
Appendix E

Preliminary Drainage Report



PRELIMINARY DRAINAGE REPORT

PREPARED FOR:

Truckee Library Joint Power Authority

TRUCKEE LIBRARY

APN: 019-450-076

Truckee, CA

Project No. 24-135

October 2025

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INTRODUCTION

The following preliminary drainage report evaluates the drainage conditions associated with the proposed Nevada County Truckee Library project. This document supplements the preliminary site improvement plans for the subject parcel.

The project affects parcel with APN 019-450-076. The project parcel is approximately 8.1 acres located at 1500 Brockway Road, Truckee, CA within the Truckee Regional Park area. The proposed project consists of a new library building and associated site improvements. Site improvements include parking, access drive aisles, utilities and drainage treatment systems, and landscaping. The proposed project construction area is approximately 2.8 acres. The location of the project is shown on the **Vicinity Map, Appendix A**.

All areas of disturbance will be properly stabilized, temporary BMP's will be installed and maintained prior to, throughout construction of the site improvements until final site stabilization. In addition, permanent BMP's will be installed to address stormwater quality and peak flow attenuation, as required.

SCOPE

This report evaluates drainage conditions associated with the proposed project improvements utilizing Town of Truckee requirements. This study models the response of the local watershed to design storm events under peak discharge conditions for both pre-development and post-development scenarios in 10-year and 100-year storms and assess the impact of the proposed improvements. Furthermore, per the Regional Water Quality Control Board – Lahontan Region and Town of Truckee requirements, the preliminary design for proposed permanent water quality BMP's for the site are also provided.

DESIGN CRITERIA

The Town of Truckee Public Improvement Engineering Standards (TOT Standards) has requirements relative to drainage design for projects. These, in addition to project specific design criteria, and those of the Town of Truckee Low Impact Development Standards (TOT LID), as approved by the Regional Water Quality Control Board, largely comprise the overall design requirements to which the project shall adhere. The various conditions and requirements can be summarized in the following basic criteria:

- Collected runoff from impervious surfaces shall be treated on-site as determined by the TOT LID Sizing Calculator (Low Impact Development Sizing Calculator) during final design.
- Since the project disturbs more than 1 acre of land, the 2-year storm event peak flow must additionally be calculated for on-site and off-site basins.
- Storm drainage facilities will be designed to provide groundwater recharge, attenuate peak flows, and minimize risk of erosion.
- Maintain pre-project watershed boundaries and drainage patterns.
- Flow concentrations shall not cause property damage.
- Energy dissipaters shall be included in outfall designs.

- All construction activities and permanent improvements shall include BMP's for the protection of water resources.
- Drainage pipes shall will be sized for the 10-year storm event (no head) and assessed for the 100-year event at final improvement plan preparation – pipe sizing not includes with this preliminary assessment report.

Drainage improvements shall be designed to comply with all the above listed constraints. In addition, this project will comply with all the requirements from the California Water Quality Control Board and Town of Truckee for Permanent and Temporary BMP's. The Lahontan Region office has an MOU with the Town of Truckee, which provides enforcement of the Terms and Conditions of the permit. The total project disturbance is more than 1 acre, therefore, a Storm Water Pollution Prevention Plan (SWPPP), that addresses the proposed project improvements, will be prepared, and implemented as part of the final improvement plans and building permit application processes.

PRE-DEVELOPMENT CONDITIONS

The project is located to the northwest of the existing Broackway Road and Palisades Drive intersection, within the eastern portion of the Truckee Regional Park.

Most of the precipitation occurs between November and May in the form of snow. The area is typically dry during mid-summer through fall until the first rains or snow fall events.

The project disturbance area is within the Truckee River watershed. The Truckee River is located on the northern edge of the project site, approximately 190 feet northwest of the proposed disturbance area. Per FEMA Flood Hazard Map, the project is within unshaded Zone X, which are areas determined to be outside of the 0.2% annual chance floodplain. The FEMA map with the project site location is included with Appendix D.

The project site slopes on an average 0% - 7% almost evenly across the entire site, excepts around the north perimeters where steeper (~2:1) slopes exist. Runoff generally runs north and northwest. Runoff from the southern portion of the project site receives off-site sheet flow from Broackway Road. Much of the ground if undeveloped areas covered with grasses, bushes and a few trees, except for portion of the existing Legacy Trail and frisbee golf course.

The *Pre-Development Drainage Map* is included in Appendix A.

POST-DEVELOPMENT CONDITIONS & HYDROLOGIC CALCULATIONS

The watershed maps shown in Appendix B show the off-site tributary areas to onsite flows, these areas remain unchanged from the pre- to the post-development conditions and it includes runoff from existing residential site and portion of Donner Way Road. Runoff from offsite areas will continue to flow in the same manner as it does under existing conditions, no flow pattern alterations are proposed as part of the project.

As mentioned above, the proposed project consists of a new library building and associated site improvements. Site improvements include parking, access drive aisles, utilities and stormwater drainage treatment systems, and landscaping.

The proposed overall watershed of the project site is subdivided as shown on the *Post-Development Drainage Map, Appendix A*. This map reflects the drainage conditions associated with the construction of the proposed project improvements.

The estimated peak flows at the points of concentration are calculated in the worksheets provided in Appendix "C". These have been calculated using the TOT Standards method for small watersheds (<320 acres).

Variables used in these calculations include the watershed area, design storm intensity, summer and winter site conditions. Design storm intensities for 10- and 100-year storms are based on an approximate mean annual precipitation for the site as determined from Standard Drawing 63, then using Standard Drawings 59 & 60 the design storm intensity is determined. Design storm intensity for 2-year storm is based on the NOAA Atlas 14 Point Precipitation Frequency intensity estimates. Rational Method "C" values representing site conditions were estimated using Standard Drawing 58. For the pre- and post-winter condition an assumed impervious area of 90% was used to account for the ground being frozen and/or saturated. Per TOT Standards, storm intensities were adjusted for snow melt by increasing the intensities by 0.10 in/hr.

Per the TOT Standards, Section 5.03 Hydrology and Runoff, an infiltration rate of 0.17 in/hr shall be used unless otherwise supported by the Geotechnical Report. The project's Geotechnical report does not mention a site-specific infiltration rate; Therefore, the Town standard was used for the purposes of this report.

For purposes of sizing the required stormwater treatment facilities, the onsite development area was subdivided into individual Drainage Management Areas according to the proposed site grading and placement of the proposed stormwater treatment facilities.

Drainage Management Area #1, which includes the path south of the parking lot, is treated by a perimeter gravel infiltration trench to the north.

Drainage Management Area #2, includes the new parking lot and associated sidewalk on the south side of the new library building. Portion of the sidewalks will be treated by perimeter gravel infiltration trenches, and remaining flows will be routed into the underground stormwater system (Rainstore or similar).

Drainage Management Area #3 includes the plaza to the west of the new building, sidewalks and the generator pad. All areas in this DMA are treated by a gravel infiltration trench.

Drainage Management Area #4 includes most of the proposed improvements, including the new library building, the patio north of the new building, and large portion of the parking lot and associated sidewalks. Runoff from DMA #4 will be routed into an onsite stormwater system (Rainstore or similar).

Drainage Management Area #5 includes the northwestern portion of the parking lot. Flows from this area will also be routed to an underground stormwater system (Rainstore or similar).

Sizing calculations of gravel infiltration trenches were performed using the Town of Truckee LID Sizing Calculator. All calculations are included in the Appendix A of this report.

A summary of the Pre- and Post-Development Peak Flows are shown on the tables below:

SUB-BASIN	AREA (AC)		SUMMER					
			Q2		Q10		Q100	
	PRE	POST	PRE	POST	PRE	POST	PRE	POST
Off-Site #1	0.5	0.5	0.43	0.43	0.49	0.49	1.4	1.4
Onsite #1	8.1	8.1	1.85	3.25	2.61	4.02	4.15	6.12

SUB-BASIN	AREA (AC)		WINTER					
			Q2		Q10		Q100	
	PRE	POST	PRE	POST	PRE	POST	PRE	POST
Off-Site #1	0.5	0.5	0.54	0.54	0.89	0.89	1.5	1.5
Onsite #1	8.1	8.1	3.09	4.49	3.84	5.27	5.38	7.37

As detailed on the table above, estimated off-site peak flows will remain unchanged from pre- to post-development conditions. The post-development peak flows for On-site #1 are estimated to increase from pre- to post-development conditions. The minimum required retention facilities volume to reduce post-development peak flows to pre-development conditions was determined by the Hydrograph Method included in Appendix C. Onsite stormwater quality treatment facilities will be utilized for peak flow attenuation and were sized utilizing the TOT LID Calculator.

It should be recognized, as with any methodology in hydrology, that these results are approximate though adequate for the purposes of this preliminary report.

WATER QUALITY TREATMENT

A combination of perimeter gravel infiltration trenches and underground stormwater systems will be used to retain, treat and facilitate infiltration of stormwater.

The project site parcel has been newly created and the parcel's APN was not recognized by the TOT LID Sizing Calculator at the time of preparation of this report; therefore, the adjacent APN was used instead for the purposes of this preliminary assessment.

All BMP's, both temporary and permanent, will be in accordance with Town of Truckee Erosion Prevention Standards and they are as follows:

Temporary Construction Phase BMP's

Construction phase BMP's include silt fencing, straw wattles, staging areas, tree protection fencing, dust control, and other miscellaneous provisions as required by the regulatory agencies. Equipment and construction materials will be transported on existing roads to minimize environmental impacts.

Furthermore, construction activities will be limited as much as possible to keep the disturbance minimized to reduce the impacts to the existing vegetation and terrain.

Permanent BMP's

Soil stabilization, revegetation, and landscaping: All non-hardscaped disturbed areas of the site will be revegetated and landscaped, per Town requirements to mitigate potential impacts due to vegetation removal for the construction of the proposed site improvements.

All stormwater runoff will be routed through both surface and underground stormwater treatment facilities. The underground treatment facilities will be equipped with an overflow pipe with a riprap protected outlet.

OVERLAND RELEASE & DOWNSTREAM ANALYSIS

Under pre-development conditions, off-site runoff from Broackway road sheets flows into the project site and drain mostly in the north, northwest direction, ultimately discharging into the Truckee River located approximately 190 feet to the north of the proposed improvements.

Under post-development conditions, off-site flows from Broackway Road will continue to sheetflow into the project area. Post-development runoff will be routed through a system of proposed perimeter gravel infiltration trenches and underground stormwater storage facilities with adequate capacity to attenuate post-development peak flows to equal or less than the pre-development flows, and to treat stormwater runoff from impervious surfaces, per Town of Truckee requirements. Therefore, no further downstream analysis has been performed beyond the consideration of the existing outflow described above.

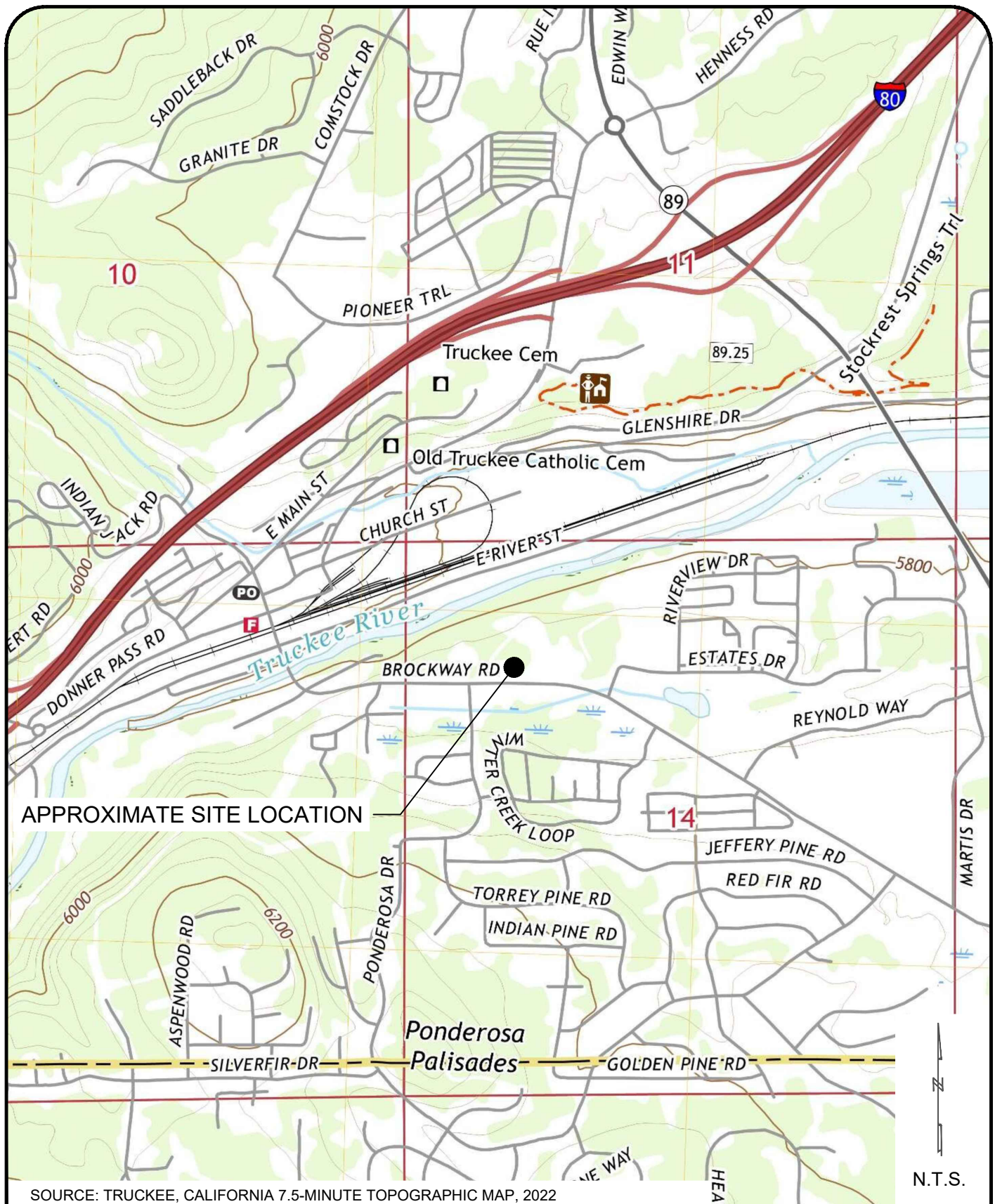
As shown in the watershed maps and peak flow calculations, no overall drainage pattern, watershed tributary area or watershed characteristic is proposed to be altered. Therefore, no adverse impact to the existing drainage pattern is expected due to the proposed improvements.

RESULTS AND CONCLUSIONS

As shown, the project does not propose to adversely alter overall drainages patterns. Onsite stormwater runoff will be routed through an adequate system of Low Impact Development permanent BMPs providing water quality treatment, as required by the Town of Truckee. Therefore, no adverse effects on the stormwater management for this site or the downstream facilities is anticipated as a result of the proposed project.

Appendix A

Vicinity Map



N | V | 5

SITE VICINITY MAP
**TRUCKEE REGIONAL PUBLIC
 LIBRARY**
 TRUCKEE, CALIFORNIA

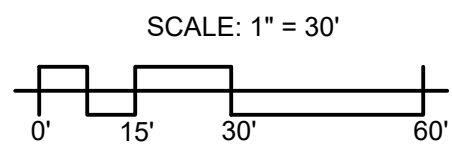
PROJECT NO.: 43369.00

DATE: DECEMBER 2024

FIGURE NO.: 1

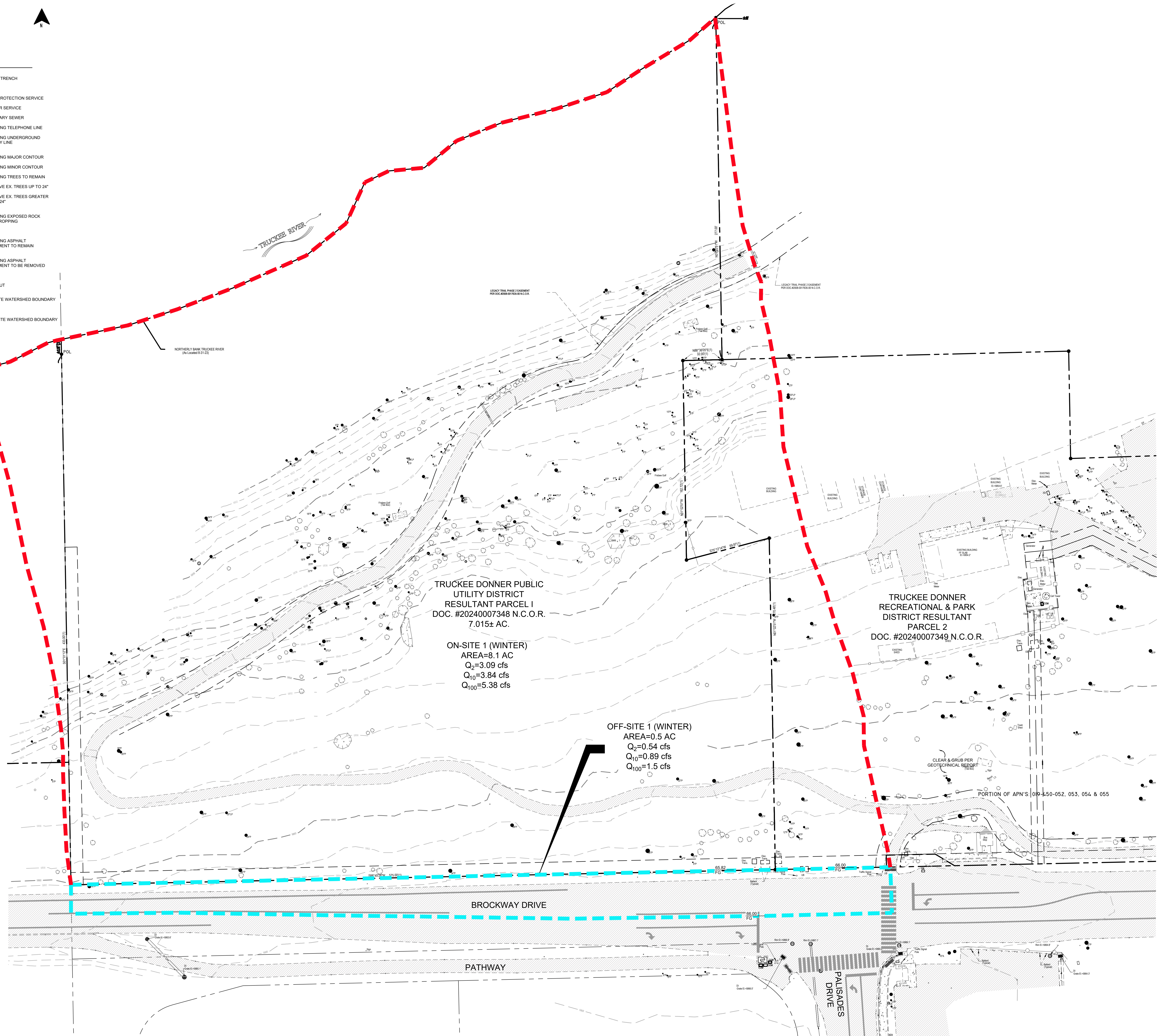
Appendix B

Watershed Map



LEGEND:

- JT— JOINT TRENCH
- G— GAS
- FP— FIRE PROTECTION SERVICE
- W— WATER SERVICE
- SS— SANITARY SEWER
- TEL— EXISTING TELEPHONE LINE
- UGU— EXISTING UNDERGROUND UTILITY LINE
- 6850— EXISTING MAJOR CONTOUR
- 6851— EXISTING MINOR CONTOUR
- 14"• REMOVE EX. TREES UP TO 24"
- 24"• REMOVE EX. TREES GREATER THAN 24"
- EXISTING EXPOSED ROCK OUTCROPPING
- EXISTING ASPHALT PAVEMENT TO REMAIN
- EXISTING ASPHALT PAVEMENT TO BE REMOVED
- SAWCUT
- ON-SITE WATERSHED BOUNDARY
- OFF-SITE WATERSHED BOUNDARY



SEAL
NOT FOR
CONSTRUCTION

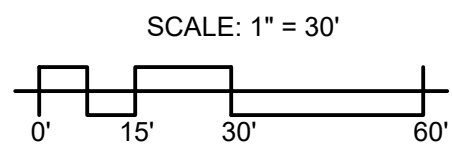
1500 BROCKWAY ROAD,
TRUCKEE, CA 96161

Drawing Title
**PRE-DEVELOPMENT
DRAINAGE MAP**

NO.	DATE	ISSUE

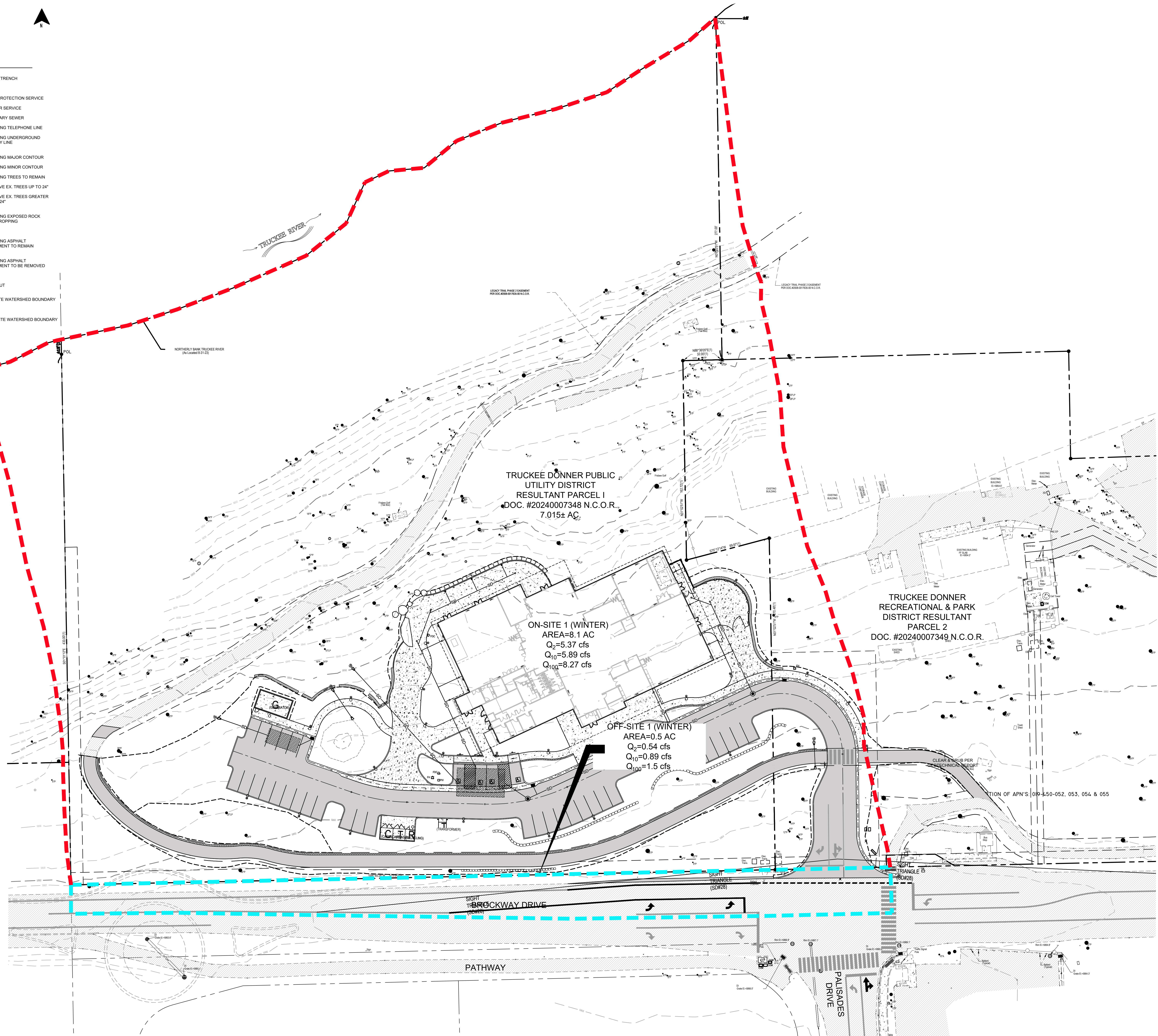
Project
NEVADA COUNTY
Truckee Regional Library

Drawn By
JW
Checked By
CS
Project No.
24-135
©/Date
10.03.2025
DRAWING NO.



LEGEND:

- JT— JOINT TRENCH
- G— GAS
- FP— FIRE PROTECTION SERVICE
- W— WATER SERVICE
- SS— SANITARY SEWER
- TEL— EXISTING TELEPHONE LINE
- UGU— EXISTING UNDERGROUND UTILITY LINE
- 6850— EXISTING MAJOR CONTOUR
- 6851— EXISTING MINOR CONTOUR
- 14"• EXISTING TREES TO REMAIN
- ✕14"✕ REMOVE EX. TREES UP TO 24"
- ✕24"✕ REMOVE EX. TREES GREATER THAN 24"
- EXISTING EXPOSED ROCK OUTCROPPING
- EXISTING ASPHALT PAVEMENT TO REMAIN
- EXISTING ASPHALT PAVEMENT TO BE REMOVED
- SAWCUT
- ON-SITE WATERSHED BOUNDARY
- OFF-SITE WATERSHED BOUNDARY



SEAL
**NOT FOR
CONSTRUCTION**

1500 BROCKWAY ROAD,
TRUCKEE, CA 96161

Drawing Title
**POST-DEVELOPMENT
DRAINAGE MAP**

NO.	DATE	ISSUE

Project
NEVADA COUNTY
Truckee Regional Library

Drawn By
JW
Checked By
CS
Project No.
24-135
©Date
10.03.2025
DRAWING NO.

Appendix C

Peak Flow Worksheets & References

Town of Truckee Public Improvement Engineering Standards						
Small Watershed Peak Flow Worksheet						
Date	October 2025					
Engineer	JKAE					
Project	Truckee Library					
Watershed	OffSite #1 - Pre & Post Development - Summer Conditions					
Area (acres)	0.50	Elevation (ft)	5858	Return Period (years)	2, 10 & 100	
	Length (feet)	Slope (V/H)	Mannings "n"	Contributing Area (Acres)	Side Slope (ft H / 1 ft V)	Response Time (minutes)
Overland Flow 1	47	0.4%	0.6	-	-	14.01
Collector 1	-	-	-	-	-	
Collector 2						
Time of Concentration (minutes)*						14.01
(Standard Drawing SD #60) 10-Year Intensity (inches/hour)						2.34
10-Year Intensity Adjusted for Snow Melt (inches/hour)						2.44
Infiltration Rate (inches/hour)**						0.17
Infiltration Factor (cfs/acre)						0.21
Impervious (acres)						0.377
Runoff Coefficient "C"						0.74
10-Year Watershed Peak Flow (cfs)						
("C" x Intensity x Area) - (Infiltration Factor x Pervious Area)						0.79

10
14
15

(Standard Drawing SD #59) 100-Year Intensity (in/hour)	3.99
100-Year Intensity Adjusted for Snow Melt (inches/hour)	4.09
Infiltration Rate (inches/hour)	0.17
Infiltration Factor (cfs/acre)	0.21
Pervious Area - 90% Impervious Winter-Snow Cover (acres)	0.377
Impervious (acres)	0.74
100-Year Watershed Peak Flow (cfs)	
("C" x Intensity x Area) - (Infiltration Factor x Pervious Area)	1.40

(NOAA Atlas 14 Intensity Table) 2-Year Intensity (in/hour)	1.38
2-Year Intensity Adjusted for Snow Melt (inches/hour)	1.48
Infiltration Rate (inches/hour)	0.17
Infiltration Factor (cfs/acre)	0.21
Impervious (acres)	0.377
Runoff Coefficient "C"	0.74
2-Year Watershed Peak Flow (cfs)	
("C" x Intensity x Area) - (Infiltration Factor x Pervious Area)	0.43

Notes:

1. Manning's "n" from EPA's Storm Water Management Model User's Manual Version 5.1, September 2015.
2. Collector equation (Equation 5.2) from Town of Truckee General Requirements Section 1.
3. Infiltration Rate of 0.17" in/hr used, per Town of Truckee requirements when a rate is not established/supported by a Geotechnical report.

Town of Truckee Public Improvement Engineering Standards						
Small Watershed Peak Flow Worksheet						
Date	October 2025					
Engineer	JKAE					
Project	Truckee Library					
Watershed	OffSite #1 - Pre & Post Development - Winter Conditions					
Area (acres)	0.50	Elevation (ft)	5858	Return Period (years)	2, 10 & 100	
	Length (feet)	Slope (V/H)	Mannings "n"	Contributing Area (Acres)	Side Slope (ft H / 1 ft V)	Response Time (minutes)
Overland Flow 1	47	0.4%	0.6	-	-	14.01
Collector 1						
Collector 2						
Time of Concentration (minutes)*						14.01
(Standard Drawing SD #60) 10-Year Intensity (inches/hour)						2.34
10-Year Intensity Adjusted for Snow Melt (inches/hour)						2.44
Infiltration Rate (inches/hour)**						0.17
Infiltration Factor (cfs/acre)						0.21
Pervious Area - 90% Impervious Winter-Snow Cover (acres)						0.05
Runoff Coefficient "C"						0.74
10-Year Watershed Peak Flow (cfs)						
("C" x Intensity x Area) - (Infiltration Factor x Pervious Area)						0.89

10
14
15

(Standard Drawing SD #59) 100-Year Intensity (in/hour)	3.99
100-Year Intensity Adjusted for Snow Melt (inches/hour)	4.09
Infiltration Rate (inches/hour)	0.17
Infiltration Factor (cfs/acre)	0.21
Pervious Area - 90% Impervious Winter-Snow Cover (acres)	0.05
Impervious (acres)	0.74
100-Year Watershed Peak Flow (cfs)	
("C" x Intensity x Area) - (Infiltration Factor x Pervious Area)	1.50

(NOAA Atlas 14 Intensity Table) 2-Year Intensity (in/hour)	1.38
2-Year Intensity Adjusted for Snow Melt (inches/hour)	1.48
Infiltration Rate (inches/hour)	0.17
Infiltration Factor (cfs/acre)	0.21
Pervious Area - 90% Impervious Winter-Snow Cover (acres)	0.05
Runoff Coefficient "C"	0.74
2-Year Watershed Peak Flow (cfs)	
("C" x Intensity x Area) - (Infiltration Factor x Pervious Area)	0.54

Notes:

1. Manning's "n" from EPA's Storm Water Management Model User's Manual Version 5.1, September 2015.
2. Collector equation (Equation 5.2) from Town of Truckee General Requirements Section 1. 90% impervious
4. Infiltration Rate of 0.17" in/hr used, per Town of Truckee requirements when a rate is not established/supported by a Geotechnical report.

Town of Truckee Public Improvement Engineering Standards						
Small Watershed Peak Flow Worksheet						
Date	October 2025					
Engineer	JKAE					
Project	Truckee Library					
Watershed	OnSite #1 - Pre-Development - Summer Conditions					
Area (acres)	8.1	Elevation (ft)	5858	Return Period (years)	2, 10 & 100	
	Length (feet)	Slope (V/H)	Mannings "n"	Contributing Area (Acres)	Side Slope (ft H / 1 ft V)	Response Time (minutes)
Overland Flow 1	300	5.4%	0.6	-	-	19.19
Collector 1	70	2.0%	0.6	0.06	1.00	3.65
Collector 2	320	24.0%	0.6	0.42	1.00	4.04
Time of Concentration (minutes)*						26.88
(Standard Drawing SD #60) 10-Year Intensity (inches/hour)						1.14
10-Year Intensity Adjusted for Snow Melt (inches/hour)						1.24
Infiltration Rate (inches/hour)**					0.17	
Infiltration Factor (cfs/acre)					0.21	
Pervious Area (acres)					6.70	
Runoff Coefficient "C"					0.40	
10-Year Watershed Peak Flow (cfs)						2.61
("C" x Intensity x Area) - (Infiltration Factor x Pervious Area)						
(Standard Drawing SD #59) 100-Year Intensity (in/hour)						1.61
100-Year Intensity Adjusted for Snow Melt (inches/hour)						1.71
Infiltration Rate (inches/hour)					0.17	
Infiltration Factor (cfs/acre)					0.21	
Pervious Area (acres)					6.70	
Runoff Coefficient "C"					0.40	
100-Year Watershed Peak Flow (cfs)						4.15
("C" x Intensity x Area) - (Infiltration Factor x Pervious Area)						
(NOAA Atlas 14 Intensity Table) 2-Year Intensity (in/hour)						0.91
2-Year Intensity Adjusted for Snow Melt (inches/hour)						1.01
Infiltration Rate (inches/hour)					0.17	
Infiltration Factor (cfs/acre)					0.21	
Pervious Area (acres)					6.70	
Runoff Coefficient "C"					0.40	
2-Year Watershed Peak Flow (cfs)						1.85
("C" x Intensity x Area) - (Infiltration Factor x Pervious Area)						

15
26.88
30

Notes:

1. Manning's "n" from EPA's Storm Water Management Model User's Manual Version 5.1, September 2015.
2. Collector equation (Equation 5.2) from Town of Truckee General Requirements Section 1.
3. Infiltration Rate of 0.17" in/hr used, per Town of Truckee requirements when a rate is not established/supported by a Geotechnical report.

Town of Truckee Public Improvement Engineering Standards						
Small Watershed Peak Flow Worksheet						
Date	October 2025					
Engineer	JKAE					
Project	Truckee Library					
Watershed	OnSite #1 - Pre-Development - Winter Conditions					
Area (acres)	8.1	Elevation (ft)	5858	Return Period (years)	2, 10 & 100	
	Length (feet)	Slope (V/H)	Mannings "n"	Contributing Area (Acres)	Side Slope (ft H / 1 ft V)	Response Time (minutes)
Overland Flow 1	300	5.4%	0.6	-	-	19.19
Collector 1	70	2.0%	0.6	0.06	1.00	3.65
Collector 2	320	24.0%	0.6	0.42	1.00	4.04
Time of Concentration (minutes)*						26.88
(Standard Drawing SD #60) 10-Year Intensity (inches/hour)						1.14
10-Year Intensity Adjusted for Snow Melt (inches/hour)						1.24
Infiltration Rate (inches/hour)**					0.17	
Infiltration Factor (cfs/acre)					0.21	
Pervious Area - 90% Impervious Winter-Snow Cover (acres)					0.81	
Runoff Coefficient "C"					0.40	
10-Year Watershed Peak Flow (cfs)						
("C" x Intensity x Area) - (Infiltration Factor x Pervious Area)					3.84	

15
26.88
30

(Standard Drawing SD #59) 100-Year Intensity (in/hour)	1.61
100-Year Intensity Adjusted for Snow Melt (inches/hour)	1.71
Infiltration Rate (inches/hour)	0.17
Infiltration Factor (cfs/acre)	0.21
Pervious Area - 90% Impervious Winter-Snow Cover (acres)	0.81
Runoff Coefficient "C"	0.40
100-Year Watershed Peak Flow (cfs)	
("C" x Intensity x Area) - (Infiltration Factor x Pervious Area)	5.38

(NOAA Atlas 14 Intensity Table) 2-Year Intensity (in/hour)	0.91
2-Year Intensity Adjusted for Snow Melt (inches/hour)	1.01
Infiltration Rate (inches/hour)	0.17
Infiltration Factor (cfs/acre)	0.21
Pervious Area - 90% Impervious Winter-Snow Cover (acres)	0.81
Runoff Coefficient "C"	0.40
2-Year Watershed Peak Flow (cfs)	
("C" x Intensity x Area) - (Infiltration Factor x Pervious Area)	3.09

Notes:

1. Manning's "n" from EPA's Storm Water Management Model User's Manual Version 5.1, September 2015.
2. Collector equation (Equation 5.2) from Town of Truckee General Requirements Section 1.
3. Site is considered 90% impervious during Winter conditions.
4. Infiltration Rate of 0.17" in/hr used, per Town of Truckee requirements when a rate is not established/supported by a Geotechnical report.

Town of Truckee Public Improvement Engineering Standards						
Small Watershed Peak Flow Worksheet						
Date	October 2025					
Engineer	JKAE					
Project	Truckee Library					
Watershed	OnSite #1 - Post Development - Summer Conditions					
Area (acres)	8.1	Elevation (ft)	5858	Return Period (years)	2, 10 & 100	
	Length (feet)	Slope (V/H)	Mannings "n"	Contributing Area (Acres)	Side Slope (ft H / 1 ft V)	Response Time (minutes)
Overland Flow 1	300	8.6%	0.6	-	-	16.74
Collector 1	266	19.7%	0.6	0.43	50.00	8.05
Collector 2						
Time of Concentration (minutes)*						24.79
(Standard Drawing SD #60) 10-Year Intensity (inches/hour)						1.19
10-Year Intensity Adjusted for Snow Melt (inches/hour)						1.29
Infiltration Rate (inches/hour)**					0.17	
Infiltration Factor (cfs/acre)					0.21	
Pervious Area (acres)					6.75	
Runoff Coefficient "C"					0.52	
10-Year Watershed Peak Flow (cfs)						
("C" x Intensity x Area) - (Infiltration Factor x Pervious Area)						4.02

15
24.79
30

(Standard Drawing SD #59) 100-Year Intensity (in/hour)	1.69
100-Year Intensity Adjusted for Snow Melt (inches/hour)	1.79
Infiltration Rate (inches/hour)	0.17
Infiltration Factor (cfs/acre)	0.21
Pervious Area (acres)	6.75
Runoff Coefficient "C"	0.52
100-Year Watershed Peak Flow (cfs)	
("C" x Intensity x Area) - (Infiltration Factor x Pervious Area)	6.12

(NOAA Atlas 14 Intensity Table) 2-Year Intensity (in/hour)	1.01
2-Year Intensity Adjusted for Snow Melt (inches/hour)	1.11
Infiltration Rate (inches/hour)	0.17
Infiltration Factor (cfs/acre)	0.21
Pervious Area (acres)	6.75
Runoff Coefficient "C"	0.52
2-Year Watershed Peak Flow (cfs)	
("C" x Intensity x Area) - (Infiltration Factor x Pervious Area)	3.25

Notes:

1. Manning's "n" from EPA's Storm Water Management Model User's Manual Version 5.1, September 2015.
2. Collector equation (Equation 5.2) from Town of Truckee General Requirements Section 1.
3. Infiltration Rate of 0.17" in/hr used, per Town of Truckee requirements when a rate is not established/supported by a Geotechnical report.

Town of Truckee Public Improvement Engineering Standards						
Small Watershed Peak Flow Worksheet						
Date	October 2025					
Engineer	JKAE					
Project	Truckee Library					
Watershed	OnSite #1 - Post Development - Winter Conditions					
Area (acres)	8.1	Elevation (ft)	5858	Return Period (years)	2, 10 & 100	
	Length (feet)	Slope (V/H)	Mannings "n"	Contributing Area (Acres)	Side Slope (ft H / 1 ft V)	Response Time (minutes)
Overland Flow 1	300	8.6%	0.6	-	-	16.74
Collector 1	266	19.7%	0.6	0.43	50.00	8.05
Collector 2						
Time of Concentration (minutes)*						24.79
(Standard Drawing SD #60) 10-Year Intensity (inches/hour)						1.19
10-Year Intensity Adjusted for Snow Melt (inches/hour)						1.29
Infiltration Rate (inches/hour)**					0.17	
Infiltration Factor (cfs/acre)					0.21	
Pervious Area - 90% Impervious Winter-Snow Cover (acres)					0.81	
Runoff Coefficient "C"					0.52	
10-Year Watershed Peak Flow (cfs)						
("C" x Intensity x Area) - (Infiltration Factor x Pervious Area)						5.27
(Standard Drawing SD #59) 100-Year Intensity (in/hour)						1.69
100-Year Intensity Adjusted for Snow Melt (inches/hour)						1.79
Infiltration Rate (inches/hour)					0.17	
Infiltration Factor (cfs/acre)					0.21	
Pervious Area - 90% Impervious Winter-Snow Cover (acres)					0.81	
Runoff Coefficient "C"					0.52	
100-Year Watershed Peak Flow (cfs)						
("C" x Intensity x Area) - (Infiltration Factor x Pervious Area)						7.37
(NOAA Atlas 14 Intensity Table) 2-Year Intensity (in/hour)						1.01
2-Year Intensity Adjusted for Snow Melt (inches/hour)						1.11
Infiltration Rate (inches/hour)					0.17	
Infiltration Factor (cfs/acre)					0.21	
Pervious Area - 90% Impervious Winter-Snow Cover (acres)					0.81	
Runoff Coefficient "C"					0.52	
2-Year Watershed Peak Flow (cfs)						
("C" x Intensity x Area) - (Infiltration Factor x Pervious Area)						4.49

15
24.79
30

Notes:

1. Manning's "n" from EPA's Storm Water Management Model User's Manual Version 5.1, September 2015.
2. Collector equation (Equation 5.2) from Town of Truckee General Requirements Section 1.
3. Site is considered 90% impervious during Winter conditions.
4. Infiltration Rate of 0.17" in/hr used, per Town of Truckee requirements when a rate is not established/supported by a Geotechnical report.

TRUCKEE LIBRARY PROJECT TRIANGULAR HYDROGRAPH DETENTION CALCULATION:

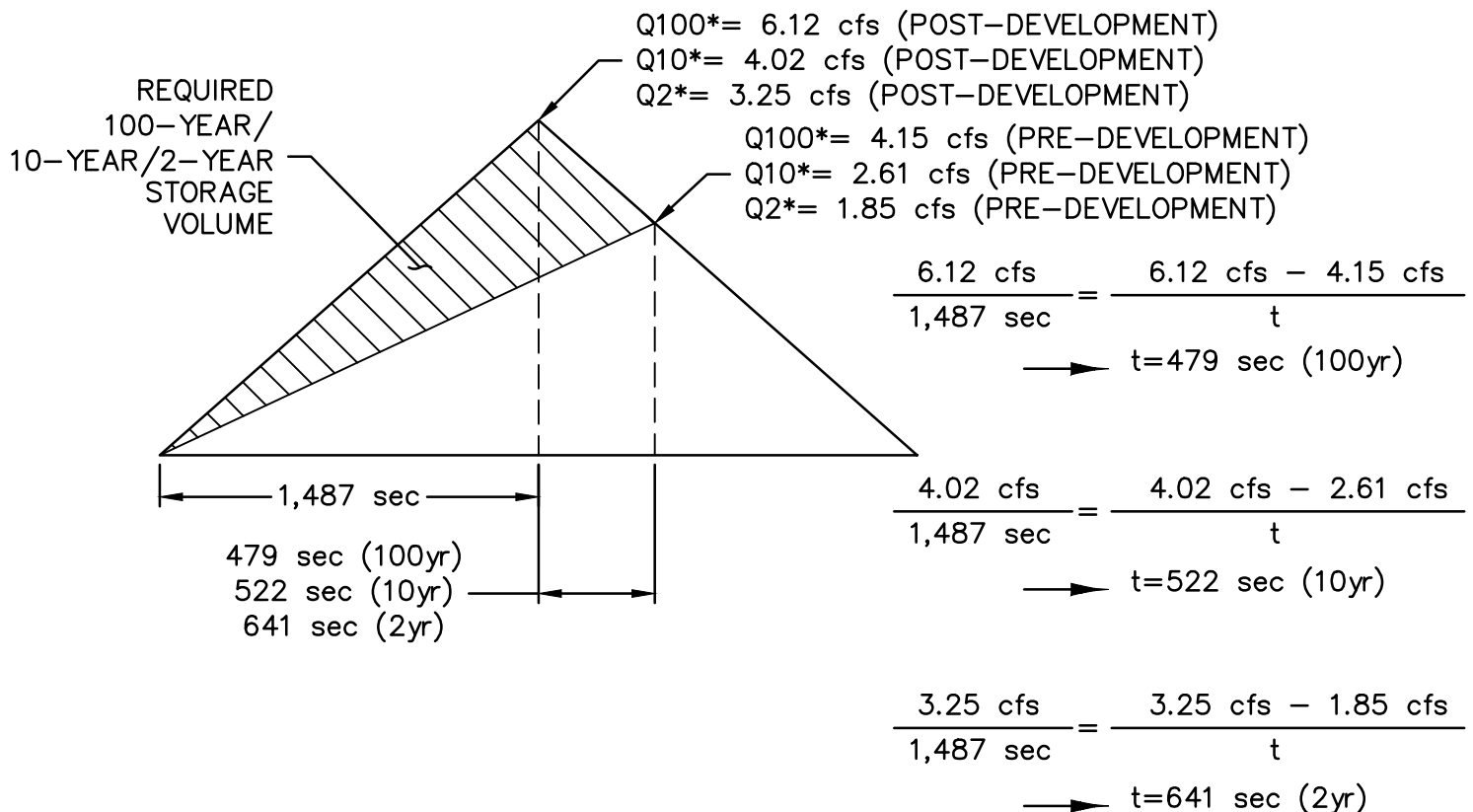
ON-SITE 1: SUMMER

PRE-DEVELOPMENT CONDITIONS:

Tc=26.66 min. ~ 1,600 sec.
 Q2*=1.85 cfs
 Q10*=2.61 cfs
 Q100*=4.15 cfs

POST-DEVELOPMENT CONDITIONS:

Tc=24.79 min. ~ 1,487 sec.
 Q2*=3.25 cfs
 Q10*=4.02 cfs
 Q100*=6.12 cfs



- A) REQUIRED 100-YEAR STORAGE VOLUME = AREA OF HYDROGRAPH =
 $(1/2 * 6.12 * 1,487) + ((6.12 + 4.15) * 479 * 1/2) - ((1,600 + 479) * 4.15 * 1/2) = \pm 2,690 \text{ CF}$
- B) REQUIRED 10-YEAR STORAGE VOLUME = AREA OF HYDROGRAPH =
 $(1/2 * 4.02 * 1,487) + ((4.02 + 2.61) * 522 * 1/2) - ((1,600 + 522) * 2.61 * 1/2) = \pm 1,950 \text{ CF}$
- C) REQUIRED 2-YEAR STORAGE VOLUME = AREA OF HYDROGRAPH =
 $(1/2 * 3.25 * 1,487) + ((3.25 + 1.85) * 641 * 1/2) - ((1,600 + 641) * 1.85 * 1/2) = \pm 1,978 \text{ CF}$
- D) TOTAL STORAGE VOLUME PROVIDED AS DETERMINED BY THE TOWN OF TRUCKEE STORM WATER QUALITY PLAN (SWQP) = $\pm 5,117 \text{ CF}^*$
- *SUM OF OF LID BMP VOLUMES FROM DMAs 1-5

TRUCKEE LIBRARY PROJECT

TRIANGULAR HYDROGRAPH DETENTION CALCULATION:

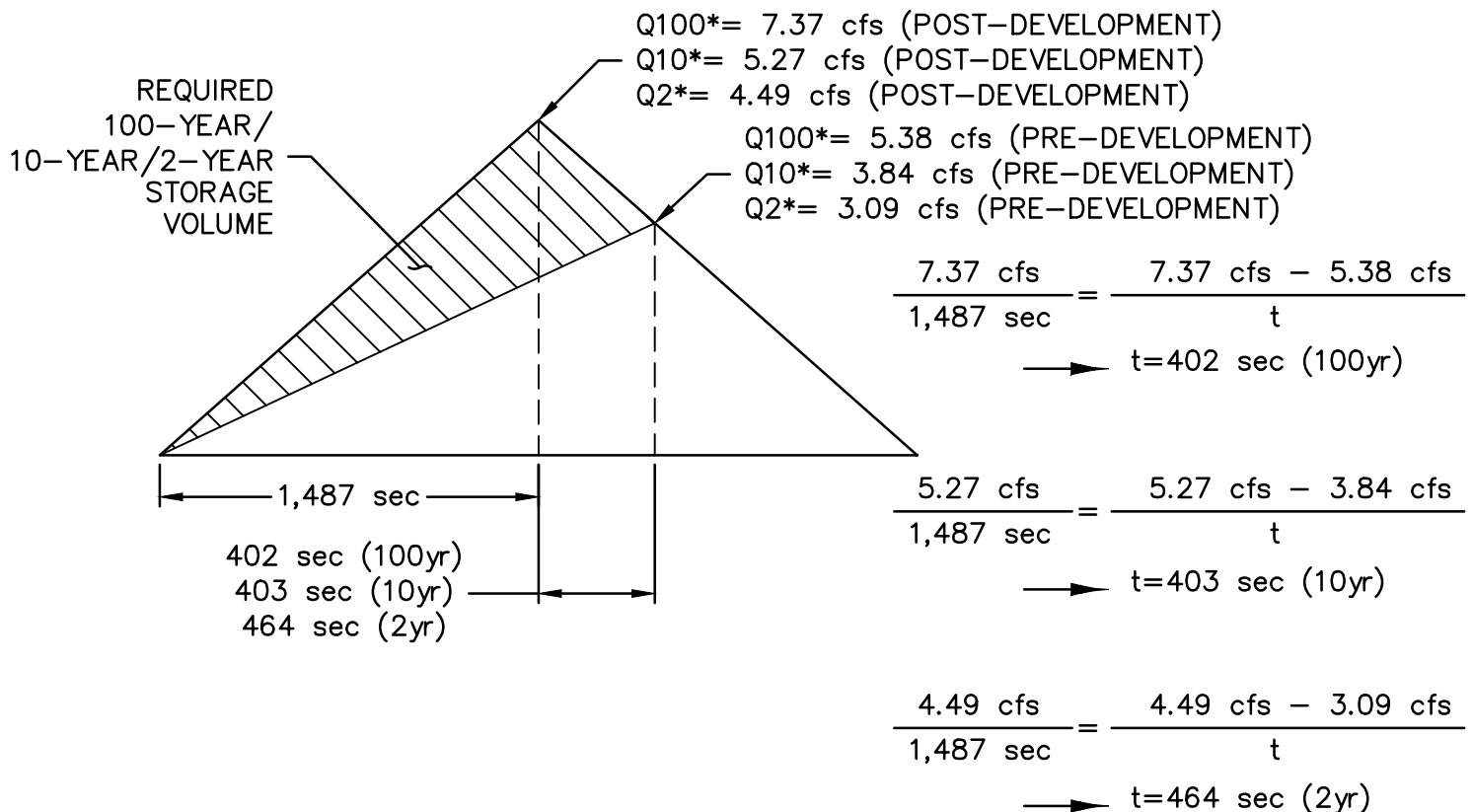
ON-SITE 1: WINTER

PRE-DEVELOPMENT CONDITIONS:

$T_c = 26.66 \text{ min.} \sim 1,600 \text{ sec.}$
 $Q_2^* = 3.09 \text{ cfs}$
 $Q_{10}^* = 3.84 \text{ cfs}$
 $Q_{100}^* = 5.38 \text{ cfs}$

POST-DEVELOPMENT CONDITIONS:

$T_c = 24.79 \text{ min.} \sim 1,487 \text{ sec.}$
 $Q_2^* = 4.49 \text{ cfs}$
 $Q_{10}^* = 5.27 \text{ cfs}$
 $Q_{100}^* = 7.37 \text{ cfs}$



A) REQUIRED 100-YEAR STORAGE VOLUME = AREA OF HYDROGRAPH =
 $(1/2 * 7.37 * 1,487) + ((7.37 + 5.38) * 402 * 1/2) - ((1,600 + 402) * 5.38 * 1/2) = \pm 2,650 \text{ CF}$

B) REQUIRED 10-YEAR STORAGE VOLUME = AREA OF HYDROGRAPH =
 $(1/2 * 5.27 * 1,487) + ((5.27 + 3.84) * 403 * 1/2) - ((1,600 + 403) * 3.84 * 1/2) = \pm 1,910 \text{ CF}$

C) REQUIRED 2-YEAR STORAGE VOLUME = AREA OF HYDROGRAPH =
 $(1/2 * 4.49 * 1,487) + ((4.49 + 3.09) * 464 * 1/2) - ((1,600 + 464) * 3.09 * 1/2) = \pm 1,905 \text{ CF}$

D) TOTAL STORAGE VOLUME PROVIDED AS DETERMINED BY THE TOWN OF TRUCKEE STORM WATER QUALITY PLAN (SWQP) = $\pm 5,117 \text{ CF}^*$

*SUM OF OF LID BMP VOLUMES FROM DMAs 1-5



NOAA Atlas 14, Volume 6, Version 2
Location name: Truckee, California, USA*
Latitude: 39.3267°, Longitude: -120.1778°
Elevation: 5859 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 & aerals](#)

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	1.67 (1.43-1.96)	2.29 (1.97-2.70)	3.14 (2.69-3.71)	3.85 (3.26-4.61)	4.87 (3.96-6.06)	5.70 (4.52-7.26)	6.59 (5.08-8.64)	7.55 (5.63-10.2)	8.95 (6.36-12.7)	10.1 (6.90-15.0)
10-min	1.19 (1.03-1.40)	1.64 (1.41-1.93)	2.25 (1.93-2.66)	2.77 (2.34-3.30)	3.49 (2.84-4.34)	4.09 (3.24-5.21)	4.72 (3.64-6.19)	5.41 (4.03-7.33)	6.41 (4.55-9.13)	7.25 (4.95-10.8)
15-min	0.964 (0.828-1.13)	1.32 (1.14-1.56)	1.82 (1.55-2.14)	2.23 (1.88-2.66)	2.82 (2.29-3.50)	3.30 (2.61-4.20)	3.81 (2.93-4.99)	4.36 (3.25-5.91)	5.17 (3.67-7.36)	5.85 (3.99-8.67)
30-min	0.580 (0.498-0.682)	0.798 (0.684-0.940)	1.09 (0.934-1.29)	1.34 (1.14-1.60)	1.70 (1.38-2.11)	1.98 (1.57-2.53)	2.29 (1.77-3.01)	2.63 (1.96-3.56)	3.12 (2.21-4.43)	3.52 (2.40-5.22)
60-min	0.378 (0.325-0.445)	0.520 (0.446-0.613)	0.713 (0.609-0.842)	0.875 (0.741-1.04)	1.11 (0.900-1.38)	1.30 (1.03-1.65)	1.50 (1.15-1.96)	1.71 (1.28-2.32)	2.03 (1.44-2.89)	2.30 (1.57-3.40)
2-hr	0.271 (0.233-0.319)	0.343 (0.294-0.404)	0.444 (0.380-0.525)	0.533 (0.451-0.636)	0.664 (0.540-0.825)	0.773 (0.613-0.984)	0.891 (0.687-1.17)	1.02 (0.762-1.39)	1.22 (0.862-1.73)	1.38 (0.939-2.04)
3-hr	0.226 (0.194-0.266)	0.276 (0.237-0.326)	0.348 (0.298-0.412)	0.412 (0.349-0.492)	0.508 (0.413-0.631)	0.589 (0.467-0.749)	0.677 (0.521-0.888)	0.776 (0.578-1.05)	0.922 (0.655-1.31)	1.05 (0.714-1.55)
6-hr	0.176 (0.151-0.208)	0.207 (0.178-0.244)	0.252 (0.215-0.298)	0.292 (0.247-0.349)	0.353 (0.287-0.439)	0.406 (0.322-0.517)	0.464 (0.357-0.609)	0.530 (0.395-0.719)	0.631 (0.448-0.898)	0.717 (0.489-1.06)
12-hr	0.133 (0.114-0.156)	0.160 (0.137-0.188)	0.197 (0.169-0.233)	0.229 (0.194-0.274)	0.275 (0.224-0.342)	0.313 (0.248-0.398)	0.352 (0.271-0.462)	0.395 (0.294-0.536)	0.456 (0.324-0.649)	0.506 (0.345-0.750)
24-hr	0.094 (0.082-0.111)	0.121 (0.105-0.142)	0.155 (0.134-0.183)	0.183 (0.157-0.217)	0.221 (0.184-0.270)	0.250 (0.205-0.311)	0.279 (0.224-0.355)	0.309 (0.242-0.403)	0.350 (0.264-0.473)	0.382 (0.280-0.531)
2-day	0.065 (0.056-0.076)	0.084 (0.073-0.099)	0.109 (0.095-0.129)	0.131 (0.112-0.155)	0.160 (0.134-0.196)	0.183 (0.150-0.228)	0.208 (0.167-0.264)	0.233 (0.182-0.303)	0.268 (0.203-0.362)	0.296 (0.217-0.412)
3-day	0.050 (0.044-0.059)	0.065 (0.057-0.077)	0.086 (0.074-0.101)	0.103 (0.089-0.123)	0.128 (0.107-0.157)	0.149 (0.122-0.185)	0.170 (0.137-0.217)	0.194 (0.152-0.253)	0.227 (0.172-0.307)	0.255 (0.187-0.355)
4-day	0.042 (0.036-0.049)	0.054 (0.047-0.064)	0.072 (0.062-0.085)	0.087 (0.074-0.103)	0.109 (0.091-0.133)	0.127 (0.104-0.158)	0.146 (0.117-0.185)	0.167 (0.131-0.217)	0.197 (0.149-0.267)	0.223 (0.163-0.310)
7-day	0.029 (0.025-0.034)	0.038 (0.033-0.044)	0.050 (0.043-0.059)	0.061 (0.052-0.072)	0.077 (0.064-0.094)	0.090 (0.073-0.112)	0.104 (0.083-0.132)	0.119 (0.093-0.155)	0.142 (0.107-0.191)	0.160 (0.117-0.223)
10-day	0.023 (0.020-0.027)	0.030 (0.026-0.035)	0.040 (0.035-0.047)	0.049 (0.042-0.058)	0.061 (0.051-0.075)	0.072 (0.059-0.089)	0.083 (0.066-0.105)	0.095 (0.074-0.124)	0.112 (0.085-0.152)	0.127 (0.093-0.177)
20-day	0.015 (0.013-0.018)	0.020 (0.017-0.024)	0.027 (0.023-0.032)	0.032 (0.028-0.039)	0.041 (0.034-0.050)	0.047 (0.038-0.059)	0.054 (0.043-0.068)	0.061 (0.048-0.079)	0.071 (0.054-0.096)	0.079 (0.058-0.110)
30-day	0.012 (0.010-0.014)	0.016 (0.014-0.019)	0.021 (0.018-0.025)	0.026 (0.022-0.031)	0.032 (0.027-0.039)	0.037 (0.030-0.046)	0.042 (0.034-0.053)	0.047 (0.037-0.061)	0.054 (0.041-0.073)	0.060 (0.044-0.084)
45-day	0.010 (0.008-0.012)	0.013 (0.011-0.015)	0.017 (0.015-0.021)	0.021 (0.018-0.025)	0.026 (0.021-0.031)	0.029 (0.024-0.036)	0.033 (0.026-0.042)	0.036 (0.028-0.048)	0.041 (0.031-0.056)	0.045 (0.033-0.063)
60-day	0.009 (0.007-0.010)	0.011 (0.010-0.014)	0.015 (0.013-0.018)	0.018 (0.015-0.021)	0.022 (0.018-0.027)	0.025 (0.020-0.031)	0.028 (0.022-0.035)	0.030 (0.024-0.040)	0.034 (0.026-0.046)	0.037 (0.027-0.052)

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.

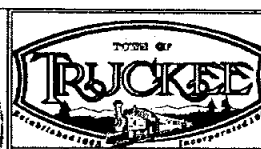
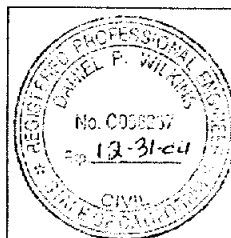
[Back to Top](#)

PF graphical

NEVADA COUNTY DESIGN STORM (INTENSITY)

10 YEAR STORM DURATION IN MINUTES FOR NEVADA COUNTY

Mean Annual Precipitation Inches	5	10	15	30	60 1hr	120 2Hr	180 3Hr	360 6Hr	720 12Hr	1440 24Hr
Intensity in inches per hour										
20	1.57	1.15	.96	.70	.51	.38	.31	.23	.17	.12
22	1.68	1.23	1.03	.75	.55	.40	.34	.25	.18	.13
24	1.80	1.31	1.10	.80	.59	.43	.36	.26	.19	.14
26	1.91	1.40	1.17	.85	.62	.46	.38	.28	.20	.15
28	2.02	1.48	1.23	.90	.66	.48	.40	.30	.22	.16
30	2.14	1.57	1.30	.95	.70	.51	.43	.31	.23	.17
32	2.25	1.65	1.37	1.01	.74	.54	.45	.33	.24	.18
34	2.37	1.73	1.44	1.06	.77	.57	.47	.35	.25	.19
36	2.48	1.82	1.51	1.11	.81	.59	.49	.36	.27	.19
38	2.59	1.90	1.58	1.16	.85	.62	.52	.38	.28	.20
40	2.71	1.98	1.65	1.21	.89	.65	.54	.40	.29	.21
42	2.82	2.07	1.72	1.26	.92	.68	.56	.41	.30	.22
44	2.94	2.15	1.79	1.31	.96	.70	.59	.43	.31	.23
46	3.05	2.23	1.86	1.36	1.00	.73	.61	.45	.33	.24
48	3.17	2.32	1.93	1.41	1.03	.76	.63	.46	.34	.25
50	3.28	2.40	2.00	1.46	1.07	.78	.65	.48	.35	.26
52	3.39	2.48	2.07	1.52	1.11	.81	.68	.50	.36	.27
54	3.51	2.57	2.14	1.57	1.15	.84	.70	.51	.37	.27
56	3.62	2.65	2.21	1.62	1.18	.87	.72	.53	.39	.28
58	3.74	2.73	2.28	1.67	1.22	.89	.74	.55	.40	.29
60	3.85	2.82	2.35	1.72	1.26	.92	.77	.56	.41	.30
62	3.96	2.90	2.42	1.77	1.30	.95	.79	.58	.42	.31
64	4.08	2.98	2.49	1.82	1.33	.98	.81	.60	.44	.32
66	4.19	3.07	2.56	1.87	1.37	1.00	.84	.61	.45	.33
68	4.31	3.15	2.63	1.92	1.41	1.03	.86	.63	.46	.34
70	4.42	3.24	2.70	1.97	1.44	1.06	.88	.65	.47	.35
72	4.53	3.32	2.77	2.02	1.48	1.08	.90	.66	.48	.35
74	4.65	3.40	2.84	2.08	1.52	1.11	.93	.68	.50	.36
76	4.76	3.49	2.90	2.13	1.56	1.14	.95	.70	.51	.37
78	4.88	3.57	2.97	2.18	1.59	1.17	.97	.71	.52	.38
80	4.99	3.65	3.04	2.23	1.63	1.19	.99	.73	.53	.39

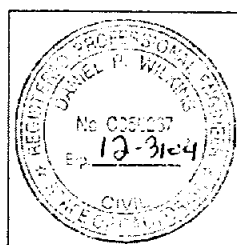


TOWN OF TRUCKEE
ENGINEERING DEPARTMENT
10 YEAR STORM DURATION
IN MINUTES FOR NEVADA COUNTY

LOCAL ROAD SYSTEM STANDARDS
NOT TO SCALE
APPROVED BY:
Daniel P. Wilkins
MAY, 2003 TOWN ENGINEER
STANDARD DRAWING
SD#60

NEVADA COUNTY DESIGN STORM (INTENSITY)
100 YEAR STORM DURATION IN MINUTES FOR NEVADA COUNTY

Mean Annual Precipitation Inches	5	10	15	30	60 1hr	120 2hr	180 3hr	360 6hr	720 12hr	1440 24hr
Intensity in inches per hour										
20	2.22	1.63	1.36	.99	.73	.53	.44	.32	.24	.17
22	2.39	1.75	1.46	1.07	.78	.57	.48	.35	.25	.19
24	2.55	1.86	1.55	1.14	.83	.61	.51	.37	.27	.20
26	2.71	1.98	1.65	1.21	.89	.65	.54	.40	.29	.21
28	2.87	2.10	1.75	1.28	.94	.69	.57	.42	.31	.22
30	3.03	2.22	1.85	1.35	.99	.73	.60	.44	.32	.24
32	3.19	2.34	1.95	1.43	1.04	.76	.64	.47	.34	.25
34	3.36	2.46	2.05	1.50	1.10	.80	.67	.49	.36	.26
36	3.52	2.58	2.15	1.57	1.15	.84	.70	.51	.38	.28
38	3.68	2.69	2.24	1.64	1.20	.88	.73	.54	.39	.29
40	3.84	2.81	2.34	1.72	1.26	.92	.77	.56	.41	.30
42	4.00	2.93	2.44	1.79	1.31	.96	.80	.58	.43	.31
44	4.17	3.05	2.54	1.86	1.36	1.00	.83	.61	.45	.33
46	4.33	3.17	2.64	1.93	1.41	1.04	.86	.63	.46	.34
48	4.49	3.29	2.74	2.00	1.47	1.07	.89	.66	.48	.35
50	4.65	3.40	2.84	2.08	1.52	1.11	.93	.68	.50	.36
52	4.81	3.52	2.94	2.15	1.57	1.15	.96	.70	.51	.38
54	4.97	3.64	3.03	2.22	1.63	1.19	.99	.73	.53	.39
56	5.14	3.76	3.13	2.29	1.68	1.23	1.02	.75	.55	.40
58	5.30	3.88	3.23	2.37	1.73	1.27	1.06	.77	.57	.41
60	5.46	4.00	3.33	2.44	1.78	1.31	1.09	.80	.58	.43
62	5.62	4.12	3.43	2.51	1.84	1.35	1.12	.82	.60	.44
64	5.78	4.23	3.53	2.58	1.89	1.38	1.15	.84	.62	.45
66	5.94	4.35	3.63	2.65	1.94	1.42	1.19	.87	.64	.46
68	6.11	4.47	3.72	2.73	2.00	1.46	1.22	.89	.65	.48
70	6.27	4.59	3.82	2.80	2.05	1.50	1.25	.91	.67	.49
72	6.43	4.71	3.92	2.87	2.10	1.54	1.28	.94	.69	.50
74	6.59	4.83	4.02	2.94	2.15	1.58	1.31	.96	.70	.52
76	6.75	4.94	4.12	3.02	2.21	1.62	1.35	.99	.72	.53
78	6.92	5.06	4.22	3.09	2.26	1.65	1.38	1.01	.74	.54
80	7.08	5.18	4.32	3.16	2.31	1.69	1.41	1.03	.76	.55



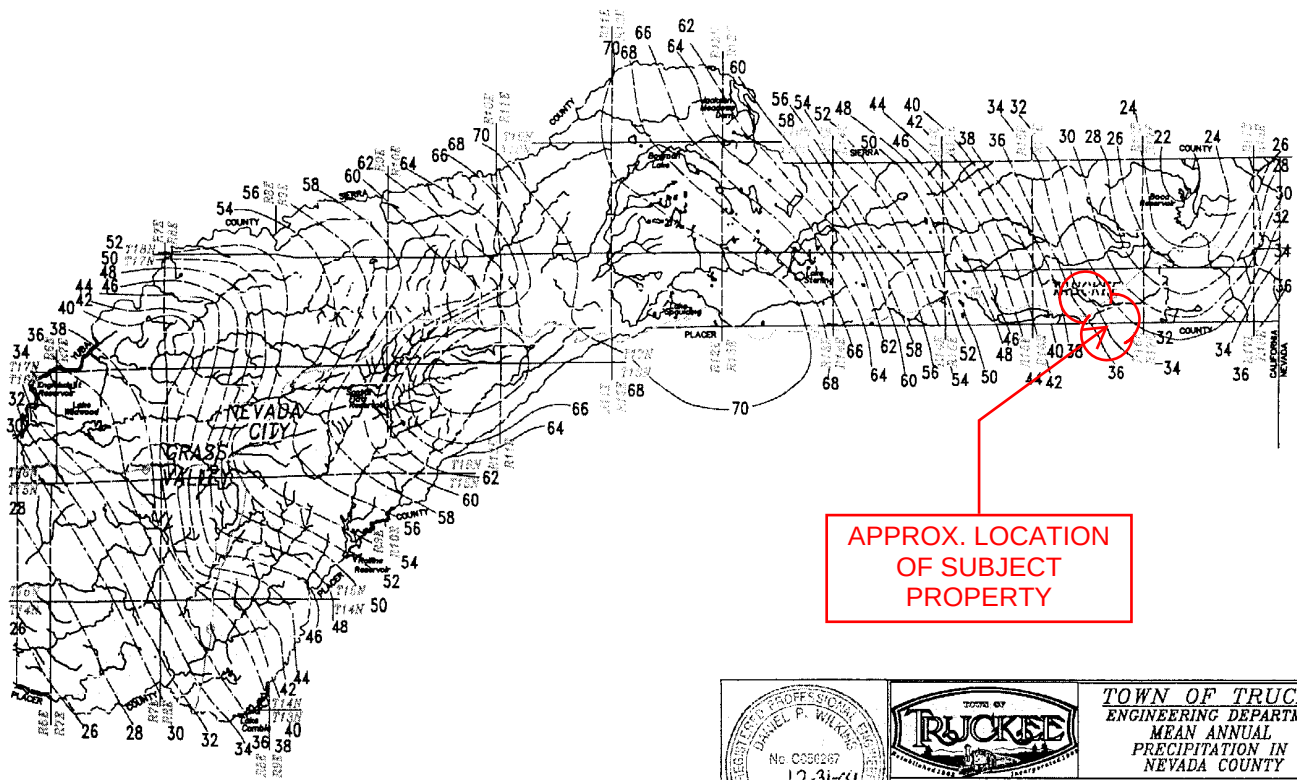
TOWN OF TRUCKEE
ENGINEERING DEPARTMENT
**100 YEAR STORM DURATION
IN MINUTES FOR NEVADA COUNTY**

NOT TO
SCALE
MAY, 2003

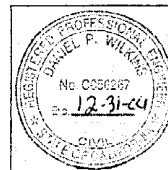
APPROVED BY:
Daniel P. Williams
TOWN ENGINEER

STANDARD
DRAWING
SD#59

NEVADA COUNTY



APPROX. LOCATION
OF SUBJECT
PROPERTY



TOWN OF TRUCKEE
ENGINEERING DEPARTMENT
MEAN ANNUAL
PRECIPITATION IN
NEVADA COUNTY

LOCAL ROAD SYSTEM STANDARDS
NOT TO SCALE
MAY, 2003
APPROVED BY:
Daniel P. Wilkins
TOWN ENGINEER
STANDARD
DRAWING
SD#63

roof, lawn, driveway, and street surfaces, with the street gutter serving as collector. It is appropriate to represent these surfaces with two overland elements: a smooth one for directly connected impervious areas, such as roofs, driveways and streets, and a rough one for landscaped and unconnected impervious areas.

Equation 5-3 is used to estimate the overland flow component of response time (7)(8). Solutions for this equation may be obtained graphically in Figure 5-1.

$$t_r = \frac{.355(nL)^{0.6}}{S^{0.3}} \quad [5-31]$$

where

t_r = response time, minutes
 n = Manning's roughness coefficient (Table 5-5)
 L = flow length, feet
 S = slope of surface, feet/feet

i) Collector Flow Equation 5-4 below or the Manning equation may be used for estimating velocities of concentrated flow in rivulets, swales, gutters, pipes, and channels. Equation 5-4 applies to an open, triangular channel with no inflow at its upstream end and side inflows uniformly distributed along its length.

This representation is considered adequate for approximating open channels and pipes in most situations. Equation 5-4 may be solved graphically using Figure 5-2.

$$t_r = \frac{.00735Ln^{.75}(1 + Z^2)^{.25}}{S^{.375}(A_cZ)^{.25}} \quad [5-4]$$

where

t_r = response time, minutes
 n = Manning's roughness coefficient
 See Table 6-3 or Table 8-1

**TABLE 5-5
ROUGHNESS PARAMETERS
FOR OVERLAND FLOW ¹**

Surface	n^2
Smooth surfaces (concrete asphalt, or bare soil)	0.11
Grass:	
Short grasses	0.15
Dense grasses	0.24
Bermuda grass	0.40
Poor grass cover on moderately rough surface	0.40
Woods with Underbrush	0.40 - 0.80

1. Sources (1) and (8).
2. Both surface roughness and vegetation cover affect runoff; but only the portion less than 0.1 foot high.

S = slope, feet horizontal/foot vertical
 L = length, feet
 Z = side slope, feet horizontal/foot vertical
 A_c = contributing area, acres

In natural watersheds, it may be appropriate to use higher values of Manning's n for the initial collector where the flow is shallow.

Manning's equation may be used to estimate the collector response time when it is felt that Equation 5-4 does not apply. A flow of 2 cfs per acre of contributing watershed should be used to evaluate velocities. The velocity computed for open channel flows using Mannings equation shall be increased by an adjustment factor as follows to account for celerity:

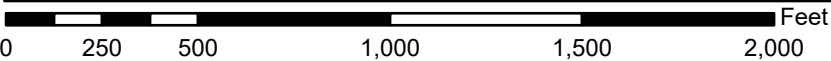
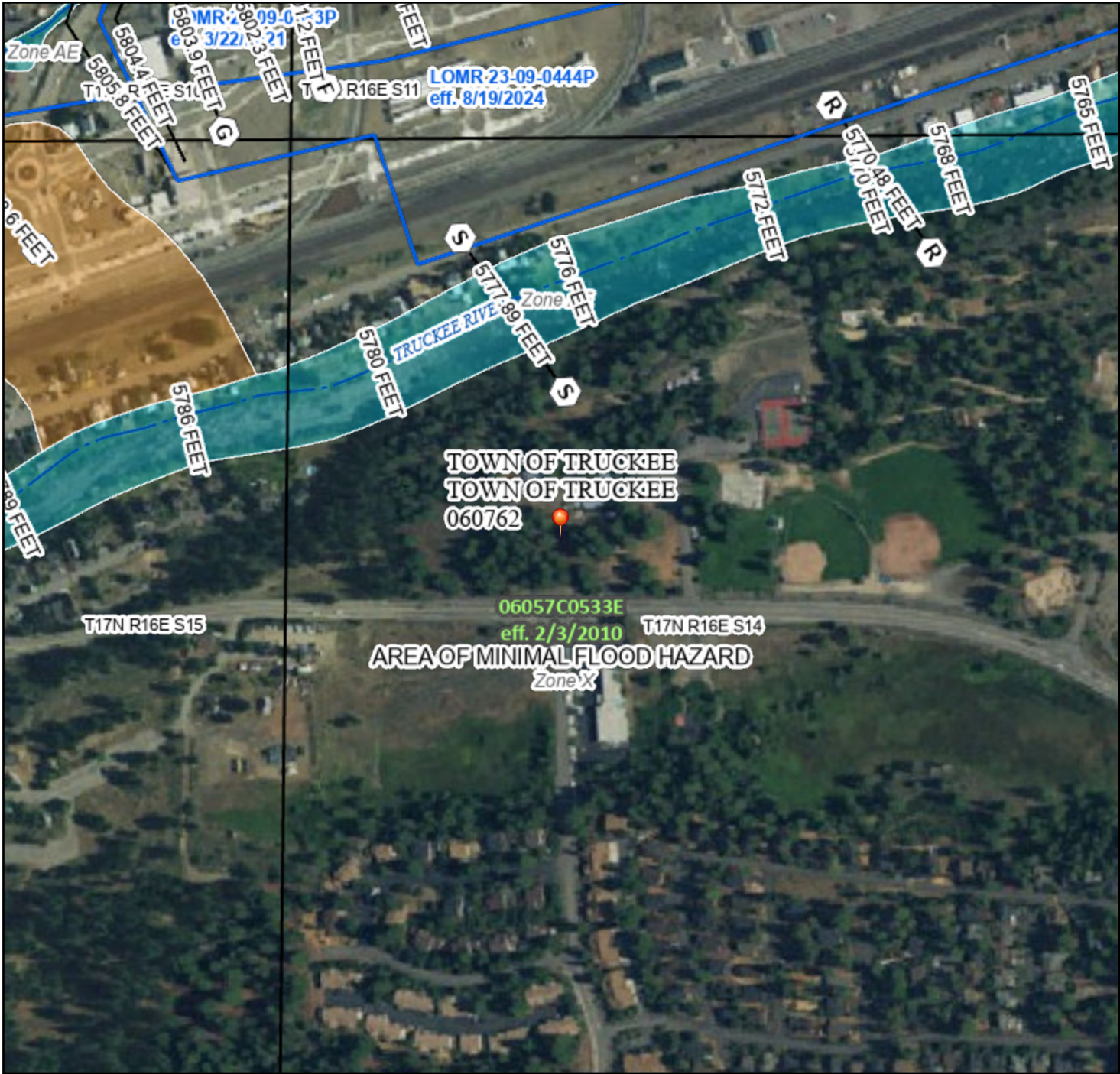
Appendix D

Flood Map

National Flood Hazard Layer FIRMette



120°10'57"W 39°19'50"N



1:6,000

120°10'19"W 39°19'23"N

Basemap Imagery Source: USGS National Map 2023

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS		Without Base Flood Elevation (BFE) Zone A, V, A99
		With BFE or Depth Zone AE, AO, AH, VE, AR
		Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD		0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile Zone X
		Future Conditions 1% Annual Chance Flood Hazard Zone X
		Area with Reduced Flood Risk due to Levee. See Notes. Zone X
		Area with Flood Risk due to Levee Zone D
OTHER AREAS		NO SCREEN Area of Minimal Flood Hazard Zone X
		Effective LOMRs
GENERAL STRUCTURES		Area of Undetermined Flood Hazard Zone D
		Channel, Culvert, or Storm Sewer
		Levee, Dike, or Floodwall
OTHER FEATURES		Cross Sections with 1% Annual Chance Water Surface Elevation
		Coastal Transect
		Base Flood Elevation Line (BFE)
		Limit of Study
		Jurisdiction Boundary
		Coastal Transect Baseline
MAP PANELS		Profile Baseline
		Hydrographic Feature
		Digital Data Available
		No Digital Data Available
		Unmapped



The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

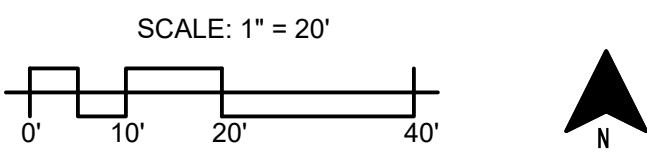
This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on **10/2/2025 at 9:46 PM** and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

Appendix E

Town of Truckee Low Impact Development (LID) Calculator



- LEGEND:
- JT JOINT TRENCH
 - G GAS
 - FP FIRE PROTECTION SERVICE
 - W WATER SERVICE
 - SS SANITARY SEWER
 - SD STORM DRAIN
 - ASPHALT PAVEMENT
 - 4" AC PAVING OVERLAYING 8" TYPE 2 AGG. BASE COMPACTED TO 95% RELATIVE COMPACTION
 - EXISTING ASPHALT PAVEMENT
 - CONCRETE
 - TRAFFIC RATED CONCRETE 6" P.C.C. OVERLAYING 6" TYPE 2 AGG. BASE COMPACTED TO 95% RELATIVE COMPACTION
 - INFILTRATION FACILITY
 - RETAINING WALL
 - EX. MAJOR CONTOURS
 - EX. MINOR CONTOURS
 - PROPOSED MAJOR CONTOURS
 - PROPOSED MINOR CONTOURS
 - GRADE BREAK

- DRAINAGE MANAGEMENT AREAS (DMA)
- DMA-1
 - DMA-2
 - DMA-3
 - DMA-4
 - DMA-5

JKAE
architecture + interiors + engineering

TRUCKEE DONNER RECREATIONAL & PARK DISTRICT
RESULTANT PARCEL 2
DOC #2024007349 N.C.O.R.

MATCH LINE SEE PAGE 2
MATCH LINE SEE PAGE 3

TRUCKEE DONNER
PUBLIC UTILITY DISTRICT
RESULTANT PARCEL 1
DOC #2024007348 N.C.O.R.
7.015± AC
XX/SUR/XXX N.C.R.
(SEE NOTE #6)

TRUCKEE DONNER
PUBLIC UTILITY DISTRICT
RESULTANT PARCEL 1
DOC #2024007348 N.C.O.R.
7.015± AC
XX/SUR/XXX N.C.R.
(SEE NOTE #6)

DMA-3
AREA = 5,281 SF

DMA-4
AREA = 23,045 SF

DMA-5
AREA = 3,195 SF

DMA-2
AREA = 30,133 SF

DMA-1
AREA = 6,570 SF

BROCKWAY ROAD
(OLD HWY. 267)

BROCKWAY DRIVE

PATHWAY

BROCKWAY ROAD
(OLD HWY. 267)

PAISADES
DRIVE

SEAL
NOT FOR
CONSTRUCTION

1500 BROCKWAY ROAD,
TRUCKEE, CA 96161

Drawing Title
BMP PLAN

NO.	DATE	ISSUE

Project
NEVADA COUNTY
Truckee Regional Library

Drawn By
JW
Checked By
CS
Project No.
24-135
©Date
09.12.2025
DRAWING NO.

LIDS Calculator

Project Info

Truckee Library	Last name...
019-450-055	10570 BROCKWAY ROAD
2.4	0.9

Drainage Management Areas (DMAs)

DMA #	(A _{imp}) Impervious Area (sf)	(V _{ret}) Storm Volume (cf)	Volume Check	
1	6570	492		X
2	30133	2259		X
3	5321	399		X
4	23045	1728		X
5	3195	239		X

Infiltration Trenches (IT), Dry Wells & Subsurface Retention

Associated DMA #	(V _v) Void Volume (0.4 = 40%)	(L) Length (ft)	(W) Width (ft)	(D) Depth (ft)	(V _{ret}) Retention Volume (cf)	
------------------	---	-----------------	----------------	----------------	---	--

1 ▾	.4	648	1.25	1	572	X
2 ▾	.4	33	1	1	24	X
2 ▾	.4	44	1	1	32	X
2 ▾	.94	26.25	22.97	3.61	2179	X
2 ▾	.94	6.56	9.84	3	197	X
3 ▾	.4	140	2.75	2	422	X
4 ▾	.94	22.97	22.97	3.61	1907	X
5 ▾	.4	125	2	2	283	X

Infiltration Basins

Associated DMA #	(V _{ret}) Retention Volume (cf)	
1 ▾		X

Naturally Vegetated Area (NVA)

Associated DMA #	(A _{per}) Pervious Area (sf)	(V _{ret}) Retention Volume (cf)