Preliminary Drainage Report

Pine View Homes

10780 East Bennett Street

Grass Valley, California 95945

Prepared For:

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August 2025

PRELIMINARY DRAINAGE REPORT

Pine View Homes

TABLE OF CONTENTS

ATTACHMENTS

I. PURPOSE

The purpose of this report is:

- To describe the existing watershed characteristic within the project area;
- To provide a drainage analysis to support the Pine View Homes development; and
- To describe the proposed storm drainage and water quality treatment system.

II. INTRODUCTION

Project Location/Description

The proposed project is located on multiple parcels with a combined acreage of approximately 52 acres. The project proposes to construct 132 townhome units and 69 single-family residential lots with associated roadways, utilities, and stormwater treatment facilities at 10780 East Bennett Street, Grass Valley, California.
(APNs 009-560-005/010/031/032/033/034/035/037/038/039).
The site is currently undeveloped and is zoned Urban Medium Density per the City of Grass Valley General Plan.

Project Site Topography/Soils

The project site is approximately 52 acres in size. There is an existing ridge to the north within the project site, so existing drainage generally sheet flows off of the site in all directions from the ridge out to the property lines. There is a swale as the runoff nears East Bennett Street to the south. Slopes range from approximately 2% to 30%. The USDA Natural Resources Conservation Center Soils Map shows the area contains mostly three soil profiles: Rock Outcrop Dubakella Complex (with a hydrologic soil group of D), Rock Outcrop Secca Complex (with a hydrologic soil group of D), and Sites Silt Loam (with a hydrologic soil group of C).

Project Drainage

In the proposed drainage condition, surface drainage from impervious asphalt surfaces, roof runoff, and concrete will be directed through storm drainage swales, catch basins and pipes, toward twelve bioretention treatment areas where storm water runoff will be stored and treated before infiltrating. Overflow runoff will run through a dissipater before ultimately leaving the property via sheet flow.

III. METHODOLOGY

Hydrology

Hydrology calculations for the project site are provided herein per *City of Grass Valley Design Standards*. The project is a Regulated Project, per City of Grass Valley Design Standards and is subject to hydromodification requirements because it would introduce more than one acre of continuous impervious area. The proposed project includes Low Impact Design (LID) measures to retain and treat stormwater runoff based on the required treatment volume of the 85th percentile, 24-hour storm runoff event using volume capture coefficients from the Urban Runoff Quality Management, WEF Manual Practice No. 23. According to the Office of

Water Programs LID sizing tool, the 85th percentile, 24-hour storm runoff event from impervious area is 1.36 inches. Calculations for the water quality treatment and retention are provided in Attachment 1. A Drainage Map is provided in Attachment 4.

Peak flows for drainage analysis and hydromodification will be determined in final design for 10- and 100-year storm events using the Rational Method:

Q = CIA

C (Runoff Coefficient) is determined from Figure V-4
I (Intensity) is determined from Figure V-1 based on Time of Concentration
Tc (Time of Concentration) = Ti (sheet flow) + Tt (channel flow)
Ti is determined from Figure V-2
Tt is determined from Figure V-3 and the equation Tt=L/60V
Tc(min) = 10 minutes
A (Area)

A full hydrologic and detention analysis will be completed during final design.

Hydraulics

Hydraulic evaluation and design will be performed in accordance with *City of Grass Valley Design Standards*.

All culverts, storm drain systems, and ditches will be designed to handle the 10-year and 100-year storm flows. Hydraulic analysis will be completed during final design.

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 (BMP) in series prior to discharge of flow to existing drainage facilities.

BMP #

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 areas remove pollutants by filtering runoff through plants and engineered subsurface soil, restores groundwater levels, and reduces peak runoff by capturing and filtering stormwater.

TC-50 Initial water quality treatment is provided in each Storm Drain Inlet utilizing a 12-inch deep sump. The sump, located below the storm drain outlet, captures sand and sediment and includes weep holes for infiltration.

The Stormwater Quality BMPs provide removal of Total Suspended Solids. The removal efficiency for the proposed multiple treatment system has been determined to be approximately 80-100%. The referenced sources (i.e., Caltrans, CASQA) were used to obtain in-field performance data for the selected BMPs. During construction, additional BMPs including temporary erosion control facilities, shall be implemented to control pollutants that have a potential to affect the quality of storm water discharges from the construction site. Implementation of BMPs for Construction Activities will be in accordance with California State Water Resources Control Board (SWRCB) requirements.

IV. RESULTS AND CONCLUSIONS

The planned design incorporates current requirements by the City of Grass Valley for storm water collection and conveyance and provides water quality protection. A summary of volume storage requirements is included in Attachment 1.

V. REFERENCES

- *California Stormwater BMP Handbook; New Development and Redevelopment,* dated January 2003
- *City of Grass Valley Design Standards,* dated May 2016
- *NRCS Web Soil Survey Map,* accessed August 2025. https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx
- *Office of Water Programs, California Phase II LID Sizing Tool,* accessed August 2025. *http://www.owp.csus.edu/LIDTool/Start.aspx*
- *Preliminary Grading and Drainage Plan for Pine View Homes,* prepared by Millennium Planning & Engineering, August 2025

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

Millennium Planning & Engineering

Lillian Sparks, PE, QSP/QSD
Senior Civil Engineer

Attachment 1

WATER QUALITY TREATMENT & RETENTION CALCULATIONS

MILLENNIUM PLANNING & ENGINEERING

Bioretention Design

Pine View Homes

Project No: 21-0513
August 2025

Project Information					
Location			10780 East Bennett Street, Grass Valley, California 95945		
85th Percentile, 24-hr Storm Depth			1.36 inches		
Soil Hydraulic Conductivity			1.00 inch/hour		
DMA	Impervious Area (sf)*	Pervious Area (sf)	Total Area (sf)	Required Retention (cf)	Total Retention Provided (cf)
1	64339	69462	133801	6760	**6876**
2	21699	29326	51025	2280	**2337**
3	44757	35475	80232	4702	**4715**
4	35000	77900	112900	3677	**3704**
5	96639	177662	274301	10153	**10273**
6	95058	118864	213922	9987	**10045**
7	80958	90347	171305	8506	**8606**
8	63100	131154	194254	6629	**6745**
9	41551	44536	86087	4365	**4422**
10	38885	27295	66180	4085	**4123**
11	69809	98986	168795	7334	**7417**
12	13000	17930	30930	1366	**1449**

* Assume 2,000 sf Impervious Area per Single-Family Residential Lot

Infiltration Facility Design							
Infiltration Area	Bottom Area (sf)	Soil Depth (ft)	Soil Porosity	Gravel Depth (ft)	Gravel Porosity	Ponding (ft)	Total Storage (cf)
INF-1	3354	3	0.4	1	0.35	0.5	**6876**
INF-2	1140	3		1		0.5	**2337**
INF-3	2300	3		1		0.5	**4715**
INF-4	3024	2		0.5		0.25	**3704**
INF-5	5011	3		1		0.5	**10273**
INF-6	4900	3		1		0.5	**10045**
INF-7	4198	3		1		0.5	**8606**
INF-8	3290	3		1		0.5	**6745**
INF-9	2157	3		1		0.5	**4422**
INF-10	2011	3		1		0.5	**4123**
INF-11	3618	3		1		0.5	**7417**
INF-12	1183	2		0.5		0.25	**1449**

California Phase II LID Sizing Tool - v1.2

Step 5 - Site Design Measures

Project name	Pine View Homes
Climate station	GRASS VALLEY #2
Saturated hydraulic conductivity	1 in/hr
Impervious area	64339 square feet
Design storm	1.36 in

DMA 1

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 1.36 Inches

LID BMP Types	Area Needed (square feet)	Area Avaliable (square feet)	Percent Accomplished
Porous Pavement	3782	0.00	0.00
Strip, Amended 6"	177388	0.00	0.00
Strip, Amended 12"	34844	0.00	0.00
Strip, Amended 18"	19320	0.00	0.00
Swale, Amended 6"[2]	177388	0.00	0.00
Swale, Amended 12"[2]	34844	0.00	0.00
Swale, Amended 18"[2]	19320	0.00	0.00
Capture and Use Storage[3]	6760 cf	0.00 cf	0.00
	Totals	0.000	0.00

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California Phase II LID Sizing Tool - v1.2

Step 5 - Site Design Measures

Project name	Pine View Homes
Climate station	GRASS VALLEY #2
Saturated hydraulic conductivity	1 in/hr
Impervious area	21699 square feet
Design storm	1.36 in

DMA 2

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 1.36 Inches

LID BMP Types	Area Needed (square feet)	Area Avaliable (square feet)	Percent Accomplished
Porous Pavement	1275	0.00	0.00
Strip, Amended 6"	59826	0.00	0.00
Strip, Amended 12"	11752	0.00	0.00
Strip, Amended 18"	6516	0.00	0.00
Swale, Amended 6"[2]	59826	0.00	0.00
Swale, Amended 12"[2]	11752	0.00	0.00
Swale, Amended 18"[2]	6516	0.00	0.00
Capture and Use Storage[3]	2280 cf	0.00 cf	0.00
	Totals	0.000	0.00

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Step 5 - Site Design Measures

Project name	Pine View Homes
Climate station	GRASS VALLEY #2
Saturated hydraulic conductivity	1 in/hr
Impervious area	44757 square feet
Design storm	1.36 in

DMA 3

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 1.36 Inches

LID BMP Types	Area Needed (square feet)	Area Avaliable (square feet)	Percent Accomplished
Porous Pavement	2631	0.00	0.00
Strip, Amended 6"	123399	0.00	0.00
Strip, Amended 12"	24239	0.00	0.00
Strip, Amended 18"	13440	0.00	0.00
Swale, Amended 6"[2]	123399	0.00	0.00
Swale, Amended 12"[2]	24239	0.00	0.00
Swale, Amended 18"[2]	13440	0.00	0.00
Capture and Use Storage[3]	4702 cf	0.00 cf	0.00
	Totals	0.000	0.00

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Step 5 - Site Design Measures

Project name	Pine View Homes
Climate station	GRASS VALLEY #2
Saturated hydraulic conductivity	1 in/hr
Impervious area	35000 square feet
Design storm	1.36 in

DMA 4

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 1.36 Inches

LID BMP Types	Area Needed (square feet)	Area Avaliable (square feet)	Percent Accomplished
Porous Pavement	2057	0.00	0.00
Strip, Amended 6"	96498	0.00	0.00
Strip, Amended 12"	18955	0.00	0.00
Strip, Amended 18"	10510	0.00	0.00
Swale, Amended 6"[2]	96498	0.00	0.00
Swale, Amended 12"[2]	18955	0.00	0.00
Swale, Amended 18"[2]	10510	0.00	0.00
Capture and Use Storage[3]	3677 cf	0.00 cf	0.00
	Totals	0.000	0.00

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Step 5 - Site Design Measures

Project name	Pine View Homes
Climate station	GRASS VALLEY #2
Saturated hydraulic conductivity	1 in/hr
Impervious area	96639 square feet
Design storm	1.36 in

DMA 5

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 1.36 Inches

LID BMP Types	Area Needed (square feet)	Area Avaliable (square feet)	Percent Accomplished
Porous Pavement	5680	0.00	0.00
Strip, Amended 6"	266442	0.00	0.00
Strip, Amended 12"	52337	0.00	0.00
Strip, Amended 18"	29018	0.00	0.00
Swale, Amended 6"[2]	266442	0.00	0.00
Swale, Amended 12"[2]	52337	0.00	0.00
Swale, Amended 18"[2]	29018	0.00	0.00
Capture and Use Storage[3]	10153 cf	0.00 cf	0.00
	Totals	0.000	0.00

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Step 5 - Site Design Measures

Project name	Pine View Homes
Climate station	GRASS VALLEY #2
Saturated hydraulic conductivity	1 in/hr
Impervious area	95058 square feet
Design storm	1.36 in

DMA 6

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 1.36 Inches

LID BMP Types	Area Needed (square feet)	Area Avaliable (square feet)	Percent Accomplished
Porous Pavement	5587	0.00	0.00
Strip, Amended 6"	262084	0.00	0.00
Strip, Amended 12"	51481	0.00	0.00
Strip, Amended 18"	28544	0.00	0.00
Swale, Amended 6"^{2}	262084	0.00	0.00
Swale, Amended 12"^{2}	51481	0.00	0.00
Swale, Amended 18"^{2}	28544	0.00	0.00
Capture and Use Storage^3	9987 cf	0.00 cf	0.00
	Totals	0.000	0.00

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Step 5 - Site Design Measures

Project name	Pine View Homes
Climate station	GRASS VALLEY #2
Saturated hydraulic conductivity	1 in/hr
Impervious area	80958 square feet
Design storm	1.36 in

DMA 7

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 1.36 Inches

LID BMP Types	Area Needed (square feet)	Area Avaliable (square feet)	Percent Accomplished
Porous Pavement	4758	0.00	0.00
Strip, Amended 6"	223209	0.00	0.00
Strip, Amended 12"	43845	0.00	0.00
Strip, Amended 18"	24310	0.00	0.00
Swale, Amended 6"^{2}	223209	0.00	0.00
Swale, Amended 12"^{2}	43845	0.00	0.00
Swale, Amended 18"^{2}	24310	0.00	0.00
Capture and Use Storage^3	8506 cf	0.00 cf	0.00
	Totals	0.000	0.00

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Step 5 - Site Design Measures

Project name	Pine View Homes
Climate station	GRASS VALLEY #2
Saturated hydraulic conductivity	1 in/hr
Impervious area	63100 square feet
Design storm	1.36 in

DMA 8

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 1.36 Inches

LID BMP Types	Area Needed (square feet)	Area Avaliable (square feet)	Percent Accomplished
Porous Pavement	3709	0.00	0.00
Strip, Amended 6"	173972	0.00	0.00
Strip, Amended 12"	34173	0.00	0.00
Strip, Amended 18"	18947	0.00	0.00
Swale, Amended 6"^{2}	173972	0.00	0.00
Swale, Amended 12"^{2}	34173	0.00	0.00
Swale, Amended 18"^{2}	18947	0.00	0.00
Capture and Use Storage^3	6629 cf	0.00 cf	0.00
	Totals	0.000	0.00

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Step 5 - Site Design Measures

Project name	Pine View Homes
Climate station	GRASS VALLEY #2
Saturated hydraulic conductivity	1 in/hr
Impervious area	41551 square feet
Design storm	1.36 in

DMA 9

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 1.36 Inches

LID BMP Types	Area Needed (square feet)	Area Avaliable (square feet)	Percent Accomplished
Porous Pavement	2442	0.00	0.00
Strip, Amended 6"	114560	0.00	0.00
Strip, Amended 12"	22503	0.00	0.00
Strip, Amended 18"	12477	0.00	0.00
Swale, Amended 6"[2]	114560	0.00	0.00
Swale, Amended 12"[2]	22503	0.00	0.00
Swale, Amended 18"[2]	12477	0.00	0.00
Capture and Use Storage[3]	4365 cf	0.00 cf	0.00
	Totals	0.000	0.00

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Step 5 - Site Design Measures

Project name	Pine View Homes
Climate station	GRASS VALLEY #2
Saturated hydraulic conductivity	1 in/hr
Impervious area	38885 square feet
Design storm	1.36 in

DMA 10

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 1.36 Inches

LID BMP Types	Area Needed (square feet)	Area Avaliable (square feet)	Percent Accomplished
Porous Pavement	2285	0.00	0.00
Strip, Amended 6"	107209	0.00	0.00
Strip, Amended 12"	21059	0.00	0.00
Strip, Amended 18"	11676	0.00	0.00
Swale, Amended 6"[2]	107209	0.00	0.00
Swale, Amended 12"[2]	21059	0.00	0.00
Swale, Amended 18"[2]	11676	0.00	0.00
Capture and Use Storage[3]	4085 cf	0.00 cf	0.00
	Totals	0.000	0.00

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Step 5 - Site Design Measures

Project name	Pine View Homes
Climate station	GRASS VALLEY #2
Saturated hydraulic conductivity	1 in/hr
Impervious area	69809 square feet
Design storm	1.36 in

DMA 11

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 1.36 Inches

LID BMP Types	Area Needed (square feet)	Area Avaliable (square feet)	Percent Accomplished
Porous Pavement	4103	0.00	0.00
Strip, Amended 6"	192470	0.00	0.00
Strip, Amended 12"	37807	0.00	0.00
Strip, Amended 18"	20962	0.00	0.00
Swale, Amended 6"[2]	192470	0.00	0.00
Swale, Amended 12"[2]	37807	0.00	0.00
Swale, Amended 18"[2]	20962	0.00	0.00
Capture and Use Storage[3]	7334 cf	0.00 cf	0.00
	Totals	0.000	0.00

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Step 5 - Site Design Measures

Project name	Pine View Homes
Climate station	GRASS VALLEY #2
Saturated hydraulic conductivity	1 in/hr
Impervious area	13000 square feet
Design storm	1.36 in

DMA 12

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 1.36 Inches

LID BMP Types	Area Needed (square feet)	Area Avaliable (square feet)	Percent Accomplished
Porous Pavement	764	0.00	0.00
Strip, Amended 6"	35842	0.00	0.00
Strip, Amended 12"	7040	0.00	0.00
Strip, Amended 18"	3904	0.00	0.00
Swale, Amended 6"[2]	35842	0.00	0.00
Swale, Amended 12"[2]	7040	0.00	0.00
Swale, Amended 18"[2]	3904	0.00	0.00
Capture and Use Storage[3]	1366 cf	0.00 cf	0.00
	Totals	0.000	0.00

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Attachment 2

HYDROLOGY CALCULATIONS

(TO BE COMPLETED IN FINAL DESIGN)

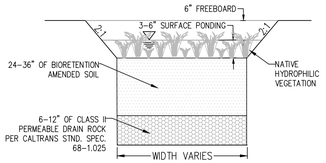
Attachment 3

HYDRAULIC CALCULATIONS

(TO BE COMPLETED IN FINAL DESIGN)

Attachment 4

DRAINAGE MAP

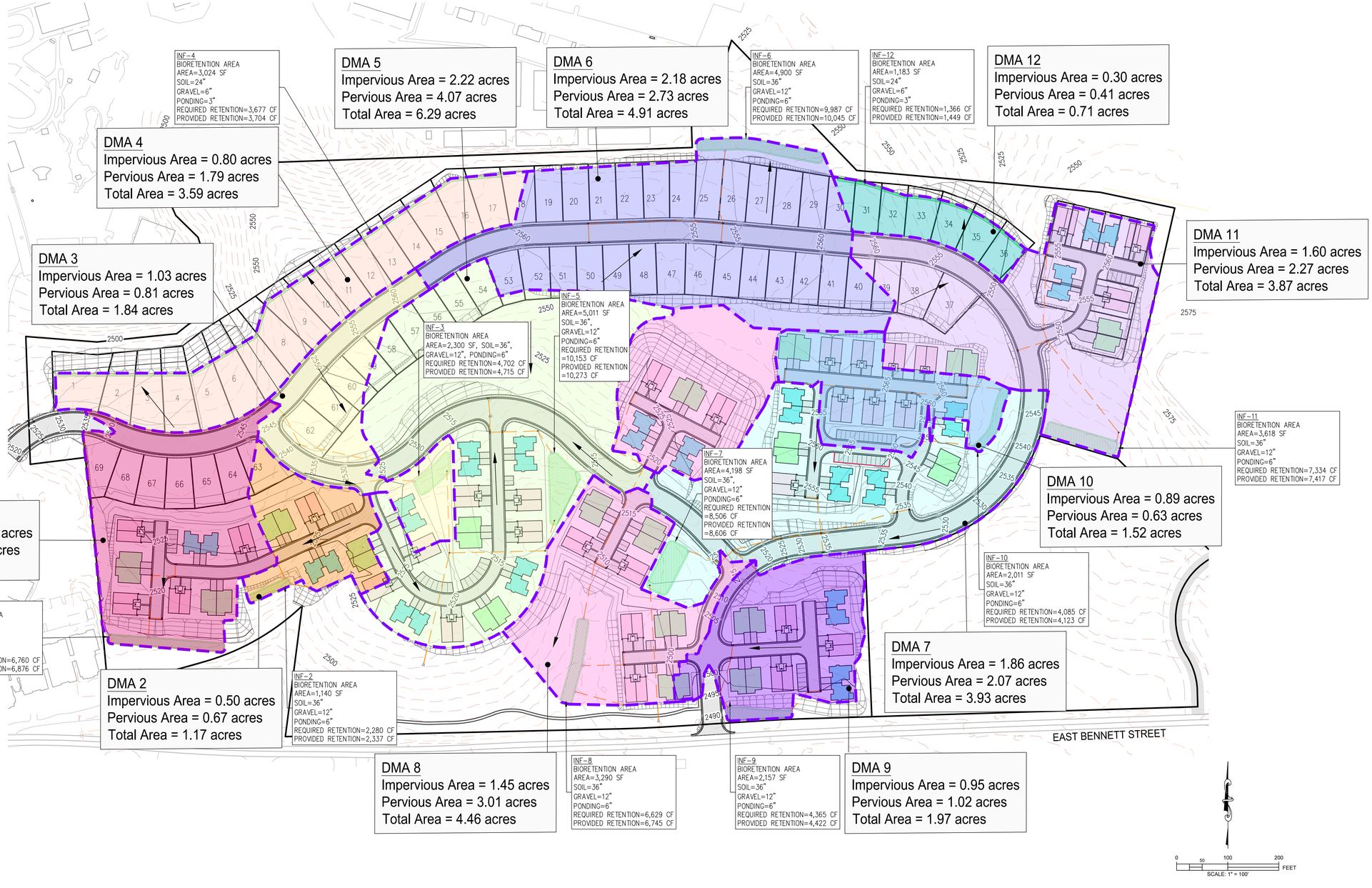


BIORETENTION TYPICAL SECTION

NOT TO SCALE

LEGEND

	PROPERTY LINE
	DRAINAGE AREA BOUNDARY
	BIORETENTION AREA
2000	EXISTING 5' CONTOURS
2000	PROPOSED 5' CONTOURS
	DIRECTION OF FLOW
12"SD	PROPOSED STORM PIPE



MILLENNIUM
PLANNING ENGINEERING SURVEYING
159 SOUTH AUBURN STREET, GRASS VALLEY, CA 95945 (530) 446-6765

REV.	DESCRIPTION	DATE

PINE VIEW HOMES
10780 EAST BENNETT STREET
GRASS VALLEY CA, 95945

DRAINAGE MAP

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

PRELIMINARY

DESIGNED BY: LAS

DRAWN BY: LAS

PROJECT NO.: 21-0513

DATE: AUGUST, 2025

SHEET NUMBER:

1 OF 1