MILLENNIUM
PLANNING & ENGINEERING

PRELIMINARY Drainage Analysis & Stormwater Quality Plan

Meadow Edge Park, Vinton

92400 Highway 70, Vinton, CA 96135 – APN: 010-200-002 & 010-200-003

Prepared For:

Route 49 Partners

N/A

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Prepared By:

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Monday, December 2, 2024

TABLE OF CONTENTS

EXHIBITS

LIST OF FIGURES

LIST OF TABLES

1 EXECUTIVE SUMMARY

1.1 Purpose

The purpose of this report is to:

- Explain with detail the pre-development conditions and existing features, and demonstrate how the proposed design intends to preserve the existing site conditions;
- Demonstrate that this project was designed to incorporate LID practices to effectively treat and return impervious area runoff to the watershed;
- Demonstrate that the post-development project flows to do not exceed the pre-development project flows for the 10-Year and 100-Year Storm Events.

1.2 Project Data

Table 1: Project Data Table

Project Name/Number	Meadow Edge Park	
Report Preparation Date	11/27/2024	
Project Location	92400 Highway 70	
Name of Developer	Route 49 Partners	
Project Type and Description	Mobile Home Park with Roads, Utility and Drainage Improvements	
Total Project Site Area	63.72	acres
Total Area of Land Disturbed	10.31	acres
Total New Impervious Surface Area	80,000	sf
Total Replaced Impervious Surface Area	0	sf
Total Pre-Project Impervious Surface Area	67,987	sf
Total Post-Project Impervious Area	147,987	sf
APN:	010-200-002 & 010-200-003	
Zoning	C-2, C-3 F, S-1	
Jurisdiction:	Plumas County	

2 SETTING

2.1 Project Location & Description

The existing project is located at 92400 Highway 70 south of Highway 70 and east of highway 49. This site is in Vinton, California and has a general elevation of 5,000 feet above sea level.

This project site currently includes a mobile home park known as Meadow Edge Park. Proposed improvements include the addition of trailer lots, gravel roadways, utility improvements, and drainage improvements.

2.2 Existing Site Features & Conditions

This project site contains various features that will affect the general hydrology of this site. This site contains small vegetation, mainly shrubs and bushes, with approximately 70%-90% groundcover. The topography is continuous with slopes of 0.5%-3% from southeast to northwest.

This site contains four (4) different types of soil with the prominent soil type being Bidwell Sandy Loam and covering 64.2% of the site and having a hydrologic soil group C. This site also contains Balman Loam (6.4% of site, Hydrologic Soil Group C), Beckwourth Sandy Loam (9.2% of site, Hydrologic Soil Group B), and Ormsby Loamy Coarse Sand (20.2% of site, Hydrologic Soil Group A). The soil onsite has a variety of hydrologic properties ranging from group C to A. See figure below for soil map generated by the United States Department of Agriculture, Natural Resources Conservation Service's online soil mapping tool, WebSoilSurvey.

Figure 1: Onsite Soil Map (USDA NRCS WebSoilSurvey)

2.3 Opportunities and Constraints for Stormwater Control

This site is required to implement stormwater control devices intended to treat and mitigate the increased runoff due to the addition of impervious development. This site design will aim to capture and treat runoff through use of infiltration best management practices before discharging the stormwater back to the natural flow path of the watershed.

3 Low Impact Development Design Strategies

3.1 Optimization of Site Layout

Through the design of this site, the topography and flow path of the undeveloped site were taken into consideration to create a development that causes little to no disruption of the natural environment. In addition, grades were designed to reduce any excessive grading. When selecting BMP's for this project site, bioretention basins were selected to capture, treat and infiltrate, as well as to increase the vegetation and natural feel of the site.

3.2 Water Quality Treatment and Retention Methods

Storm drainage from impervious areas (roads, walks, roofs) is collected and routed through water quality treatment facilities for removal of potential pollutants. This consists of one or more of the following Best Management Practices (BMPs) in series prior to discharge of flow to existing drainage facilities.

BMP #	Description
TC-30	Vegetated swales and rock-lined swales will provide pre-treatment by collecting and slowly conveying runoff to downstream treatment facilities. They are designed to treat runoff through filtering and trapping sediment and other pollutants with angular rock lining or vegetation in the channel, filtering through a subsoil matrix and infiltration into the underlying soils.
TC-32	Bioretention's function as a soil and plant-based filtration device to remove pollutants through a variety of physical, biological, and chemical treatment processes. These facilities consist of a grass buffer, strip, sand bed, ponding area, organic layer, planting soil, and plants.

During construction, additional BMPs including temporary erosion control facilities shall be implemented to control any pollutants that could potentially affect the quality of storm water discharges from the site.

For preliminary purposes, the bioretention basins were sized using the California Phase II LID Sizing Tool provided by OWP at Sacramento State and funded by the California State Water Resources Control Board's Prop 84 Stormwater Grant Program. The bioretention basins proposed for this project comply with LID design standards. See Exhibit 2 for LID sizing calculations.

4 HYDROLOGY ANALYSIS

4.1 Methodology

During the final design phase, software will be used to analyze the hydrology and hydraulics of the pre- and post-development conditions. A unit hydrograph method will be utilized in conjunction with the TR-55 small watershed hydrology to determine runoff from each area. The modeled storm events will be generated using rainfall depths provided by NOAA. The 10-year & 100-year required storm events will be generated using a SCS Type Ia dimensionless rainfall distribution curve with the determined rainfall depths.

For preliminary purposes, the Rational Method has been used to determine pre- and post-development project flows. The increase in runoff from development will be mitigated in the final design by a detention analysis.

Q = CIA, where

Q = flow (cubic feet per second)
C = dimensionless Runoff Coefficient
I = rainfall intensity (inches/hour)
(per NOAA Altas 14 Precipitation Data, **Exhibit 1**)
Tc = time of concentration= To + Ts (duration in minutes)
To = TR-55 Method, Ts = Mannings Equation
A = drainage area (acres)

See Exhibit 1 for details.

4.2 Existing Conditions

The existing site typically drains southeast to northwest with slopes ranging from 0.5% to 3%. For the purposes of this report, the saturated hydraulic conductivity of the soil is to be 1.5 inches per hour. The ground cover consists of grass and shrubs and contributes to the arresting of the surface runoff. Given the site slopes and groundcover, this site will have limited runoff and flows off the site will be minimal.

Any runoff that leaves the site will continue in its natural drainage path east before reaching an unnamed creek. This creek appears to be used primarily for irrigation with its size decreasing steadily as the elevation reduces. Any runoff that is not used for irrigation will end up in the Little Last Chance Lake.

Table 2: Pre-Development Drainage Area Breakdown

Area ID	*Area*		*Roof*	*Paving*	*Natural*	*Total Impervious*	*Total Pervious*	*% Impervious*
	sf	acres	sf	sf	sf	sf	sf	
DMA-1	1,743,605	40.03	26,400	16,500	1,700,705	42,900	1,700,705	2%
DMA-2	505,014	11.59	0	0	505,014	0	505,014	0%
Total =	2,248,619	51.62	26,400	16,500		42,900	2,205,719	2%

4.3 Proposed Conditions

The proposed development will encompass the northwest corner of the site and proposes the addition of gravel roads, utility infrastructure, septic improvements and leach field, and drainage improvements. To ensure that the natural drainage path interruptions are mitigated, three (3) bioretention basins will be constructed. These basins will aim to detain, treat, and infiltrate excess runoff created by the proposed development. Overflow from these treatment basins will be discharged via keyways on the basin and returned to the natural flow path of the watershed. See Exhibit 5, Post-Development Hydrology Map for breakdown.

Table 3: Post Development Drainage Area Breakdown

Area ID	*Area*		*Roof*	*Paving*	*Total Impervious*	*Total Pervious*	*% Impervious*
	sf	acres	sf	sf	sf	sf	
DMA-1A	112,361	2.58	24,000	0	24,000	88,361	21%
DMA-1B	132,500	3.04	23,200	0	23,200	109,300	17.5%
DMA-1C	186,581	4.28	32,800	0	32,800	153,781	17.5%
DMA-1D	1,338,961	30.74	26,400	16,500	42,900	1,296,061	3%
DMA-2	500,503	11.49	0	0	0	500,503	0%
Total =	2,270,906	52.13	106,400	16,500	122,900	2,148,006	5%

*The impervious area for this site was calculated assuming that each onsite lot contains 1,600 sf of impervious area

4.4 Detention Analysis

To be completed during final design phase.

5 HYDRAULIC CALCULATIONS & RESULTS (FULL RESULTS DURING FINAL DESIGN)

5.1 Methodology

To be completed during final design phase.

5.2 Hydraulic Results

To be completed during final design phase.

6 CONCLUSION

6.1 Final Notes

In conclusion, this preliminary design meets LID treatment standards, and preserves the existing site features. This design follows state and local regulations, and the design will function as intended. The increase in runoff due to development is calculated to be approximately 6.26 cfs for the 10-Year design storm and 11.04 cfs for the 100-Year design storm. A complete detention

analysis will be completed during final design to mitigate the increase in runoff and ensure the post-development project flows do not exceed the pre-development project flows.

6.2 References

- United States Department of Agriculture, Natural Resources Conservation Service, Web Soil Survey; https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx. Last modified July 7, 2019.
- California State Waterboards, California Phase II LID Sizing Tool v1.2, by OWP at Sacramento State; https://www.owp.csus.edu/LIDTool/Start.aspx?Station=042467&Ksat=1.5&Area=28800&Units=SqFt&Back=True
- Improvement Plans for Meadow Edge Park, Vinton by Millennium Planning and Engineering. Dated December 2, 2024.

Please feel free to contact our office at (530) 446-6765 with any questions.

Millennium Planning & Engineering

Lillian Sparks, PE, QSP/QSD
Senior Civil Engineer

The following pages contain supporting attachments and exhibits referenced in the body of the report. Please use attachments as referenced.

EXHIBIT 1

Storm Event Data

TO BE COMPLETED DURING FINAL DESIGN PHASE

NOAA Atlas 14, Volume 6, Version 2
Location name: Chilcoot-Vinton, California, USA*
Latitude: 39.8045°, Longitude: -120.1781°
Elevation: 4950 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

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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	1.08 (0.936-1.25)	1.49 (1.30-1.73)	2.09 (1.81-2.44)	2.64 (2.26-3.10)	3.47 (2.87-4.21)	4.18 (3.40-5.20)	4.98 (3.94-6.35)	5.88 (4.52-7.73)	7.26 (5.35-9.95)	8.45 (6.01-12.0)
10-min	0.774 (0.672-0.900)	1.07 (0.924-1.24)	1.50 (1.30-1.75)	1.89 (1.62-2.22)	2.48 (2.06-3.02)	2.99 (2.43-3.73)	3.56 (2.82-4.55)	4.21 (3.24-5.53)	5.20 (3.83-7.13)	6.06 (4.31-8.60)
15-min	0.624 (0.540-0.724)	0.860 (0.748-1.00)	1.21 (1.04-1.41)	1.52 (1.31-1.79)	2.00 (1.66-2.44)	2.41 (1.96-3.00)	2.88 (2.28-3.67)	3.40 (2.61-4.46)	4.19 (3.09-5.74)	4.88 (3.48-6.93)
30-min	0.426 (0.370-0.496)	0.588 (0.510-0.684)	0.826 (0.716-0.964)	1.04 (0.894-1.22)	1.37 (1.13-1.67)	1.65 (1.34-2.05)	1.97 (1.56-2.51)	2.32 (1.79-3.05)	2.87 (2.11-3.93)	3.34 (2.38-4.74)
60-min	0.300 (0.260-0.348)	0.413 (0.359-0.481)	0.580 (0.503-0.677)	0.731 (0.628-0.861)	0.962 (0.798-1.17)	1.16 (0.942-1.44)	1.38 (1.09-1.76)	1.63 (1.26-2.14)	2.02 (1.49-2.76)	2.35 (1.67-3.33)
2-hr	0.205 (0.178-0.238)	0.254 (0.220-0.295)	0.330 (0.286-0.386)	0.403 (0.346-0.474)	0.520 (0.432-0.634)	0.627 (0.509-0.780)	0.752 (0.595-0.959)	0.901 (0.693-1.18)	1.14 (0.840-1.56)	1.36 (0.966-1.93)
3-hr	0.167 (0.145-0.194)	0.200 (0.174-0.233)	0.253 (0.219-0.296)	0.305 (0.262-0.358)	0.389 (0.323-0.474)	0.468 (0.380-0.582)	0.562 (0.445-0.717)	0.675 (0.520-0.887)	0.862 (0.636-1.18)	1.04 (0.737-1.47)
6-hr	0.115 (0.100-0.133)	0.133 (0.115-0.155)	0.163 (0.141-0.190)	0.193 (0.165-0.227)	0.243 (0.202-0.296)	0.291 (0.236-0.362)	0.350 (0.277-0.447)	0.423 (0.325-0.556)	0.546 (0.403-0.749)	0.665 (0.473-0.944)
12-hr	0.076 (0.066-0.088)	0.094 (0.081-0.109)	0.120 (0.104-0.140)	0.145 (0.124-0.170)	0.183 (0.152-0.223)	0.217 (0.176-0.270)	0.256 (0.202-0.326)	0.300 (0.231-0.394)	0.370 (0.272-0.507)	0.431 (0.307-0.613)
24-hr	0.052 (0.046-0.061)	0.072 (0.063-0.083)	0.099 (0.086-0.115)	0.122 (0.106-0.144)	0.156 (0.131-0.189)	0.183 (0.151-0.227)	0.213 (0.171-0.270)	0.245 (0.192-0.319)	0.290 (0.218-0.394)	0.328 (0.239-0.460)
2-day	0.032 (0.028-0.037)	0.044 (0.039-0.052)	0.061 (0.054-0.072)	0.076 (0.066-0.090)	0.098 (0.083-0.119)	0.116 (0.096-0.144)	0.136 (0.109-0.173)	0.158 (0.123-0.205)	0.189 (0.142-0.257)	0.215 (0.157-0.302)
3-day	0.025 (0.022-0.029)	0.034 (0.029-0.039)	0.047 (0.041-0.054)	0.058 (0.050-0.068)	0.075 (0.063-0.091)	0.089 (0.074-0.111)	0.105 (0.085-0.133)	0.123 (0.096-0.160)	0.149 (0.112-0.202)	0.171 (0.124-0.240)
4-day	0.020 (0.018-0.023)	0.027 (0.024-0.032)	0.038 (0.033-0.044)	0.048 (0.041-0.056)	0.062 (0.052-0.075)	0.074 (0.061-0.091)	0.087 (0.070-0.111)	0.102 (0.080-0.133)	0.124 (0.093-0.168)	0.143 (0.104-0.201)
7-day	0.013 (0.011-0.015)	0.018 (0.016-0.021)	0.025 (0.022-0.029)	0.031 (0.027-0.037)	0.041 (0.034-0.050)	0.049 (0.040-0.061)	0.058 (0.047-0.074)	0.068 (0.053-0.089)	0.084 (0.063-0.113)	0.097 (0.070-0.136)
10-day	0.010 (0.009-0.012)	0.014 (0.012-0.016)	0.019 (0.017-0.022)	0.024 (0.021-0.028)	0.031 (0.026-0.038)	0.037 (0.031-0.046)	0.044 (0.036-0.056)	0.052 (0.041-0.068)	0.064 (0.048-0.086)	0.074 (0.053-0.103)
20-day	0.006 (0.005-0.007)	0.008 (0.007-0.010)	0.012 (0.010-0.014)	0.015 (0.013-0.017)	0.019 (0.016-0.023)	0.023 (0.019-0.028)	0.027 (0.021-0.034)	0.031 (0.024-0.041)	0.037 (0.028-0.051)	0.043 (0.031-0.060)
30-day	0.005 (0.004-0.005)	0.007 (0.006-0.008)	0.009 (0.008-0.011)	0.012 (0.010-0.014)	0.015 (0.012-0.018)	0.018 (0.014-0.022)	0.020 (0.016-0.026)	0.023 (0.018-0.031)	0.028 (0.021-0.038)	0.031 (0.023-0.044)
45-day	0.004 (0.003-0.004)	0.005 (0.005-0.006)	0.007 (0.006-0.009)	0.009 (0.008-0.011)	0.012 (0.010-0.014)	0.014 (0.011-0.017)	0.016 (0.012-0.020)	0.018 (0.014-0.023)	0.021 (0.016-0.028)	0.023 (0.017-0.033)
60-day	0.003 (0.003-0.004)	0.004 (0.004-0.005)	0.006 (0.005-0.007)	0.008 (0.007-0.009)	0.010 (0.008-0.012)	0.011 (0.009-0.014)	0.013 (0.010-0.016)	0.014 (0.011-0.019)	0.017 (0.012-0.023)	0.018 (0.013-0.026)

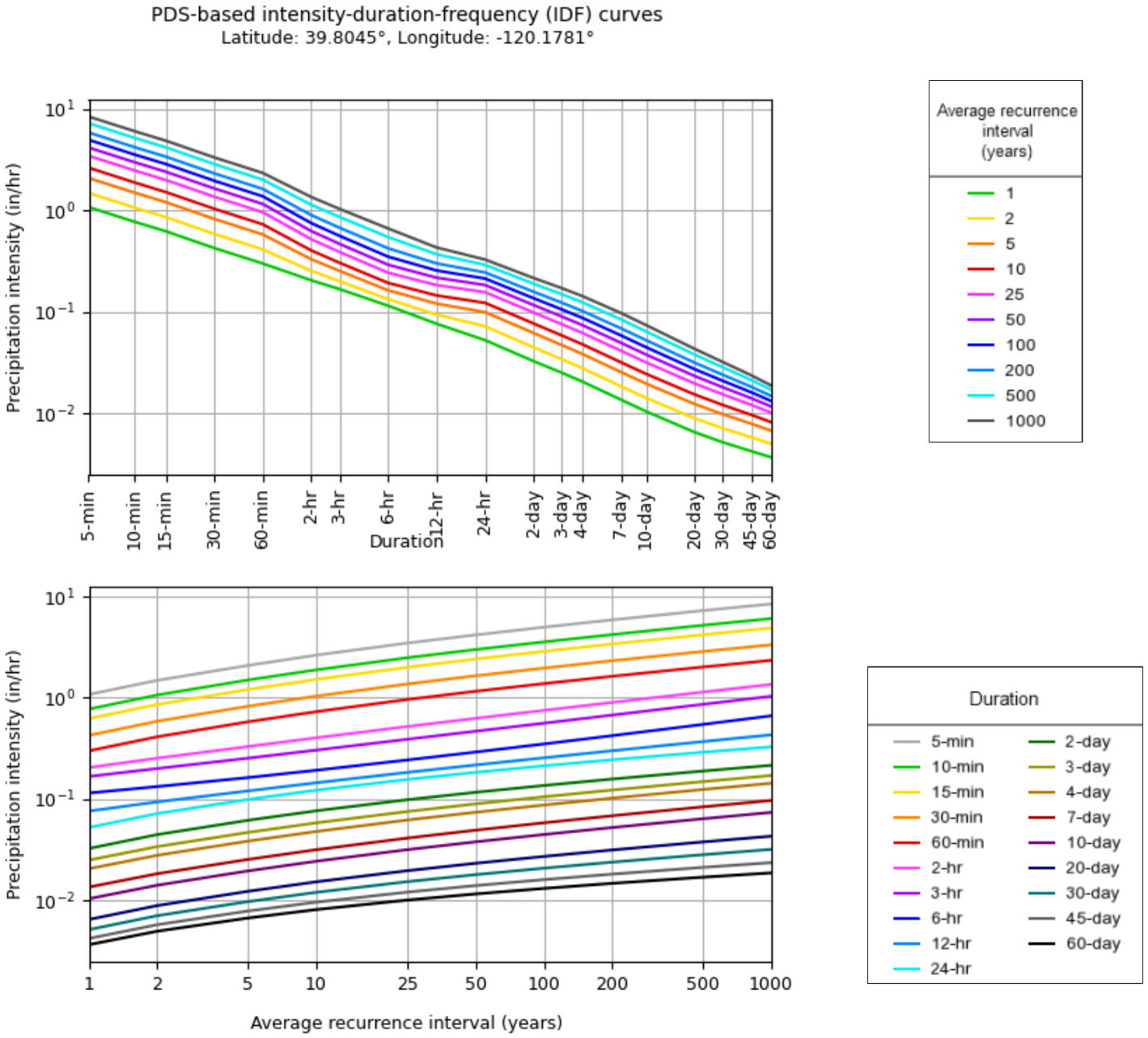
[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

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.

Back to Top

PF graphical



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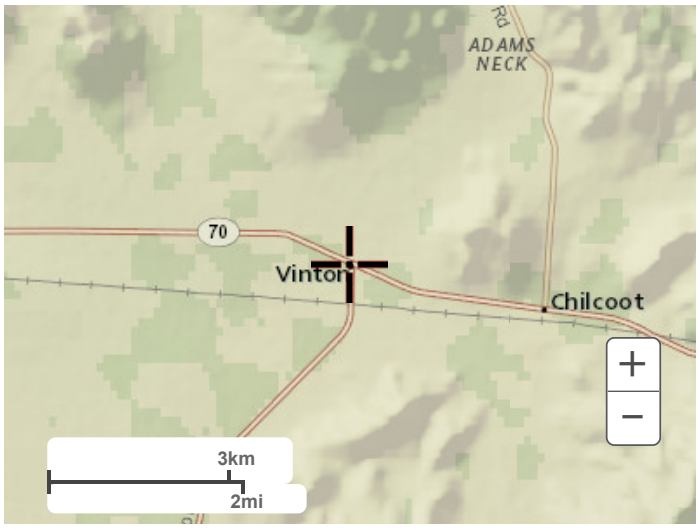
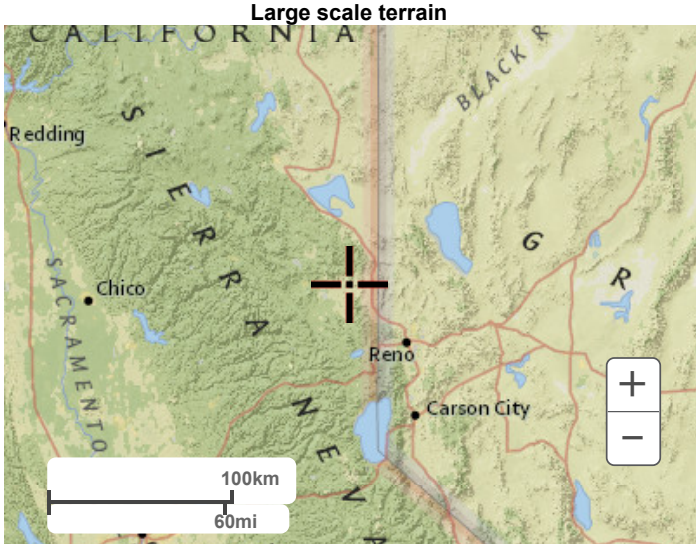
Back to Top

Maps & aerials

Small scale terrain



Large scale terrain



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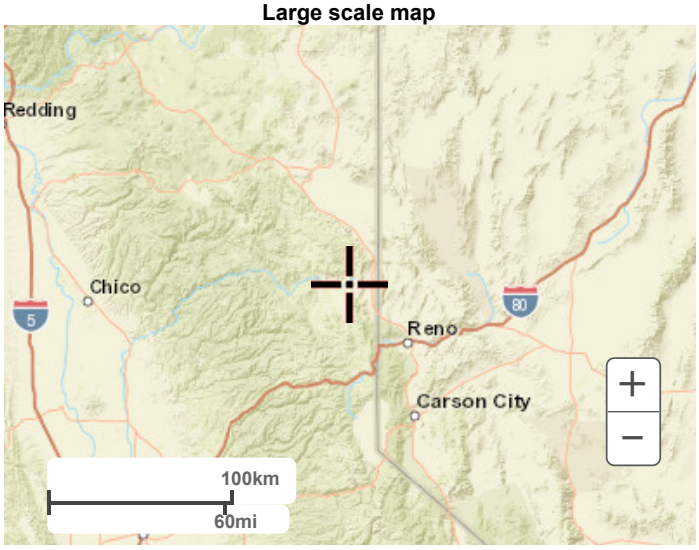

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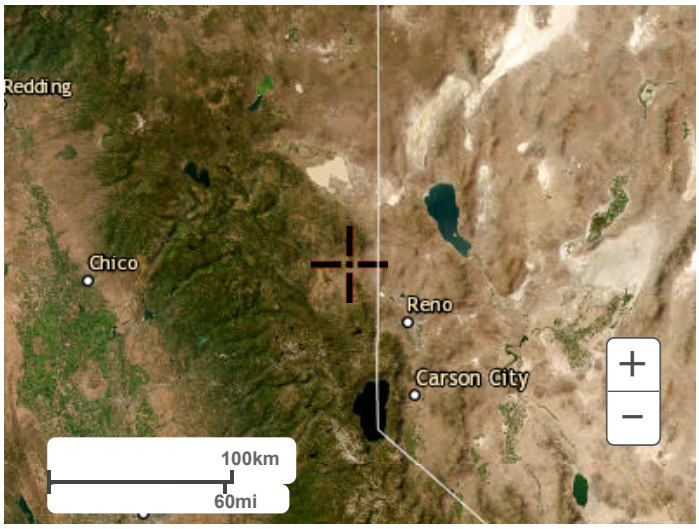

Back to Top

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Disclaimer

NOAA Atlas 14, Volume 6, Version 2
Location name: Chilcoot, California, USA*
Latitude: 39.8033°, Longitude: -120.1747°
Elevation: 4950 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)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.089 (0.078-0.104)	0.123 (0.107-0.143)	0.173 (0.150-0.202)	0.218 (0.187-0.256)	0.287 (0.238-0.349)	0.346 (0.281-0.430)	0.412 (0.326-0.525)	0.487 (0.374-0.638)	0.600 (0.443-0.822)	0.699 (0.497-0.992)
10-min	0.128 (0.112-0.149)	0.177 (0.154-0.205)	0.248 (0.215-0.289)	0.313 (0.269-0.367)	0.411 (0.341-0.500)	0.495 (0.403-0.616)	0.590 (0.467-0.752)	0.697 (0.537-0.915)	0.860 (0.634-1.18)	1.00 (0.713-1.42)
15-min	0.155 (0.135-0.180)	0.214 (0.186-0.248)	0.300 (0.260-0.349)	0.378 (0.325-0.444)	0.497 (0.413-0.604)	0.599 (0.487-0.745)	0.713 (0.565-0.910)	0.843 (0.649-1.11)	1.04 (0.767-1.42)	1.21 (0.862-1.72)
30-min	0.212 (0.184-0.246)	0.292 (0.254-0.339)	0.410 (0.355-0.477)	0.516 (0.444-0.607)	0.679 (0.564-0.825)	0.818 (0.665-1.02)	0.975 (0.772-1.24)	1.15 (0.887-1.51)	1.42 (1.05-1.95)	1.66 (1.18-2.35)
60-min	0.298 (0.259-0.345)	0.410 (0.357-0.476)	0.576 (0.499-0.670)	0.725 (0.623-0.852)	0.953 (0.791-1.16)	1.15 (0.934-1.43)	1.37 (1.08-1.74)	1.62 (1.24-2.12)	2.00 (1.47-2.73)	2.32 (1.65-3.30)
2-hr	0.408 (0.355-0.473)	0.506 (0.440-0.587)	0.658 (0.571-0.767)	0.803 (0.690-0.943)	1.04 (0.860-1.26)	1.25 (1.01-1.55)	1.50 (1.18-1.91)	1.79 (1.38-2.35)	2.26 (1.67-3.10)	2.69 (1.92-3.82)
3-hr	0.501 (0.436-0.581)	0.601 (0.523-0.698)	0.760 (0.659-0.885)	0.913 (0.785-1.07)	1.17 (0.968-1.42)	1.40 (1.14-1.74)	1.68 (1.33-2.14)	2.02 (1.55-2.65)	2.57 (1.90-3.52)	3.09 (2.20-4.39)
6-hr	0.687 (0.598-0.797)	0.797 (0.693-0.926)	0.977 (0.847-1.14)	1.16 (0.994-1.36)	1.46 (1.21-1.77)	1.74 (1.42-2.17)	2.09 (1.66-2.67)	2.53 (1.95-3.32)	3.26 (2.40-4.46)	3.96 (2.82-5.62)
12-hr	0.920 (0.801-1.07)	1.13 (0.985-1.32)	1.45 (1.26-1.69)	1.75 (1.50-2.06)	2.21 (1.84-2.69)	2.62 (2.13-3.25)	3.08 (2.44-3.93)	3.61 (2.78-4.74)	4.44 (3.28-6.09)	5.18 (3.69-7.35)
24-hr	1.26 (1.11-1.46)	1.73 (1.52-2.01)	2.38 (2.09-2.77)	2.94 (2.56-3.45)	3.74 (3.15-4.54)	4.40 (3.63-5.45)	5.10 (4.11-6.46)	5.86 (4.60-7.63)	6.95 (5.24-9.42)	7.85 (5.72-11.0)
2-day	1.57 (1.38-1.82)	2.15 (1.89-2.50)	2.97 (2.60-3.46)	3.68 (3.20-4.32)	4.73 (3.98-5.74)	5.60 (4.62-6.93)	6.54 (5.27-8.29)	7.58 (5.94-9.86)	9.08 (6.84-12.3)	10.3 (7.53-14.5)
3-day	1.80 (1.59-2.09)	2.45 (2.16-2.85)	3.38 (2.96-3.94)	4.21 (3.66-4.94)	5.44 (4.58-6.59)	6.47 (5.34-8.00)	7.60 (6.12-9.63)	8.86 (6.95-11.5)	10.7 (8.08-14.5)	12.3 (8.97-17.3)
4-day	1.98 (1.74-2.30)	2.68 (2.36-3.12)	3.70 (3.25-4.31)	4.61 (4.01-5.42)	5.98 (5.03-7.24)	7.13 (5.88-8.82)	8.41 (6.77-10.6)	9.83 (7.71-12.8)	12.0 (9.01-16.2)	13.8 (10.0-19.3)
7-day	2.28 (2.01-2.65)	3.10 (2.72-3.60)	4.28 (3.75-4.98)	5.34 (4.64-6.27)	6.94 (5.84-8.41)	8.31 (6.85-10.3)	9.83 (7.92-12.4)	11.5 (9.05-15.0)	14.1 (10.6-19.1)	16.3 (11.9-22.9)
10-day	2.50 (2.20-2.90)	3.40 (2.99-3.95)	4.70 (4.12-5.48)	5.87 (5.10-6.89)	7.62 (6.42-9.24)	9.11 (7.52-11.3)	10.8 (8.67-13.6)	12.6 (9.89-16.4)	15.4 (11.6-20.9)	17.8 (12.9-24.9)
20-day	3.12 (2.75-3.62)	4.28 (3.76-4.97)	5.92 (5.19-6.90)	7.35 (6.39-8.63)	9.45 (7.96-11.5)	11.2 (9.23-13.8)	13.1 (10.5-16.6)	15.2 (11.9-19.7)	18.2 (13.7-24.6)	20.7 (15.1-29.0)
30-day	3.72 (3.27-4.31)	5.11 (4.49-5.94)	7.04 (6.17-8.19)	8.69 (7.55-10.2)	11.1 (9.31-13.4)	13.0 (10.7-16.1)	15.0 (12.1-19.0)	17.3 (13.5-22.5)	20.4 (15.4-27.7)	23.0 (16.8-32.3)
45-day	4.56 (4.01-5.29)	6.24 (5.48-7.25)	8.52 (7.46-9.92)	10.4 (9.06-12.2)	13.1 (11.0-15.9)	15.2 (12.5-18.8)	17.4 (14.0-22.0)	19.7 (15.5-25.7)	23.0 (17.3-31.2)	25.6 (18.6-35.9)
60-day	5.28 (4.64-6.12)	7.18 (6.30-8.33)	9.68 (8.48-11.3)	11.7 (10.2-13.8)	14.6 (12.3-17.7)	16.8 (13.8-20.7)	19.0 (15.3-24.1)	21.3 (16.7-27.8)	24.5 (18.5-33.3)	27.0 (19.7-37.9)

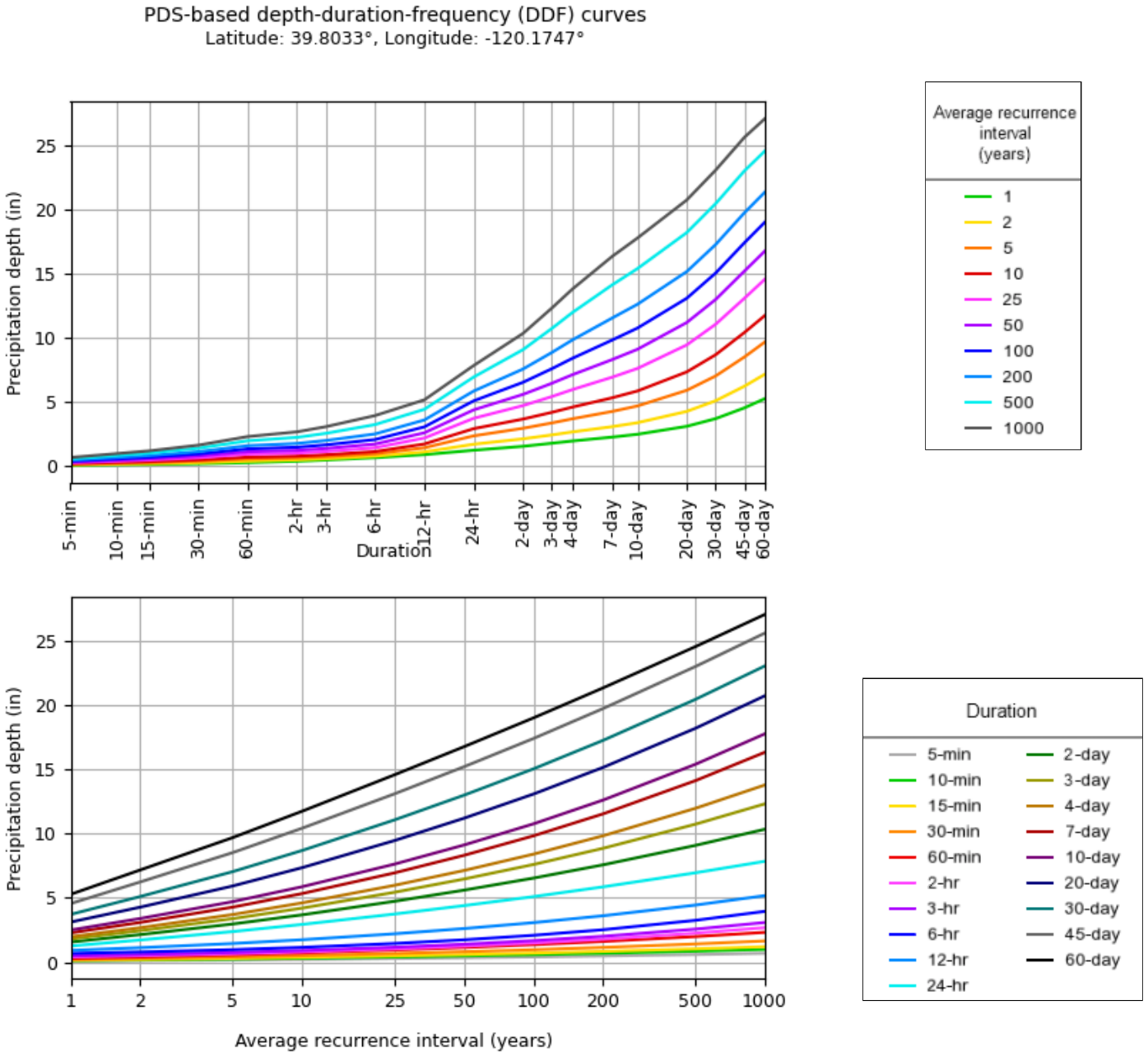
[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

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.

Back to Top

PF graphical



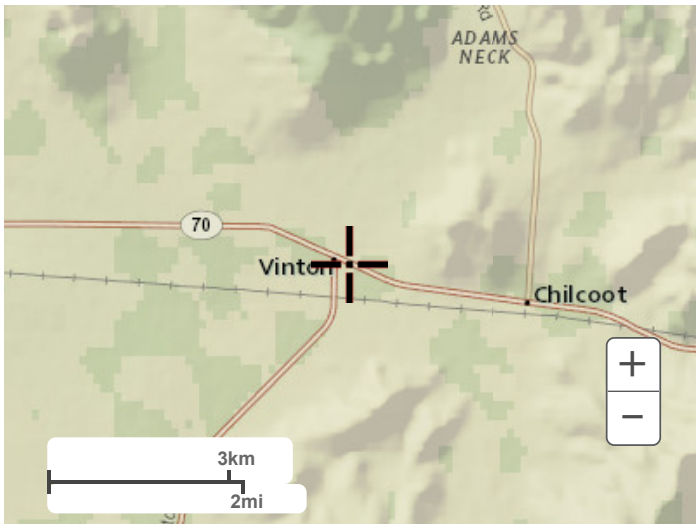
NOAA Atlas 14, Volume 6, Version 2

Created (GMT): Wed Nov 27 23:27:24 2024

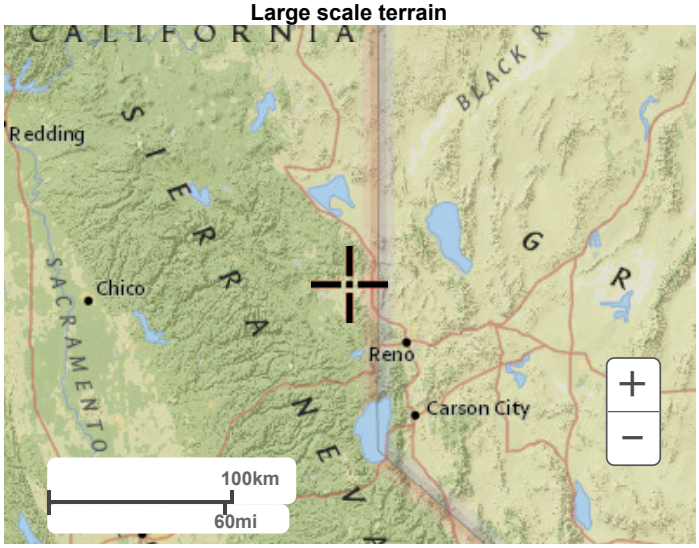
Back to Top

Maps & aerials

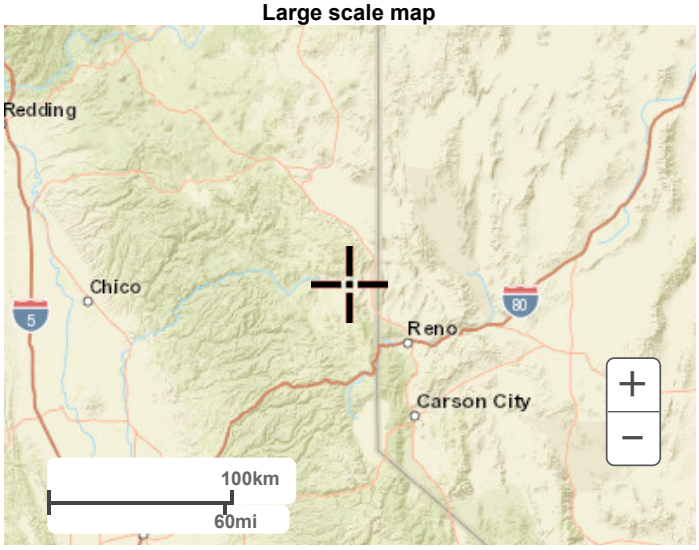
Small scale terrain



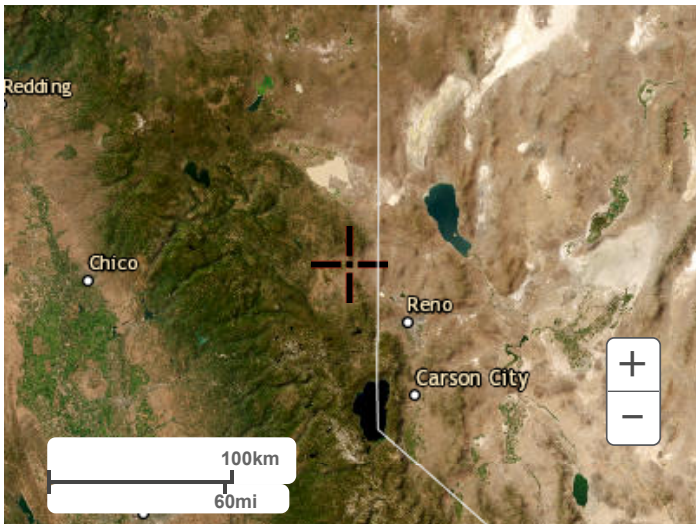
Large scale terrain



Large scale map



Large scale aerial



Back to Top

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National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
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Questions?: HDSC.Questions@noaa.gov

Disclaimer

Hydrology Calculations
Meadow Edge Park
Vinton, CA

November 27, 2024

Q=CIA
PRE-DEVELOPMENT HYDROLOGY

DMA 1

"A": AREA

TOTAL =	40.03	AC

"C": RUNOFF COEFFICIENT

			C
PAVEMENT =	0.38	AC	0.90
ROOF =	0.61	AC	0.95
LANDSCAPE =	39.04	AC	0.35
Total =	40.03	AC	

COMPOSITE C =	0.36

"I": RAINFALL INTENSITY

Mannings Roughness, n=	0.035	
Length, L=	3018	ft
24hr - 2Year Intensity, P2=	1.73	in/hr
Slope, s=	0.005	ft/ft
Sheet Flow=	110.6	min.

Tt = Overland Sheet Flow Travel Time =
(0.007*((n*L)^0.8)*60)/(P2^0.5)*(S^0.4)

Total Time of Concentration=	110.6	min.

PER NOAA ATLAS PRECIPITATION DATA:

Linear Interpolation - 10yr		
Tc1	**Tc2**	**Tc3**
60	110.6	120
I1	**I2 (Solve)**	**I3**
0.731	0.45	0.403

PER NOAA ATLAS PRECIPITATION DATA:

I-10 YEAR=	0.45	IN/HR
I-100 YEAR=	0.85	IN/HR

Linear Interpolation - 100 yr		
Tc1	**Tc2**	**Tc3**
60	110.6	120
I1	**I2 (Solve)**	**I3**
1.380	0.85	0.752

Q=CIA	
Q10	6.63 CFS
Q100	12.40 CFS

Hydrology Calculations
Meadow Edge Park
Vinton, CA

November 27, 2024

Q=CIA
PRE-DEVELOPMENT HYDROLOGY

DMA 2

"A": AREA

TOTAL =	11.59	AC

"C": RUNOFF COEFFICIENT

			C
PAVEMENT =	0.00	AC	0.90
ROOF =	0.00	AC	0.95
LANDSCAPE =	11.59	AC	0.35
Total =	11.59	AC	

COMPOSITE C =	0.35

"I": RAINFALL INTENSITY

Mannings Roughness, n=	0.035	
Length, L=	1747	ft
24hr - 2Year Intensity, P2=	1.73	in/hr
Slope, s=	0.003	ft/ft
Sheet Flow=	87.6	min.

Tt = Overland Sheet Flow Travel Time =
(0.007*((n*L)^0.8)*60)/(P2^0.5)*(S^0.4)
(TR-55 Method)

Total Time of Concentration=	87.6	min.

PER NOAA ATLAS PRECIPITATION DATA:

Linear Interpolation - 10yr		
Tc1	**Tc2**	**Tc3**
60	87.6	120
I1	**I2 (Solve)**	**I3**
0.731	0.58	0.403

PER NOAA ATLAS PRECIPITATION DATA:

I-10 YEAR=	0.58	IN/HR
I-100 YEAR=	1.09	IN/HR

Linear Interpolation - 100 yr		
Tc1	**Tc2**	**Tc3**
60	87.6	120
I1	**I2 (Solve)**	**I3**
1.380	1.09	0.752

Q=CIA	
Q10	2.35 CFS
Q100	4.42 CFS

Hydrology Calculations
Meadow Edge Park
Vinton, CA

November 27, 2024

Q=CIA

POST-DEVELOPMENT HYDROLOGY

DMA 1A

"A": AREA

TOTAL =	2.58	AC

"C": RUNOFF COEFFICIENT

			C
PAVEMENT =	0.00	AC	0.90
ROOF =	0.55	AC	0.95
LANDSCAPE =	2.03	AC	0.35
Total =	2.58	AC	

COMPOSITE C =	0.48

"I": RAINFALL INTENSITY

Mannings Roughness, n=	0.035	
Length, L=	173	ft
24hr - 2Year Intensity, P2=	1.73	in/hr
Slope, s=	0.005	ft/ft
Sheet Flow=	11.2	min.

Overland Sheet Flow Travel Time =
(0.007*((n*L)^0.8)*60)/(P2^0.5)*(S^0.4)
(TR-55 Method)

Mannings Roughness, n=	0.035	
Length, L=	904	ft
Slope, s=	0.005	ft/ft
Hydraulic Radius, R=	0.212	ft
Velocity, V=	1.06	ft/sec
Concentrated Flow=	14.2	min.

Concentrated Flow Travel Time =
L/(60*V), where
V=(1.49*(R^0.67)*(s^0.5))/n
(Manning's Equation)

Total Time of Concentration=	25.4	min.

Linear Interpolation - 10yr		
Tc1	**Tc2**	**Tc3**
15	25.4	30
I1	**I2 (Solve)**	**I3**
1.52	1.19	1.04

Linear Interpolation - 100 yr		
Tc1	**Tc2**	**Tc3**
15	25.4	30
I1	**I2 (Solve)**	**I3**
2.880	2.25	1.97

PER NOAA ATLAS PRECIPITATION DATA:

I-10 YEAR=	1.19	IN/HR
I-100 YEAR=	2.25	IN/HR

Q=CIA	
Q10	1.47 CFS
Q100	2.78 CFS

Hydrology Calculations
Meadow Edge Park
Vinton, CA

November 27, 2024

Q=CIA

POST-DEVELOPMENT HYDROLOGY

DMA 1B

"A": AREA

TOTAL =	3.04	AC

"C": RUNOFF COEFFICIENT

			C
PAVEMENT =	0.00	AC	0.90
ROOF =	0.53	AC	0.95
LANDSCAPE =	2.51	AC	0.35
Total =	3.04	AC	

COMPOSITE C =	0.46

"I": RAINFALL INTENSITY

Mannings Roughness, n=	0.035	
Length, L=	131	ft
24hr - 2Year Intensity, P2=	1.73	in/hr
Slope, s=	0.005	ft/ft
Sheet Flow=	9.0	min.

Overland Sheet Flow Travel Time =
(0.007*((n*L)^0.8)*60)/(P2^0.5)*(S^0.4)
(TR-55 Method)

Mannings Roughness, n=	0.035	
Length, L=	900	ft
Slope, s=	0.005	ft/ft
Hydraulic Radius, R=	0.212	ft
Velocity, V=	1.06	ft/sec
Concentrated Flow=	14.1	min.

Concentrated Flow Travel Time =
L/(60*V), where
V=(1.49*(R^0.67)*(s^0.5))/n
(Manning's Equation)

Total Time of Concentration=	23.1	min.

Linear Interpolation - 10yr		
Tc1	**Tc2**	**Tc3**
15	23.1	30
I1	**I2 (Solve)**	**I3**
1.52	1.26	1.04

Linear Interpolation - 100 yr		
Tc1	**Tc2**	**Tc3**
15	23.1	30
I1	**I2 (Solve)**	**I3**
2.880	2.39	1.97

PER NOAA ATLAS PRECIPITATION DATA:

I-10 YEAR=	1.26	IN/HR
I-100 YEAR=	2.39	IN/HR

Q=CIA	
Q10	1.75 CFS
Q100	3.31 CFS

Hydrology Calculations
Meadow Edge Park
Vinton, CA

November 27, 2024

Q=CIA

POST-DEVELOPMENT HYDROLOGY

DMA 1C

"A": AREA

TOTAL = 4.28 AC

"C": RUNOFF COEFFICIENT

			C
PAVEMENT =	0.00	AC	0.90
ROOF =	0.75	AC	0.95
LANDSCAPE =	3.53	AC	0.35
Total =	4.28	AC	

COMPOSITE C = 0.46

"I": RAINFALL INTENSITY

Mannings Roughness, n=	0.035	
Length, L=	255	ft
24hr - 2Year Intensity, P2=	1.73	in/hr
Slope, s=	0.005	ft/ft
Sheet Flow=	15.3	min.

Overland Sheet Flow Travel Time =
(0.007*((n*L)^0.8)*60)/(P2^0.5)*(S^0.4)
(TR-55 Method)

Mannings Roughness, n=	0.035	
Length, L=	1041	ft
Slope, s=	0.005	ft/ft
Hydraulic Radius, R=	0.212	ft
Velocity, V=	1.06	ft/sec
Concentrated Flow=	16.3	min.

Concentrated Flow Travel Time =
L/(60*V), where
V=(1.49*(R^0.67)*(s^0.5))/n
(Manning's Equation)

Total Time of Concentration= 31.6 min.

Linear Interpolation - 10yr		
Tc1	Tc2	Tc3
30	31.6	60
I1	I2 (Solve)	I3
1.04	1.02	0.731

Linear Interpolation - 100 yr		
Tc1	Tc2	Tc3
30	31.6	60
I1	I2 (Solve)	I3
1.970	1.94	1.38

PER NOAA ATLAS PRECIPITATION DATA:

I-10 YEAR=	1.02	IN/HR
I-100 YEAR=	1.94	IN/HR

Q=CIA	
Q10	2.00 CFS
Q100	3.78 CFS

Hydrology Calculations
Meadow Edge Park
Vinton, CA

November 27, 2024

Q=CIA

POST-DEVELOPMENT HYDROLOGY

DMA 1D

"A": AREA

TOTAL = 30.74 AC

"C": RUNOFF COEFFICIENT

			C
PAVEMENT =	0.38	AC	0.90
ROOF =	0.61	AC	0.95
LANDSCAPE =	29.75	AC	0.35
Total =	30.74	AC	

COMPOSITE C = 0.37

"I": RAINFALL INTENSITY

Mannings Roughness, n=	0.035	
Length, L=	1556	ft
24hr - 2Year Intensity, P2=	1.73	in/hr
Slope, s=	0.005	ft/ft
Sheet Flow=	65.1	min.

Overland Sheet Flow Travel Time =
(0.007*((n*L)^0.8)*60)/(P2^0.5)*(S^0.4)
(TR-55 Method)

Mannings Roughness, n=	0.035	
Length, L=	1572	ft
Slope, s=	0.005	ft/ft
Hydraulic Radius, R=	1.12	ft
Velocity, V=	3.25	ft/sec
Concentrated Flow=	8.1	min.

Concentrated Flow Travel Time =
L/(60*V), where
V=(1.49*(R^0.67)*(s^0.5))/n
(Manning's Equation)

Total Time of Concentration= 73.2 min.

Linear Interpolation - 10yr		
Tc1	Tc2	Tc3
60	73.2	120
I1	I2 (Solve)	I3
0.731	0.66	0.403

Linear Interpolation - 100 yr		
Tc1	Tc2	Tc3
60	73.2	120
I1	I2 (Solve)	I3
1.380	1.24	0.752

PER NOAA ATLAS PRECIPITATION DATA:

I-10 YEAR=	0.66	IN/HR
I-100 YEAR=	1.24	IN/HR

Q=CIA	
Q10	7.47 CFS
Q100	14.08 CFS

Hydrology Calculations
Meadow Edge Park
Vinton, CA

November 27, 2024

Q=CIA

POST-DEVELOPMENT HYDROLOGY

DMA 2

"A": AREA

TOTAL =	11.49	AC

"C": RUNOFF COEFFICIENT

			C
PAVEMENT =	0.00	AC	0.90
ROOF =	0.00	AC	0.95
LANDSCAPE =	11.49	AC	0.35
Total =	11.49	AC	

COMPOSITE C =	0.35

"I": RAINFALL INTENSITY

Mannings Roughness, n=	0.035	
Length, L=	1747	ft
24hr - 2Year Intensity, P2=	1.73	in/hr
Slope, s=	0.003	ft/ft
Sheet Flow=	87.6	min.

Overland Sheet Flow Travel Time =
(0.007*((n*L)^0.8)*60)/(P2^0.5)*(S^0.4)
(TR-55 Method)

Total Time of Concentration=	87.6	min.

PER NOAA ATLAS PRECIPITATION DATA:

I-10 YEAR=	0.58	IN/HR
I-100 YEAR=	1.09	IN/HR

Linear Interpolation - 10yr		
Tc1	**Tc2**	**Tc3**
60	87.6	120
I1	**I2 (Solve)**	**I3**
0.731	0.58	0.403

Linear Interpolation - 100 yr		
Tc1	**Tc2**	**Tc3**
60	87.6	120
I1	**I2 (Solve)**	**I3**
1.380	1.09	0.752

Q=CIA	
Q10	2.33 CFS
Q100	4.39 CFS

EXHIBIT 2

LID Treatment & Compliance

California Phase II LID Sizing Tool - v1.2

DMA #1

Step 5 - Site Design Measures

Project name	Meadow Edge Park
Climate station	DONNER MEM SP
Saturated hydraulic conductivity	1.5 in/hr
Impervious area	24000 square feet
Design storm	0.97 in

Site Design Measures (SDMs) must first be implemented to the extent technically feasible before implementing Storm Water Treatment Measures (SWTMs). SDMs must be sized using the 85th percentile, 24-hour storm, or another design storm as adopted by local regulators.

Site Design Measures Using a Design Storm of 0.97 Inches

LID BMP Types	Area Needed (square feet)	Area Avaliable (square feet)	Percent Accomplished
Porous Pavement	987	0.00	0.00
Strip, Amended 6"	25019	0.00	0.00
Strip, Amended 12"	7896	0.00	0.00
Strip, Amended 18"	4688	0.00	0.00
Swale, Amended 6"[2]	25019	0.00	0.00
Swale, Amended 12"[2]	7896	0.00	0.00
Swale, Amended 18"[2]	4688	0.00	0.00
Capture and Use Storage[3]	1778 cf	0.00 cf	0.00
	Totals	0.000	0.00

BACK NEXT

Instructions for Site Design Measures +

Footnotes +

Background +

CA Phase II LID Sizing Tool Methods +

Special Notes Regarding the Tables +

California Phase II LID Sizing Tool - v1.2

DMA #2

Step 5 - Site Design Measures

Project name	Meadow Edge Park
Climate station	DONNER MEM SP
Saturated hydraulic conductivity	1.5 in/hr
Impervious area	23200 square feet
Design storm	0.97 in

Site Design Measures (SDMs) must first be implemented to the extent technically feasible before implementing Storm Water Treatment Measures (SWTMs). SDMs must be sized using the 85th percentile, 24-hour storm, or another design storm as adopted by local regulators.

Site Design Measures Using a Design Storm of 0.97 Inches

LID BMP Types	Area Needed (square feet)	Area Avaliable (square feet)	Percent Accomplished
Porous Pavement	955	0.00	0.00
Strip, Amended 6"	24185	0.00	0.00
Strip, Amended 12"	7633	0.00	0.00
Strip, Amended 18"	4531	0.00	0.00
Swale, Amended 6"[2]	24185	0.00	0.00
Swale, Amended 12"[2]	7633	0.00	0.00
Swale, Amended 18"[2]	4531	0.00	0.00
Capture and Use Storage[3]	1719 cf	0.00 cf	0.00
	Totals	0.000	0.00

BACK NEXT

Instructions for Site Design Measures +

Footnotes +

Background +

CA Phase II LID Sizing Tool Methods +

Special Notes Regarding the Tables +

California Phase II LID Sizing Tool - v1.2

DMA #3

Step 5 - Site Design Measures

Project name	Meadow Edge Park
Climate station	DONNER MEM SP
Saturated hydraulic conductivity	1.5 in/hr
Impervious area	32800 square feet
Design storm	0.97 in

Site Design Measures (SDMs) must first be implemented to the extent technically feasible before implementing Storm Water Treatment Measures (SWTMs). SDMs must be sized using the 85th percentile, 24-hour storm, or another design storm as adopted by local regulators.

Site Design Measures Using a Design Storm of 0.97 Inches

LID BMP Types	Area Needed (square feet)	Area Avaliable (square feet)	Percent Accomplished
Porous Pavement	1349	0.00	0.00
Strip, Amended 6"	34193	0.00	0.00
Strip, Amended 12"	10791	0.00	0.00
Strip, Amended 18"	6406	0.00	0.00
Swale, Amended 6"[2]	34193	0.00	0.00
Swale, Amended 12"[2]	10791	0.00	0.00
Swale, Amended 18"[2]	6406	0.00	0.00
Capture and Use Storage[3]	2430 cf	0.00 cf	0.00
	Totals	0.000	0.00

BACK NEXT

Instructions for Site Design Measures +

Footnotes +

Background +

CA Phase II LID Sizing Tool Methods +

Special Notes Regarding the Tables +

Bioretention Sizing

ID	*Serving DMA*	*Required LID Treatment Volume* cf	*Bio Area* sf	*Ponding Depth* ft	*Soil Depth* ft	*Soil Porosity*	*Gravel Depth* ft	*Gravel Porosity*	*Bioretention Volume* cf
Bio-1	DMA-1	**1,778**	2,693	0.25	1.0	0.4	0.5	0.4	**2,289**
Bio-2	DMA-2	**1,719**	2,693	0.25	1.0	0.4	0.5	0.4	**2,289**
Bio-3	DMA-3	**2,430**	2,770	0.25	1.0	0.4	0.75	0.4	**2,632**

EXHIBIT 3

Detention Analysis

TO BE COMPLETED DURING FINAL DESIGN PHASE

EXHIBIT 4

Hydraulic Analysis & Profiles

TO BE COMPLETED DURING FINAL DESIGN PHASE

EXHIBIT 5

Drainage Maps

LEGEND	
	PROPERTY LINE
	EXISTING DRAINAGE SWALE
	EXISTING STORM DRAIN PIPE
	WATERSHED BOUNDARY

STATE HIGHWAY 70

EDE STREET

OLD ROAD

EXISTING DEVELOPMENT

PRE-DMA-1

Total Area =	40.03 Acres
Impervious Area =	0.99 Acres
Pervious Area =	39.04 Acres

PRE-DEVELOPMENT PROJECT FLOWS
Q (10-Year) = 6.63 cfs
Q (100-Year) = 12.40 cfs

Tc = 110.6 minutes

PRE-DEVELOPMENT PROJECT FLOWS
Q (10-Year) = 2.35 cfs
Q (100-Year) = 4.42 cfs

Tc = 87.6 minutes

PRE-DMA-2

Total Area =	11.59 Acres
Impervious Area =	0.00 Acres
Pervious Area =	11.59 Acres

0 50 100 200 FEET
SCALE: 1" = 100'

MILLENNIUM PLANNING & ENGINEERING
471 SUTTON WAY, SUITE 210, GRASS VALLEY, CA 95945 (530) 446-6765

REV.	DESCRIPTION	DATE

MEADOW EDGE PARK

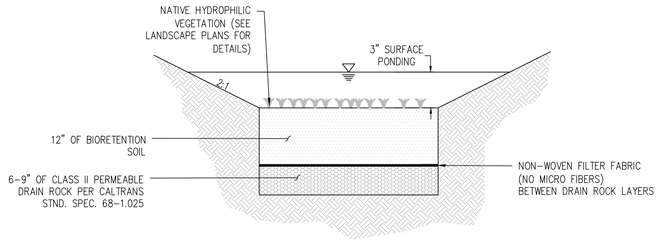
92400 HIGHWAY 70
VINTON, CALIFORNIA

PRE-DEVELOPMENT HYDROLOGY MAP

REGISTERED PROFESSIONAL ENGINEER
LILLIAN A. SPARKS
No. C95724
PRELIMINARY
CIVIL
STATE OF CALIFORNIA

DESIGNED BY: LAS
DRAWN BY: LAS
PROJECT NO.: 20-1104
DATE: DECEMBER 2024

SHEET NUMBER:
1 of 2



BIORETENTION TYPICAL SECTION DETAIL

NTS

LEGEND	
	PROPERTY LINE
	EASEMENT & RIGHT-OF-WAY
	EXISTING DRAINAGE SWALE
	EXISTING STORM DRAIN PIPE
	WATERSHED BOUNDARY
	PROPOSED GRAVEL ROAD

POST-DMA-1D
Total Area = 30.74 Acres
Impervious Area = 0.99 Acres
Pervious Area = 29.75 Acres

POST-DMA-1C
Total Area = 4.28 Acres
Impervious Area = 0.75 Acres
Pervious Area = 3.53 Acres

POST-DMA-1B
Total Area = 3.04 Acres
Impervious Area = 0.53 Acres
Pervious Area = 2.51 Acres

POST-DMA-1A
Total Area = 2.58 Acres
Impervious Area = 0.55 Acres
Pervious Area = 2.03 Acres

POST-DMA-2
Total Area = 11.49 Acres
Impervious Area = 0.00 Acres
Pervious Area = 11.49 Acres

POST-DEVELOPMENT PROJECT FLOWS
Q (10-Year) = 12.69 cfs
Q (100-Year) = 23.95 cfs

DMA 1D
Q (10-Year) = 7.47 cfs
Q (100-Year) = 14.08 cfs

DMA 1C
Q (10-Year) = 2.00 cfs
Q (100-Year) = 3.78 cfs

DMA 1B
Q (10-Year) = 1.75 cfs
Q (100-Year) = 3.31 cfs

DMA 1A
Q (10-Year) = 1.47 cfs
Q (100-Year) = 2.78 cfs

POST-DEVELOPMENT PROJECT FLOWS
Q (10-Year) = 2.33 cfs
Q (100-Year) = 4.39 cfs

Tc = 31.6 minutes
Tc = 23.1 minutes
Tc = 25.4 minutes
Tc = 73.2 minutes
Tc = 87.6 minutes

BIORETENTION BASIN 3
BIORETENTION BASIN 2
BIORETENTION BASIN 1

STATE HIGHWAY 70
EDE STREET
OLD ROAD
EXISTING DEVELOPMENT

0 50 100 200 FEET
SCALE: 1" = 100'

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REV.	DESCRIPTION	DATE

MEADOW EDGE PARK
92400 HIGHWAY 70
VINTON, CALIFORNIA

POST-DEVELOPMENT HYDROLOGY MAP

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