 0.05 | 0.29 | Total Flow to AD-18, SD-22 |
| 24 | A 24 | - | - | - | - | 7.00 | 7.00 | 5.35 | 0.90 | 0.34 | 0.34 | 0.31 | 0.31 | 1.64 | Total Flow to CB-1, SD-23 |
| 25 | A 25 | - | - | - | - | 7.00 | 7.00 | 5.35 | 0.33 | 0.14 | 0.14 | 0.05 | 0.05 | 0.25 | Overland Flow to DI-6, SD-24 |
| 25 | | | | | | | 10.00 | Combines POC 4 Through POC 15 | | | | | 2.00 | 8.80 | Total Flow to DI-6, SD-24 |
| 26 | A 26 | - | - | - | - | 7.00 | 7.00 | 5.35 | 0.33 | 0.13 | 0.13 | 0.04 | 0.04 | 0.23 | Overland Flow to Swale-1, AD-19, SD-25 |
| 27 | A 27 | - | - | - | - | 7.00 | 7.00 | 5.35 | 0.33 | 0.14 | 0.14 | 0.05 | 0.05 | 0.25 | Overland Flow to Swale-2, AD-20, SD-26 |
| 27 | | | | | | | 7.00 | Combines POC 26 Through POC 27 | | | | | 0.09 | 0.48 | Total Flow to SD-27 |
| 28 | | | | | | | 10.00 | Combines POC 1 Through POC 28 | | | | | 2.51 | 11.03 | Total Flow to SD-28 |

**ON SITE - POST CONSTRUCTION RUNOFF COEFFICIENT**

| DRAINAGE AREA | ACRES | C | t (min) | LAND USE* | SOIL TYPE | AVE SLOPE (%) |
|---|---|---|---|---|---|---|
| A1 | 0.05 | 0.90 | 7.00 | HD | C | 0-2 |
| A2 | 0.06 | 0.90 | 7.00 | HD | C | 0-2 |
| A3 | 0.43 | 0.74 | 10.00 | MD | C | >2-6 |
| A4 | 0.05 | 0.90 | 7.00 | HD | C | 0-2 |
| A5 | 0.06 | 0.90 | 7.00 | HD | C | 0-2 |
| A6 | 0.06 | 0.90 | 7.00 | HD | C | 0-2 |
| A7 | 0.05 | 0.90 | 7.00 | HD | C | 0-2 |
| A8 | 0.13 | 0.90 | 7.00 | HD | C | >2-6 |
| A9 | 0.44 | 0.74 | 10.00 | MD | C | >2-6 |
| A10 | 0.08 | 0.90 | 7.00 | HD | C | 0-2 |
| A11 | 0.07 | 0.90 | 7.00 | HD | C | 0-2 |
| A12 | 0.06 | 0.90 | 7.00 | HD | C | 0-2 |
| A13 | 0.07 | 0.90 | 7.00 | HD | C | 0-2 |
| A14 | 0.09 | 0.90 | 7.00 | HD | C | 0-2 |
| A15 | 0.12 | 0.90 | 7.00 | HD | C | 0-2 |
| A16 | 0.15 | 0.50 | 7.00 | LD | C | 0-2 |
| A17 | 0.06 | 0.90 | 7.00 | HD | C | 0-2 |
| A18 | 0.25 | 0.90 | 7.00 | HD | C | 0-2 |
| A19 | 0.04 | 0.90 | 7.00 | HD | C | 0-2 |
| A20 | 0.02 | 0.90 | 7.00 | HD | C | 0-2 |
| A21 | 0.06 | 0.90 | 7.00 | HD | C | 0-2 |
| A22 | 0.06 | 0.90 | 7.00 | HD | C | 0-2 |
| A23 | 0.06 | 0.90 | 7.00 | HD | C | 0-2 |
| A24 | 0.34 | 0.90 | 7.00 | HD | C | 0-2 |
| A25 | 0.14 | 0.33 | 7.00 | R | C | 0-2 |
| A26 | 0.13 | 0.33 | 7.00 | R | C | 0-2 |
| A27 | 0.14 | 0.33 | 7.00 | R | C | 0-2 |

***Land Use Designation**

HD - High Density
LD - Low Density
MD - Medium Density
MLD - Medium/Low Density
R - Rural
B/C - Business or Commercial
I - Industrial
P - Parks and Recreation
AG - Agricultural or Open Space

Reference Table C-1 of the Sonoma County FMDM, 2020.

**Rainfall Intensity vs Duration**

$$I = 15.59 / t^{0.55}$$

**I** = intensity (in/hour)

**t** = time of concentration (minutes)

**Table C-1**. Runoff Coefficients (*Cs*) (Incremental Rational Method)

| Land Use | Lot Size (acres) | Impervious Fraction | Average Slope (%) | | | |
|---|---|---|---|---|---|---|
| | | | 0-2 | >2-6 | >6-12 | >12 |
| **Soil Type A** | | | | | | |
| Residential[1] | | | | | | |
| Rural | | 0.03 | 0.24 | 0.28 | 0.34 | 0.38 |
| Very low density | 2 | 0.11 | 0.29 | 0.34 | 0.38 | 0.42 |
| | 1 | 0.24 | 0.38 | 0.42 | 0.46 | 0.49 |
| Low density | 1/2 | 0.32 | 0.43 | 0.47 | 0.50 | 0.53 |
| | 1/3 | 0.41 | 0.50 | 0.53 | 0.56 | 0.58 |
| Medium-low density | 1/4 | 0.49 | 0.55 | 0.58 | 0.60 | 0.62 |
| Medium density | 1/8 | 0.70 | 0.70 | 0.71 | 0.73 | 0.74 |
| Medium-high density | 1/18 | 1 | 0.90 | 0.90 | 0.90 | 0.90 |
| Business, commercial, etc. | | 1 | 0.90 | 0.90 | 0.90 | 0.90 |
| General industrial | | 1 | 0.90 | 0.90 | 0.90 | 0.90 |
| Parks and recreation | | 0.05 | 0.25 | 0.25 | 0.30 | 0.35 |
| Ag and open space | | 0.02 | 0.23 | 0.23 | 0.28 | 0.33 |
| **Soil Type B** | | | | | | |
| Residential[1] | | | | | | |
| Rural | | 0.03 | 0.28 | 0.33 | 0.39 | 0.43 |
| Very low density | 2 | 0.11 | 0.34 | 0.38 | 0.43 | 0.47 |
| | 1 | 0.24 | 0.42 | 0.45 | 0.50 | 0.53 |
| Low density | 1/2 | 0.32 | 0.47 | 0.50 | 0.54 | 0.57 |
| | 1/3 | 0.41 | 0.53 | 0.56 | 0.59 | 0.61 |
| Medium-low density | 1/4 | 0.49 | 0.58 | 0.60 | 0.63 | 0.65 |
| Medium density | 1/8 | 0.70 | 0.71 | 0.73 | 0.74 | 0.76 |
| Medium-high density | 1/18 | 1 | 0.90 | 0.90 | 0.90 | 0.90 |
| Business, commercial, etc. | | 1 | 0.90 | 0.90 | 0.90 | 0.90 |
| General industrial | | 1 | 0.90 | 0.90 | 0.90 | 0.90 |
| Parks and recreation | | 0.05 | 0.25 | 0.30 | 0.34 | 0.40 |
| Ag and open space | | 0.02 | 0.23 | 0.28 | 0.33 | 0.38 |
| **Soil Type C** | | | | | | |
| Residential[1] | | | | | | |
| Rural | | 0.03 | 0.33 | 0.38 | 0.43 | 0.47 |
| Very low density | 2 | 0.11 | 0.38 | 0.42 | 0.47 | 0.51 |
| | 1 | 0.24 | 0.45 | 0.49 | 0.53 | 0.57 |
| Low density | 1/2 | 0.32 | 0.50 | 0.53 | 0.57 | 0.60 |

| Land Use | Lot Size (acres) | Impervious Fraction | Average Slope (%) | | | |
|---|---|---|---|---|---|---|
| | | | 0-2 | >2-6 | >6-12 | >12 |
| | 1/3 | 0.41 | 0.56 | 0.59 | 0.62 | 0.64 |
| Medium-low density | 1/4 | 0.49 | 0.60 | 0.63 | 0.65 | 0.68 |
| Medium density | 1/8 | 0.70 | 0.73 | 0.74 | 0.76 | 0.77 |
| Medium-high density | 1/18 | 1 | 0.90 | 0.90 | 0.90 | 0.90 |
| Business, commercial, etc. | | 1 | 0.90 | 0.90 | 0.90 | 0.90 |
| General industrial | | 1 | 0.90 | 0.90 | 0.90 | 0.90 |
| Parks and recreation | | 0.05 | 0.34 | 0.39 | 0.44 | 0.48 |
| Ag and open space | | 0.02 | 0.33 | 0.38 | 0.43 | 0.47 |
| **Soil Type D** | | | | | | |
| Residential[1] | | | | | | |
| Rural | | 0.03 | 0.38 | 0.43 | 0.48 | 0.52 |
| Very low density | 2 | 0.11 | 0.42 | 0.47 | 0.52 | 0.55 |
| | 1 | 0.24 | 0.49 | 0.53 | 0.57 | 0.60 |
| Low density | 1/2 | 0.32 | 0.54 | 0.57 | 0.61 | 0.63 |
| | 1/3 | 0.41 | 0.59 | 0.62 | 0.65 | 0.67 |
| Medium-low density | 1/4 | 0.49 | 0.63 | 0.65 | 0.68 | 0.70 |
| Medium density | 1/8 | 0.70 | 0.74 | 0.76 | 0.77 | 0.78 |
| Medium-high density | 1/18 | 1 | 0.90 | 0.90 | 0.90 | 0.90 |
| Business, commercial | | 1 | 0.90 | 0.90 | 0.90 | 0.90 |
| General industrial | | 1 | 0.90 | 0.90 | 0.90 | 0.90 |
| Parks and recreation | | 0.05 | 0.39 | 0.44 | 0.49 | 0.53 |
| Ag and open space | | 0.02 | 0.38 | 0.42 | 0.48 | 0.52 |

[1] *Percent impervious values are based on analysis conducted by ESA for Sonoma County Water Agency (Sonoma Water) in 2014, using a sample of existing developed areas.*

[2] *For residential areas, composite* C *values were developed as follows:* C *values for soil type from Los Angeles County Hydrology Manual (1991) were modified for slope using the vegetated areas curve from Plate B-1 of SCWA (1983) for pervious areas within a given slope range and a* C *of 0.90 for all impervious areas.*

*Source: Approach adapted from McCuen 1989*

# Intensity Duration Frequency Curve (IDF Curve)

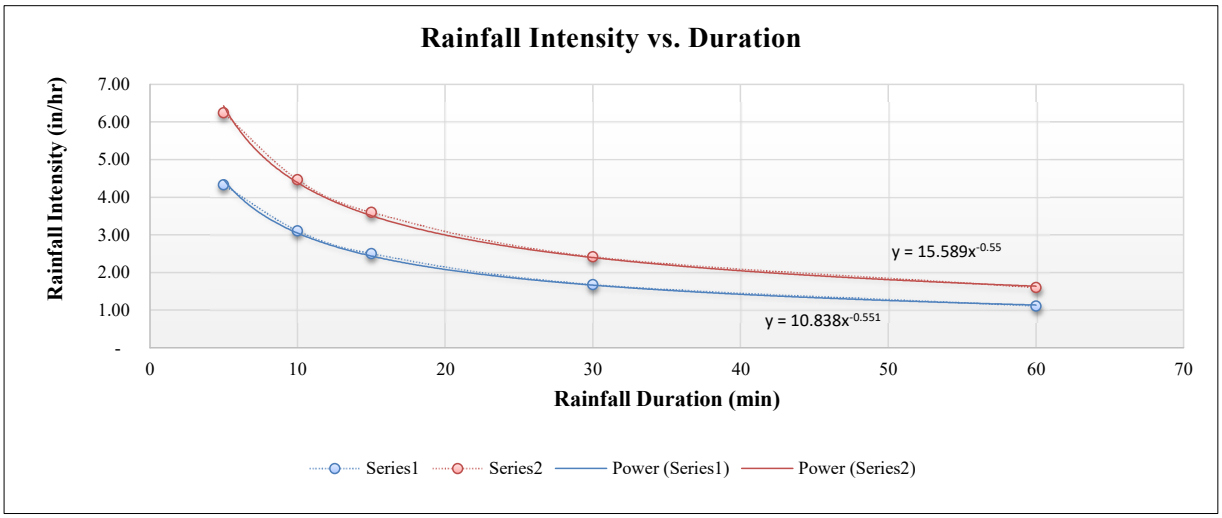
**NOAA Atlas 14 Point Precipitation Frequency Estimates**

https://hdsc.nws.noaa.gov/hdsc/pfds/pfds_map_cont.html

**Project:** Valentine Avenue
**JN:** 25213

**Date:** 12/10/2025
**Designer:** KM

**Location:** Sebastopol, CA




| NOAA Atlas 14 Data Rainfall Intensity (in/hr) | | |
|---|---|---|
| **Duration (min)** | **10-yr** | **100-yr** |
| 5 | 4.33 | 6.24 |
| 10 | 3.11 | 4.47 |
| 15 | 2.50 | 3.60 |
| 30 | 1.68 | 2.42 |
| 60 | 1.11 | 1.60 |

**Rainfall Intensity vs Duration**

$$I = a * t^{b}$$

**I =** intensity (in/hour)
**t =** time of concentration/ rainfall duration (minutes)

| 10-Year Trendline Values | |
|---|---|
| a = | 10.838 |
| b = | -0.551 |

| 100-Year Trendline Values | |
|---|---|
| a = | 15.589 |
| b = | -0.55 |

**NOAA Atlas 14, Volume 6, Version 2**
**Location name: Sebastopol, California, USA***
**Latitude: 38.4027°, Longitude: -122.8422°**
**Elevation: 197 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 | **2.50** (2.22-2.83) | **3.05** (2.71-3.47) | **3.77** (3.34-4.30) | **4.33** (3.80-4.99) | **5.09** (4.30-6.11) | **5.66** (4.66-6.96) | **6.24** (4.98-7.90) | **6.82** (5.26-8.92) | **7.58** (5.57-10.4) | **8.16** (5.76-11.7) |
| 10-min | **1.79** (1.59-2.03) | **2.19** (1.94-2.49) | **2.70** (2.39-3.08) | **3.11** (2.72-3.58) | **3.65** (3.08-4.37) | **4.06** (3.34-4.99) | **4.47** (3.56-5.66) | **4.88** (3.77-6.39) | **5.43** (4.00-7.46) | **5.85** (4.13-8.37) |
| 15-min | **1.44** (1.28-1.64) | **1.76** (1.57-2.00) | **2.18** (1.93-2.48) | **2.50** (2.20-2.88) | **2.94** (2.48-3.53) | **3.27** (2.69-4.02) | **3.60** (2.88-4.56) | **3.94** (3.04-5.15) | **4.38** (3.22-6.02) | **4.72** (3.33-6.75) |
| 30-min | **0.970** (0.862-1.10) | **1.19** (1.05-1.35) | **1.46** (1.30-1.67) | **1.68** (1.48-1.94) | **1.98** (1.67-2.37) | **2.20** (1.81-2.71) | **2.42** (1.93-3.07) | **2.65** (2.04-3.46) | **2.94** (2.16-4.05) | **3.17** (2.24-4.54) |
| 60-min | **0.642** (0.571-0.729) | **0.785** (0.697-0.892) | **0.968** (0.857-1.10) | **1.11** (0.977-1.28) | **1.31** (1.10-1.57) | **1.46** (1.20-1.79) | **1.60** (1.28-2.03) | **1.75** (1.35-2.29) | **1.95** (1.43-2.68) | **2.10** (1.48-3.00) |
| 2-hr | **0.471** (0.419-0.535) | **0.574** (0.510-0.652) | **0.703** (0.622-0.802) | **0.804** (0.705-0.926) | **0.936** (0.789-1.12) | **1.03** (0.849-1.27) | **1.13** (0.901-1.43) | **1.22** (0.945-1.60) | **1.35** (0.990-1.85) | **1.44** (1.02-2.06) |
| 3-hr | **0.390** (0.347-0.443) | **0.475** (0.422-0.540) | **0.581** (0.514-0.663) | **0.663** (0.581-0.764) | **0.769** (0.648-0.922) | **0.847** (0.695-1.04) | **0.922** (0.736-1.17) | **0.996** (0.769-1.30) | **1.09** (0.802-1.50) | **1.16** (0.820-1.66) |
| 6-hr | **0.290** (0.258-0.329) | **0.355** (0.315-0.403) | **0.434** (0.384-0.495) | **0.495** (0.434-0.570) | **0.572** (0.482-0.686) | **0.628** (0.516-0.772) | **0.681** (0.544-0.863) | **0.733** (0.566-0.960) | **0.799** (0.588-1.10) | **0.847** (0.598-1.21) |
| 12-hr | **0.199** (0.177-0.226) | **0.250** (0.222-0.284) | **0.311** (0.275-0.354) | **0.356** (0.313-0.411) | **0.414** (0.349-0.497) | **0.455** (0.374-0.560) | **0.494** (0.394-0.625) | **0.531** (0.410-0.695) | **0.578** (0.425-0.794) | **0.611** (0.431-0.875) |
| 24-hr | **0.131** (0.118-0.149) | **0.169** (0.151-0.192) | **0.213** (0.191-0.243) | **0.247** (0.219-0.283) | **0.288** (0.248-0.341) | **0.317** (0.268-0.382) | **0.344** (0.285-0.424) | **0.370** (0.299-0.468) | **0.403** (0.313-0.529) | **0.426** (0.320-0.577) |
| 2-day | **0.091** (0.082-0.103) | **0.117** (0.105-0.133) | **0.147** (0.132-0.168) | **0.170** (0.151-0.195) | **0.198** (0.171-0.235) | **0.218** (0.184-0.263) | **0.236** (0.196-0.291) | **0.254** (0.205-0.321) | **0.276** (0.214-0.362) | **0.291** (0.219-0.395) |
| 3-day | **0.070** (0.063-0.079) | **0.089** (0.080-0.102) | **0.113** (0.101-0.128) | **0.130** (0.116-0.149) | **0.151** (0.131-0.179) | **0.166** (0.141-0.200) | **0.180** (0.149-0.222) | **0.193** (0.156-0.245) | **0.210** (0.163-0.275) | **0.221** (0.166-0.300) |
| 4-day | **0.059** (0.053-0.066) | **0.075** (0.067-0.085) | **0.094** (0.084-0.107) | **0.109** (0.097-0.125) | **0.126** (0.109-0.149) | **0.139** (0.117-0.167) | **0.150** (0.124-0.185) | **0.161** (0.130-0.204) | **0.175** (0.136-0.229) | **0.184** (0.139-0.250) |
| 7-day | **0.042** (0.038-0.047) | **0.053** (0.048-0.061) | **0.067** (0.060-0.076) | **0.077** (0.069-0.089) | **0.090** (0.077-0.106) | **0.098** (0.083-0.119) | **0.107** (0.088-0.131) | **0.114** (0.092-0.145) | **0.124** (0.096-0.163) | **0.130** (0.098-0.177) |
| 10-day | **0.033** (0.030-0.038) | **0.042** (0.038-0.048) | **0.053** (0.048-0.061) | **0.061** (0.054-0.070) | **0.071** (0.061-0.084) | **0.078** (0.066-0.094) | **0.084** (0.070-0.104) | **0.091** (0.073-0.115) | **0.098** (0.076-0.129) | **0.103** (0.078-0.140) |
| 20-day | **0.022** (0.020-0.025) | **0.028** (0.025-0.032) | **0.035** (0.032-0.040) | **0.041** (0.036-0.047) | **0.047** (0.041-0.056) | **0.052** (0.044-0.062) | **0.056** (0.046-0.069) | **0.060** (0.048-0.075) | **0.064** (0.050-0.085) | **0.068** (0.051-0.092) |
| 30-day | **0.018** (0.016-0.020) | **0.022** (0.020-0.026) | **0.028** (0.025-0.032) | **0.032** (0.029-0.037) | **0.037** (0.032-0.044) | **0.041** (0.035-0.049) | **0.044** (0.036-0.054) | **0.047** (0.038-0.060) | **0.051** (0.039-0.067) | **0.053** (0.040-0.072) |
| 45-day | **0.014** (0.013-0.016) | **0.018** (0.016-0.021) | **0.023** (0.020-0.026) | **0.026** (0.023-0.030) | **0.030** (0.026-0.036) | **0.033** (0.028-0.040) | **0.036** (0.029-0.044) | **0.038** (0.030-0.048) | **0.041** (0.032-0.054) | **0.043** (0.032-0.058) |
| 60-day | **0.013** (0.011-0.015) | **0.016** (0.014-0.018) | **0.020** (0.018-0.023) | **0.023** (0.020-0.026) | **0.026** (0.023-0.031) | **0.029** (0.024-0.035) | **0.031** (0.026-0.038) | **0.033** (0.027-0.042) | **0.035** (0.027-0.047) | **0.037** (0.028-0.050) |

[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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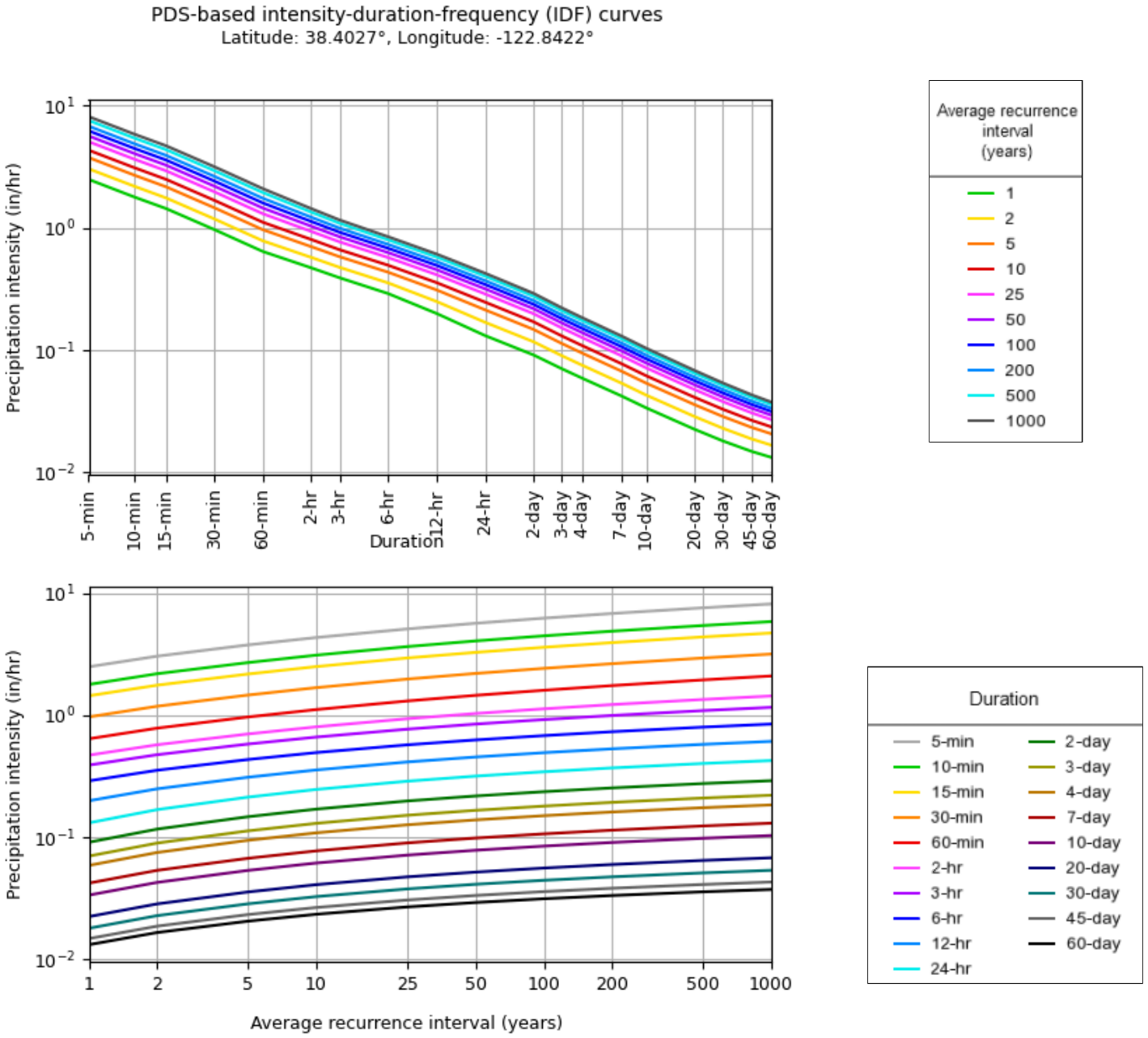
## PF graphical




NOAA Atlas 14, Volume 6, Version 2

Created (GMT): Thu Oct 23 16:25:01 2025

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## Maps & aerials

**Small scale terrain**


**Large scale terrain**


**Large scale map**


**Large scale aerial**


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US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

# 6. Inlet Capacity Calculations

# Inlet Capacity Calculations

**10-Year Storm Event**
**Post Construction**

**Project:** **8100 Valentine Avenue** **Date:** 12/10/2025

**JN:** **25213**

| Structure | p or b (ft) | Q (cfs) | H (ft) | GR Elev. | Ponding Elev. | Grate Notes |
|---|---|---|---|---|---|---|
| **AD-1** | 1.57 | 0.17 | 0.11 | 197.50 | 197.61 | 6" Area Drain |
| **AD-2** | 1.57 | 0.20 | 0.12 | 198.10 | 198.22 | 6" Area Drain |
| **AD-3** | 1.57 | 0.17 | 0.11 | 198.40 | 198.51 | 6" Area Drain |
| **AD-4** | 1.57 | 0.20 | 0.12 | 198.40 | 198.52 | 6" Area Drain |
| **AD-5** | 1.57 | 0.20 | 0.12 | 198.60 | 198.72 | 6" Area Drain |
| **AD-6** | 1.57 | 0.17 | 0.11 | 198.80 | 198.91 | 6" Area Drain |
| **AD-7** | 2.09 | 0.43 | 0.17 | 199.00 | 199.17 | 8" Area Drain |
| **AD-8** | 2.09 | 0.27 | 0.12 | 194.90 | 195.02 | 8" Area Drain |
| **AD-9** | 2.09 | 0.23 | 0.11 | 194.90 | 195.01 | 8" Area Drain |
| **AD-10** | 2.09 | 0.20 | 0.10 | 195.20 | 195.30 | 8" Area Drain |
| **AD-11** | 2.09 | 0.23 | 0.11 | 195.10 | 195.21 | 8" Area Drain |
| **AD-12** | 1.57 | 0.40 | 0.19 | 195.20 | 195.39 | 6" Area Drain |
| **AD-13** | 1.57 | 0.20 | 0.12 | 193.10 | 193.22 | 6" Area Drain |
| **AD-14** | 2.09 | 0.83 | 0.26 | 192.40 | 192.66 | 8" Area Drain |
| **AD-15** | 1.57 | 0.07 | 0.06 | 192.60 | 192.66 | 6" Area Drain |
| **AD-16** | 1.57 | 0.20 | 0.12 | 192.90 | 193.02 | 6" Area Drain |
| **AD-17** | 1.57 | 0.20 | 0.12 | 192.90 | 193.02 | 6" Area Drain |
| **AD-18** | 1.57 | 0.20 | 0.12 | 192.90 | 193.02 | 6" Area Drain |
| **AD-19** | 2.09 | 0.16 | 0.09 | 197.00 | 197.09 | 8" Area Drain |
| **AD-20** | 2.09 | 0.17 | 0.09 | 195.10 | 195.19 | 8" Area Drain |
| **DI-1** | 4.00 | 1.27 | 0.22 | 194.70 | 194.92 | Oldcastle Model DI-2424 |
| **DI-2** | 4.00 | 1.95 | 0.30 | 195.00 | 195.30 | Oldcastle Model DI-2424 |
| **DI-3** | 4.00 | 0.30 | 0.09 | 194.80 | 194.89 | Oldcastle Model DI-2424 |
| **DI-4** | 4.00 | 0.28 | 0.08 | 194.00 | 194.08 | Oldcastle Model DI-2424 |
| **DI-5** | 4.00 | 0.13 | 0.05 | 192.20 | 192.25 | Oldcastle Model DI-2424 |
| **DI-6** | 4.00 | 6.11 | 0.64 | 190.50 | 191.14 | Oldcastle Model DI-2424 |

**Grate Equation:**

Flow through top grate: $H = (Q/3.0*p))^{2/3}$

**Where:** p = 1/2 grate perimeter (ft)

H = water depth (ft) from top grate

# 7. 100 Year Overland Release Map

DRAINAGE AREA LEGEND

PROPERTY LINE (℄)

DIRECTION OF FLOW

100-YEAR OVERLAND RELEASE ROUTE

197.7 SLAB
197.7 SLAB
198.4 SLAB
198.4 SLAB
198.4 SLAB
198.7 SLAB
198.7 SLAB
199.3 SLAB
199.3 SLAB
199.3 SLAB
199.3 SLAB
199.5 SLAB
199.5 SLAB
199.7 SLAB
199.7 SLAB
200.0 SLAB
200.0 SLAB
197.0 SLAB
196.0 SLAB
196.0 SLAB
197.0 SLAB
196.0 SLAB
197.0 SLAB
196.0 SLAB
196.0 SLAB
197.5 SLAB
196.0 SLAB
195.0 SLAB
194.0 SLAB
195.0 SLAB
194.0 SLAB
195.0 SLAB
194.0 SLAB
194.3 SLAB
193.2 SLAB

VALENTINE AVENUE

20' 10' 0 10' 20' 40' 60'

Graphic Scale: 1" = 20'

December 10, 2025

# 100 YEAR OVERLAND RELEASE MAP

VALENTINE AVENUE
8100 Valentine Avenue, Sebastopol, CA
APN 004-510-054

adobe associates, inc.
civil engineering I land surveying I wastewater
1220 N. Dutton Ave., Santa Rosa, CA 95401
P. (707) 541-2300 F. (707) 541-2301
Website: www.adobeinc.com
"A Service You Can Count On!"

T:\2025 PROJECTS\25213\dwg\Adobe-Design\Const Docs\Drainage\25213-100 Year Overland Release Map.dwg, Koi Murata, 12/10/2025 4:07:56 PM

# Appendix I

# Stormdrain/ Grade Break Analysis

# Hydraulic Analysis Report

## Project Data

Project Title: 25213-Valentine Avenue

Designer: KM

Project Date: Wednesday, December 10, 2025

Project Units: U.S. Customary Units

Notes:

## Channel Analysis: SD-1

Notes:

## Input Parameters

Channel Type: Circular

Pipe Diameter: 0.5000 ft

Longitudinal Slope: 0.0100 ft/ft

Manning's n: 0.0120

Flow: 0.1700 cfs

## Result Parameters

Depth: 0.1808 ft

Area of Flow: 0.0640 ft^2

Wetted Perimeter: 0.6453 ft

Hydraulic Radius: 0.0993 ft

Average Velocity: 2.6545 ft/s

Top Width: 0.4805 ft

Froude Number: 1.2813

Critical Depth: 0.2058 ft

Critical Velocity: 2.2311 ft/s

Critical Slope: 0.0062 ft/ft

Critical Top Width: 0.49 ft

Calculated Max Shear Stress: 0.1128 lb/ft^2

Calculated Avg Shear Stress: 0.0619 lb/ft^2

## Channel Analysis: SD-2

Notes:

## Input Parameters

Channel Type: Circular

Pipe Diameter: 0.5000 ft

Longitudinal Slope: 0.0100 ft/ft

Manning's n: 0.0120

Flow: 0.2000 cfs

## Result Parameters

Depth: 0.1974 ft

Area of Flow: 0.0721 ft^2

Wetted Perimeter: 0.6794 ft

Hydraulic Radius: 0.1061 ft

Average Velocity: 2.7750 ft/s

Top Width: 0.4888 ft

Froude Number: 1.2736

Critical Depth: 0.2239 ft

Critical Velocity: 2.3492 ft/s

Critical Slope: 0.0064 ft/ft

Critical Top Width: 0.50 ft

Calculated Max Shear Stress: 0.1232 lb/ft^2

Calculated Avg Shear Stress: 0.0662 lb/ft^2

## Channel Analysis: SD-3

Notes:

## Input Parameters

Channel Type: Circular

Pipe Diameter: 1.0000 ft

Longitudinal Slope: 0.0100 ft/ft

Manning's n: 0.0120

Flow: 1.2700 cfs

## Result Parameters

Depth: 0.3948 ft

Area of Flow: 0.2883 ft^2

Wetted Perimeter: 1.3588 ft

Hydraulic Radius: 0.2122 ft

Average Velocity: 4.4052 ft/s

Top Width: 0.9776 ft

Froude Number: 1.4296

Critical Depth: 0.4756 ft

Critical Velocity: 3.4483 ft/s

Critical Slope: 0.0051 ft/ft

Critical Top Width: 1.00 ft

Calculated Max Shear Stress: 0.2464 lb/ft^2

Calculated Avg Shear Stress: 0.1324 lb/ft^2

## Channel Analysis: SD-4

Notes:

## Input Parameters

Channel Type: Circular

Pipe Diameter: 0.5000 ft

Longitudinal Slope: 0.0100 ft/ft

Manning's n: 0.0120

Flow: 0.1700 cfs

## Result Parameters

Depth: 0.1808 ft

Area of Flow: 0.0640 ft^2

Wetted Perimeter: 0.6453 ft

Hydraulic Radius: 0.0993 ft

Average Velocity: 2.6545 ft/s

Top Width: 0.4805 ft

Froude Number: 1.2813

Critical Depth: 0.2058 ft

Critical Velocity: 2.2311 ft/s

Critical Slope: 0.0062 ft/ft

Critical Top Width: 0.49 ft

Calculated Max Shear Stress: 0.1128 lb/ft^2

Calculated Avg Shear Stress: 0.0619 lb/ft^2

## Channel Analysis: SD-5

Notes:

## Input Parameters

Channel Type: Circular

Pipe Diameter: 0.5000 ft

Longitudinal Slope: 0.0100 ft/ft

Manning's n: 0.0120

Flow: 0.2000 cfs

## Result Parameters

Depth: 0.1974 ft

Area of Flow: 0.0721 ft^2

Wetted Perimeter: 0.6794 ft

Hydraulic Radius: 0.1061 ft

Average Velocity: 2.7750 ft/s

Top Width: 0.4888 ft

Froude Number: 1.2736

Critical Depth: 0.2239 ft

Critical Velocity: 2.3492 ft/s

Critical Slope: 0.0064 ft/ft

Critical Top Width: 0.50 ft

Calculated Max Shear Stress: 0.1232 lb/ft^2

Calculated Avg Shear Stress: 0.0662 lb/ft^2

## Channel Analysis: SD-6

Notes:

## Input Parameters

Channel Type: Circular

Pipe Diameter: 0.5000 ft

Longitudinal Slope: 0.0100 ft/ft

Manning's n: 0.0120

Flow: 0.2000 cfs

## Result Parameters

Depth: 0.1974 ft

Area of Flow: 0.0721 ft^2

Wetted Perimeter: 0.6794 ft

Hydraulic Radius: 0.1061 ft

Average Velocity: 2.7750 ft/s

Top Width: 0.4888 ft

Froude Number: 1.2736

Critical Depth: 0.2239 ft

Critical Velocity: 2.3492 ft/s

Critical Slope: 0.0064 ft/ft

Critical Top Width: 0.50 ft

Calculated Max Shear Stress: 0.1232 lb/ft^2

Calculated Avg Shear Stress: 0.0662 lb/ft^2

## Channel Analysis: SD-7

Notes:

## Input Parameters

Channel Type: Circular

Pipe Diameter: 0.5000 ft

Longitudinal Slope: 0.0100 ft/ft

Manning's n: 0.0120

Flow: 0.4300 cfs

## Result Parameters

Depth: 0.3104 ft

Area of Flow: 0.1281 ft^2

Wetted Perimeter: 0.9074 ft

Hydraulic Radius: 0.1412 ft

Average Velocity: 3.3571 ft/s

Top Width: 0.4852 ft

Froude Number: 1.1514

Critical Depth: 0.3340 ft

Critical Velocity: 3.0855 ft/s

Critical Slope: 0.0081 ft/ft

Critical Top Width: 0.47 ft

Calculated Max Shear Stress: 0.1937 lb/ft^2

Calculated Avg Shear Stress: 0.0881 lb/ft^2

## Channel Analysis: SD-8

Notes:

## Input Parameters

Channel Type: Circular

Pipe Diameter: 1.0000 ft

Longitudinal Slope: 0.0050 ft/ft

Manning's n: 0.0120

Flow: 1.9500 cfs

## Result Parameters

Depth: 0.6250 ft

Area of Flow: 0.5164 ft^2

Wetted Perimeter: 1.8235 ft

Hydraulic Radius: 0.2832 ft

Average Velocity: 3.7761 ft/s

Top Width: 0.9682 ft

Froude Number: 0.9112

Critical Depth: 0.5957 ft

Critical Velocity: 3.9974 ft/s

Critical Slope: 0.0058 ft/ft

Critical Top Width: 0.98 ft

Calculated Max Shear Stress: 0.1950 lb/ft^2

Calculated Avg Shear Stress: 0.0884 lb/ft^2

## Channel Analysis: SD-9

Notes:

## Input Parameters

Channel Type: Circular

Pipe Diameter: 0.6700 ft

Longitudinal Slope: 0.0100 ft/ft

Manning's n: 0.0120

Flow: 0.2700 cfs

## Result Parameters

Depth: 0.2050 ft

Area of Flow: 0.0914 ft^2

Wetted Perimeter: 0.7855 ft

Hydraulic Radius: 0.1164 ft

Average Velocity: 2.9525 ft/s

Top Width: 0.6175 ft

Froude Number: 1.3521

Critical Depth: 0.2398 ft

Critical Velocity: 2.3816 ft/s

Critical Slope: 0.0055 ft/ft

Critical Top Width: 0.64 ft

Calculated Max Shear Stress: 0.1279 lb/ft^2

Calculated Avg Shear Stress: 0.0726 lb/ft^2

## Channel Analysis: SD-10

Notes:

## Input Parameters

Channel Type: Circular

Pipe Diameter: 0.6700 ft

Longitudinal Slope: 0.0100 ft/ft

Manning's n: 0.0120

Flow: 0.2300 cfs

## Result Parameters

Depth: 0.1888 ft

Area of Flow: 0.0815 ft^2

Wetted Perimeter: 0.7499 ft

Hydraulic Radius: 0.1087 ft

Average Velocity: 2.8209 ft/s

Top Width: 0.6028 ft

Froude Number: 1.3517

Critical Depth: 0.2205 ft

Critical Velocity: 2.2753 ft/s

Critical Slope: 0.0055 ft/ft

Critical Top Width: 0.63 ft

Calculated Max Shear Stress: 0.1178 lb/ft^2

Calculated Avg Shear Stress: 0.0678 lb/ft^2

## Channel Analysis: SD-11

Notes:

## Input Parameters

Channel Type: Circular

Pipe Diameter: 0.6700 ft

Longitudinal Slope: 0.0100 ft/ft

Manning's n: 0.0120

Flow: 0.7000 cfs

## Result Parameters

Depth: 0.3459 ft

Area of Flow: 0.1836 ft^2

Wetted Perimeter: 1.0742 ft

Hydraulic Radius: 0.1709 ft

Average Velocity: 3.8132 ft/s

Top Width: 0.6696 ft

Froude Number: 1.2835

Critical Depth: 0.3942 ft

Critical Velocity: 3.2445 ft/s

Critical Slope: 0.0066 ft/ft

Critical Top Width: 0.66 ft

Calculated Max Shear Stress: 0.2158 lb/ft^2

Calculated Avg Shear Stress: 0.1066 lb/ft^2

## Channel Analysis: SD-12

Notes:

## Input Parameters

Channel Type: Circular

Pipe Diameter: 0.6700 ft

Longitudinal Slope: 0.0100 ft/ft

Manning's n: 0.0120

Flow: 0.9300 cfs

## Result Parameters

Depth: 0.4135 ft

Area of Flow: 0.2284 ft^2

Wetted Perimeter: 1.2108 ft

Hydraulic Radius: 0.1886 ft

Average Velocity: 4.0725 ft/s

Top Width: 0.6514 ft

Froude Number: 1.2121

Critical Depth: 0.4567 ft

Critical Velocity: 3.6329 ft/s

Critical Slope: 0.0075 ft/ft

Critical Top Width: 0.62 ft

Calculated Max Shear Stress: 0.2580 lb/ft^2

Calculated Avg Shear Stress: 0.1177 lb/ft^2

## Channel Analysis: SD-13

Notes:

## Input Parameters

Channel Type: Circular

Pipe Diameter: 0.6700 ft

Longitudinal Slope: 0.0100 ft/ft

Manning's n: 0.0120

Flow: 1.2400 cfs

## Result Parameters

Depth: 0.5136 ft

Area of Flow: 0.2900 ft^2

Wetted Perimeter: 1.4291 ft

Hydraulic Radius: 0.2029 ft

Average Velocity: 4.2761 ft/s

Top Width: 0.5669 ft

Froude Number: 1.0536

Critical Depth: 0.5267 ft

Critical Velocity: 4.1705 ft/s

Critical Slope: 0.0095 ft/ft

Critical Top Width: 0.55 ft

Calculated Max Shear Stress: 0.3205 lb/ft^2

Calculated Avg Shear Stress: 0.1266 lb/ft^2

## Channel Analysis: SD-14

Notes:

## Input Parameters

Channel Type: Circular

Pipe Diameter: 0.5000 ft

Longitudinal Slope: 0.0100 ft/ft

Manning's n: 0.0120

Flow: 0.4000 cfs

## Result Parameters

Depth: 0.2960 ft

Area of Flow: 0.1210 ft^2

Wetted Perimeter: 0.8779 ft

Hydraulic Radius: 0.1379 ft

Average Velocity: 3.3049 ft/s

Top Width: 0.4915 ft

Froude Number: 1.1736

Critical Depth: 0.3218 ft

Critical Velocity: 2.9948 ft/s

Critical Slope: 0.0078 ft/ft

Critical Top Width: 0.48 ft

Calculated Max Shear Stress: 0.1847 lb/ft^2

Calculated Avg Shear Stress: 0.0860 lb/ft^2

## Channel Analysis: SD-15

Notes:

## Input Parameters

Channel Type: Circular

Pipe Diameter: 1.0000 ft

Longitudinal Slope: 0.0100 ft/ft

Manning's n: 0.0120

Flow: 3.3000 cfs

## Result Parameters

Depth: 0.7115 ft

Area of Flow: 0.5977 ft^2

Wetted Perimeter: 2.0075 ft

Hydraulic Radius: 0.2977 ft

Average Velocity: 5.5214 ft/s

Top Width: 0.9062 ft

Froude Number: 1.1981

Critical Depth: 0.7773 ft

Critical Velocity: 5.0376 ft/s

Critical Slope: 0.0081 ft/ft

Critical Top Width: 0.83 ft

Calculated Max Shear Stress: 0.4439 lb/ft^2

Calculated Avg Shear Stress: 0.1858 lb/ft^2

## Channel Analysis: SD-16

Notes:

## Input Parameters

Channel Type: Circular

Pipe Diameter: 0.5000 ft

Longitudinal Slope: 0.0100 ft/ft

Manning's n: 0.0120

Flow: 0.2000 cfs

## Result Parameters

Depth: 0.1974 ft

Area of Flow: 0.0721 ft^2

Wetted Perimeter: 0.6794 ft

Hydraulic Radius: 0.1061 ft

Average Velocity: 2.7750 ft/s

Top Width: 0.4888 ft

Froude Number: 1.2736

Critical Depth: 0.2239 ft

Critical Velocity: 2.3492 ft/s

Critical Slope: 0.0064 ft/ft

Critical Top Width: 0.50 ft

Calculated Max Shear Stress: 0.1232 lb/ft^2

Calculated Avg Shear Stress: 0.0662 lb/ft^2

## Channel Analysis: SD-17

Notes:

## Input Parameters

Channel Type: Circular

Pipe Diameter: 0.6700 ft

Longitudinal Slope: 0.0100 ft/ft

Manning's n: 0.0120

Flow: 0.8300 cfs

## Result Parameters

Depth: 0.3840 ft

Area of Flow: 0.2090 ft^2

Wetted Perimeter: 1.1508 ft

Hydraulic Radius: 0.1816 ft

Average Velocity: 3.9713 ft/s

Top Width: 0.6628 ft

Froude Number: 1.2463

Critical Depth: 0.4305 ft

Critical Velocity: 3.4669 ft/s

Critical Slope: 0.0071 ft/ft

Critical Top Width: 0.64 ft

Calculated Max Shear Stress: 0.2396 lb/ft^2

Calculated Avg Shear Stress: 0.1133 lb/ft^2

## Channel Analysis: SD-18

Notes:

## Input Parameters

Channel Type: Circular

Pipe Diameter: 1.0000 ft

Longitudinal Slope: 0.0150 ft/ft

Manning's n: 0.0120

Flow: 4.4800 cfs

## Result Parameters

Depth: 0.7763 ft

Area of Flow: 0.6542 ft^2

Wetted Perimeter: 2.1563 ft

Hydraulic Radius: 0.3034 ft

Average Velocity: 6.8480 ft/s

Top Width: 0.8335 ft

Froude Number: 1.3621

Critical Depth: 0.8853 ft

Critical Velocity: 6.0920 ft/s

Critical Slope: 0.0120 ft/ft

Critical Top Width: 0.64 ft

Calculated Max Shear Stress: 0.7266 lb/ft^2

Calculated Avg Shear Stress: 0.2840 lb/ft^2

## Channel Analysis: SD-19

Notes:

## Input Parameters

Channel Type: Circular

Pipe Diameter: 0.5000 ft

Longitudinal Slope: 0.0100 ft/ft

Manning's n: 0.0120

Flow: 0.0700 cfs

## Result Parameters

Depth: 0.1146 ft

Area of Flow: 0.0339 ft^2

Wetted Perimeter: 0.4992 ft

Hydraulic Radius: 0.0680 ft

Average Velocity: 2.0626 ft/s

Top Width: 0.4203 ft

Froude Number: 1.2792

Critical Depth: 0.1300 ft

Critical Velocity: 1.7255 ft/s

Critical Slope: 0.0061 ft/ft

Critical Top Width: 0.44 ft

Calculated Max Shear Stress: 0.0715 lb/ft^2

Calculated Avg Shear Stress: 0.0424 lb/ft^2

## Channel Analysis: SD-20

Notes:

## Input Parameters

Channel Type: Circular

Pipe Diameter: 0.5000 ft

Longitudinal Slope: 0.0100 ft/ft

Manning's n: 0.0120

Flow: 0.2000 cfs

## Result Parameters

Depth: 0.1974 ft

Area of Flow: 0.0721 ft^2

Wetted Perimeter: 0.6794 ft

Hydraulic Radius: 0.1061 ft

Average Velocity: 2.7750 ft/s

Top Width: 0.4888 ft

Froude Number: 1.2736

Critical Depth: 0.2239 ft

Critical Velocity: 2.3492 ft/s

Critical Slope: 0.0064 ft/ft

Critical Top Width: 0.50 ft

Calculated Max Shear Stress: 0.1232 lb/ft^2

Calculated Avg Shear Stress: 0.0662 lb/ft^2

## Channel Analysis: SD-21

Notes:

## Input Parameters

Channel Type: Circular

Pipe Diameter: 0.5000 ft

Longitudinal Slope: 0.0100 ft/ft

Manning's n: 0.0120

Flow: 0.2000 cfs

## Result Parameters

Depth: 0.1974 ft

Area of Flow: 0.0721 ft^2

Wetted Perimeter: 0.6794 ft

Hydraulic Radius: 0.1061 ft

Average Velocity: 2.7750 ft/s

Top Width: 0.4888 ft

Froude Number: 1.2736

Critical Depth: 0.2239 ft

Critical Velocity: 2.3492 ft/s

Critical Slope: 0.0064 ft/ft

Critical Top Width: 0.50 ft

Calculated Max Shear Stress: 0.1232 lb/ft^2

Calculated Avg Shear Stress: 0.0662 lb/ft^2

## Channel Analysis: SD-22

Notes:

## Input Parameters

Channel Type: Circular

Pipe Diameter: 0.5000 ft

Longitudinal Slope: 0.0100 ft/ft

Manning's n: 0.0120

Flow: 0.2000 cfs

## Result Parameters

Depth: 0.1974 ft

Area of Flow: 0.0721 ft^2

Wetted Perimeter: 0.6794 ft

Hydraulic Radius: 0.1061 ft

Average Velocity: 2.7750 ft/s

Top Width: 0.4888 ft

Froude Number: 1.2736

Critical Depth: 0.2239 ft

Critical Velocity: 2.3492 ft/s

Critical Slope: 0.0064 ft/ft

Critical Top Width: 0.50 ft

Calculated Max Shear Stress: 0.1232 lb/ft^2

Calculated Avg Shear Stress: 0.0662 lb/ft^2

## Channel Analysis: SD-23

Notes:

## Input Parameters

Channel Type: Circular

Pipe Diameter: 0.6700 ft

Longitudinal Slope: 0.0100 ft/ft

Manning's n: 0.0120

Flow: 1.1400 cfs

## Result Parameters

Depth: 0.4786 ft

Area of Flow: 0.2694 ft^2

Wetted Perimeter: 1.3492 ft

Hydraulic Radius: 0.1997 ft

Average Velocity: 4.2309 ft/s

Top Width: 0.6053 ft

Froude Number: 1.1175

Critical Depth: 0.5058 ft

Critical Velocity: 3.9926 ft/s

Critical Slope: 0.0087 ft/ft

Critical Top Width: 0.58 ft

Calculated Max Shear Stress: 0.2986 lb/ft^2

Calculated Avg Shear Stress: 0.1246 lb/ft^2

## Channel Analysis: SD-24

Notes:

## Input Parameters

Channel Type: Circular

Pipe Diameter: 1.5000 ft

Longitudinal Slope: 0.0100 ft/ft

Manning's n: 0.0120

Flow: 6.1100 cfs

## Result Parameters

Depth: 0.7825 ft

Area of Flow: 0.9323 ft^2

Wetted Perimeter: 2.4212 ft

Hydraulic Radius: 0.3850 ft

Average Velocity: 6.5539 ft/s

Top Width: 1.4986 ft

Froude Number: 1.4644

Critical Depth: 0.9551 ft

Critical Velocity: 5.1461 ft/s

Critical Slope: 0.0053 ft/ft

Critical Top Width: 1.44 ft

Calculated Max Shear Stress: 0.4883 lb/ft^2

Calculated Avg Shear Stress: 0.2403 lb/ft^2

## Channel Analysis: SD-25

Notes:

## Input Parameters

Channel Type: Circular

Pipe Diameter: 0.6700 ft

Longitudinal Slope: 0.0100 ft/ft

Manning's n: 0.0120

Flow: 0.1600 cfs

## Result Parameters

Depth: 0.1571 ft

Area of Flow: 0.0630 ft^2

Wetted Perimeter: 0.6774 ft

Hydraulic Radius: 0.0930 ft

Average Velocity: 2.5411 ft/s

Top Width: 0.5677 ft

Froude Number: 1.3447

Critical Depth: 0.1829 ft

Critical Velocity: 2.0518 ft/s

Critical Slope: 0.0055 ft/ft

Critical Top Width: 0.60 ft

Calculated Max Shear Stress: 0.0980 lb/ft^2

Calculated Avg Shear Stress: 0.0580 lb/ft^2

## Channel Analysis: SD-26

Notes:

## Input Parameters

Channel Type: Circular

Pipe Diameter: 0.5000 ft

Longitudinal Slope: 0.0100 ft/ft

Manning's n: 0.0120

Flow: 0.1700 cfs

## Result Parameters

Depth: 0.1808 ft

Area of Flow: 0.0640 ft^2

Wetted Perimeter: 0.6453 ft

Hydraulic Radius: 0.0993 ft

Average Velocity: 2.6545 ft/s

Top Width: 0.4805 ft

Froude Number: 1.2813

Critical Depth: 0.2058 ft

Critical Velocity: 2.2311 ft/s

Critical Slope: 0.0062 ft/ft

Critical Top Width: 0.49 ft

Calculated Max Shear Stress: 0.1128 lb/ft^2

Calculated Avg Shear Stress: 0.0619 lb/ft^2

## Channel Analysis: SD-27

Notes:

## Input Parameters

Channel Type: Circular

Pipe Diameter: 1.5000 ft

Longitudinal Slope: 0.0100 ft/ft

Manning's n: 0.0120

Flow: 0.3300 cfs

## Result Parameters

Depth: 0.1755 ft

Area of Flow: 0.1157 ft^2

Wetted Perimeter: 1.0472 ft

Hydraulic Radius: 0.1105 ft

Average Velocity: 2.8518 ft/s

Top Width: 0.9642 ft

Froude Number: 1.4507

Critical Depth: 0.2119 ft

Critical Velocity: 2.1667 ft/s

Critical Slope: 0.0046 ft/ft

Critical Top Width: 1.04 ft

Calculated Max Shear Stress: 0.1095 lb/ft^2

Calculated Avg Shear Stress: 0.0690 lb/ft^2

## Channel Analysis: SD-28

Notes:

## Input Parameters

Channel Type: Circular

Pipe Diameter: 1.5000 ft

Longitudinal Slope: 0.0100 ft/ft

Manning's n: 0.0120

Flow: 7.6500 cfs

## Result Parameters

Depth: 0.9004 ft

Area of Flow: 1.1076 ft^2

Wetted Perimeter: 2.6590 ft

Hydraulic Radius: 0.4166 ft

Average Velocity: 6.9068 ft/s

Top Width: 1.4695 ft

Froude Number: 1.4020

Critical Depth: 1.0715 ft

Critical Velocity: 5.6639 ft/s

Critical Slope: 0.0061 ft/ft

Critical Top Width: 1.36 ft

Calculated Max Shear Stress: 0.5618 lb/ft^2

Calculated Avg Shear Stress: 0.2599 lb/ft^2

## Channel Analysis: Valley Gutter-1

Notes:

### Input Parameters

Channel Type: Triangular

Side Slope 1 (Z1): 20.0000 ft/ft

Side Slope 2 (Z2): 20.0000 ft/ft

Longitudinal Slope: 0.0050 ft/ft

Manning's n: 0.0350

Flow: 1.2700 cfs

### Result Parameters

Depth: 0.2802 ft

Area of Flow: 1.5697 ft^2

Wetted Perimeter: 11.2201 ft

Hydraulic Radius: 0.1399 ft

Average Velocity: 0.8091 ft/s

Top Width: 11.2061 ft

Froude Number: 0.3810

Critical Depth: 0.1904 ft

Critical Velocity: 1.7510 ft/s

Critical Slope: 0.0392 ft/ft

Critical Top Width: 7.62 ft

Calculated Max Shear Stress: 0.0874 lb/ft^2

Calculated Avg Shear Stress: 0.0436 lb/ft^2

## Channel Analysis: Valley Gutter-2

Notes:

### Input Parameters

Channel Type: Triangular

Side Slope 1 (Z1): 20.0000 ft/ft

Side Slope 2 (Z2): 20.0000 ft/ft

Longitudinal Slope: 0.0050 ft/ft

Manning's n: 0.0350

Flow: 1.9500 cfs

### Result Parameters

Depth: 0.3290 ft

Area of Flow: 2.1652 ft^2

Wetted Perimeter: 13.1775 ft

Hydraulic Radius: 0.1643 ft

Average Velocity: 0.9006 ft/s

Top Width: 13.1611 ft

Froude Number: 0.3913

Critical Depth: 0.2261 ft

Critical Velocity: 1.9078 ft/s

Critical Slope: 0.0370 ft/ft

Critical Top Width: 9.04 ft

Calculated Max Shear Stress: 0.1027 lb/ft^2

Calculated Avg Shear Stress: 0.0513 lb/ft^2

## Channel Analysis: Swale-1

Notes:

## Input Parameters

Channel Type: Triangular

Side Slope 1 (Z1): 2.0000 ft/ft

Side Slope 2 (Z2): 2.0000 ft/ft

Longitudinal Slope: 0.0050 ft/ft

Manning's n: 0.0350

Flow: 0.1600 cfs

## Result Parameters

Depth: 0.3140 ft

Area of Flow: 0.1972 ft^2

Wetted Perimeter: 1.4045 ft

Hydraulic Radius: 0.1404 ft

Average Velocity: 0.8112 ft/s

Top Width: 1.2562 ft

Froude Number: 0.3607

Critical Depth: 0.2089 ft

Critical Velocity: 1.8338 ft/s

Critical Slope: 0.0440 ft/ft

Critical Top Width: 0.84 ft

Calculated Max Shear Stress: 0.0980 lb/ft^2

Calculated Avg Shear Stress: 0.0438 lb/ft^2

## Channel Analysis: Swale-2

Notes:

## Input Parameters

Channel Type: Triangular

Side Slope 1 (Z1): 2.0000 ft/ft

Side Slope 2 (Z2): 2.0000 ft/ft

Longitudinal Slope: 0.0050 ft/ft

Manning's n: 0.0350

Flow: 0.1700 cfs

## Result Parameters

Depth: 0.3213 ft

Area of Flow: 0.2064 ft^2

Wetted Perimeter: 1.4367 ft

Hydraulic Radius: 0.1437 ft

Average Velocity: 0.8235 ft/s

Top Width: 1.2851 ft

Froude Number: 0.3621

Critical Depth: 0.2140 ft

Critical Velocity: 1.8562 ft/s

Critical Slope: 0.0437 ft/ft

Critical Top Width: 0.86 ft

Calculated Max Shear Stress: 0.1002 lb/ft^2

Calculated Avg Shear Stress: 0.0448 lb/ft^2

## Channel Analysis: GB-1

Notes:

## Input Parameters

Channel Type: Triangular

Side Slope 1 (Z1): 2.0000 ft/ft

Side Slope 2 (Z2): 2.0000 ft/ft

Longitudinal Slope: 0.0050 ft/ft

Manning's n: 0.0350

Flow: 0.2800 cfs

## Result Parameters

Depth: 0.3874 ft

Area of Flow: 0.3001 ft^2

Wetted Perimeter: 1.7324 ft

Hydraulic Radius: 0.1732 ft

Average Velocity: 0.9330 ft/s

Top Width: 1.5495 ft

Froude Number: 0.3736

Critical Depth: 0.2613 ft

Critical Velocity: 2.0510 ft/s

Critical Slope: 0.0409 ft/ft

Critical Top Width: 1.05 ft

Calculated Max Shear Stress: 0.1209 lb/ft^2

Calculated Avg Shear Stress: 0.0541 lb/ft^2

## Channel Analysis: GB-2

Notes:

## Input Parameters

Channel Type: Triangular

Side Slope 1 (Z1): 2.0000 ft/ft

Side Slope 2 (Z2): 2.0000 ft/ft

Longitudinal Slope: 0.0050 ft/ft

Manning's n: 0.0350

Flow: 0.0700 cfs

## Result Parameters

Depth: 0.2303 ft

Area of Flow: 0.1061 ft^2

Wetted Perimeter: 1.0301 ft

Hydraulic Radius: 0.1030 ft

Average Velocity: 0.6597 ft/s

Top Width: 0.9213 ft

Froude Number: 0.3426

Critical Depth: 0.1501 ft

Critical Velocity: 1.5543 ft/s

Critical Slope: 0.0491 ft/ft

Critical Top Width: 0.60 ft

Calculated Max Shear Stress: 0.0719 lb/ft^2

Calculated Avg Shear Stress: 0.0321 lb/ft^2

# Appendix II

# Soil Analysis


Map Scale: 1:911 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 10 20 40 60

Feet
0 40 80 160 240

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

## MAP LEGEND

**Area of Interest (AOI)**

- Area of Interest (AOI)

**Soils**

- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

**Special Point Features**

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

**Water Features**

- Streams and Canals

**Transportation**

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

**Background**

- Aerial Photography

## MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

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

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

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

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

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

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

Soil Survey Area: Sonoma County, California
Survey Area Data: Version 18, Sep 8, 2024

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

Date(s) aerial images were photographed: Mar 26, 2022—Apr 25, 2022

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

# Map Unit Legend

| Map Unit Symbol | Map Unit Name | Acres in AOI | Percent of AOI |
|---|---|---|---|
| GdC | Goldridge fine sandy loam, 2 to 9 percent slopes | 2.8 | 100.0% |
| **Totals for Area of Interest** | | **2.8** | **100.0%** |

# Sonoma County, California

## GdC—Goldridge fine sandy loam, 2 to 9 percent slopes

### Map Unit Setting

*National map unit symbol:* hfcy
*Elevation:* 200 to 2,000 feet
*Mean annual precipitation:* 40 inches
*Mean annual air temperature:* 57 degrees F
*Frost-free period:* 225 to 240 days
*Farmland classification:* Prime farmland if irrigated

### Map Unit Composition

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

### Description of Goldridge

#### Setting

*Landform:* Hills
*Landform position (two-dimensional):* Backslope
*Landform position (three-dimensional):* Side slope
*Down-slope shape:* Concave
*Across-slope shape:* Convex
*Parent material:* Residuum weathered from sandstone

#### Typical profile

*H1 - 0 to 24 inches:* fine sandy loam
*H2 - 24 to 28 inches:* sandy clay loam
*H3 - 28 to 72 inches:* sandy clay loam

#### Properties and qualities

*Slope:* 2 to 9 percent
*Depth to restrictive feature:* More than 80 inches
*Drainage class:* Moderately well drained
*Runoff class:* Medium
*Capacity of the most limiting layer to transmit water (Ksat):* Moderately high (0.20 to 0.57 in/hr)
*Depth to water table:* More than 80 inches
*Frequency of flooding:* None
*Frequency of ponding:* None
*Available water supply, 0 to 60 inches:* Moderate (about 8.7 inches)

#### Interpretive groups

*Land capability classification (irrigated):* 3e
*Land capability classification (nonirrigated):* 3e
*Hydrologic Soil Group:* C
*Ecological site:* F004BK103CA - Upper slopes and higher elevation mountains

*Hydric soil rating:* No

**Minor Components**

**Blucher**
*Percent of map unit:* 4 percent
*Hydric soil rating:* No

**Cotati**
*Percent of map unit:* 4 percent
*Hydric soil rating:* No

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

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

**Unnamed**
*Percent of map unit:* 1 percent
*Landform:* Swales
*Hydric soil rating:* Yes

# Data Source Information

Soil Survey Area: Sonoma County, California
Survey Area Data: Version 18, Sep 8, 2024