Candor Rock, Inc. | **Civil Engineers**
Eureka, CA

TECHNICAL MEMORANDUM

Site Specific Drainage Analysis
Ramirze Minor Subdivision

Date:	**February 23, 2024**
Prepared For:	**Freddy Ramirez**
Prepared By:	**Andy Sundquist, PE**
Attachment 1:	**Tentative Map**
Attachment 2:	**NRCS Average Velocity Chart for Overland Flow Travel Time**
Attachment 3:	**NOAA Intensity Duration Frequency Chart**

REGISTERED PROFESSIONAL ENGINEER
ANDREW C. SUNDQUIST
80576
CIVIL
STATE OF CALIFORNIA
02-23-2024

1.0 INTRODUCTION AND PROJECT DESCRIPTION

Mr. Ramirez (Ramirez) is developing a parcel of land located at 5445 Northridge Drive, in Cutten, California. Ramirez is currently in the application process of subdividing the parcel into four separate parcels. The Ramirez Minor Subdivision Project (hereinafter "Project") is a subdivision of APN 303-270-028, an approximately 1.94-acre parcel, into four separate parcels. The resultant parcels will be approximately 0.84-acres, 0.48-acres, 0.35-acres and 0.26-acres in size. The existing parcel is undeveloped forest land and is bound by Northridge Drive to the north and west, an existing subdivision to the south and forest land (McKay Community Forest) to the east.

The proposed subdivision will separate the existing parcel into four separate parcels with the intent of single-family housing on the four future parcels. Each of the future parcels contains relatively flat areas to the northwest and is assumed to be used as the building sites. No major grading or surface contouring is assumed as a result of the subdivision, therefore general drainage patterns will remain unaffected. Offsite improvements and new sidewalks are not required conditions of the subdivision.

2.0 PURPOSE

The purpose of this site-specific drainage analysis is to determine the existing site drainage characteristics and identify any impacts the proposed subdivision may have on the existing drainage courses and stormwater runoff.

3.0 EXISTING SITE INFORMATION

The approximately 1.94-acre parcel is accessed from Northridge Drive, a Humboldt County maintained paved road with no existing storm drain infrastructure and is surrounded by residential parcels similar in size and topography. The subject parcel consists of undeveloped forest land consisting predominantly of redwood and fir trees. The perimeters consist predominantly of redwood trees and the McKay Community Forest.

The existing parcel is considered one drainage area that drains as sheet flow from the west to east, there is no drainage infrastructure on the parcel. The existing parcel is located in the Eureka Plain Watershed, stormwater runoff from the parcel drains to Henderson Gulch, east of the site and eventually into Ryan Creek which empties into Humboldt Bay to the north.

4.0 PEAK STORMWATER DISCHARGE CALCULATIONS

For the purpose of determining the impacts of the minor subdivision on downstream stormwater runoff the Rational Method has been employed. The Rational Method (Eqn. 1) was used to estimate the existing and post-development peak discharge flows at the site. This method takes into account the rainfall intensity for a given storm event, the type of surfaces present at the site, and the area associated with each surface.

Rational Method

$$Q = CiA \quad Eqn. 1$$

Where:

- Q = Peak stormwater discharge flow, in cubic feet per second (cfs)
- C = Surface runoff coefficient
- i = Rainfall intensity, in inches per hour (in/hr)
- A = Surface area, in acres (ac)

The project site is assumed to be one drainage area discharging as sheet flow to the northeastern perimeter of the parcel towards Henderson Gulch. The time of concentration is estimated utilizing a simplified version of the NRCS method (Eqn. 2) and the *NRCS Average Velocity Chart for Overland Flow Travel Time* (Attachment 3).

Time of Concentration

$$t_c = \frac{\sum L_{o,ft}}{v\,(60\frac{sec}{min})} = \frac{493\ ft}{0.70\ ft/\text{sec}\ \left(60\frac{sec}{min}\right)} = 11.7\ Min \quad Eqn.2$$

Where

- t_c = Time of Concentration (minutes)
- L_o = Overland Flow Distance (feet)
- v = Velocity (ft/sec) *from NRCS Average Velocity Chart for Overland Flow Travel Time, bare land*

Time of Concentration for overland flow of stormwater discharging from the site was estimated to be 11.7-minutes for both the existing and post-development conditions, for the purpose of this technical memorandum, a conservative 10-minute time of concentration was used for the Rational Method calculations. An estimate of size for individual surface types for the existing conditions is summarized in Table 2 below. Additionally, runoff coefficients have been assigned to each surface type and composite runoff coefficients have been calculated.

Table 1. Existing Conditions Area Surfaces and Runoff Coefficients

Surface Type	Area (acres)	Runoff Coefficient
Impervious	0.00	0.9
Unimproved Land	1.94	0.2
Composite Runoff Coefficient		**0.20**

The rainfall intensity data for the 10-minute, 10-year & 100-year storm events were obtained from the National Oceanic and Atmospheric Administration (NOAA) *Precipitation Frequency Data Service*. Tabular and graphic rainfall intensity data is included as Attachment 4. Table 2 below summarizes the Rational Method parameters and the resultant peak stormwater discharge flow anticipated based on the existing site conditions during the 10-minute, 10-year and 100-year storm events.

Table 2. Existing Conditions Peak Stormwater Discharge

Site Conditions	Composite Runoff Coefficient	Rainfall Intensity "I" (in/hr)		Area (acres)	Peak Stormwater Discharge Flow Rate "Q" (cfs)	
		10 year	100 year		10 year	100 year
Existing Conditions	0.20	2.20	3.62	1.94	0.9	1.4

As displayed in Table 2 above the existing parcel is estimated to produce 0.9 and 1.4 CFS of stormwater during a 10-year and 100-year storm events, respectively.

5.0 FUTURE DEVELOPMENTS & LID CONSIDERATIONS

The proposed subdivision involves creating four new parcels from the existing 1.94-acre parcel. Creating the new parcels does not involve any on or offsite improvements or developments, therefore there is no effect on the existing drainage patterns or stormwater runoff. Proposed future developments will likely include single

family residential structures. During the future design and development phase of these new parcels, stormwater runoff will need to be considered as well as Low Impact Development (LID).

6.0 METHODS AND CALCULATIONS

Humboldt County Public Works staff have indicated that, for post-construction stormwater control and drainage design, the County requires that any new stormwater generated from the Project for an 85th percentile storm event be retained onsite. The Humboldt County LID Design manual indicates that an 85th percentile storm event for Eureka is equal to 0.65-inches of stormwater.

Currently is no development plan for the newly created parcels. Therefore, for future consideration, we assumed a 3,000 square foot impervious development area on each parcel and propose the following alternatives to comply with LID regulations.

6.1 Parcel #1

Parcel #1 is formed by the proposed property lines of Parcel #1, the southern most parcel.

Table 3. Parcel #1 Runoff Volume and Storage Volume

Total Area Draining to Self-Retaining Swale (ft^2)	Rainfall from 85th Percentile Storm (ft)	Total Volume of Stormwater Runoff from DMA #2 (ft^3)	Total Length of Self-Retaining Swale(ft)	Total Storage Volume of Self-Retaining Swale (ft^3)
3,000	**0.054**	**162**	**60**	**180**

Parcel-1 drains stormwater by sheet flow from the south to the north towards its northern perimeter, before eventually discharging to the east to a natural drainage course. Parcel-1 is assumed to have a total impervious development footprint of 3,000 square-feet of surface area draining to the self-retaining swale. Roof and concrete are the contributors of impervious runoff in Parcel-1 and will discharge to the self-retaining swale by sheet flow. The self-retaining swale will be designed and constructed to retain a minimum volume of 162 cubic feet of stormwater. Overflow from the from the self-retaining area will discharge towards the eastern perimeter. The self-retaining swale shall be 60-feet in length, 4-feet wide and 1-foot deep, each linear foot of swale shall have a stormwater storage capacity of 3-cubic feet. The swale is proposed to be located along the norther perimeter of parcel 1.

6.2 Parcel's #1, #2, & #3

Parcels #1, 2, and 3 are formed by the proposed property lines of Parcel #1, 2 & 3. All three parcels are similar in size and topography.

Table 3 Parcels #1, #2, #3 Runoff Volume and Storage Volume

Total Area Draining to Self-Retaining Swale (ft^2)	Rainfall from 85th Percentile Storm (ft)	Total Volume of Stormwater Runoff from DMA #2 (ft^3)	Total Area of Self-Retaining Area(ft^2)	Total Storage Volume of Self-Retaining Area (ft^3)
3,000	**0.054**	**162**	**178**	**178**

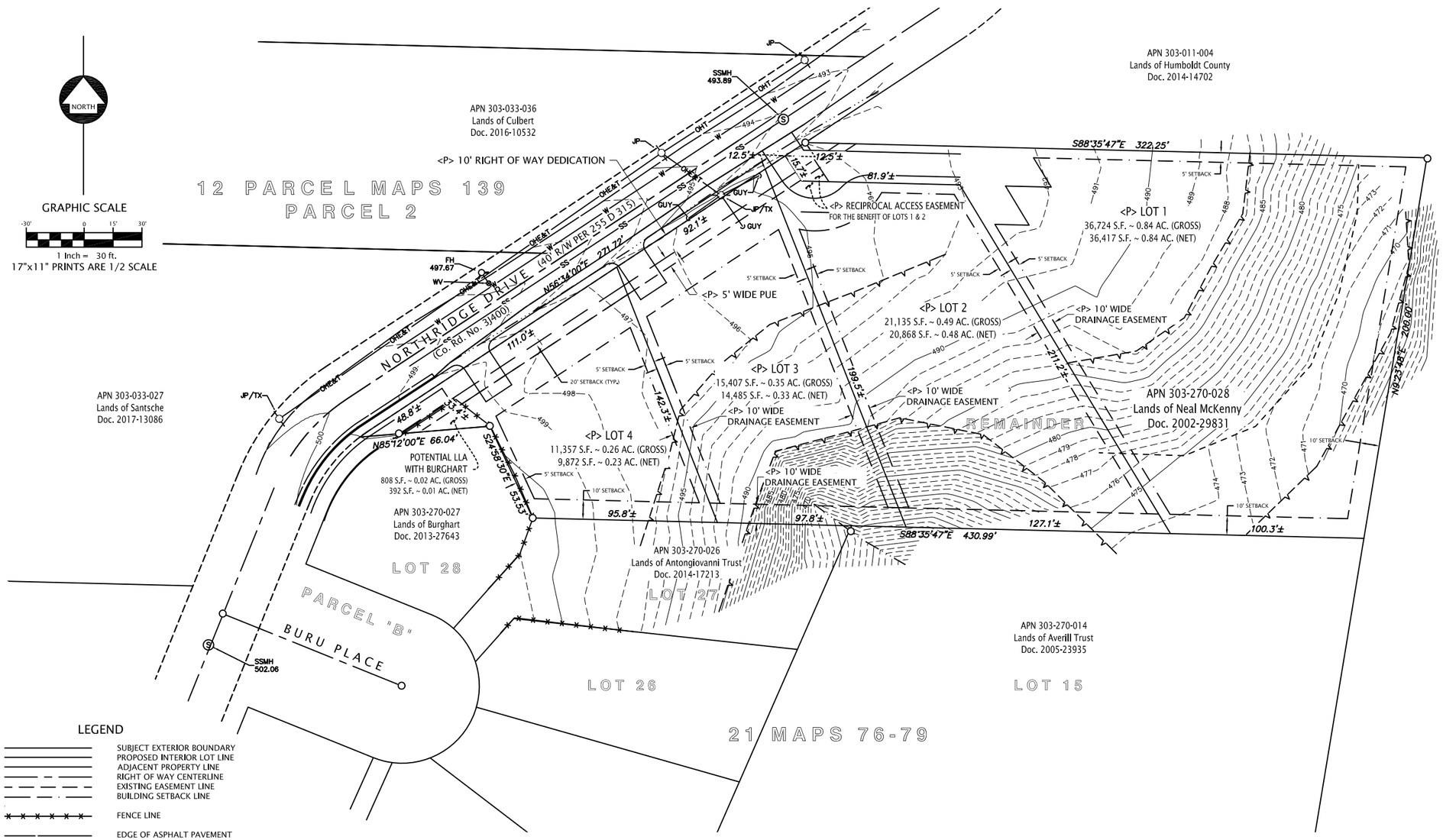
Parcels 1, 2, & 3 differ slightly from Parcel-1, these three parcels drain from the west to east and are not well suited for a self-retaining swale along one of their perimeters. Parcels 1, 2, & 3 are more suited for a shallow self-retaining area created by a depression formed in the ground with a minimum stormwater storage volume of 162 cubic feet with drainage from impervious areas directed towards the depression. An example self-retaining area would have the dimensions of a circular radius of 7.5-feet and a depth of 1-foot providing a storage volume of 178 cubic feet.

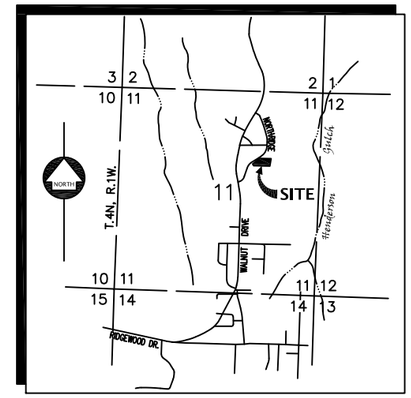
7.0 CONCLUSION

Subdividing the existing parcel into four separate parcels has no impact on downstream stormwater infrastructure. Once development plans are prepared for each parcel, the developer will need to mitigate stormwater runoff based on their development footprint. Mitigation alternatives above are for an assumed 3,000 square foot development footprint. If development footprints differ in size, runoff calculations will need to be reevaluated and mitigation measures will need to be developed for proposed development.

ATTACHMENT 1

Tentative Map





VICINITY MAP
SCALE: 1" = 2,000'

PROJECT DATA

Owner / Applicant:	Curb Appeal Construction
C/O:	Blaine O'Shaugnessy
APN:	303-270-028
Mailing Address:	5445 Northridge Drive Cutten, CA 95503
Phone:	
General Plan:	RL1-7
Principal Zoning:	R1-B-7 (ECP)
Building Setbacks:	Front: 20' Interior Side: 5' Exterior Side: 5' Rear: 10'

Agent:	Jesse Buffington
	Points West Surveying Company
Mailing Address:	5201 Carlson Park Drive
	Arcata, CA 95521
Phone:	707.840.9510
Fax:	707.840.9542
Email:	Buffington@PointsWestSurveying.com

SURVEYOR'S STATEMENT

This map was prepared by me, or under my direction, and is based upon a field survey.

SIGNED_____

DATED_____

Jesse N. Buffington
PLS 9339

LICENSED LAND SURVEYOR
JESSE N. BUFFINGTON
No. 9339
STATE OF CALIFORNIA

LEGEND

- SUBJECT EXTERIOR BOUNDARY
- PROPOSED INTERIOR LOT LINE
- ADJACENT PROPERTY LINE
- RIGHT OF WAY CENTERLINE
- EXISTING EASEMENT LINE
- BUILDING SETBACK LINE
- FENCE LINE
- EDGE OF ASPHALT PAVEMENT
- EXISTING GROUND CONTOURS (ONE FOOT INTERVALS)
- OHE — OVERHEAD ELECTRIC
- OHE&T — OVERHEAD ELECTRIC & TELEPHONE
- G — EXISTING GAS LINE
- EXISTING STORM DRAIN CULVERT
- SS — EXISTING SANITARY SEWER LINE
- PROPOSED SANITARY SEWER LINE
- W — EXISTING WATER LINE
- PROPOSED WATER LINE
- EM — ELECTRIC METER
- GM — GAS METER
- GV — GAS VALVE
- JP — JOINT UTILITY POLE
- JP/LP — JOINT UTILITY POLE WITH STREET LAMP
- STORM DRAIN INLET
- SSMH — SANITARY SEWER MANHOLE
- SSCO — SANITARY SEWER CLEANOUT
- FH — FIRE HYDRANT
- WM — WATER METER
- WV — WATER VALVE
- PARKING SPACE

PROJECT NOTES

1) This Tentative Map represents a proposed Minor Subdivision of the lands described in document 2002-29831 into 4 parcels. Said parcel is currently undeveloped.
2) The area contained within the lands described in document 2002-29831 is 84,623 square feet; the resultant proposed Lot 1 would contain 36,724 square feet, proposed Lot 2 would contain 21,135 square feet, proposed Lot 3 would contain 15,407 square feet and proposed Lot 4 would contain 11,357 square feet.
3) Zoning for the project site is RL.5 (MCCP).
4) Boundary lines and existing easements of record shown hereon are based on a Title Report by Fidelity National Title, File No. FHBT-2012200165, dated 2/10/2022. Boundary lines are based on measurements to Monument of record per,Book 21 of Maps, Page 76.
5) All easements of record are shown on this Tentative Map and will appear on the recorded subdivision map.
6) Intended use of the parcels to be created would be residential development.
7) Topography is shown at 1' intervals based on field survey by Points West Surveying performed in August 2022.
8) Elevations shown hereon are assumed with an elevation of 500' assigned at Points West Control Point No. 50. all elevations shown are relative to said point.
9) The subject parcel is served water and sewer by Humboldt Community Services district, Gas and Electric service is provided by PG&E. Telephone is served by AT&T.
10) The nearest Fire hydrant is located across Northridge Drive, 36' from the west line of proposed Lot 4 and 70' from the West corner between Lots 3 and 4.

REFERENCES

R1 Quail Ridge Subdivision - Unit 2, by K. Omsberg, 5/16/1995, recorded in Book 21 of Maps, Page 76-79.

R2 Record of Survey Louisiana Pacific and McKenny, by M. Ohern, 12/16/1992 recorded in Book 53 of Surveys, Page 111.

PRELIMINARY

APN 303-270-028

TENTATIVE MAP

FOR

CURB APPEAL CONSTRUCTION

NE 1/4 SECTION 11, T4N, R1W, HUMBOLDT MERIDIAN

IN THE UNINCORPORATED AREA OF CUTTEN,
HUMBOLDT COUNTY, STATE OF CALIFORNIA
Date: SEPTEMBER 2022

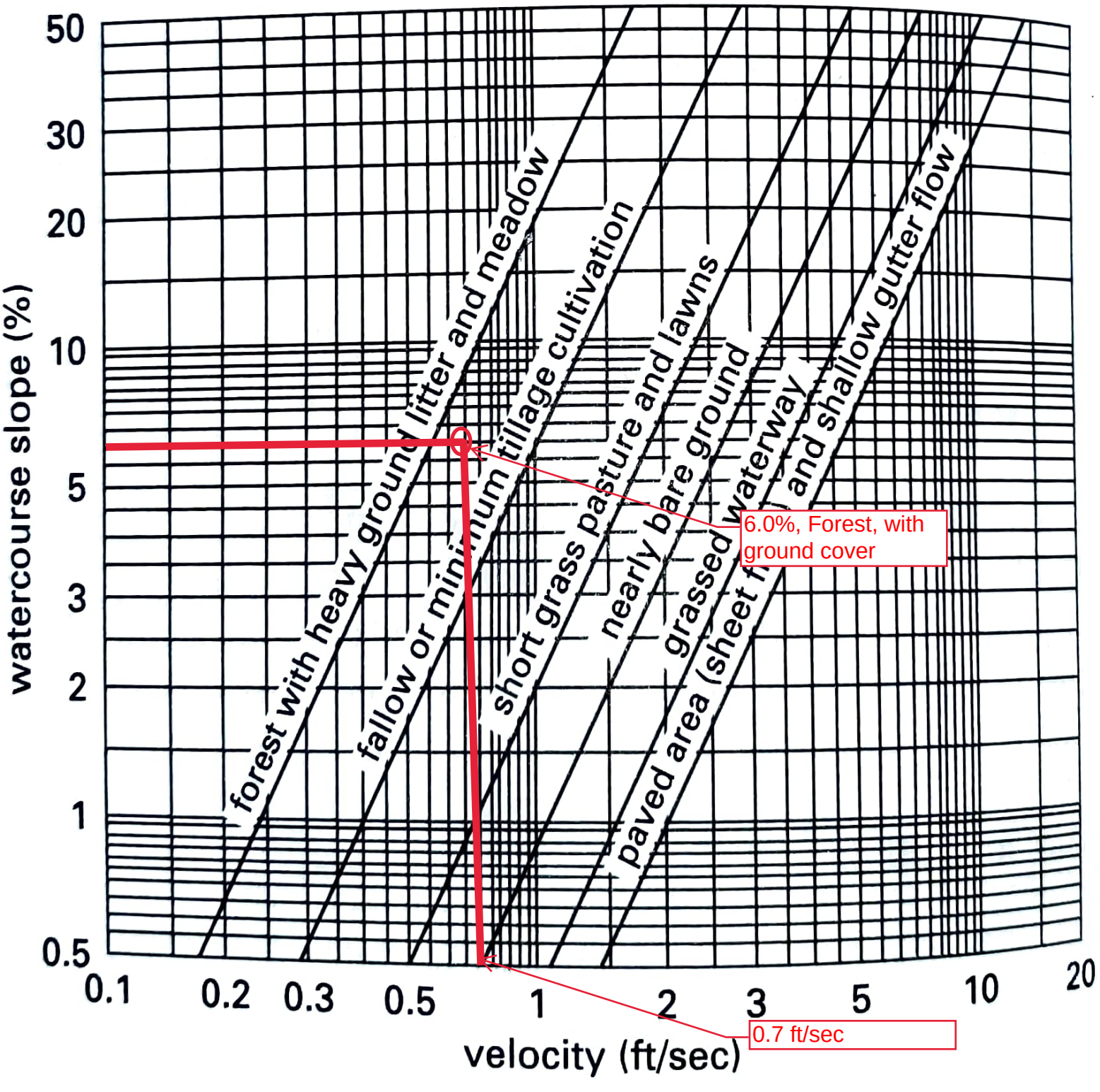
SCALE: 1" = 30' SHEET 1 OF 1

POINTS WEST SURVEYING CO.
5201 Carlson Park Dr., Suite 3 · Arcata, CA 95521
707·840·9510 · Phone 707·840·9542 · Fax

ATTACHMENT 2

NRCS Average Velocity Chart for Overland Flow Travel Time

Figure 20.4 *NRCS Average Velocity Chart for Overland Flow Travel Time*



ATTACHMENT 3

NOAA Intensity Duration Frequency Table

NOAA Atlas 14, Volume 6, Version 2
Location name: Eureka, California, USA*
Latitude: 40.7481°, Longitude: -124.1444°
Elevation: 277 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

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

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

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

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**1.56** (1.37-1.79)	**1.97** (1.73-2.28)	**2.56** (2.23-2.95)	**3.06** (2.65-3.58)	**3.80** (3.16-4.61)	**4.40** (3.58-5.47)	**5.05** (4.08-6.47)	**5.77** (4.42-7.62)	**6.80** (4.97-9.43)	**7.67** (5.38-11.0)
10-min	**1.12** (0.978-1.28)	**1.42** (1.24-1.63)	**1.83** (1.60-2.12)	**2.20** (1.90-2.56)	**2.72** (2.27-3.31)	**3.16** (2.56-3.92)	**3.62** (2.86-4.64)	**4.13** (3.16-5.46)	**4.88** (3.56-6.76)	**5.50** (3.85-7.91)
15-min	**0.900** (0.788-1.04)	**1.14** (1.00-1.32)	**1.48** (1.29-1.71)	**1.77** (1.53-2.07)	**2.20** (1.83-2.66)	**2.54** (2.07-3.16)	**2.92** (2.31-3.74)	**3.34** (2.55-4.40)	**3.93** (2.87-5.45)	**4.43** (3.11-6.38)
30-min	**0.612** (0.538-0.704)	**0.776** (0.680-0.894)	**1.00** (0.878-1.16)	**1.20** (1.04-1.41)	**1.49** (1.24-1.81)	**1.73** (1.41-2.15)	**1.99** (1.57-2.54)	**2.27** (1.73-3.00)	**2.68** (1.95-3.71)	**3.01** (2.11-4.34)
60-min	**0.431** (0.378-0.496)	**0.546** (0.478-0.630)	**0.707** (0.618-0.818)	**0.847** (0.733-0.989)	**1.05** (0.875-1.28)	**1.22** (0.990-1.52)	**1.40** (1.10-1.79)	**1.60** (1.22-2.11)	**1.88** (1.37-2.61)	**2.12** (1.49-3.06)
2-hr	**0.335** (0.294-0.385)	**0.413** (0.362-0.477)	**0.524** (0.457-0.606)	**0.620** (0.536-0.724)	**0.759** (0.632-0.922)	**0.874** (0.710-1.09)	**0.999** (0.789-1.28)	**1.13** (0.867-1.50)	**1.33** (0.971-1.84)	**1.50** (1.05-2.15)
3-hr	**0.288** (0.252-0.331)	**0.351** (0.308-0.405)	**0.441** (0.385-0.510)	**0.518** (0.448-0.605)	**0.631** (0.525-0.766)	**0.723** (0.588-0.900)	**0.823** (0.650-1.05)	**0.932** (0.712-1.23)	**1.09** (0.794-1.51)	**1.22** (0.855-1.76)
6-hr	**0.216** (0.189-0.248)	**0.261** (0.228-0.300)	**0.323** (0.282-0.373)	**0.376** (0.325-0.439)	**0.453** (0.377-0.550)	**0.515** (0.418-0.641)	**0.582** (0.459-0.744)	**0.654** (0.500-0.864)	**0.758** (0.552-1.05)	**0.843** (0.591-1.21)
12-hr	**0.156** (0.137-0.180)	**0.188** (0.164-0.217)	**0.231** (0.202-0.267)	**0.267** (0.231-0.312)	**0.319** (0.265-0.387)	**0.360** (0.292-0.448)	**0.403** (0.318-0.516)	**0.450** (0.344-0.594)	**0.515** (0.375-0.713)	**0.568** (0.398-0.818)
24-hr	**0.111** (0.099-0.126)	**0.133** (0.119-0.152)	**0.164** (0.146-0.187)	**0.189** (0.167-0.218)	**0.224** (0.192-0.266)	**0.251** (0.212-0.304)	**0.280** (0.231-0.346)	**0.310** (0.249-0.393)	**0.351** (0.272-0.463)	**0.384** (0.288-0.523)
2-day	**0.072** (0.065-0.082)	**0.088** (0.079-0.100)	**0.108** (0.097-0.124)	**0.125** (0.111-0.144)	**0.148** (0.127-0.176)	**0.165** (0.139-0.200)	**0.184** (0.151-0.227)	**0.202** (0.162-0.257)	**0.228** (0.176-0.301)	**0.248** (0.186-0.337)
3-day	**0.055** (0.049-0.063)	**0.067** (0.060-0.077)	**0.083** (0.074-0.096)	**0.096** (0.085-0.111)	**0.114** (0.098-0.136)	**0.128** (0.107-0.155)	**0.141** (0.116-0.175)	**0.155** (0.125-0.197)	**0.175** (0.135-0.230)	**0.189** (0.142-0.258)
4-day	**0.046** (0.041-0.052)	**0.056** (0.050-0.064)	**0.070** (0.062-0.080)	**0.081** (0.072-0.093)	**0.096** (0.082-0.114)	**0.107** (0.090-0.130)	**0.118** (0.097-0.147)	**0.130** (0.104-0.165)	**0.146** (0.113-0.192)	**0.158** (0.118-0.215)
7-day	**0.033** (0.030-0.038)	**0.041** (0.037-0.047)	**0.051** (0.046-0.059)	**0.059** (0.052-0.068)	**0.070** (0.060-0.083)	**0.078** (0.066-0.095)	**0.086** (0.071-0.107)	**0.095** (0.076-0.120)	**0.106** (0.082-0.139)	**0.114** (0.085-0.155)
10-day	**0.027** (0.024-0.031)	**0.034** (0.030-0.038)	**0.042** (0.037-0.048)	**0.049** (0.043-0.056)	**0.057** (0.049-0.068)	**0.064** (0.054-0.077)	**0.070** (0.058-0.087)	**0.077** (0.062-0.098)	**0.086** (0.066-0.113)	**0.092** (0.069-0.126)
20-day	**0.018** (0.016-0.021)	**0.023** (0.021-0.026)	**0.029** (0.026-0.033)	**0.033** (0.029-0.038)	**0.039** (0.033-0.046)	**0.043** (0.036-0.052)	**0.047** (0.039-0.059)	**0.052** (0.041-0.066)	**0.057** (0.044-0.075)	**0.061** (0.046-0.083)
30-day	**0.015** (0.014-0.017)	**0.019** (0.017-0.022)	**0.024** (0.021-0.027)	**0.027** (0.024-0.031)	**0.032** (0.027-0.038)	**0.035** (0.030-0.043)	**0.038** (0.032-0.048)	**0.041** (0.033-0.053)	**0.046** (0.035-0.060)	**0.049** (0.036-0.066)
45-day	**0.013** (0.012-0.015)	**0.016** (0.014-0.019)	**0.020** (0.018-0.023)	**0.023** (0.020-0.027)	**0.027** (0.023-0.032)	**0.029** (0.025-0.036)	**0.032** (0.026-0.040)	**0.034** (0.028-0.044)	**0.038** (0.029-0.050)	**0.040** (0.030-0.055)
60-day	**0.012** (0.010-0.013)	**0.014** (0.013-0.016)	**0.018** (0.016-0.020)	**0.020** (0.018-0.023)	**0.023** (0.020-0.028)	**0.025** (0.021-0.031)	**0.028** (0.023-0.034)	**0.030** (0.024-0.038)	**0.032** (0.025-0.043)	**0.034** (0.025-0.047)

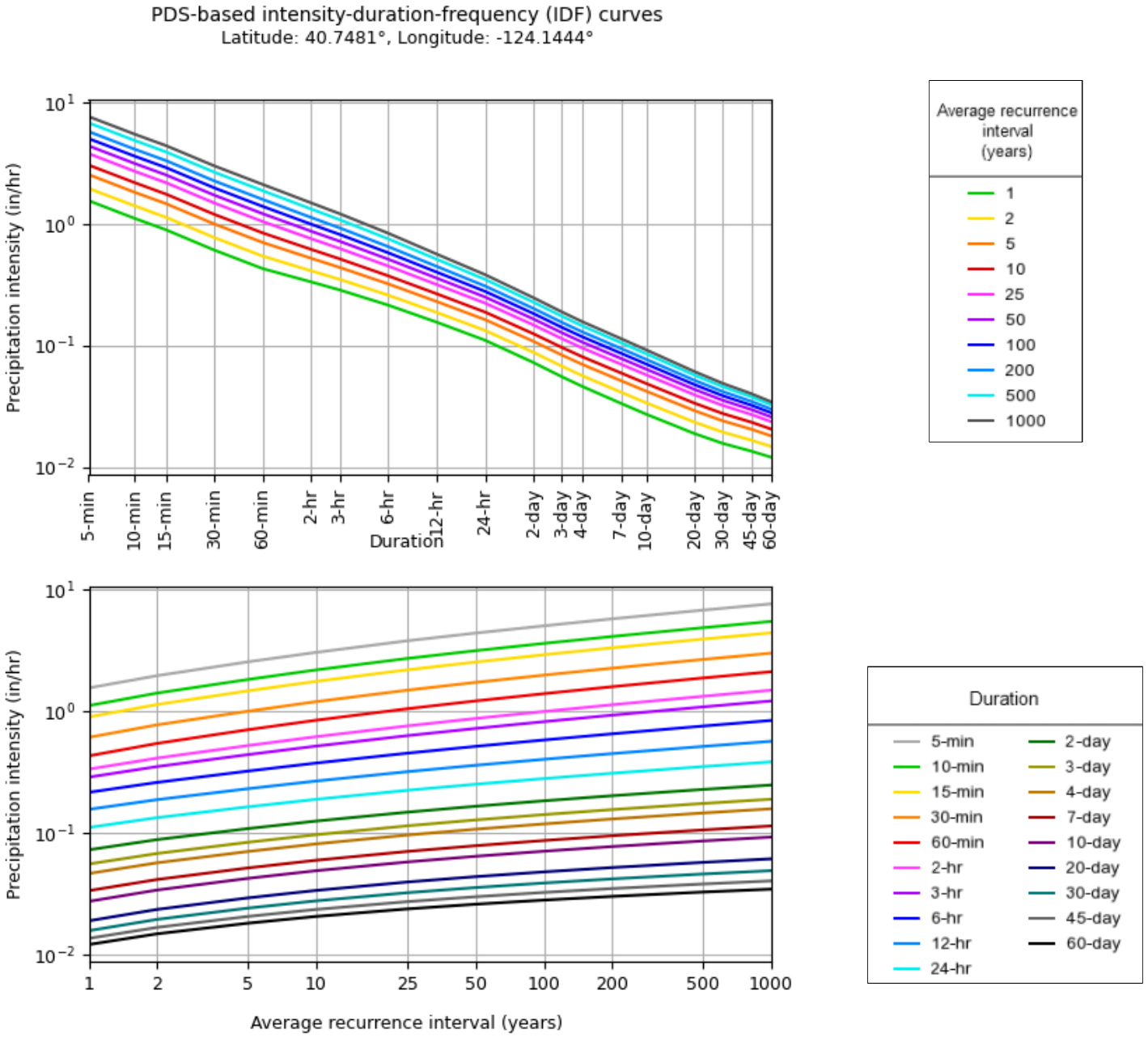
[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

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

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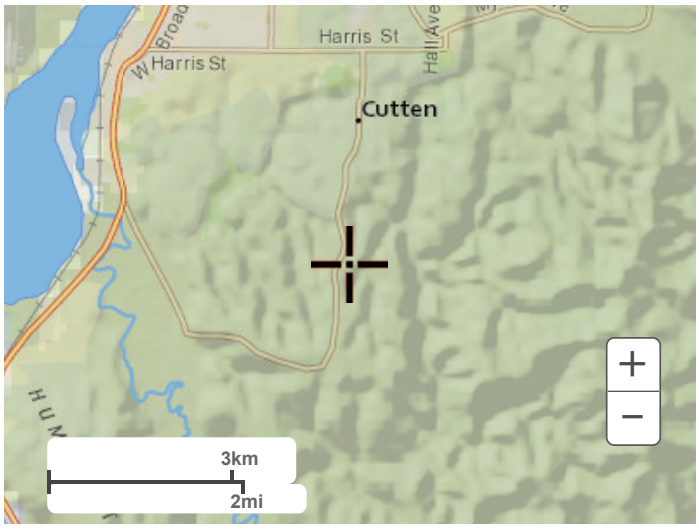
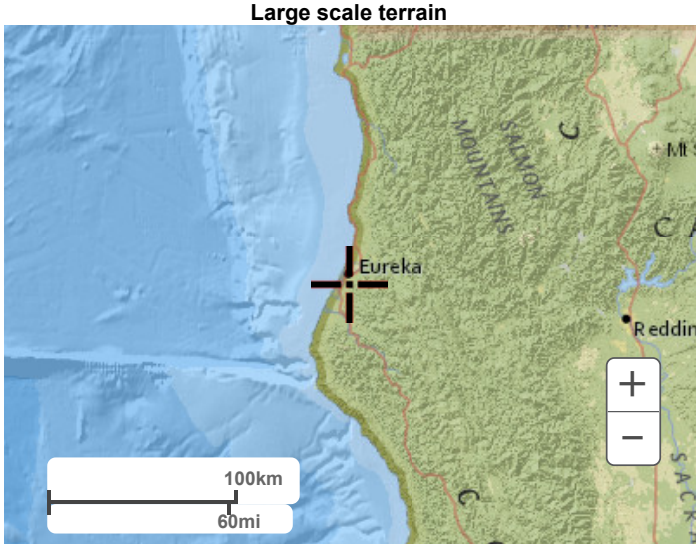
Back to Top

Maps & aerials

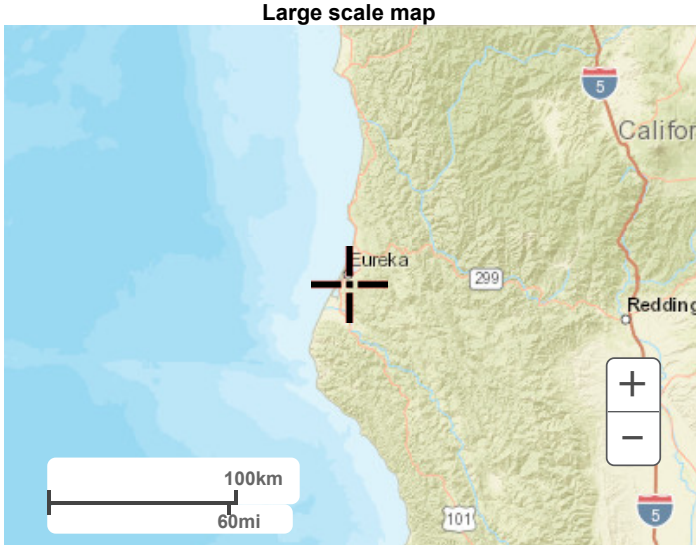
Small scale terrain



Large scale terrain



Large scale map



Large scale aerial

Back to Top

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