Stormwater Control Plan

Prepared For:

We Are Up
4636 Fieldbrook Rd #109
McKinleyville, CA 95519

April 4, 2025

Prepared By:

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Introduction

The following report presents the stormwater design plan and stormwater modeling completed for the We Are Up project in support of the facility meeting applicable State and local stormwater regulations.

Project Location

The proposed project is located in the unincorporated community of McKinleyville, Humboldt County, California. McKinleyville is situated on the Pacific Coast, approximately 14 miles north of Eureka, California and 90 miles south of the Oregon border (Figure 1).

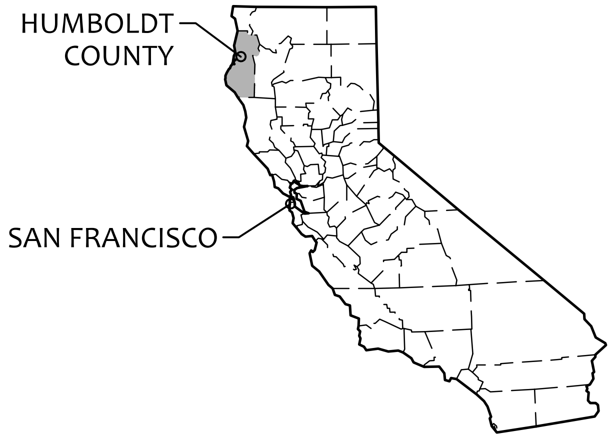
The Project will be located on approximately 17.38 contiguous acres east of Central Avenue between Bartow Road and Hideaway Court. The Project site is comprised of four Assessor's Parcel Numbers (APNs) which are generally described below:

APN	Street Address	Parcel Size (acres)	Existing Use
509-181-003	1551 Central Avenue	0.135	Vacant
509-181-012	1529 Central Avenue	1.06	Vacant
509-181-005	1515 Central Avenue	0.735	Single family and multifamily (duplex)
509-181-061	144 Weirup Lane	15.45	Multifamily (duplex); open space

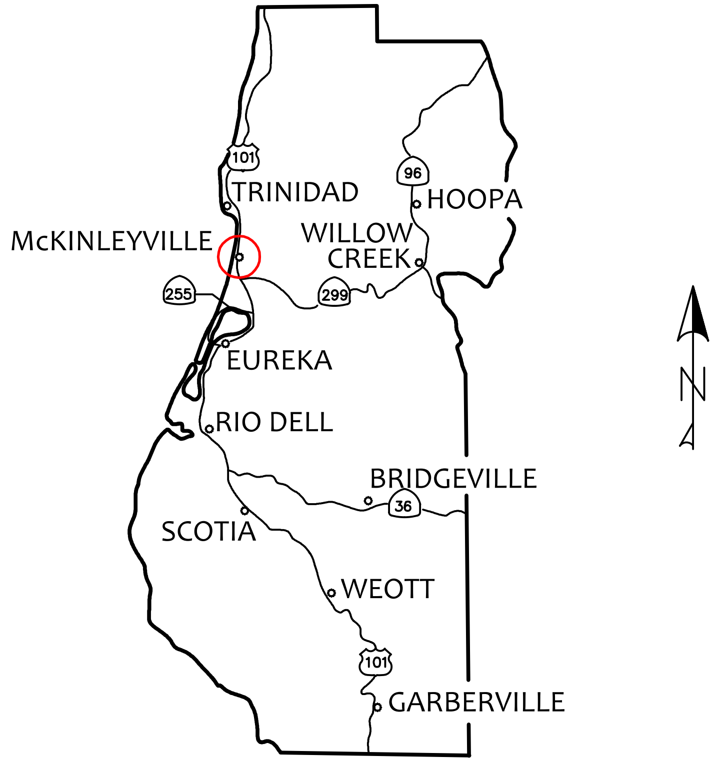
Existing Site Conditions

The area surrounding the smaller parcels along Central Avenue is characterized as mixed-use development with a combination of single-family homes, duplexes and commercial buildings. The Mill Creek Shopping Center is directly across the street (Central Avenue).

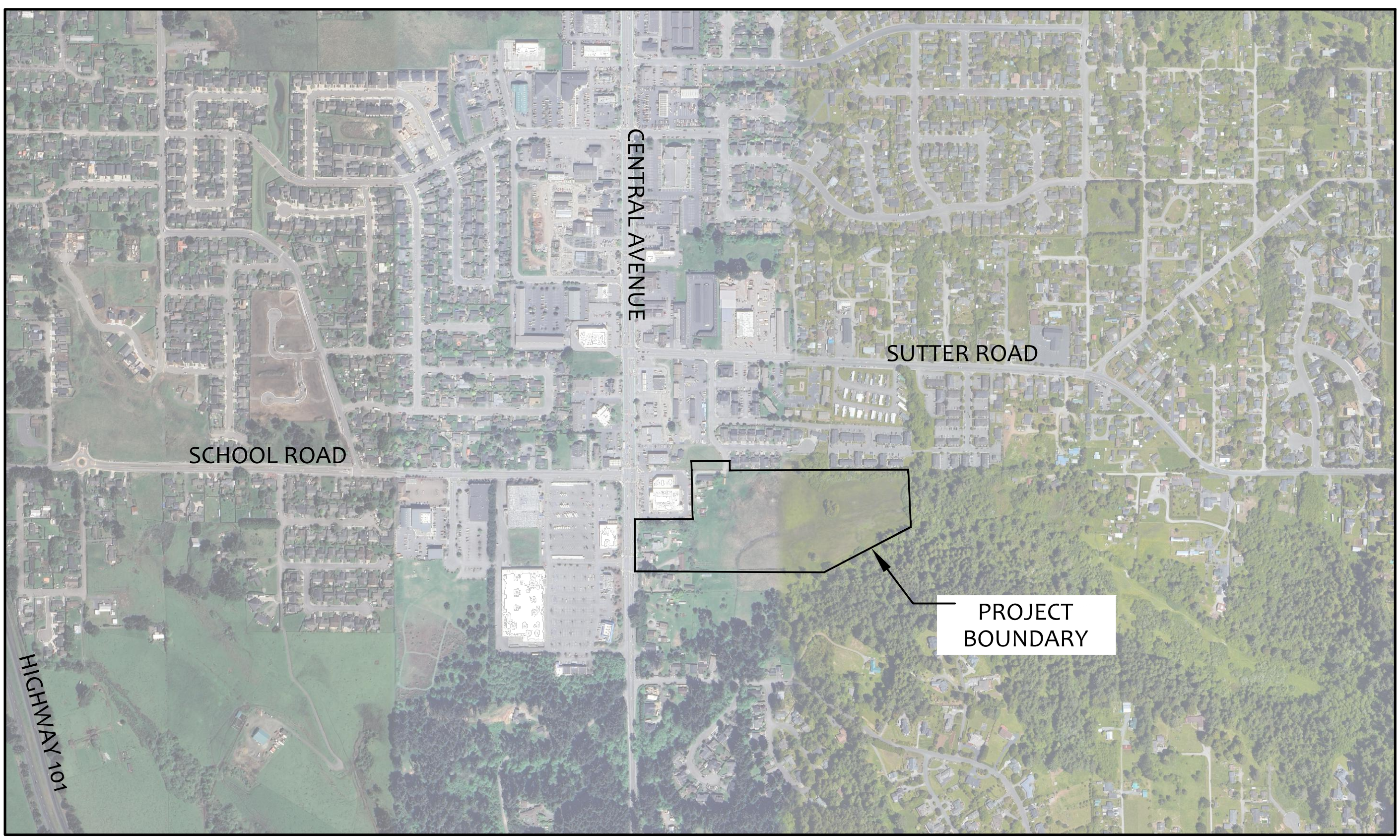
The larger Weirup Lane property is bordered by retail commercial development along its western boundary and a combination of single-family homes, multifamily apartments and the offices of the McKinleyville Community Services District (MCSD) to the north. To the east and to the south the property is bordered by Mill Creek which leads into a riparian forest with wetlands and scattered single-family homesites.



CALIFORNIA



HUMBOLDT COUNTY



VICINITY MAP

Standing Wave Engineering 600 F St, Suite 3 #113 Arcata, CA 95521 707.267.5243	Project No.: 0222	Drawn By: NPS	Project: We Are Up Housing
	Original Sheet Size: 8.5" x 11"	Date: 3/31/2025	Sheet Title: Figure 1 - Vicinity Map

Data Source: Google Maps

Terrain in the vicinity gradually slopes to the southeast toward Mill Creek (Figure 2). There is a 15- to 20-foot drainage easement bisecting APN 509-181-061 along a north-south axis for MCSD drainage purposes. The MCSD drainage pipe currently terminates near the center of the property. Also, a 15- to 20-foot MCSD sewer easement is located along the south and southeast portion of the parcel. The MCSD easement parallels the southern parcel boundary to the parcel midpoint before shifting south to follow Mill Creek.

The southeast portion of APN 509-181-061 is included in the mapped Federal Emergency Management Agency (FEMA) 100-year flood zone.

Proposed Improvements

The proposed project includes the construction of a new infill mixed-use planned development consisting of residential housing units, a community center, a greenhouse, a barn, and installation of associated site improvements, including an access road, walking trails, outdoor recreation activities (e.g. badminton, basketball), related lighting, stormwater features, wetland creation, and riparian planting (Figure 3).

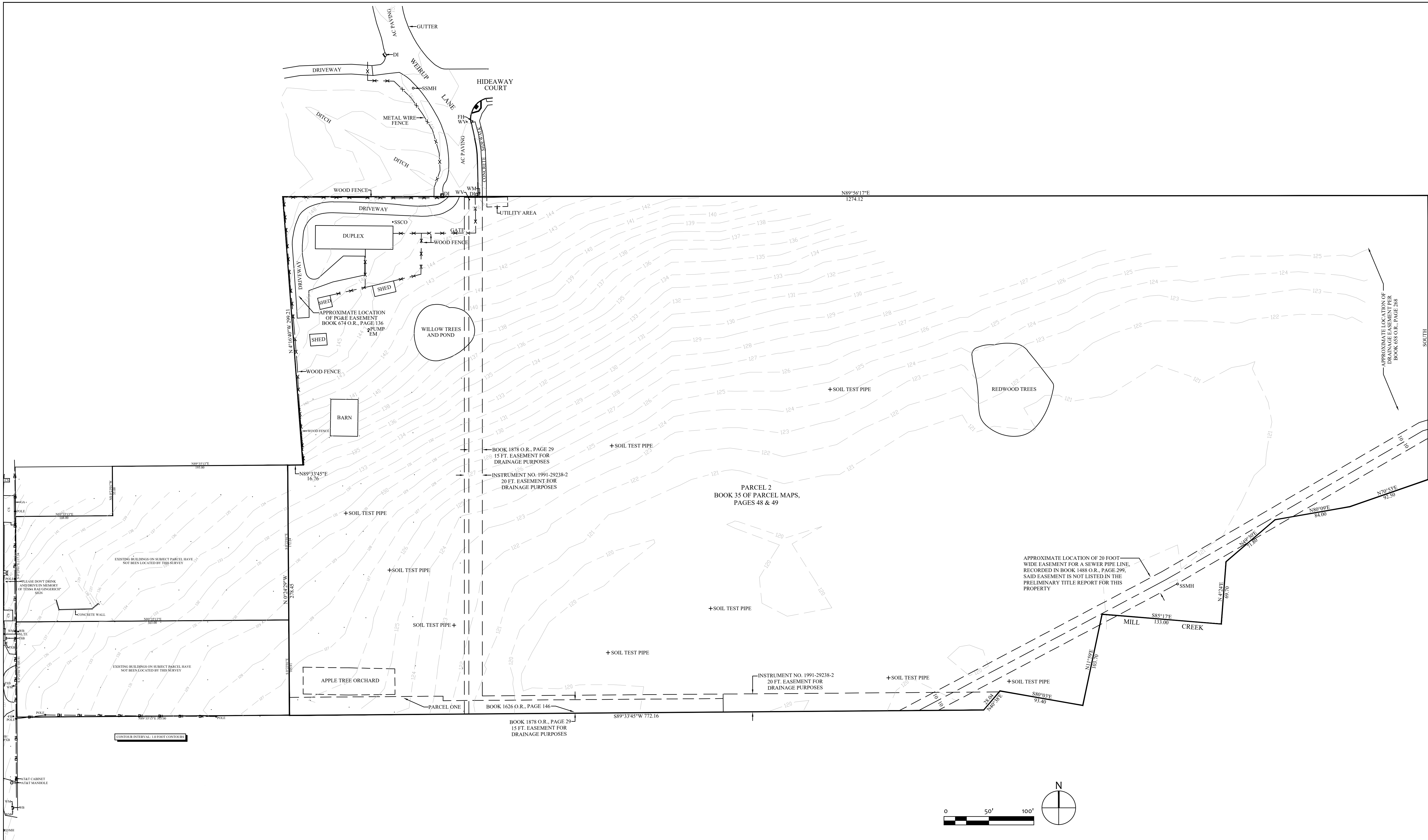
The Project intends to create an integrated, replicable "ecosystem of care" anchored in long term affordable housing, agriculture, workforce development, environmental preservation, enrichment, and community-building to transform the lives of residents, their families, and the region. A mix of residents, including people with intellectual disabilities, seniors, students in related fields of study, will create a community that celebrates belonging, empowers the abilities of its residents, provides better outcomes, and lowers societal costs.

Project Stormwater Requirements

MS4 Requirements

The proposed project will be constructed on approximately 6.43 acres of the approximate 17.38 acre project property. The preexisting site conditions include approximately 0.20 acres of impervious development (buildings and a gravel road) and approximately 6.23 acres of undeveloped pervious space (vegetated and forested areas) in the proposed development area (note that the survey completed for this project only includes topo data for the three smaller parcels located along Central Avenue and no existing buildings or driveways in this area, therefore the existing impervious surface estimate for this project is underestimated). The post-development project area will include approximately 3.86 acres of impervious development and approximately 2.57 acres of pervious area in the development footprint.

The We Are Up project lies within the County of Humboldt's regulated Municipal Separate Storm Sewer System (MS4) permit boundaries and as such it will be required to meet the stormwater regulations contained in the Humboldt Low Impact Development (LID) Standards Manual (Northcoast Stormwater Coalition, 2021). Based on the project size and anticipated



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No.	Revision/Issue	Date

Project No.:	Drawn By:	Client:	Sheet Title:
0222	NPS	We Are Up	Existing Site Conditions
Original Sheet Size: ANSI D	**Date:** 11/13/2024	**Project:** We Are Up Housing Project	**Sheet:** Figure 2

1 Sheet of 1

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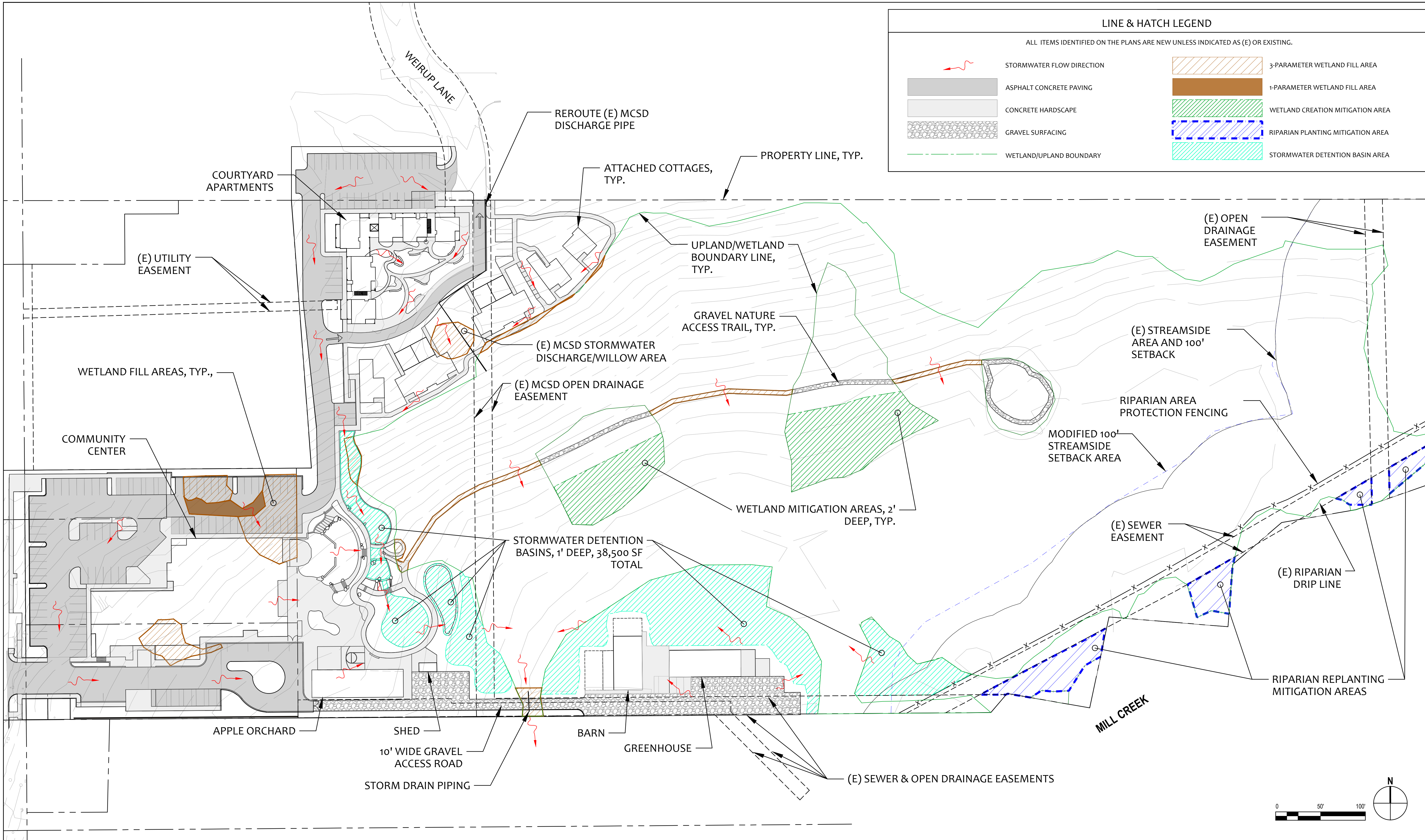

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No.	Revision/Issue	Date

Project No.: 0222	Drawn By: NPS	Client: We Are Up	Sheet Title: Conceptual Site Map
Original Sheet Size: ANSI D	Date: 4/2/2025	Project: We Are Up Housing Project	Sheet: Figure 3
			Sheet of

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impermeable surface area the We Are Up project will be required to meet the Regulated, and Hydromodifications Project standards of the LID Manual as follows:

- **85th Percentile 24-hour Storm Event** – In accordance with section E.12 of the MS4 General Permit, site design measures shall be implemented based on the objective of capturing stormwater runoff from the 85th percentile 24-hour storm event, to the extent technically feasible. Any remaining runoff, from impervious DMAs, may then be directed to one or more bioretention facilities or equivalent.
- **Hydromodification** – Hydromodification projects are Regulated Projects creating and/or replacing one acre or more of impervious surface that create a net increase in impervious surface. The required performance standard for hydromodification control consists of maintaining post-project runoff at or below pre-project flow rates for the 2-year, 24-hour storm event.

County Requirements

The proposed project is also located within the jurisdictional boundaries of the McKinleyville Community Plan and is required to mitigate storm water runoff to predevelopment levels. Specifically, per Section 3310 (5) of the McKinleyville Community Plan the "Development shall only be allowed in such a manner that downstream peak flows will not be increased (Humboldt County, 2017)." In communications with Humbold County staff (K. Freed, personal communication, August 3, 2023) this requirement translates to the following design standard:

- **County Drainage** – A stormwater detention/retention basin must be installed at the project site. The basin must be sized to detain the stormwater runoff generated from the 100-year, 10-minute storm event, and release the water from the site at pre-development levels anticipated to occur during the 2 year, 24-hour storm event.

Quantitative Design Standards

Table 1 summarizes the quantitative design standard input values associated with each of the stormwater requirements outlined above, and the data source for each standard value.

Table 1: Project Stormwater Requirements

Storm Event	Standard	Data Source
85th Percentile	0.65 inches	Humboldt LID Standards Manual
2 Year, 24-hour	2.93 inches	
100 Year, 10-minute	0.604 inches	NOAA website (Attachment A)

Hydrologic Analysis

Site Design

In order to analyze the stormwater runoff at the site, the project footprint was broken up into drainage management areas (DMAs) which are areas, both impervious and pervious, that divide a project site into small drainage units, each unit draining to a common point. Figure 4 depicts the four DMAs determined for the site, which are explained in greater detail below:

- **DMA 1** – DMA 1 is predominantly comprised of paved roads and parking lots, buildings, sidewalks, and landscape planting areas. Stormwater runoff from this DMA will be routed -via surface flow, drainage inlets, and stormwater piping - directly to the vegetated stormwater detention basins located in DMA 2.
- **DMA 2** – DMA 2 is predominantly comprised of paved parking lots and driveways, buildings, sidewalks, landscape planting areas, a gravel trail, and a series of vegetated stormwater detention basins. Stormwater within this DMA will be routed -via surface flow, drainage inlets, and stormwater piping - directly to the vegetated stormwater detention basins within the DMA, which then discharge via surface flow to DMA 4.
- **DMA 3** – DMA 3 is predominantly comprised of a gravel access road and parking lot, ADA concrete hardscape, and two buildings. Stormwater from this DMA will be routed via surface flow directly to DMA 4.
- **DMA 4** – DMA 4 contains two stormwater detention basins that collect and detain the stormwater runoff from DMAs 2 and 3. Stormwater runoff from this DMA will collect at the low point of the site where it will ultimately discharge offsite via elevated stormwater piping located near the south-central point of the site.

Hydrologic Analysis Methodology

Hydrologic analyses for the site stormwater runoff were conducted using the NRCS Curve Number Method as described in the U.S. Department of Agriculture (USDA) Urban Hydrology for Small Watersheds TR-55 Manual (USDA, 1986). Relevant portions of the manual, including equations used and assumed parameter input values are included in Attachment B.

Data Input Values

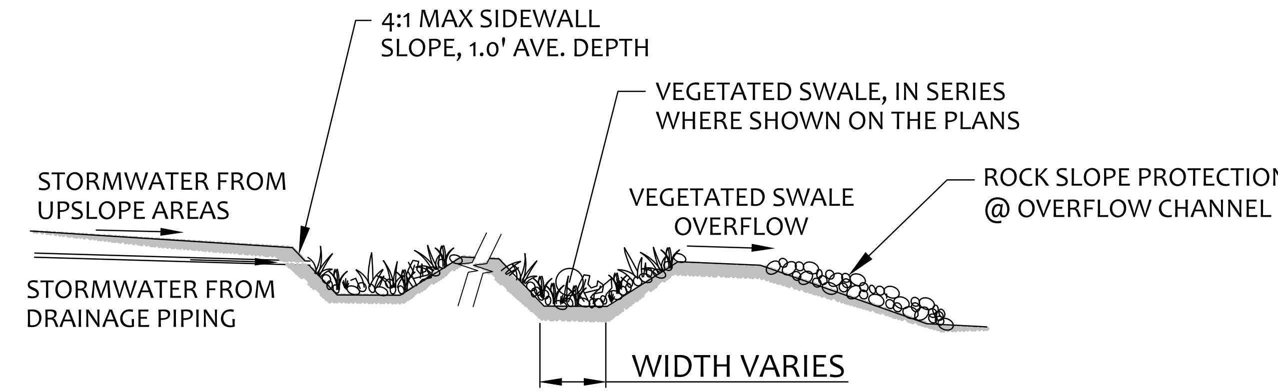
The NRCS Curve Number Method requires several site specific and regionally based parameter values for estimating stormwater runoff. Table 2 below outlines the input parameter values used for this project:

Table 2: Stormwater Input Values

Parameter	Value	Data Source
Runoff Curve Number: CN, Open Space and Landscaping	61	Table 2-2a, TR-55 Manual
Runoff Curve Number: CN, Paved Parking Lots and Roofs	98	
Runoff Curve Number: CN, Gravel Roads	85	
Rainfall Distribution Type	IA	Figure B-2, TR-55 Manual
Time of Concentration, Tc	10 min	Assumed Minimum
Hydrologic Soil Group	B	NRCS Soils Report (Attachment C)

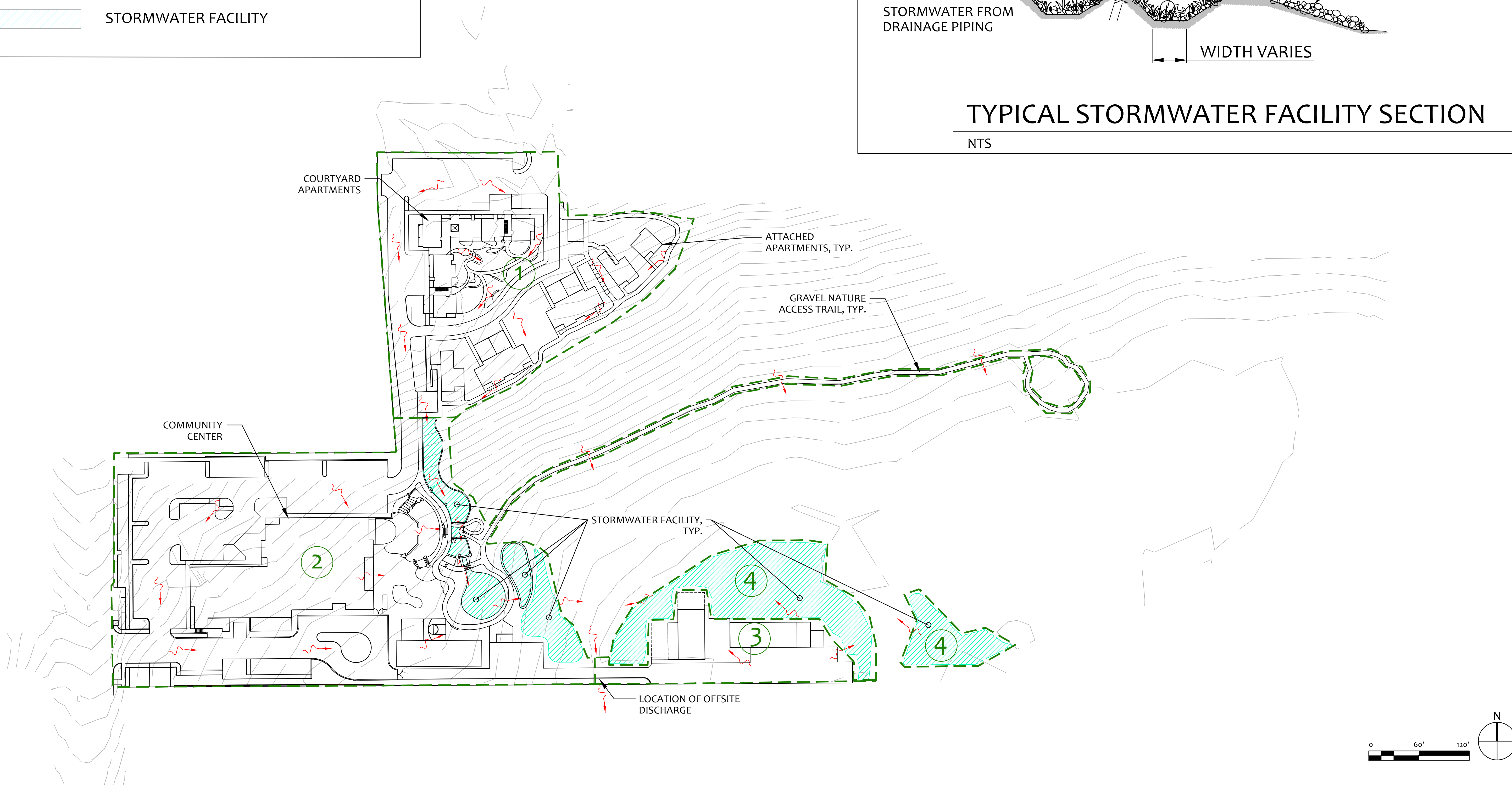
LINE & HATCH LEGEND

- DRAINAGE MANAGEMENT AREA BOUNDARY
- DRAINAGE MANAGEMENT AREA NUMBER
- STORMWATER FLOW
- STORMWATER FACILITY



TYPICAL STORMWATER FACILITY SECTION

NTS



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85^{th} Percentile Storm Event Analysis

The volume of stormwater required to be captured to meet the 85^{th} percentile, 24-hour stormwater event was calculated by taking the square footage of new impermeable surfaces for each DMA and multiplying it by the design 85^{th} percentile, 24-hour storm event rainfall for the site (0.65 inches). The required storage volume by DMA is tabulated in Table 3 below:

Table 3: 85^{th} Percentile Storm Event Required Stormwater Capture Volumes by DMA

DMA	Area (SF)	Impervious Area (SF)	Pervious Area (SF)	Required Storage Volume (CF)
1	79,551	48,159	31,392	2,609
2	151,816	103,738	48,078	5,619
3	22,765	16,245	6,520	880
4	25,928	0	25,928	0
Totals	**280,060**	**168,142**	**118,252**	**9,108**

Hydromodification Analysis

Pre-development and post-development composite CN and peak discharge values were calculated for the proposed project using the NRCS Curve Number Method. The pre and post development peak discharge values were also utilized to determine the required stormwater detention basin volume required to capture the 2 year, 24-hour storm event. Table 4 below summarizes the hydromodification results for the We Are Up site. Calculation details are included in Attachment D.

Table 4: Hydromodification Analysis Results

Pre-Development Peak Discharge	0.22 CFS
Post-Development Peak Discharge (without stormwater basins)	1.90 CFS
Stormwater Detention Basin Volume Required	31,467 CF

County Drainage Analysis

The volume of water associated with the County drainage requirement (0.604 inches) is less than the volume of water associated with the MS4 Hydromodification requirement (2.93 inches). Since both requirements have the same 2 year, 24-hour pre-development discharge requirement, and the MS4 requirement is more conservative, no further analysis of the site using the County drainage requirement was completed.

Detention Basin Volume Comparison

The available stormwater runoff volume associated with the designed site detention basins was calculated by multiplying the combined total basin footprints (38,500 SF) by their average depths (1 ft). Table 5 below highlights the stormwater volumes required by the 85th percentile and hydromodification regulations, and compares them to the volume provided by the We Are Up stormwater detention basins.

Table 5: Comparison of Required vs Designed Storage Volumes

85th Percentile Required Storage Volume	9,108 CF
Hydromodification Required Storage Volume	31,467 CF
Stormwater Detention Basin Volume Provided	38,500 CF

Discussion and Conclusion

The hydrologic analysis of the We Are Up project demonstrates that the stormwater detention basins designed for the site will be capable of capturing and detaining either of the required 85th 24-hour or the 2 year 24-hour storm events. Additionally, the analysis performed herein demonstrates that post-project offsite runoff will remain at or below pre-project flow rates for the 2-year, 24-hour storm event.

In conclusion, the analysis performed for the project shows that the designed storm water treatment and management system for the We Are Up project is capable of handling the stormwater requirements of both the MS4 permit and the McKinleyville Community Plan.

References

Humboldt County. (October 23, 2017). Humboldt County GENERAL PLAN Community Areas, McKinleyville Community Plan. Eureka, CA:Humboldt County

National Oceanic and Atmospheric Administration (NOAA). 2025. Hydrometeorological Design Studies Center. Accessed April 2025. https://hdsc.nws.noaa.gov/pfds/pfds_map_cont.html?bkmrk=ca

Northcoast Stormwater Coalition. (August 18, 2021). Humboldt Low Impact Development Stormwater Manual v3.0. Eureka, CA:Humboldt County

U.S. Department of Agriculture (USDA). (June 1986). Urban Hydrology for Small Watersheds: TR-55.

Attachments

Attachment A – NOAA Data

Attachment B – USDA Equations and Assumed Values

Attachment C – Site Soils Data

Attachment D – Calculations

Attachment A:

NOAA Rainfall Data

NOAA ATLAS 14 POINT PRECIPITATION FREQUENCY ESTIMATES: CA

Data description

Data type: Precipitation depth **Units:** English **Time series type:** Partial duration

Select location

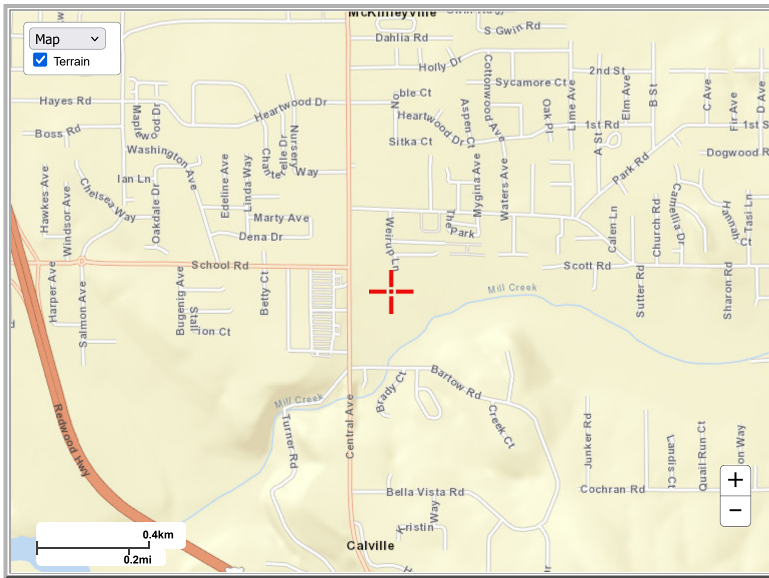
1) Manually:

a) By location (decimal degrees, use "-" for S and W): Latitude: [ ] Longitude: [ ] Submit

b) By station (list of CA stations): Select station

c) By address Search

2) Use map:



a) Select location
Move crosshair or double click

b) Click on station icon
Show stations on map

Location information:
Name: Mckinleyville, California, USA*
Latitude: 40.9334°
Longitude: -124.0991°
Elevation: 140 ft **

* Source: ESRI Maps
** Source: USGS

POINT PRECIPITATION FREQUENCY (PF) ESTIMATES

WITH 90% CONFIDENCE INTERVALS AND SUPPLEMENTARY INFORMATION
NOAA Atlas 14, Volume 6, Version 2

PF tabular | PF graphical | Supplementary information | Print page

PDS-based 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	**0.133** (0.117-0.154)	**0.167** (0.146-0.193)	**0.215** (0.188-0.249)	**0.257** (0.222-0.300)	**0.317** (0.264-0.385)	**0.367** (0.298-0.457)	**0.421** (0.333-0.540)	**0.481** (0.367-0.636)	**0.568** (0.414-0.787)	**0.641** (0.449-0.923)
10-min	**0.191** (0.167-0.220)	**0.240** (0.210-0.277)	**0.308** (0.269-0.357)	**0.368** (0.318-0.430)	**0.455** (0.378-0.552)	**0.526** (0.427-0.655)	**0.604** (0.477-0.773)	**0.689** (0.527-0.911)	**0.814** (0.593-1.13)	**0.918** (0.643-1.32)
15-min	**0.231** (0.202-0.266)	**0.290** (0.254-0.335)	**0.373** (0.325-0.432)	**0.445** (0.384-0.520)	**0.550** (0.457-0.668)	**0.637** (0.517-0.792)	**0.731** (0.576-0.935)	**0.834** (0.637-1.10)	**0.984** (0.717-1.36)	**1.11** (0.778-1.60)
30-min	**0.310** (0.272-0.358)	**0.390** (0.341-0.450)	**0.501** (0.437-0.580)	**0.597** (0.516-0.698)	**0.738** (0.614-0.897)	**0.855** (0.694-1.06)	**0.981** (0.774-1.26)	**1.12** (0.856-1.48)	**1.32** (0.964-1.83)	**1.49** (1.04-2.15)
60-min	**0.435** (0.382-0.502)	**0.546** (0.478-0.631)	**0.702** (0.612-0.813)	**0.838** (0.724-0.980)	**1.04** (0.861-1.26)	**1.20** (0.973-1.49)	**1.38** (1.09-1.76)	**1.57** (1.20-2.08)	**1.86** (1.35-2.57)	**2.09** (1.47-3.02)
2-hr	**0.672** (0.589-0.774)	**0.826** (0.723-0.953)	**1.04** (0.908-1.21)	**1.23** (1.06-1.44)	**1.50** (1.25-1.82)	**1.72** (1.40-2.14)	**1.96** (1.55-2.51)	**2.22** (1.70-2.94)	**2.60** (1.90-3.61)	**2.92** (2.04-4.20)
3-hr	**0.869** (0.762-1.00)	**1.06** (0.927-1.22)	**1.32** (1.16-1.53)	**1.55** (1.34-1.81)	**1.88** (1.56-2.29)	**2.15** (1.74-2.68)	**2.44** (1.92-3.12)	**2.75** (2.10-3.64)	**3.20** (2.34-4.44)	**3.58** (2.51-5.16)
6-hr	**1.33** (1.16-1.53)	**1.61** (1.40-1.85)	**1.98** (1.73-2.30)	**2.31** (1.99-2.70)	**2.77** (2.30-3.36)	**3.14** (2.55-3.91)	**3.53** (2.79-4.52)	**3.96** (3.02-5.23)	**4.56** (3.32-6.32)	**5.05** (3.54-7.28)
12-hr	**1.97** (1.73-2.28)	**2.38** (2.08-2.75)	**2.94** (2.56-3.40)	**3.40** (2.94-3.97)	**4.04** (3.36-4.91)	**4.56** (3.70-5.67)	**5.09** (4.02-6.52)	**5.66** (4.33-7.48)	**6.46** (4.71-8.95)	**7.10** (4.98-10.2)
24-hr	**2.85** (2.55-3.26)	**3.47** (3.10-3.96)	**4.28** (3.81-4.89)	**4.94** (4.37-5.70)	**5.86** (5.03-6.96)	**6.58** (5.54-7.96)	**7.31** (6.03-9.05)	**8.08** (6.50-10.3)	**9.14** (7.08-12.1)	**9.98** (7.49-13.6)
2-day	**3.83** (3.43-4.37)	**4.68** (4.18-5.34)	**5.78** (5.15-6.62)	**6.68** (5.91-7.70)	**7.89** (6.78-9.38)	**8.82** (7.44-10.7)	**9.77** (8.06-12.1)	**10.7** (8.64-13.6)	**12.1** (9.34-15.9)	**13.1** (9.83-17.8)
3-day	**4.48** (4.00-5.10)	**5.49** (4.91-6.27)	**6.80** (6.06-7.78)	**7.85** (6.95-9.05)	**9.27** (7.96-11.0)	**10.4** (8.73-12.5)	**11.4** (9.44-14.2)	**12.6** (10.1-16.0)	**14.1** (10.9-18.6)	**15.2** (11.4-20.7)
4-day	**5.02** (4.50-5.73)	**6.18** (5.52-7.05)	**7.66** (6.83-8.76)	**8.85** (7.83-10.2)	**10.4** (8.97-12.4)	**11.6** (9.82-14.1)	**12.9** (10.6-15.9)	**14.1** (11.3-17.9)	**15.8** (12.2-20.8)	**17.0** (12.8-23.2)
7-day	**6.35** (5.68-7.24)	**7.86** (7.02-8.97)	**9.77** (8.71-11.2)	**11.3** (9.99-13.0)	**13.3** (11.4-15.8)	**14.8** (12.5-17.9)	**16.3** (13.4-20.2)	**17.8** (14.3-22.6)	**19.8** (15.4-26.2)	**21.4** (16.0-29.1)
10-day	**7.38** (6.60-8.42)	**9.16** (8.18-10.5)	**11.4** (10.2-13.0)	**13.2** (11.6-15.2)	**15.5** (13.3-18.4)	**17.2** (14.5-20.8)	**18.9** (15.6-23.4)	**20.6** (16.6-26.2)	**22.9** (17.7-30.1)	**24.6** (18.4-33.4)
20-day	**10.1** (9.02-11.5)	**12.5** (11.2-14.3)	**15.5** (13.9-17.8)	**17.9** (15.8-20.6)	**20.9** (17.9-24.8)	**23.1** (19.4-27.9)	**25.2** (20.8-31.2)	**27.3** (21.9-34.7)	**30.0** (23.2-39.6)	**32.1** (24.0-43.6)
30-day	**12.6** (11.2-14.3)	**15.6** (13.9-17.8)	**19.2** (17.1-22.0)	**22.0** (19.5-25.4)	**25.6** (22.0-30.4)	**28.2** (23.7-34.1)	**30.6** (25.3-37.9)	**33.1** (26.6-42.0)	**36.2** (28.0-47.7)	**38.4** (28.8-52.3)
45-day	**16.2** (14.5-18.5)	**20.0** (17.9-22.8)	**24.6** (21.9-28.1)	**28.0** (24.8-32.3)	**32.3** (27.8-38.4)	**35.4** (29.8-42.9)	**38.3** (31.6-47.4)	**41.2** (33.1-52.3)	**44.7** (34.6-59.0)	**47.4** (35.5-64.4)
60-day	**19.3** (17.2-22.0)	**23.6** (21.1-27.0)	**28.9** (25.7-33.0)	**32.8** (29.0-37.8)	**37.6** (32.3-44.7)	**41.0** (34.6-49.7)	**44.3** (36.5-54.8)	**47.4** (38.1-60.1)	**51.2** (39.6-67.6)	**54.0** (40.5-73.5)

[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.

Estimates from the table in CSV format: Precipitation frequency estimates Submit

Attachment B:

USDA Equations and Assumed Values

Chapter 2 Estimating Runoff

SCS runoff curve number method

The SCS Runoff Curve Number (CN) method is described in detail in NEH-4 (SCS 1985). The SCS runoff equation is

$$Q = \frac{(P - I_a)^2}{(P - I_a) + S} \qquad \text{[eq. 2-1]}$$

where

Q = runoff (in)
P = rainfall (in)
S = potential maximum retention after runoff begins (in) and
I_a = initial abstraction (in)

Initial abstraction (I_a) is all losses before runoff begins. It includes water retained in surface depressions, water intercepted by vegetation, evaporation, and infiltration. I_a is highly variable but generally is correlated with soil and cover parameters. Through studies of many small agricultural watersheds, I_a was found to be approximated by the following empirical equation:

$$I_a = 0.2S \qquad \text{[eq. 2-2]}$$

By removing I_a as an independent parameter, this approximation allows use of a combination of S and P to produce a unique runoff amount. Substituting equation 2-2 into equation 2-1 gives:

$$Q = \frac{(P - 0.2S)^2}{(P + 0.8S)} \qquad \text{[eq. 2-3]}$$

S is related to the soil and cover conditions of the watershed through the CN. CN has a range of 0 to 100, and S is related to CN by:

$$S = \frac{1000}{CN} - 10 \qquad \text{[eq. 2-4]}$$

Figure 2-1 and table 2-1 solve equations 2-3 and 2-4 for a range of CN's and rainfall.

Factors considered in determining runoff curve numbers

The major factors that determine CN are the hydrologic soil group (HSG), cover type, treatment, hydrologic condition, and antecedent runoff condition (ARC). Another factor considered is whether impervious areas outlet directly to the drainage system (connected) or whether the flow spreads over pervious areas before entering the drainage system (unconnected). Figure 2-2 is provided to aid in selecting the appropriate figure or table for determining curve numbers.

CN's in table 2-2 (*a* to *d*) represent average antecedent runoff condition for urban, cultivated agricultural, other agricultural, and arid and semiarid rangeland uses. Table 2-2 assumes impervious areas are directly connected. The following sections explain how to determine CN's and how to modify them for urban conditions.

Hydrologic soil groups

Infiltration rates of soils vary widely and are affected by subsurface permeability as well as surface intake rates. Soils are classified into four HSG's (A, B, C, and D) according to their minimum infiltration rate, which is obtained for bare soil after prolonged wetting. Appendix A defines the four groups and provides a list of most of the soils in the United States and their group classification. The soils in the area of interest may be identified from a soil survey report, which can be obtained from local SCS offices or soil and water conservation district offices.

Most urban areas are only partially covered by impervious surfaces: the soil remains an important factor in runoff estimates. Urbanization has a greater effect on runoff in watersheds with soils having high infiltration rates (sands and gravels) than in watersheds predominantly of silts and clays, which generally have low infiltration rates.

Any disturbance of a soil profile can significantly change its infiltration characteristics. With urbanization, native soil profiles may be mixed or removed or fill material from other areas may be introduced. Therefore, a method based on soil texture is given in appendix A for determining the HSG classification for disturbed soils.

Table 2-2a Runoff curve numbers for urban areas [1/]

Cover description: Cover type and hydrologic condition	Average percent impervious area [2/]	Curve numbers for hydrologic soil group: A	B	C	D
Fully developed urban areas (vegetation established)					
Open space (lawns, parks, golf courses, cemeteries, etc.) [3/]:					
Poor condition (grass cover < 50%)		68	79	86	89
Fair condition (grass cover 50% to 75%)		49	69	79	84
Good condition (grass cover > 75%)		39	61	74	80
Impervious areas:					
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)		98	98	98	98
Streets and roads:					
Paved; curbs and storm sewers (excluding right-of-way)		98	98	98	98
Paved; open ditches (including right-of-way)		83	89	92	93
Gravel (including right-of-way)		76	85	89	91
Dirt (including right-of-way)		72	82	87	89
Western desert urban areas:					
Natural desert landscaping (pervious areas only) [4/]		63	77	85	88
Artificial desert landscaping (impervious weed barrier, desert shrub with 1- to 2-inch sand or gravel mulch and basin borders)		96	96	96	96
Urban districts:					
Commercial and business	85	89	92	94	95
Industrial	72	81	88	91	93
Residential districts by average lot size:					
1/8 acre or less (town houses)	65	77	85	90	92
1/4 acre	38	61	75	83	87
1/3 acre	30	57	72	81	86
1/2 acre	25	54	70	80	85
1 acre	20	51	68	79	84
2 acres	12	46	65	77	82
Developing urban areas					
Newly graded areas (pervious areas only, no vegetation) [5/]		77	86	91	94
Idle lands (CN's are determined using cover types similar to those in table 2-2c).					

1 Average runoff condition, and $I_a = 0.2S$.

2 The average percent impervious area shown was used to develop the composite CN's. Other assumptions are as follows: impervious areas are directly connected to the drainage system, impervious areas have a CN of 98, and pervious areas are considered equivalent to open space in good hydrologic condition. CN's for other combinations of conditions may be computed using figure 2-3 or 2-4.

3 CN's shown are equivalent to those of pasture. Composite CN's may be computed for other combinations of open space cover type.

4 Composite CN's for natural desert landscaping should be computed using figures 2-3 or 2-4 based on the impervious area percentage (CN = 98) and the pervious area CN. The pervious area CN's are assumed equivalent to desert shrub in poor hydrologic condition.

5 Composite CN's to use for the design of temporary measures during grading and construction should be computed using figure 2-3 or 2-4 based on the degree of development (impervious area percentage) and the CN's for the newly graded pervious areas.

Chapter 4 Graphical Peak Discharge Method

This chapter presents the Graphical Peak Discharge method for computing peak discharge from rural and urban areas. The Graphical method was developed from hydrograph analyses using TR-20, "Computer Program for Project Formulation—Hydrology" (SCS 1983). The peak discharge equation used is:

$$q_p = q_u A_m Q F_p \qquad \text{[eq. 4-1]}$$

where:

q_p = peak discharge (cfs)
q_u = unit peak discharge (csm/in)
A_m = drainage area (mi^2)
Q = runoff (in)
F_p = pond and swamp adjustment factor

The input requirements for the Graphical method are as follows: (1) T_c (hr), (2) drainage area (mi^2), (3) appropriate rainfall distribution (I, IA, II, or III), (4) 24-hour rainfall (in), and (5) CN. If pond and swamp areas are spread throughout the watershed and are not considered in the T_c computation, an adjustment for pond and swamp areas is also needed.

Peak discharge computation

For a selected rainfall frequency, the 24-hour rainfall (P) is obtained from appendix B or more detailed local precipitation maps. CN and total runoff (Q) for the watershed are computed according to the methods outlined in chapter 2. The CN is used to determine the initial abstraction (I_a) from table 4-1. I_a / P is then computed.

If the computed I_a / P ratio is outside the range in exhibit 4 (4-I, 4-IA, 4-II, and 4-III) for the rainfall distribution of interest, then the limiting value should be used. If the ratio falls between the limiting values, use linear interpolation. Figure 4-1 illustrates the sensitivity of I_a / P to CN and P.

Peak discharge per square mile per inch of runoff (q_u) is obtained from exhibit 4-I, 4-IA, 4-II, or 4-III by using T_c (chapter 3), rainfall distribution type, and I_a / P ratio. The pond and swamp adjustment factor is obtained from table 4-2 (rounded to the nearest table value). Use worksheet 4 in appendix D to aid in computing the peak discharge using the Graphical method.

Figure 4-1 Variation of I_a / P for P and CN

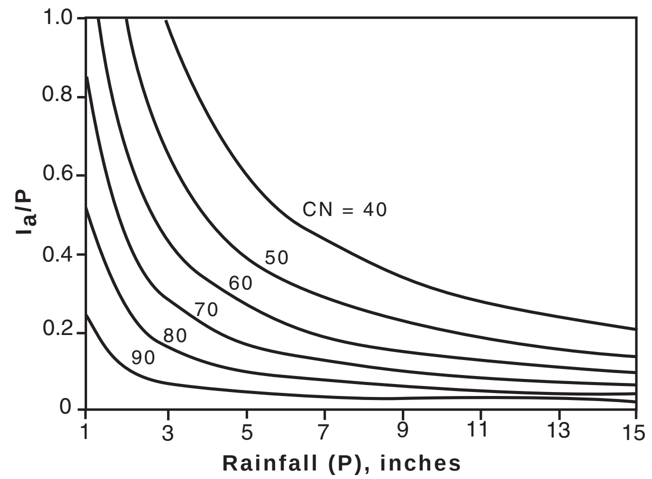
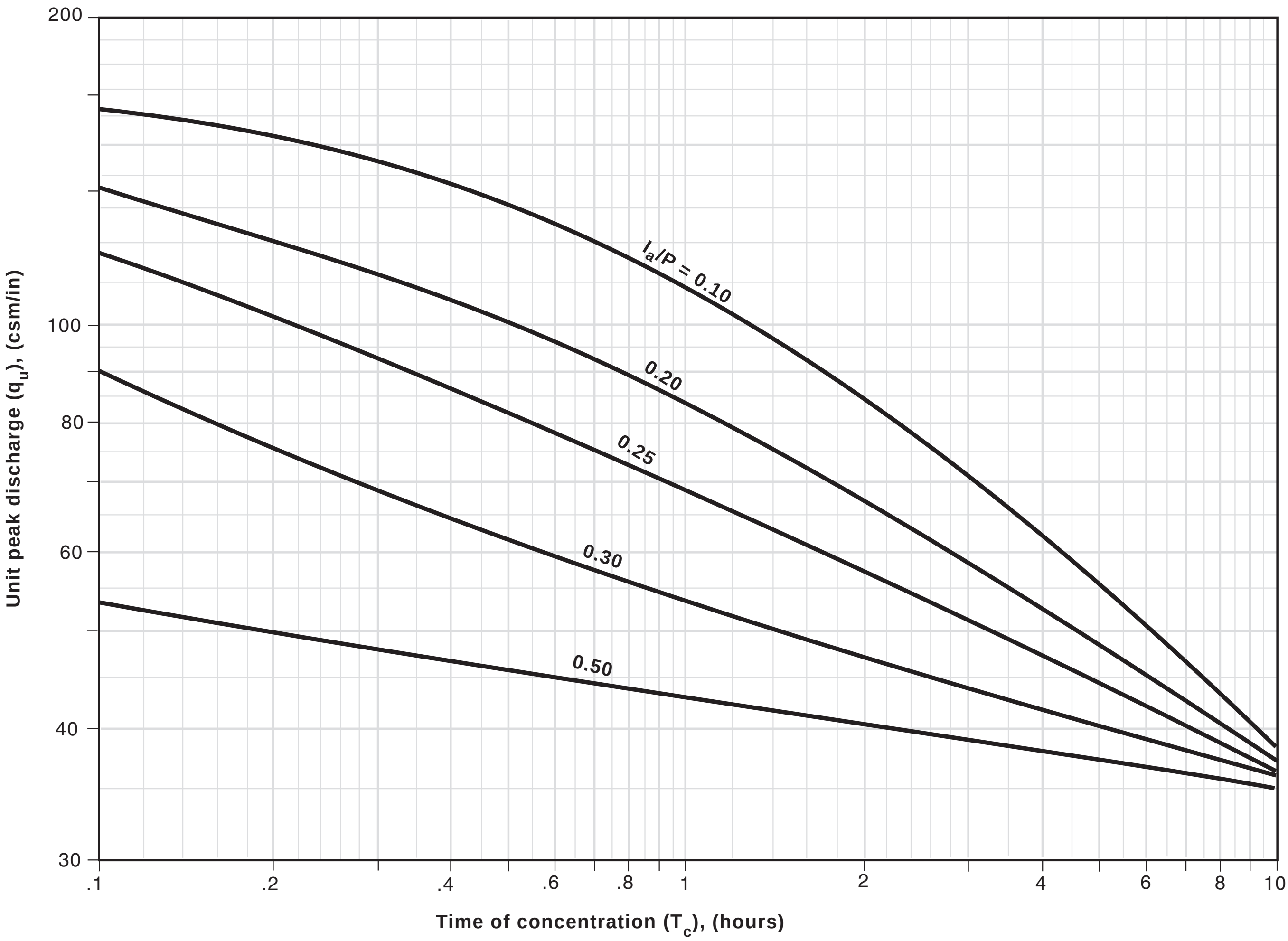


Table 4-1 I_a values for runoff curve numbers

Curve number	I_a (in)	Curve number	I_a (in)
40	3.000	70	0.857
41	2.878	71	0.817
42	2.762	72	0.778
43	2.651	73	0.740
44	2.545	74	0.703
45	2.444	75	0.667
46	2.348	76	0.632
47	2.255	77	0.597
48	2.167	78	0.564
49	2.082	79	0.532
50	2.000	80	0.500
51	1.922	81	0.469
52	1.846	82	0.439
53	1.774	83	0.410
54	1.704	84	0.381
55	1.636	85	0.353
56	1.571	86	0.326
57	1.509	87	0.299
58	1.448	88	0.273
59	1.390	89	0.247
60	1.333	90	0.222
61	1.279	91	0.198
62	1.226	92	0.174
63	1.175	93	0.151
64	1.125	94	0.128
65	1.077	95	0.105
66	1.030	96	0.083
67	0.985	97	0.062
68	0.941	98	0.041
69	0.899		

Exhibit 4-IA Unit peak discharge (q_u) for NRCS (SCS) type IA rainfall distribution



Input requirements and procedures

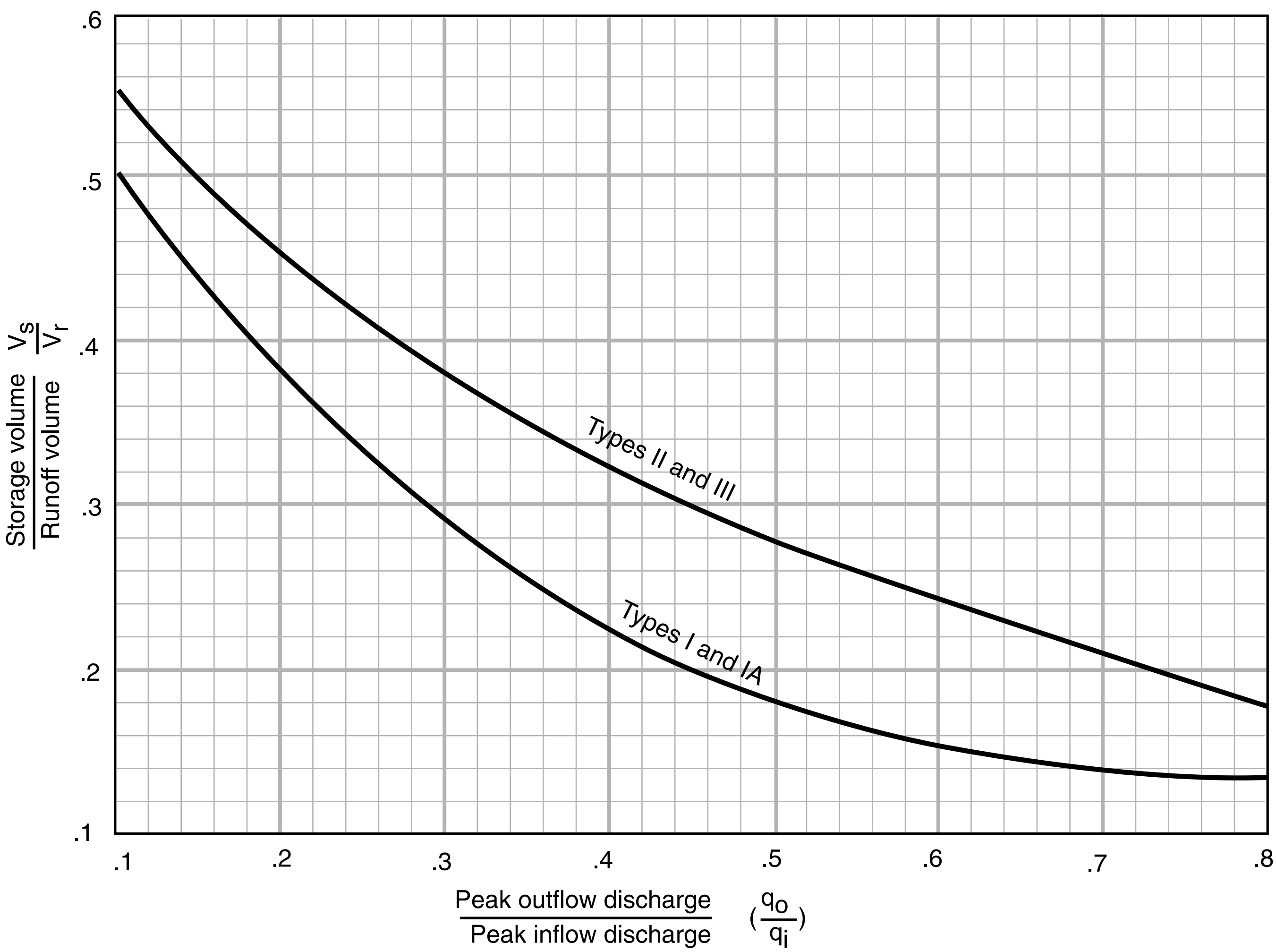
Use figure 6-1 estimate storage volume (V_s) required or peak outflow discharge (q_o). The most frequent application is to estimate V_s, for which the required inputs are runoff volume (V_r), q_o, and peak inflow discharge (q_i). To estimate q_o, the required inputs are V_r, V_s, and q_i.

Estimating V_s

Use worksheet 6a to estimate V_s, storage volume required, by the following procedure.

1. Determine q_o. Many factors may dictate the selection of peak outflow discharge. The most common is to limit downstream discharges to a desired level, such as predevelopment discharge. Another factor may be that the outflow device has already been selected.
2. Estimate q_i by procedures in chapters 4 or 5. Do not use peak discharges developed by other procedure. When using the Tabular Hydrograph method to estimate q_i for a subarea, only use peak discharge associated with T_t = 0.

Figure 6-1 Approximate detention basin routing for rainfall types I, IA, II, and III



3. Compute q_o/q_i and determine V_s/V_r from figure 6-1.
4. Q (in inches) was determined when computing q_i in step 2, but now it must be converted to the units in which V_s is to be expressed—most likely, acre-feet or cubic feet. The most common conversion of Q to V_r is expressed in acre-feet:

$$V_r = 53.33Q(A_m) \qquad \text{[eq. 6-1]}$$

where
V_r = runoff volume (acre-ft)
Q = runoff (in)
A_m = drainage area (mi^2), and
53.33 = conversion factor from in-mi^2 to acre-ft.

5. Use the results of steps 3 to 4 to compute V_s:

$$V_s = V_r\left(\frac{V_s}{V_i}\right) \qquad \text{[eq. 6-2]}$$

where
V_s = storage volume required (acre-ft).

6. The stage in the detention basin corresponding to V_s must be equal to the stage used to generate q_o. In most situations a minor modification of the outflow device can be made. If the device has been preselected. repeat the calculations with a modified q_o value.

Estimating q_o

Use worksheet 6b to estimate q_o, required peak outflow discharge, by the following procedure.

1. Determine V_s. If the maximum stage in the detention basin is constrained, set V_s by the maximum permissible stage.
2. Compute Q (in inches) by the procedures in chapter 2, and convert it to the same units as V_s (see step 4 in "estimating V_s").
3. Compute V_s/V_r and determine q_o/q_i from figure 6-1.
4. Estimate q_i by the procedures in chapters 4 or 5. Do not use discharges developed by any other method. When using Tabular method to estimate q_i for a subarea, use only the peak discharge associated with $T_t = 0$.
5. From steps 3 to 4, compute q_o:

$$q_o = q_i\left(\frac{q_o}{q_i}\right) \qquad \text{[eq. 6-3]}$$

6. Proportion the outflow device so that the stage at q_o is equal to the stage corresponding to V_s. If q_o cannot be calibrated except in discrete steps (i.e., pipe sizes), repeat the procedure until the stages for q_o and V_s are approximately equal.

Limitations

- This routing method is less accurate as the q_o/q_i ratio approaches the limits shown in figure 6-1. The curves in figure 6-1 depend on the relationship between available storage, outflow device, inflow volume, and shape of the inflow hydrograph. When storage volume (V_s) required is small, the shape of the outflow hydrograph is sensitive to the rate of the inflow hydrograph. Conversely, when V_s is large, the inflow hydrograph shape has little effect on the outflow hydrograph. In such instances, the outflow hydrograph is controlled by the hydraulics of the outflow device and the procedure therefore yields consistent results. When the peak outflow discharge (q_o) approaches the peak flow discharge (q_i) parameters that affect the rate of rise of a hydrograph, such as rainfall volume, curve number, and time of concentration, become especially significant.
- The procedure should not be used to perform final design if an error in storage of 25 percent cannot be tolerated. Figure 6-1 is biased to prevent undersizing of outflow devices, but it may significantly overestimate the required storage capacity. More detailed hydrograph development and routing will often pay for itself through reduced construction costs.

Attachment C:

Site Soils Data

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Humboldt County, Central Part, California

We Are Up Soils

March 20, 2023

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map

Map Scale: 1:2,130 if printed on A landscape (11" x 8.5") sheet.

Meters: 0, 30, 60, 120, 180

Feet: 0, 100, 200, 400, 600

N

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 1:24,000.

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
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: Humboldt County, Central Part, California
Survey Area Data: Version 9, Sep 1, 2022

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

Date(s) aerial images were photographed: Jun 1, 2022—Jun 19, 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
171	Worswick-Arlynda complex 0 to 2 percent slopes	1.2	8.0%
226	Arcata and Candymountain soils, 2 to 9 percent slopes	13.9	92.0%
Totals for Area of Interest		**15.1**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Humboldt County, Central Part, California

171—Worswick-Arlynda complex 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 2ll1w
Elevation: 0 to 810 feet
Mean annual precipitation: 60 to 75 inches
Mean annual air temperature: 50 to 55 degrees F
Frost-free period: 275 to 330 days
Farmland classification: Prime farmland if irrigated and drained

Map Unit Composition

Worswick and similar soils: 55 percent
Arlynda and similar soils: 35 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Worswick

Setting

Landform: River valleys
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainbase
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from mixed sources

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
A1 - 1 to 2 inches: silt loam
A2 - 2 to 4 inches: silt loam
Bwg - 4 to 9 inches: silt loam
Cg1 - 9 to 15 inches: loamy sand
Cg2 - 15 to 30 inches: gravelly loam
Cg3 - 30 to 36 inches: silt loam
Cg4 - 36 to 60 inches: silt loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Very poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: About 0 to 4 inches
Frequency of flooding: OccasionalNone
Frequency of ponding: Occasional
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 9.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: B/D

Ecological site: F004BX111CA - Redwood/western swordfern-redwood sorrel, floodplains and terraces, loam
Other vegetative classification: Forest Type IV, coastal (RNPF004CA)
Hydric soil rating: Yes

Description of Arlynda

Setting

Landform: River valleys
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainbase
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from mixed sources

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
A - 1 to 2 inches: silt loam
Bwg - 2 to 15 inches: loam
Cg - 15 to 35 inches: loam
2CAgb - 35 to 60 inches: loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Very poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 2.00 in/hr)
Depth to water table: About 2 to 20 inches
Frequency of flooding: OccasionalNone
Frequency of ponding: Frequent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 11.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: B/D
Ecological site: F004BX111CA - Redwood/western swordfern-redwood sorrel, floodplains and terraces, loam
Other vegetative classification: Forest Type IV, coastal (RNPF004CA)
Hydric soil rating: Yes

Minor Components

Fluventic dystrudepts, loamy-skeletal

Percent of map unit: 5 percent
Landform: Alluvial fans
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainbase
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: F004BX111CA - Redwood/western swordfern-redwood sorrel, floodplains and terraces, loam
Other vegetative classification: Forest Type IV, coastal (RNPF004CA)
Hydric soil rating: No

Bigtree

Percent of map unit: 5 percent
Landform: Fan remnants, terraces, alluvial fans
Landform position (two-dimensional): Toeslope, backslope
Landform position (three-dimensional): Mountainbase
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: F004BX111CA - Redwood/western swordfern-redwood sorrel, floodplains and terraces, loam
Other vegetative classification: Forest Type IV, coastal (RNPF004CA)
Hydric soil rating: No

226—Arcata and Candymountain soils, 2 to 9 percent slopes

Map Unit Setting

National map unit symbol: 2lmt1
Elevation: 10 to 310 feet
Mean annual precipitation: 35 to 90 inches
Mean annual air temperature: 52 to 55 degrees F
Frost-free period: 275 to 325 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Arcata and similar soils: 50 percent
Candymountain and similar soils: 35 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Arcata

Setting

Landform: Marine terraces
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Marine deposits derived from sedimentary rock

Typical profile

A - 0 to 27 inches: loam
AB - 27 to 36 inches: loam
Bw - 36 to 63 inches: sandy loam

Properties and qualities

Slope: 2 to 9 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)

Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 9.6 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B
Ecological site: F004BX121CA - Redwood-Sitka spruce/salal-California huckleberry/western swordfern, marine terraces, marine deposits, sandy loam and loam
Hydric soil rating: No

Description of Candymountain

Setting

Landform: Marine terraces
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Marine deposits derived from sedimentary rock

Typical profile

A - 0 to 17 inches: fine sandy loam
Bw - 17 to 55 inches: fine sandy loam
C - 55 to 79 inches: loamy very fine sand

Properties and qualities

Slope: 2 to 9 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 8.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Ecological site: F004BX121CA - Redwood-Sitka spruce/salal-California huckleberry/western swordfern, marine terraces, marine deposits, sandy loam and loam
Hydric soil rating: No

Minor Components

Urban land, residential

Percent of map unit: 4 percent
Landform: Marine terraces
Hydric soil rating: No

Halfbluff

Percent of map unit: 4 percent
Landform: Marine terraces
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: F004BX118CA - Sitka spruce-redwood/salal/western brackenfern, marine terraces, marine deposits, fine sandy loam
Other vegetative classification: Forest Type IV, coastal (RNPF004CA)
Hydric soil rating: No

Megwil,

Percent of map unit: 3 percent
Landform: Marine terraces
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: F004BX120CA - Redwood-Sitka spruce/California huckleberry-salmonberry/western swordfern-deer fern, marine terraces, loam
Hydric soil rating: No

Talawa

Percent of map unit: 2 percent
Landform: Marine terraces
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Timmons

Percent of map unit: 2 percent
Landform: Marine terraces
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: F004BX121CA - Redwood-Sitka spruce/salal-California huckleberry/western swordfern, marine terraces, marine deposits, sandy loam and loam
Hydric soil rating: No

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Attachment D:

Calculations

Pre Development

Cover Type	CN Value (Table 2-2a)	Area (SF)	CN x Area
Open Space Grass, Landscaping	61	271,345	16,552,045
Paved Parking Lot, Roofs, Sidewalk	98	4,031	395,038
Gravel Road	85	4,684	398,140
	Totals	280,060	17,345,223

Pre-Development CN	62

P - Rainfall (in)	2.93	
S - Potential Maximum Retention (in)	6.15	Equation 2-4
Q - Runoff (in)	0.37	Eauation 2-3
Ia - Initial Abstraction (in)	1.23	Equation 2-2
Ia/P	0.42	
Tc - Time of Concentration (hrs)	0.17	
qu - Unit Peak Discharge (csm/in)	60	Exhibit 4-IA
A - Area (mi2)	0.0100458	
Fp - Pond/Swamp Factor	1	

qp - Peak Discharge (CFS)	0.22	Equation 4-1

Post Development

Cover Type	CN Value (Table 2-2a)	Area (SF)	CN x Area
Open Space Grass, Landscaping	61	111,918	6,826,998
Paved Parking Lot, Roofs, Sidewalk	98	149,957	14,695,786
Gravel Road	85	18,185	1,545,725
	Totals	280,060	23,068,509

Post-Development CN	82

P - Rainfall (in)	2.93	
S - Potential Maximum Retention (in)	2.14	Equation 2-4
Q - Runoff (in)	1.35	Eauation 2-3
Ia - Initial Abstraction (in)	0.43	Equation 2-2
Ia/P	0.15	
Tc - Time of Concentration (hrs)	0.17	
qu - Unit Peak Discharge (csm/in)	140	Exhibit 4-IA
A - Area (mi2)	0.0100458	
Fp - Pond/Swamp Factor	1	

qp - Peak Discharge (CFS)	1.90	Equation 4-1

Storage Volume Analysis

q0 - Peak Outflow Discharge (CFS) [same as pre-development qp]	0.22	
qi - Peak Inflow Discharge (CFS) [same as post-development qp]	1.90	
q0/qi	0.12	
Vs/Vr	0.48	Figure 6-1
Vr - Runoff Volume (acre-ft)	0.72	Equation 6-1

Vr - Runoff Volume (CF)	31,467

Detention Pond Area (SF)	38,500
Average Detention Pond Depth (FT)	1.0

Detention Pond Volume (CF)	38,500