

Appendix I

Hydrology and Water Quality

Drainage Analysis

Stormwater Control Plan

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DRAINAGE ANALYSIS

Fire Station 10

**7952 Hollister Avenue
CITY OF GOLETA, CA**



**PREPARED FOR:
Kruger, Bensen, Ziemer Architects, Inc.
December 13, 2017**

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- B Pre-Project Conditions Drainage Exhibit
- C Post Project Conditions Drainage Exhibit

PURPOSE

The purpose of this report is to analyze existing and proposed drainage characteristics of the project site and to evaluate the impacts of the proposed development and the mitigation measures proposed as part of the development.

PROJECT DESCRIPTION

The project parcel, identified as APN # 079-1210-075, located at 7952 Hollister Avenue, in the City of Goleta, is an irregularly shaped lot located northeasterly of the intersection of Hollister Avenue and Cathedral Oaks Road. The lot is bounded on its northerly side by the railroad right of way and Highway 101 and on the easterly side by an adjoining property improved with a housing subdivision.

Kruger Bensen Zeimer Architects, Inc. proposes to develop the 1.21 acre undeveloped property with a new fire station. The proposed project would consist of a fire department structure, driveway, parking and vehicle circulation provisions, storm drainage and stormwater quality /detention facilities, landscaped open space and typical utility improvements.



Figure 1. Vicinity Map

EXISTING DRAINAGE

See Appendix B, Pre-Project Conditions Drainage Exhibit, which shows the existing parcel, and topography in the pre-development condition.

The site is currently undeveloped. Existing vegetation on the site consists primarily of weeds, shrubs, and grasses, with a mix of primarily Eucalyptus and Acacia trees. Site soils are classified primarily as Goleta Fine Sandy Loam, which is included in Hydrologic Soil Group D and, therefore, has relatively low rates of infiltration.

The project parcel has an approximately average slope of 1.4% and drains in a predominantly southeasterly direction. The majority of the storm water runoff generated on site sheet flows southeasterly and southerly until draining into the Hollister Avenue Right-of-Way. Drainage continues easterly in the gutter until entering a drainage inlet and subsequent stormdrain approximately 880 feet down Hollister Avenue.

The pre-project hydrologic peak flows generated on the project site have been calculated as follows:

PRE-PROJECT PEAKFLOWS						
Return Period	2	5	10	25	50	100
CFS	0.72	1.47	2.01	2.71	3.22	3.72

See Appendix A, Pre-Project Hydrology Calculations for details.

PROPOSED DRAINAGE

See Appendix C, Post Project Conditions Drainage Exhibit, which shows the site with the proposed improvements for reference to the following discussion.

As previously described, the site is to be improved with eighta new fire station and other associated typical appurtenances. Total impervious surface coverage on the lot has been estimated to be approximately 84% after completion of the project.

Due to the increased hardscape and, therefore, increased peakflows resulting from the proposed improvements, detention facilities are proposed to be constructed for stormwater peakflow attenuation.

Detention facilities shall consist of an open basin and a permeable paver parking lot as shown on the attached drainage exhibit.

Drainage from Drainage Management Area (DMA) 1 will flow in a westerly direction until reaching a drainage inlet with a storm drain leading to Stormwater Control Measure (SCM) 1. Any runoff from DMA 1 not collected in the drainage inlet / storm drain will directed via surface grading into the basin.

Drainage from DMA 2 will be conveyed by proposed surface grading either directly into the SCM 2 or to a catch basin and storm drain connected to the facility.

The storm drainage storage system is proposed to be constructed to satisfy the City of Goleta requirements for flood control and for water quality.

Flood control design is such that post project peakflows not exceed pre-project peakflows for the 2-year through 100 year storm events and a separate stormwater control plan has been prepared to satisfy water quality requirements.

Calculations were modeled by including DMA's 1 and 2 connecting to their respective SCM's, and a separate DMA 3, for all areas not tributary to either of the stormwater control measures.

Peakflows from both SCM's and from DMA 3 were then added and compared to the pre-project peak flows.

Results of this analysis are as shown in the table below:

Return yr.	2	5	10	25	50	100
DMA 1	0.27	0.60	0.74	0.86	0.94	1.01
DMA 2	0.15	0.17	0.19	0.21	0.23	0.24
DMA 3	0.29	0.44	0.54	0.67	0.77	0.86
Sum Post	0.71	1.21	1.47	1.74	1.94	2.11
Pre	0.72	1.47	2.01	2.71	3.22	3.72
Diff.	0.01	0.26	0.54	0.97	1.28	1.61
Post<Pre	Y	Y	Y	Y	Y	Y

See Appendix B, Post Project Hydrology Calculations for calculation details.

METHOD OF ANALYSIS

This analysis is based on topography compiled by Wallace Group, October 26, 2016, as well as the current Preliminary Improvement Plan by Flowers & Associates, Inc., dated May 23, 2017. Hydrologic peak flow calculations were made for the existing (pre-project – Appendix B) and proposed (post project – Appendix C) conditions for the 2-yr, 5-yr, 10-yr, 25-year, 50-year and 100-year storm events using HydroCAD hydrologic modeling software. Analysis of the detention system was also performed using HydroCAD.

Details of the hydrologic and hydraulic computational methods can be found in Appendices A and B.

ANALYSIS RESULTS

It can be seen from the calculation results that the proposed improvements increase the peak flows on the site, however this is mitigated by the proposed detention system. The proposed detention system reduces the peakflows as shown in the table above.

The results do not include additional peakflow reduction due to infiltration which would result in increased factor of safety.

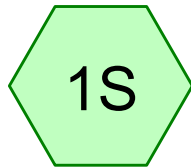
CONCLUSION

This analysis was performed to calculate the "before" (existing) and "after" (improved) project stormwater peakflows using the 2, 5, 10, 25, 50 and 100 year design storm events.

Results of this analysis show that the stormwater runoff resulting from development of the project site would be increased in all design storm events. In order to accommodate the increase in flows, an onsite detention system has been proposed consisting of an open basin and a permeable paver basin, each with a gravel section beneath incorporated to accommodate water quality requirements.

The analysis herein concludes that the proposed development of the project area will have the effect of decreasing the stormwater peakflows in the Hollister Avenue gutter.

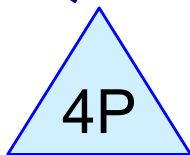
APPENDIX A
**PRE-PROJECT
And
POST PROJECT**
**HYDROLOGY
And
HYDRAULIC
CALCULATIONS**



FireStn10 PRE



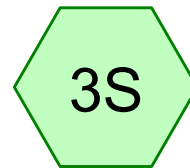
DMA 1



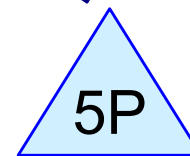
SCM 1



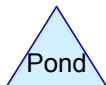
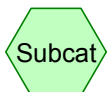
DMA 3 no SCM



DMA 2



SCM 2



Summary for Subcatchment 1S: FireStn10 PRE

Runoff = 0.72 cfs @ 10.04 hrs, Volume= 0.128 af, Depth> 1.27"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.50 hrs, dt= 0.10 hrs
Type I 24-hr 2 yr Rainfall=3.20"

Area (ac)	CN	Description
0.600	73	Brush, Good, HSG D
0.610	82	Woods/grass comb., Fair, HSG D
1.210	78	Weighted Average
1.210	78	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.0					Direct Entry, Developed

Summary for Subcatchment 2S: DMA 1

Runoff = 0.96 cfs @ 10.02 hrs, Volume= 0.156 af, Depth> 2.83"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.50 hrs, dt= 0.10 hrs
Type I 24-hr 2 yr Rainfall=3.20"

Area (sf)	CN	Description
8,437	98	Roofs, HSG D
17,870	98	Paved parking, HSG D
2,520	80	>75% Grass cover, Good, HSG D
28,827	96	Weighted Average
2,520	80	8.74% Pervious Area
26,307	98	91.26% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.0					Direct Entry, Developed

Summary for Subcatchment 3S: DMA 2

Runoff = 0.46 cfs @ 10.02 hrs, Volume= 0.075 af, Depth> 2.78"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.50 hrs, dt= 0.10 hrs
Type I 24-hr 2 yr Rainfall=3.20"

Area (sf)	CN	Description
3,120	98	Roofs, HSG D
7,934	98	Paved parking, HSG D
* 3,000	89	Permeable AC, HSG D
14,054	96	Weighted Average
3,000	89	21.35% Pervious Area
11,054	98	78.65% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.0					Direct Entry, Developed

Summary for Subcatchment 4S: DMA 3 no SCM

Runoff = 0.29 cfs @ 10.02 hrs, Volume= 0.047 af, Depth> 2.50"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.50 hrs, dt= 0.10 hrs
Type I 24-hr 2 yr Rainfall=3.20"

Area (sf)	CN	Description
6,905	98	Paved parking, HSG D
2,922	80	>75% Grass cover, Good, HSG D
9,827	93	Weighted Average
2,922	80	29.73% Pervious Area
6,905	98	70.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.0					Direct Entry, Developed

Summary for Pond 4P: SCM 1

Inflow Area = 0.662 ac, 91.26% Impervious, Inflow Depth > 2.83" for 2 yr event
 Inflow = 0.96 cfs @ 10.02 hrs, Volume= 0.156 af
 Outflow = 0.27 cfs @ 10.63 hrs, Volume= 0.104 af, Atten= 72%, Lag= 36.5 min
 Primary = 0.20 cfs @ 10.63 hrs, Volume= 0.041 af
 Secondary = 0.07 cfs @ 10.63 hrs, Volume= 0.062 af

Routing by Stor-Ind method, Time Span= 0.00-24.50 hrs, dt= 0.10 hrs
 Peak Elev= 119.03' @ 10.63 hrs Surf.Area= 4,712 sf Storage= 3,126 cf

Plug-Flow detention time= 341.4 min calculated for 0.104 af (66% of inflow)
 Center-of-Mass det. time= 182.9 min (901.1 - 718.2)

Volume	Invert	Avail.Storage	Storage Description
#1	118.50'	4,260 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
#2	115.50'	1,739 cf	26.00'W x 76.00'L x 2.20'H Prismatoid 4,347 cf Overall x 40.0% Voids
		5,998 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
118.50	2,500	0	0
119.00	2,722	1,306	1,306
120.00	3,186	2,954	4,260

Device	Routing	Invert	Outlet Devices
#1	Primary	118.75'	5.8" Vert. Orifice/Grate C= 0.600
#2	Secondary	118.50'	2.0" Vert. Orifice/Grate C= 0.600

Primary OutFlow Max=0.20 cfs @ 10.63 hrs HW=119.03' (Free Discharge)
 ↳1=Orifice/Grate (Orifice Controls 0.20 cfs @ 1.80 fps)

Secondary OutFlow Max=0.07 cfs @ 10.63 hrs HW=119.03' (Free Discharge)
 ↳2=Orifice/Grate (Orifice Controls 0.07 cfs @ 3.22 fps)

Summary for Pond 5P: SCM 2

Inflow Area = 0.323 ac, 78.65% Impervious, Inflow Depth > 2.78" for 2 yr event
 Inflow = 0.46 cfs @ 10.02 hrs, Volume= 0.075 af
 Outflow = 0.15 cfs @ 10.56 hrs, Volume= 0.075 af, Atten= 69%, Lag= 32.5 min
 Primary = 0.15 cfs @ 10.56 hrs, Volume= 0.075 af

Routing by Stor-Ind method, Time Span= 0.00-24.50 hrs, dt= 0.10 hrs
 Peak Elev= 116.89' @ 10.56 hrs Surf.Area= 0.074 ac Storage= 0.012 af

Plug-Flow detention time= 18.9 min calculated for 0.074 af (100% of inflow)
 Center-of-Mass det. time= 18.8 min (743.4 - 724.6)

Volume	Invert	Avail.Storage	Storage Description
#1	116.50'	0.055 af	43.25'W x 75.00'L x 1.85'H Prismatic 0.138 af Overall x 40.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Primary	116.00'	2.5" Vert. Orifice/Grate C= 0.600

Primary OutFlow Max=0.15 cfs @ 10.56 hrs HW=116.89' (Free Discharge)
 ↳1=Orifice/Grate (Orifice Controls 0.15 cfs @ 4.26 fps)

Summary for Subcatchment 1S: FireStn10 PRE

Runoff = 1.47 cfs @ 10.03 hrs, Volume= 0.240 af, Depth> 2.38"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.50 hrs, dt= 0.10 hrs
Type I 24-hr 5 yr Rainfall=4.61"

Area (ac)	CN	Description
0.600	73	Brush, Good, HSG D
0.610	82	Woods/grass comb., Fair, HSG D
1.210	78	Weighted Average
1.210	78	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.0					Direct Entry, Developed

Summary for Subcatchment 2S: DMA 1

Runoff = 1.41 cfs @ 10.02 hrs, Volume= 0.232 af, Depth> 4.21"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.50 hrs, dt= 0.10 hrs
Type I 24-hr 5 yr Rainfall=4.61"

Area (sf)	CN	Description
8,437	98	Roofs, HSG D
17,870	98	Paved parking, HSG D
2,520	80	>75% Grass cover, Good, HSG D
28,827	96	Weighted Average
2,520	80	8.74% Pervious Area
26,307	98	91.26% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.0					Direct Entry, Developed

Summary for Subcatchment 3S: DMA 2

Runoff = 0.69 cfs @ 10.02 hrs, Volume= 0.112 af, Depth> 4.16"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.50 hrs, dt= 0.10 hrs
Type I 24-hr 5 yr Rainfall=4.61"

Area (sf)	CN	Description
3,120	98	Roofs, HSG D
7,934	98	Paved parking, HSG D
* 3,000	89	Permeable AC, HSG D
14,054	96	Weighted Average
3,000	89	21.35% Pervious Area
11,054	98	78.65% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.0					Direct Entry, Developed

Summary for Subcatchment 4S: DMA 3 no SCM

Runoff = 0.44 cfs @ 10.02 hrs, Volume= 0.072 af, Depth> 3.83"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.50 hrs, dt= 0.10 hrs
Type I 24-hr 5 yr Rainfall=4.61"

Area (sf)	CN	Description
6,905	98	Paved parking, HSG D
2,922	80	>75% Grass cover, Good, HSG D
9,827	93	Weighted Average
2,922	80	29.73% Pervious Area
6,905	98	70.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.0					Direct Entry, Developed

Summary for Pond 4P: SCM 1

Inflow Area = 0.662 ac, 91.26% Impervious, Inflow Depth > 4.21" for 5 yr event
 Inflow = 1.41 cfs @ 10.02 hrs, Volume= 0.232 af
 Outflow = 0.60 cfs @ 10.40 hrs, Volume= 0.177 af, Atten= 57%, Lag= 23.2 min
 Primary = 0.51 cfs @ 10.40 hrs, Volume= 0.104 af
 Secondary = 0.09 cfs @ 10.40 hrs, Volume= 0.073 af

Routing by Stor-Ind method, Time Span= 0.00-24.50 hrs, dt= 0.10 hrs
 Peak Elev= 119.33' @ 10.40 hrs Surf.Area= 4,850 sf Storage= 3,960 cf

Plug-Flow detention time= 262.7 min calculated for 0.176 af (76% of inflow)
 Center-of-Mass det. time= 136.8 min (847.0 - 710.2)

Volume	Invert	Avail.Storage	Storage Description
#1	118.50'	4,260 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
#2	115.50'	1,739 cf	26.00'W x 76.00'L x 2.20'H Prismatoid 4,347 cf Overall x 40.0% Voids
		5,998 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
118.50	2,500	0	0
119.00	2,722	1,306	1,306
120.00	3,186	2,954	4,260

Device	Routing	Invert	Outlet Devices
#1	Primary	118.75'	5.8" Vert. Orifice/Grate C= 0.600
#2	Secondary	118.50'	2.0" Vert. Orifice/Grate C= 0.600

Primary OutFlow Max=0.51 cfs @ 10.40 hrs HW=119.33' (Free Discharge)
 ↳1=Orifice/Grate (Orifice Controls 0.51 cfs @ 2.79 fps)

Secondary OutFlow Max=0.09 cfs @ 10.40 hrs HW=119.33' (Free Discharge)
 ↳2=Orifice/Grate (Orifice Controls 0.09 cfs @ 4.15 fps)

Summary for Pond 5P: SCM 2

Inflow Area = 0.323 ac, 78.65% Impervious, Inflow Depth > 4.16" for 5 yr event
 Inflow = 0.69 cfs @ 10.02 hrs, Volume= 0.112 af
 Outflow = 0.17 cfs @ 10.69 hrs, Volume= 0.112 af, Atten= 75%, Lag= 40.5 min
 Primary = 0.17 cfs @ 10.69 hrs, Volume= 0.112 af

Routing by Stor-Ind method, Time Span= 0.00-24.50 hrs, dt= 0.10 hrs
 Peak Elev= 117.22' @ 10.69 hrs Surf.Area= 0.074 ac Storage= 0.021 af

Plug-Flow detention time= 33.4 min calculated for 0.112 af (100% of inflow)
 Center-of-Mass det. time= 33.2 min (748.7 - 715.4)

Volume	Invert	Avail.Storage	Storage Description
#1	116.50'	0.055 af	43.25'W x 75.00'L x 1.85'H Prismatic 0.138 af Overall x 40.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Primary	116.00'	2.5" Vert. Orifice/Grate C= 0.600

Primary OutFlow Max=0.17 cfs @ 10.69 hrs HW=117.22' (Free Discharge)
 ↳1=Orifice/Grate (Orifice Controls 0.17 cfs @ 5.08 fps)

Summary for Subcatchment 1S: FireStn10 PRE

Runoff = 2.01 cfs @ 10.03 hrs, Volume= 0.321 af, Depth> 3.18"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.50 hrs, dt= 0.10 hrs
Type I 24-hr 10 yr Rainfall=5.55"

Area (ac)	CN	Description
0.600	73	Brush, Good, HSG D
0.610	82	Woods/grass comb., Fair, HSG D
1.210	78	Weighted Average
1.210	78	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.0					Direct Entry, Developed

Summary for Subcatchment 2S: DMA 1

Runoff = 1.71 cfs @ 10.02 hrs, Volume= 0.284 af, Depth> 5.14"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.50 hrs, dt= 0.10 hrs
Type I 24-hr 10 yr Rainfall=5.55"

Area (sf)	CN	Description
8,437	98	Roofs, HSG D
17,870	98	Paved parking, HSG D
2,520	80	>75% Grass cover, Good, HSG D
28,827	96	Weighted Average
2,520	80	8.74% Pervious Area
26,307	98	91.26% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.0					Direct Entry, Developed

Summary for Subcatchment 3S: DMA 2

Runoff = 0.84 cfs @ 10.02 hrs, Volume= 0.137 af, Depth> 5.10"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.50 hrs, dt= 0.10 hrs
Type I 24-hr 10 yr Rainfall=5.55"

Area (sf)	CN	Description
3,120	98	Roofs, HSG D
7,934	98	Paved parking, HSG D
* 3,000	89	Permeable AC, HSG D
14,054	96	Weighted Average
3,000	89	21.35% Pervious Area
11,054	98	78.65% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.0					Direct Entry, Developed

Summary for Subcatchment 4S: DMA 3 no SCM

Runoff = 0.54 cfs @ 10.02 hrs, Volume= 0.089 af, Depth> 4.74"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.50 hrs, dt= 0.10 hrs
Type I 24-hr 10 yr Rainfall=5.55"

Area (sf)	CN	Description
6,905	98	Paved parking, HSG D
2,922	80	>75% Grass cover, Good, HSG D
9,827	93	Weighted Average
2,922	80	29.73% Pervious Area
6,905	98	70.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.0					Direct Entry, Developed

Summary for Pond 4P: SCM 1

Inflow Area = 0.662 ac, 91.26% Impervious, Inflow Depth > 5.14" for 10 yr event
 Inflow = 1.71 cfs @ 10.02 hrs, Volume= 0.284 af
 Outflow = 0.74 cfs @ 10.40 hrs, Volume= 0.227 af, Atten= 57%, Lag= 22.9 min
 Primary = 0.64 cfs @ 10.40 hrs, Volume= 0.147 af
 Secondary = 0.10 cfs @ 10.40 hrs, Volume= 0.080 af

Routing by Stor-Ind method, Time Span= 0.00-24.50 hrs, dt= 0.10 hrs
 Peak Elev= 119.51' @ 10.40 hrs Surf.Area= 4,935 sf Storage= 4,497 cf

Plug-Flow detention time= 234.2 min calculated for 0.226 af (80% of inflow)
 Center-of-Mass det. time= 123.4 min (830.1 - 706.7)

Volume	Invert	Avail.Storage	Storage Description
#1	118.50'	4,260 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
#2	115.50'	1,739 cf	26.00'W x 76.00'L x 2.20'H Prismatoid 4,347 cf Overall x 40.0% Voids
		5,998 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
118.50	2,500	0	0
119.00	2,722	1,306	1,306
120.00	3,186	2,954	4,260

Device	Routing	Invert	Outlet Devices
#1	Primary	118.75'	5.8" Vert. Orifice/Grate C= 0.600
#2	Secondary	118.50'	2.0" Vert. Orifice/Grate C= 0.600

Primary OutFlow Max=0.64 cfs @ 10.40 hrs HW=119.51' (Free Discharge)
 ↳1=Orifice/Grate (Orifice Controls 0.64 cfs @ 3.47 fps)

Secondary OutFlow Max=0.10 cfs @ 10.40 hrs HW=119.51' (Free Discharge)
 ↳2=Orifice/Grate (Orifice Controls 0.10 cfs @ 4.64 fps)

Summary for Pond 5P: SCM 2

Inflow Area = 0.323 ac, 78.65% Impervious, Inflow Depth > 5.10" for 10 yr event
 Inflow = 0.84 cfs @ 10.02 hrs, Volume= 0.137 af
 Outflow = 0.19 cfs @ 10.76 hrs, Volume= 0.137 af, Atten= 77%, Lag= 44.4 min
 Primary = 0.19 cfs @ 10.76 hrs, Volume= 0.137 af

Routing by Stor-Ind method, Time Span= 0.00-24.50 hrs, dt= 0.10 hrs
 Peak Elev= 117.47' @ 10.76 hrs Surf.Area= 0.074 ac Storage= 0.029 af

Plug-Flow detention time= 43.9 min calculated for 0.136 af (100% of inflow)
 Center-of-Mass det. time= 43.6 min (755.0 - 711.3)

Volume	Invert	Avail.Storage	Storage Description
#1	116.50'	0.055 af	43.25'W x 75.00'L x 1.85'H Prismaoid 0.138 af Overall x 40.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Primary	116.00'	2.5" Vert. Orifice/Grate C= 0.600

Primary OutFlow Max=0.19 cfs @ 10.76 hrs HW=117.47' (Free Discharge)
 ↳1=Orifice/Grate (Orifice Controls 0.19 cfs @ 5.62 fps)

Summary for Subcatchment 1S: FireStn10 PRE

Runoff = 2.71 cfs @ 10.03 hrs, Volume= 0.425 af, Depth> 4.21"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.50 hrs, dt= 0.10 hrs
Type I 24-hr 25 yr Rainfall=6.71"

Area (ac)	CN	Description
0.600	73	Brush, Good, HSG D
0.610	82	Woods/grass comb., Fair, HSG D
1.210	78	Weighted Average
1.210	78	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.0					Direct Entry, Developed

Summary for Subcatchment 2S: DMA 1

Runoff = 2.09 cfs @ 10.02 hrs, Volume= 0.347 af, Depth> 6.29"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.50 hrs, dt= 0.10 hrs
Type I 24-hr 25 yr Rainfall=6.71"

Area (sf)	CN	Description
8,437	98	Roofs, HSG D
17,870	98	Paved parking, HSG D
2,520	80	>75% Grass cover, Good, HSG D
28,827	96	Weighted Average
2,520	80	8.74% Pervious Area
26,307	98	91.26% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.0					Direct Entry, Developed

Summary for Subcatchment 3S: DMA 2

Runoff = 1.02 cfs @ 10.02 hrs, Volume= 0.168 af, Depth> 6.25"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.50 hrs, dt= 0.10 hrs
Type I 24-hr 25 yr Rainfall=6.71"

Area (sf)	CN	Description
3,120	98	Roofs, HSG D
7,934	98	Paved parking, HSG D
* 3,000	89	Permeable AC, HSG D
14,054	96	Weighted Average
3,000	89	21.35% Pervious Area
11,054	98	78.65% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.0					Direct Entry, Developed

Summary for Subcatchment 4S: DMA 3 no SCM

Runoff = 0.67 cfs @ 10.02 hrs, Volume= 0.110 af, Depth> 5.86"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.50 hrs, dt= 0.10 hrs
Type I 24-hr 25 yr Rainfall=6.71"

Area (sf)	CN	Description
6,905	98	Paved parking, HSG D
2,922	80	>75% Grass cover, Good, HSG D
9,827	93	Weighted Average
2,922	80	29.73% Pervious Area
6,905	98	70.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.0					Direct Entry, Developed

Summary for Pond 4P: SCM 1

Inflow Area = 0.662 ac, 91.26% Impervious, Inflow Depth > 6.29" for 25 yr event
 Inflow = 2.09 cfs @ 10.02 hrs, Volume= 0.347 af
 Outflow = 0.86 cfs @ 10.42 hrs, Volume= 0.289 af, Atten= 59%, Lag= 24.0 min
 Primary = 0.75 cfs @ 10.42 hrs, Volume= 0.201 af
 Secondary = 0.11 cfs @ 10.42 hrs, Volume= 0.089 af

Routing by Stor-Ind method, Time Span= 0.00-24.50 hrs, dt= 0.10 hrs
 Peak Elev= 119.71' @ 10.42 hrs Surf.Area= 5,030 sf Storage= 5,109 cf

Plug-Flow detention time= 210.2 min calculated for 0.289 af (83% of inflow)
 Center-of-Mass det. time= 112.7 min (816.2 - 703.4)

Volume	Invert	Avail.Storage	Storage Description
#1	118.50'	4,260 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
#2	115.50'	1,739 cf	26.00'W x 76.00'L x 2.20'H Prismatoid
		4,347 cf Overall	x 40.0% Voids
		5,998 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
118.50	2,500	0	0
119.00	2,722	1,306	1,306
120.00	3,186	2,954	4,260

Device	Routing	Invert	Outlet Devices
#1	Primary	118.75'	5.8" Vert. Orifice/Grate C= 0.600
#2	Secondary	118.50'	2.0" Vert. Orifice/Grate C= 0.600

Primary OutFlow Max=0.75 cfs @ 10.42 hrs HW=119.71' (Free Discharge)
 ↳1=Orifice/Grate (Orifice Controls 0.75 cfs @ 4.09 fps)

Secondary OutFlow Max=0.11 cfs @ 10.42 hrs HW=119.71' (Free Discharge)
 ↳2=Orifice/Grate (Orifice Controls 0.11 cfs @ 5.12 fps)

Summary for Pond 5P: SCM 2

Inflow Area = 0.323 ac, 78.65% Impervious, Inflow Depth > 6.25" for 25 yr event
 Inflow = 1.02 cfs @ 10.02 hrs, Volume= 0.168 af
 Outflow = 0.21 cfs @ 10.84 hrs, Volume= 0.168 af, Atten= 79%, Lag= 49.1 min
 Primary = 0.21 cfs @ 10.84 hrs, Volume= 0.168 af

Routing by Stor-Ind method, Time Span= 0.00-24.50 hrs, dt= 0.10 hrs
 Peak Elev= 117.79' @ 10.84 hrs Surf.Area= 0.074 ac Storage= 0.039 af

Plug-Flow detention time= 57.2 min calculated for 0.167 af (100% of inflow)
 Center-of-Mass det. time= 56.9 min (764.4 - 707.5)

Volume	Invert	Avail.Storage	Storage Description
#1	116.50'	0.055 af	43.25'W x 75.00'L x 1.85'H Prismatic 0.138 af Overall x 40.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Primary	116.00'	2.5" Vert. Orifice/Grate C= 0.600

Primary OutFlow Max=0.21 cfs @ 10.84 hrs HW=117.79' (Free Discharge)
 ↳1=Orifice/Grate (Orifice Controls 0.21 cfs @ 6.26 fps)

Summary for Subcatchment 1S: FireStn10 PRE

Runoff = 3.22 cfs @ 10.02 hrs, Volume= 0.503 af, Depth> 4.98"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.50 hrs, dt= 0.10 hrs
Type I 24-hr 50 yr Rainfall=7.56"

Area (ac)	CN	Description
0.600	73	Brush, Good, HSG D
0.610	82	Woods/grass comb., Fair, HSG D
1.210	78	Weighted Average
1.210	78	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.0					Direct Entry, Developed

Summary for Subcatchment 2S: DMA 1

Runoff = 2.36 cfs @ 10.02 hrs, Volume= 0.393 af, Depth> 7.13"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.50 hrs, dt= 0.10 hrs
Type I 24-hr 50 yr Rainfall=7.56"

Area (sf)	CN	Description
8,437	98	Roofs, HSG D
17,870	98	Paved parking, HSG D
2,520	80	>75% Grass cover, Good, HSG D
28,827	96	Weighted Average
2,520	80	8.74% Pervious Area
26,307	98	91.26% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.0					Direct Entry, Developed

Summary for Subcatchment 3S: DMA 2

Runoff = 1.15 cfs @ 10.02 hrs, Volume= 0.191 af, Depth> 7.09"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.50 hrs, dt= 0.10 hrs
Type I 24-hr 50 yr Rainfall=7.56"

Area (sf)	CN	Description
3,120	98	Roofs, HSG D
7,934	98	Paved parking, HSG D
* 3,000	89	Permeable AC, HSG D
14,054	96	Weighted Average
3,000	89	21.35% Pervious Area
11,054	98	78.65% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.0					Direct Entry, Developed

Summary for Subcatchment 4S: DMA 3 no SCM

Runoff = 0.77 cfs @ 10.02 hrs, Volume= 0.126 af, Depth> 6.69"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.50 hrs, dt= 0.10 hrs
Type I 24-hr 50 yr Rainfall=7.56"

Area (sf)	CN	Description
6,905	98	Paved parking, HSG D
2,922	80	>75% Grass cover, Good, HSG D
9,827	93	Weighted Average
2,922	80	29.73% Pervious Area
6,905	98	70.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.0					Direct Entry, Developed

Summary for Pond 4P: SCM 1

Inflow Area = 0.662 ac, 91.26% Impervious, Inflow Depth > 7.13" for 50 yr event
 Inflow = 2.36 cfs @ 10.02 hrs, Volume= 0.393 af
 Outflow = 0.94 cfs @ 10.43 hrs, Volume= 0.335 af, Atten= 60%, Lag= 25.0 min
 Primary = 0.82 cfs @ 10.43 hrs, Volume= 0.240 af
 Secondary = 0.12 cfs @ 10.43 hrs, Volume= 0.095 af

Routing by Stor-Ind method, Time Span= 0.00-24.50 hrs, dt= 0.10 hrs
 Peak Elev= 119.86' @ 10.43 hrs Surf.Area= 5,096 sf Storage= 5,547 cf

Plug-Flow detention time= 196.2 min calculated for 0.335 af (85% of inflow)
 Center-of-Mass det. time= 107.1 min (808.7 - 701.6)

Volume	Invert	Avail.Storage	Storage Description
#1	118.50'	4,260 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
#2	115.50'	1,739 cf	26.00'W x 76.00'L x 2.20'H Prismatoid 4,347 cf Overall x 40.0% Voids
		5,998 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
118.50	2,500	0	0
119.00	2,722	1,306	1,306
120.00	3,186	2,954	4,260

Device	Routing	Invert	Outlet Devices
#1	Primary	118.75'	5.8" Vert. Orifice/Grate C= 0.600
#2	Secondary	118.50'	2.0" Vert. Orifice/Grate C= 0.600

Primary OutFlow Max=0.82 cfs @ 10.43 hrs HW=119.85' (Free Discharge)
 ↑1=**Orifice/Grate** (Orifice Controls 0.82 cfs @ 4.47 fps)

Secondary OutFlow Max=0.12 cfs @ 10.43 hrs HW=119.85' (Free Discharge)
 ↑2=**Orifice/Grate** (Orifice Controls 0.12 cfs @ 5.43 fps)

Summary for Pond 5P: SCM 2

Inflow Area = 0.323 ac, 78.65% Impervious, Inflow Depth > 7.09" for 50 yr event
 Inflow = 1.15 cfs @ 10.02 hrs, Volume= 0.191 af
 Outflow = 0.23 cfs @ 10.89 hrs, Volume= 0.191 af, Atten= 80%, Lag= 52.4 min
 Primary = 0.23 cfs @ 10.89 hrs, Volume= 0.191 af

Routing by Stor-Ind method, Time Span= 0.00-24.50 hrs, dt= 0.10 hrs
 Peak Elev= 118.04' @ 10.89 hrs Surf.Area= 0.074 ac Storage= 0.046 af

Plug-Flow detention time= 66.7 min calculated for 0.191 af (100% of inflow)
 Center-of-Mass det. time= 66.6 min (771.9 - 705.3)

Volume	Invert	Avail.Storage	Storage Description
#1	116.50'	0.055 af	43.25'W x 75.00'L x 1.85'H Prismaoid 0.138 af Overall x 40.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Primary	116.00'	2.5" Vert. Orifice/Grate C= 0.600

Primary OutFlow Max=0.23 cfs @ 10.89 hrs HW=118.04' (Free Discharge)
 ↑1=**Orifice/Grate** (Orifice Controls 0.23 cfs @ 6.71 fps)

Summary for Subcatchment 1S: FireStn10 PRE

Runoff = 3.72 cfs @ 10.02 hrs, Volume= 0.579 af, Depth> 5.74"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.50 hrs, dt= 0.10 hrs
Type I 24-hr 100 yr Rainfall=8.38"

Area (ac)	CN	Description
0.600	73	Brush, Good, HSG D
0.610	82	Woods/grass comb., Fair, HSG D
1.210	78	Weighted Average
1.210	78	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.0					Direct Entry, Developed

Summary for Subcatchment 2S: DMA 1

Runoff = 2.63 cfs @ 10.02 hrs, Volume= 0.438 af, Depth> 7.95"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.50 hrs, dt= 0.10 hrs
Type I 24-hr 100 yr Rainfall=8.38"

Area (sf)	CN	Description
8,437	98	Roofs, HSG D
17,870	98	Paved parking, HSG D
2,520	80	>75% Grass cover, Good, HSG D
28,827	96	Weighted Average
2,520	80	8.74% Pervious Area
26,307	98	91.26% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.0					Direct Entry, Developed

Summary for Subcatchment 3S: DMA 2

Runoff = 1.28 cfs @ 10.02 hrs, Volume= 0.213 af, Depth> 7.91"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.50 hrs, dt= 0.10 hrs
Type I 24-hr 100 yr Rainfall=8.38"

Area (sf)	CN	Description
3,120	98	Roofs, HSG D
7,934	98	Paved parking, HSG D
* 3,000	89	Permeable AC, HSG D
14,054	96	Weighted Average
3,000	89	21.35% Pervious Area
11,054	98	78.65% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.0					Direct Entry, Developed

Summary for Subcatchment 4S: DMA 3 no SCM

Runoff = 0.86 cfs @ 10.02 hrs, Volume= 0.141 af, Depth> 7.50"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.50 hrs, dt= 0.10 hrs
Type I 24-hr 100 yr Rainfall=8.38"

Area (sf)	CN	Description
6,905	98	Paved parking, HSG D
2,922	80	>75% Grass cover, Good, HSG D
9,827	93	Weighted Average
2,922	80	29.73% Pervious Area
6,905	98	70.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.0					Direct Entry, Developed

Summary for Pond 4P: SCM 1

Inflow Area = 0.662 ac, 91.26% Impervious, Inflow Depth > 7.95" for 100 yr event
 Inflow = 2.63 cfs @ 10.02 hrs, Volume= 0.438 af
 Outflow = 1.01 cfs @ 10.45 hrs, Volume= 0.380 af, Atten= 62%, Lag= 25.9 min
 Primary = 0.88 cfs @ 10.45 hrs, Volume= 0.279 af
 Secondary = 0.12 cfs @ 10.45 hrs, Volume= 0.100 af

Routing by Stor-Ind method, Time Span= 0.00-24.50 hrs, dt= 0.10 hrs
 Peak Elev= 119.99' @ 10.45 hrs Surf.Area= 5,158 sf Storage= 5,974 cf

Plug-Flow detention time= 184.2 min calculated for 0.378 af (86% of inflow)
 Center-of-Mass det. time= 102.8 min (802.9 - 700.0)

Volume	Invert	Avail.Storage	Storage Description
#1	118.50'	4,260 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
#2	115.50'	1,739 cf	26.00'W x 76.00'L x 2.20'H Prismatoid 4,347 cf Overall x 40.0% Voids
		5,998 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
118.50	2,500	0	0
119.00	2,722	1,306	1,306
120.00	3,186	2,954	4,260

Device	Routing	Invert	Outlet Devices
#1	Primary	118.75'	5.8" Vert. Orifice/Grate C= 0.600
#2	Secondary	118.50'	2.0" Vert. Orifice/Grate C= 0.600

Primary OutFlow Max=0.88 cfs @ 10.45 hrs HW=119.99' (Free Discharge)
 ↳1=Orifice/Grate (Orifice Controls 0.88 cfs @ 4.81 fps)

Secondary OutFlow Max=0.12 cfs @ 10.45 hrs HW=119.99' (Free Discharge)
 ↳2=Orifice/Grate (Orifice Controls 0.12 cfs @ 5.71 fps)

Summary for Pond 5P: SCM 2

Inflow Area = 0.323 ac, 78.65% Impervious, Inflow Depth > 7.91" for 100 yr event
 Inflow = 1.28 cfs @ 10.02 hrs, Volume= 0.213 af
 Outflow = 0.24 cfs @ 10.94 hrs, Volume= 0.213 af, Atten= 81%, Lag= 55.2 min
 Primary = 0.24 cfs @ 10.94 hrs, Volume= 0.213 af

Routing by Stor-Ind method, Time Span= 0.00-24.50 hrs, dt= 0.10 hrs
 Peak Elev= 118.29' @ 10.94 hrs Surf.Area= 0.074 ac Storage= 0.053 af

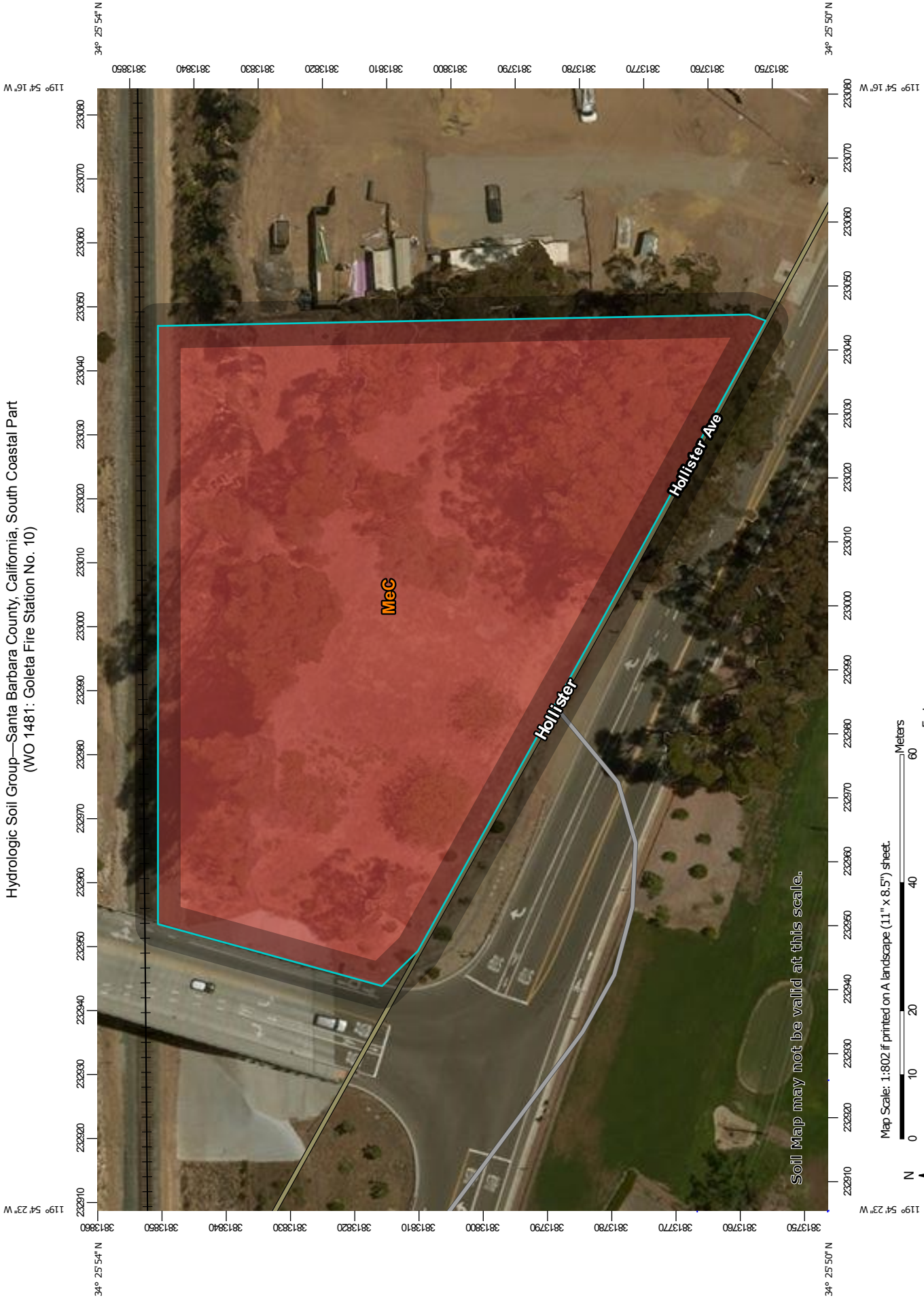
Plug-Flow detention time= 76.0 min calculated for 0.213 af (100% of inflow)
 Center-of-Mass det. time= 76.0 min (779.4 - 703.5)

Volume	Invert	Avail.Storage	Storage Description
#1	116.50'	0.055 af	43.25'W x 75.00'L x 1.85'H Prismatic 0.138 af Overall x 40.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Primary	116.00'	2.5" Vert. Orifice/Grate C= 0.600

Primary OutFlow Max=0.24 cfs @ 10.94 hrs HW=118.29' (Free Discharge)
 ↳1=Orifice/Grate (Orifice Controls 0.24 cfs @ 7.12 fps)

Hydrologic Soil Group—Santa Barbara County, California, South Coastal Part
(WO 1481: Goleta Fire Station No. 10)



Soil Map may not be valid at this scale.

Map Scale: 1:802 if printed on A landscape (11" x 8.5") sheet.



Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84



Natural Resources
Conservation Service

Web Soil Survey
National Cooperative Soil Survey

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Santa Barbara County, California, South Coastal Part (CA673)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
MeC	Milpitas-Positas fine sandy loams, 2 to 9 percent slopes	D	1.7	100.0%
Totals for Area of Interest			1.7	100.0%

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

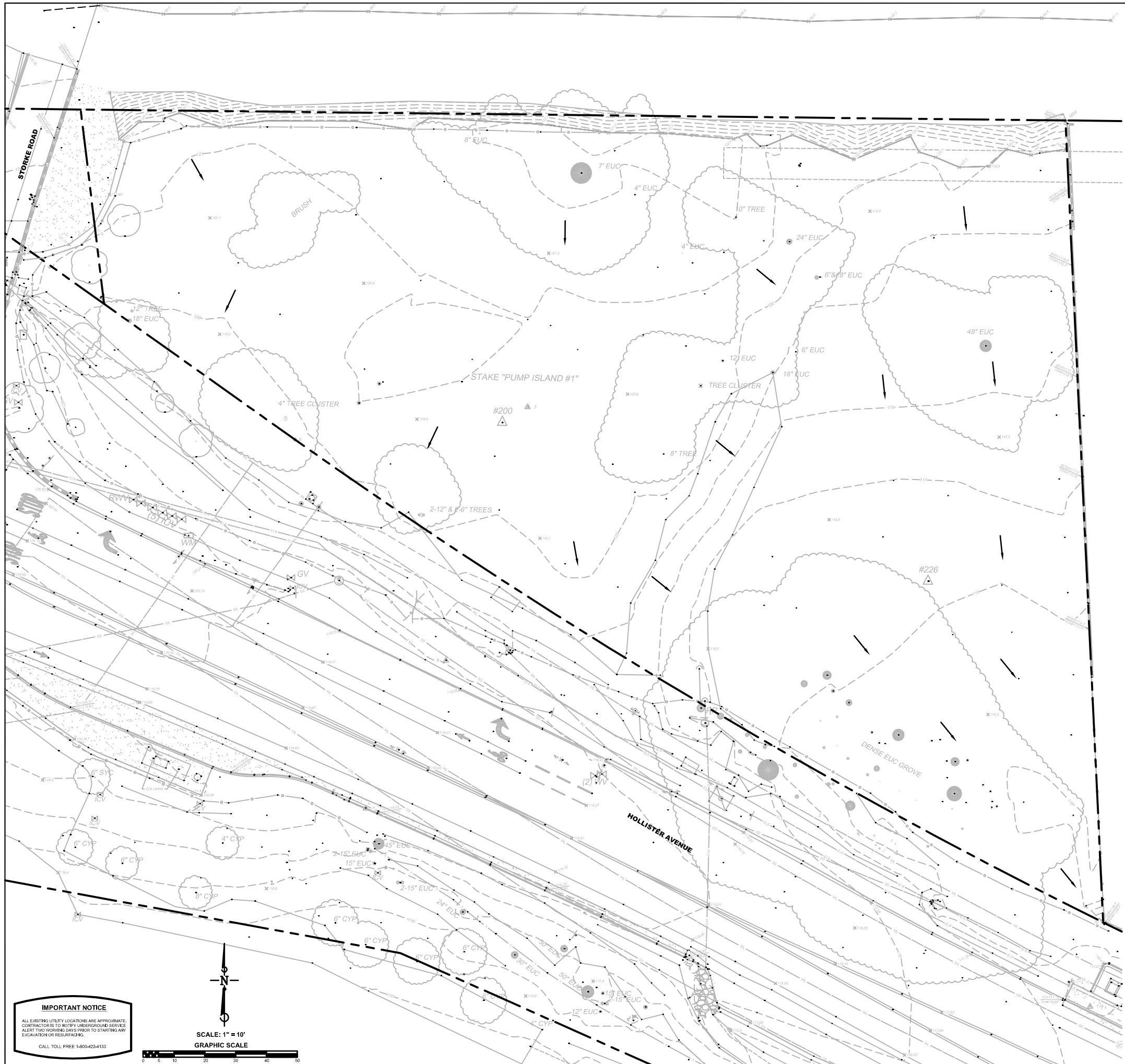
Rating Options

Aggregation Method: Dominant Condition

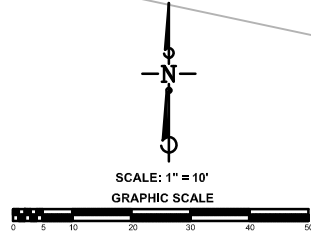
APPENDIX B

PRE-PROJECT CONDITIONS DRAINAGE EXHIBIT

PRE-PROJECT PEAKFLOWS						
Return yr.	2	5	10	25	50	100
CFS	0.72	1.47	2.01	2.71	3.22	3.72



IMPORTANT NOTICE
 ALL EXISTING UTILITY LOCATIONS ARE APPROXIMATE.
 CONTRACTORS TO NOTIFY UNDERGROUND SERVICE
 ALERT TWO WORKING DAYS PRIOR TO STARTING ANY
 EXCAVATION OR RESURFACING.
 CALL TOLL FREE 1-800-422-4133

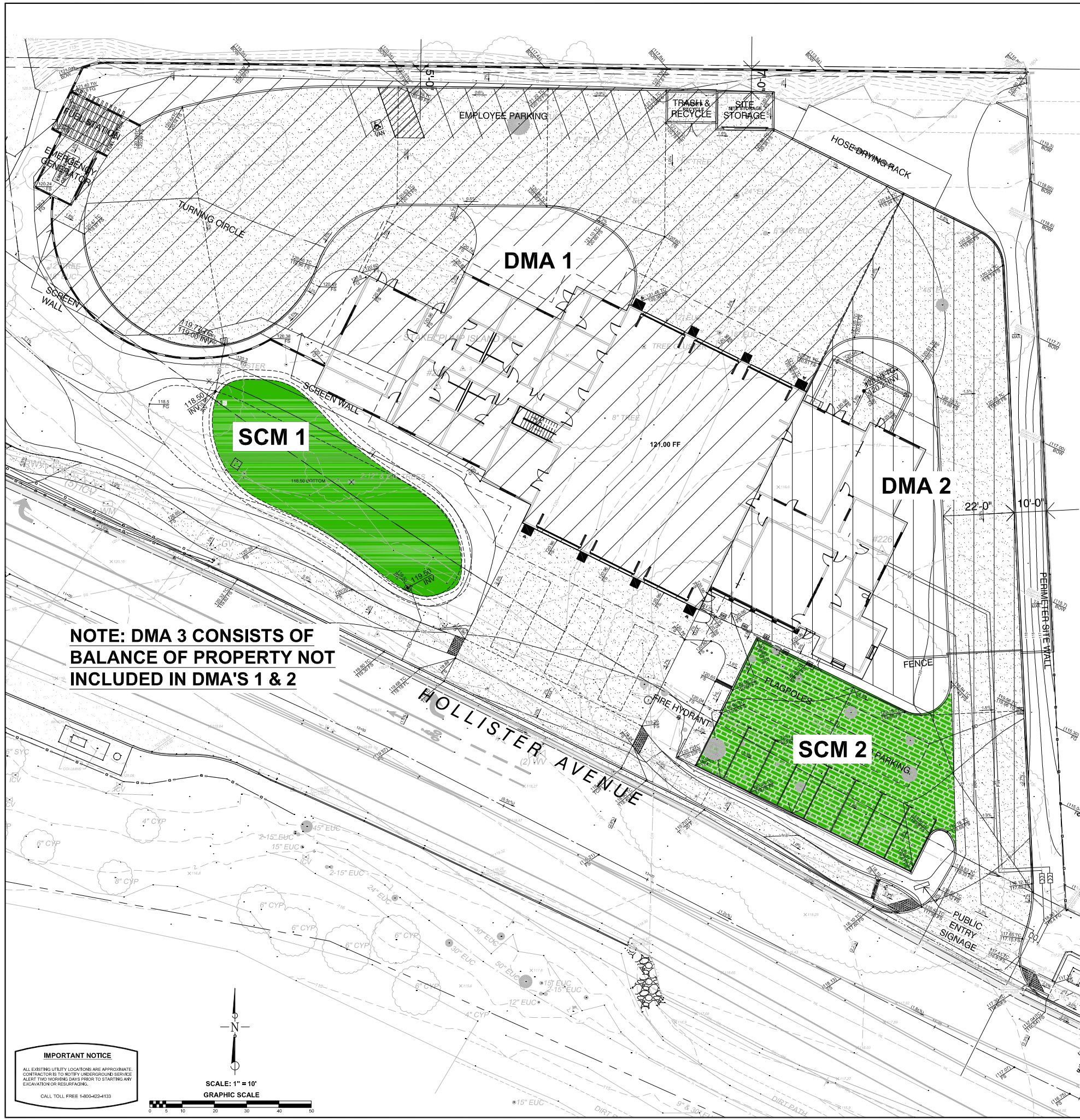


**GOLETA FIRE
 STATION 10**
 PRE-PROJECT CONDITIONS
 DRAINAGE EXHIBIT
 CITY OF GOLETA, CALIFORNIA

FLOWERS & ASSOCIATES, INC.
 CIVIL ENGINEERS
 201 N. Calle Cesar Chavez, Suite 100 Santa Barbara, CA 93103
 Telephone (805) 966-2224
 PRELIMINARY
 NOT FOR CONSTRUCTION DATE: _____

APPENDIX C

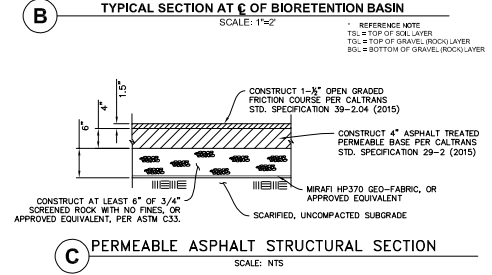
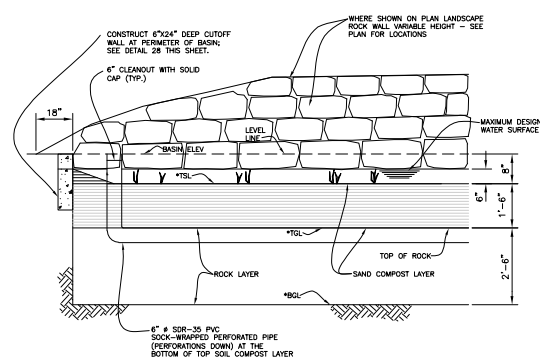
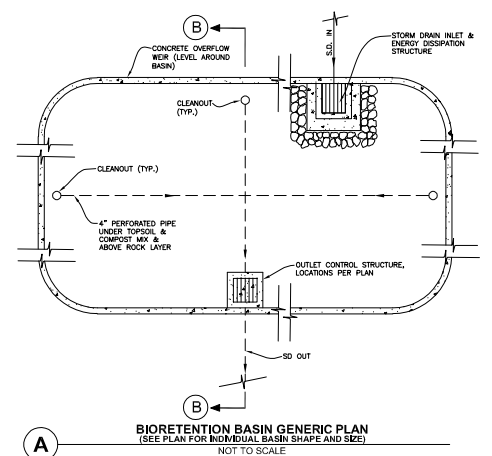
POST PROJECT CONDITIONS DRAINAGE EXHIBIT



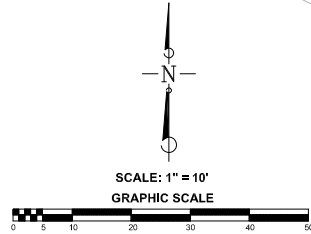
NOTE: DMA 3 CONSISTS OF BALANCE OF PROPERTY NOT INCLUDED IN DMA'S 1 & 2

Return yr.	2	5	10	25	50	100
DMA 1	0.27	0.60	0.74	0.86	0.94	1.01
DMA 2	0.15	0.17	0.19	0.21	0.23	0.24
DMA 3	0.29	0.44	0.54	0.67	0.77	0.86
Sum Post	0.71	1.21	1.47	1.74	1.94	2.11
Pre	0.72	1.47	2.01	2.71	3.22	3.72
Diff.	0.01	0.26	0.54	0.97	1.28	1.61
Post<Pre	Y	Y	Y	Y	Y	Y

PEAKFLOW RESULTS SUMMARY



IMPORTANT NOTICE
 ALL EXISTING UTILITY LOCATIONS ARE APPROXIMATE. CONTRACTORS TO NOTIFY UNDERGROUND SERVICE ALERT TWO WORKING DAYS PRIOR TO STARTING ANY EXCAVATION OR RESURFACING.
 CALL TOLL FREE 1-800-422-4133



GOLETA FIRE STATION 10
 POST PROJECT CONDITIONS
 DRAINAGE EXHIBIT
 CITY OF GOLETA, CALIFORNIA

FLOWERS & ASSOCIATES, INC.
 CIVIL ENGINEERS
 201 N. Calle Cesar Chavez, Suite 100 Santa Barbara, CA 93103
 Telephone (805) 966-2224
 PRELIMINARY
 NOT FOR CONSTRUCTION DATE: _____

**Stormwater Control Plan
for
Fire Station 10**

7952 Hollister Avenue
City of Goleta, CA



May 31, 2017

FLOWERS & ASSOCIATES, INC.

Robert A. Schmidt, P.E.

201 North Calle Cesar Chavez, Ste. 100, Santa Barbara, CA 93103

(805) 966-2224 Fax (805) 965-3372

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Attachments/Exhibits

Exhibit 1	Santa Barbara County Storm Water Control Measure Sizing Calculator
Exhibit 2	Stormwater Control Plan

Appendices

This Stormwater Control Plan was prepared using the template dated 18 February 2014 [draft].

I. Project Data

Table 1. Project Data

Project Name/Number	Goleta Fire Station #10: W.O. 1481
Application Submittal Date	May 2017
Project Location	7952 Hollister Ave, City of Goleta, CA
Project Phase No.	NA
Project Type and Description	Commercial Building and Site Improvements
Total Project Site Area (acres)	Approx. 1.21 acres
Total New Impervious Surface Area	Approx. 44,000 sf
Total Replaced Impervious Surface Area	Approx. 0 sf
Total Pre-Project Impervious Surface Area	Approx 0 sf
Total Post-Project Impervious Surface Area	Approx. 44,000 sf
Net Impervious Area	Approx. 44,000 sf reduction
Watershed Management Zone(s)	1
Design Storm Frequency and Depth	95 th percentile/24 hr. storm (2.4 inches)
Urban Sustainability Area	NA

II. Setting

II.A. Project Location and Description

See Figure 1, "Vicinity Map" and Exhibit 1 (attached). The proposed project is within the City of Goleta, CA.

The project consists of site and building improvements as well as proposed lot line adjustment.

Site development is to include surface drainage and water quality improvements, as well as additional landscaping, including bioretention basins

Stormwater runoff from the property generally drains in a southeasterly direction toward a roadside swale in the Hollister Avenue right of way, and subsequently to the public storm drainage system and the Pacific Ocean.

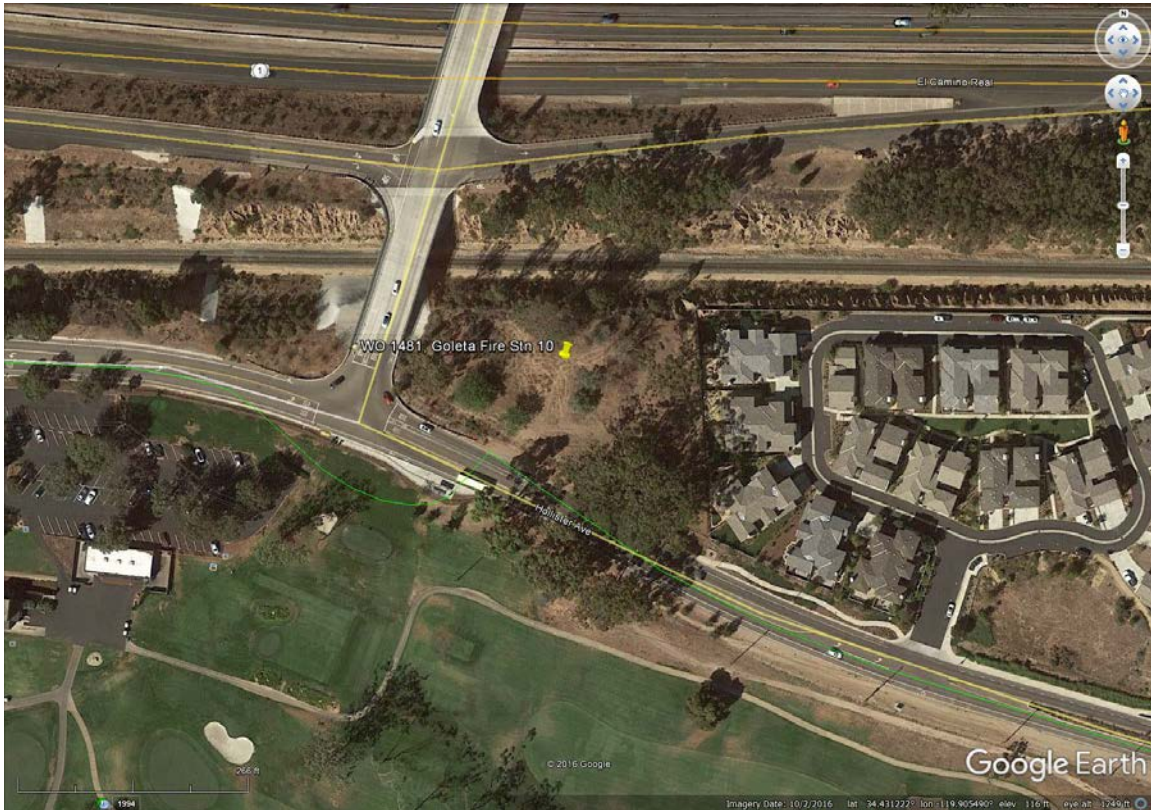


Figure 1. Vicinity Map

The project proposes to generally maintain existing drainage patterns.

II.B. Opportunities and Constraints for Stormwater Control

It is proposed to control stormwater onsite through the incorporation of a bioretention basin and a permeable paver parking lot which treat and infiltrate stormwater.

The project improvements will result in creating two discreet drainage management areas (DMA's), each of which will have a dedicated stormwater control measure (SCM).

II.C. Low Impact Development Design Strategies to be implemented onsite:

- Dispersal of runoff to proposed pervious areas – bioretention basins
- Stormwater Control Measures – discharge of roof runoff downspouts and surface drainage from impervious surfaces to a bioretention basin or permeable paver area.

III. Documentation of Drainage Design

III.A. Descriptions of each Drainage Management Area

The Drainage Management Areas (DMAs) for this project are divided into DMA's A & B, with surface type and area as shown in the table below. See Exhibit 1 for graphical representation of DMA's.

Table 2. Drainage Management Areas (DMAs)

DMA Name	Surface Type	Area (square feet)
A. WEST - NEW	Asphalt / concrete / roof	26,307
B. EAST NEW	Asphalt /concrete, roof	11,054

III.B. Onsite Storm Water Control Measures (SCMs)

All proposed onsite impervious surface development will drain to stormwater control measures consisting of a bioretention basin or permeable paver parking lot.

The bioretention basins will utilize the sand/compost planting medium specified in Santa Barbara County's Technical Guide and the Central Coast's Post-Construction Requirements, designed to filter runoff at a rate of at least 5 inches per hour. A minimum of 30 inches of "Class 2" permeable material, which typically has porosity of approximately 40%, will provide storage and more treatment below the soil mix. This project's proposed bioretention basins are designed to achieve and exceed treatment requirements.

The bioretention basins are designed to manage/detain peak flows and infiltrate to the maximum extent practicable, with "bleeders" that will slowly release treated and detained stormwater to the adjacent curb and gutter in Hollister Avenue. The bioretention basins have a collective area of approximately 5,500 square feet. If the basins were specified to have Class 2 permeable material with minimum depths as calculated by the Central Coast Region Stormwater Control Measure Sizing Calculator, the corresponding total volume capacity of the basins would be approximately 5,650 cubic feet (pond area x depth x 0.4 porosity).

However, we have designed the basins to have a uniform aggregate depth of 36" which will provide an overall stormwater storage volume capacity of approximately 6,780 cubic (6,650 s.f x 1.5 ft x 0.4 void), which exceeds the volume required by the calculator by over 1,000 cubic feet.

III.C. Storm Water Calculator and Site Constraints

Central Coast Region Stormwater Control Measure Sizing Calculator was utilized to determine sizing of the site's storm water control measures (see Exhibit 2 attached, "Central Coast Region Stormwater Control Measure Sizing Calculator").

It should also be noted that the bioretention basin section construction detail in the project construction plans, is based on the detail provided in the Stormwater Technical Guide and has been modified to be more conservative by incorporating 1 foot of ponding depth as opposed to the 0.67 foot (8 in.) of ponding depth specified in the calculations.

Therefore, although not quantified in the SCM Calculator, there will actually be an additional 825 cubic feet (0.33 feet for 2,500 sq.ft. of SCM area) of additional stormwater storage volume provided, thus ensuring the conservative nature of the design and significantly increasing the factor of safety. This modification to the standard bioretention basin configuration, which will conform to the detail in all other aspects, was done in order to provide additional ponding volume, thereby maximizing infiltration and groundwater recharge in the current period of extreme drought.

The site drainage design is summarized in tables below.

III.D. Tabulation and Sizing Calculations

Table 4. Information Summary for LID Facility/Storm Water Control Measure

Total Project Area (Square Feet)	1.21 +/- ac
Design Storm Depth	2.4 inches
Applicable Requirements	Tier 3
Storm Water Control Measure(s)	2,500 sf bioretention basin, 3,000 sf permeable infiltration area

Table 5. LID/Storm Water Control Measures Sizing and Volumes

LID/SCM	Area
Bioretention Basin	2,500 sq.ft. +/- 3,000 cu.ft.
Infiltration Basin	3,000 sq.ft. +/- 2,600 cu.ft.

IV. Source Control Measures

Site activities and potential sources of pollutants

Table 6. Source Control Table

Potential source of runoff pollutants	Permanent source control BMPs	Operational source control BMPs
<p>Landscaping Pesticide Use/Building and Grounds Maintenance</p>	<p>Final Landscape Plans shall: Preserve existing native trees, shrubs, and ground cover to the maximum extent possible.</p> <p>Design landscaping to minimize irrigation and runoff, to promote surface infiltration where appropriate, and to minimize the use of fertilizers and pesticides that can contribute to stormwater pollution. Where landscaped areas are used to retain or detain stormwater, specify plants that are tolerant of saturated soil conditions.</p> <p>Consider using pest-resistant plants, especially adjacent to hardscape.</p> <p>To insure successful establishment, select plants appropriate to site soils, slopes, climate, sun, wind, rain, land use, air movement, ecological consistency, and plant interactions.</p>	<p>Maintain landscaping using minimum or no pesticides.</p> <p>See applicable operational BMPs in Fact Sheet SC-41, "Building and Grounds Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com</p> <p>Provide IPM information to new owners, lessees and operators.</p>
<p>Outdoor Storage of Equipment or Materials</p>	<p>Include a detailed description of materials to be stored, storage areas, and structural features to prevent pollutants from entering storm drains.</p> <p>Where appropriate, reference documentation of compliance with the requirements of programs for: Hazardous Waste Generation, Hazardous Materials Release</p>	<p>See the Fact Sheets SC-31, "Outdoor Liquid Container Storage" and SC-33, "Outdoor Storage of Raw Materials" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com</p>

	Response and Inventory, California Accidental Release (CalARP), Aboveground Storage Tank, Uniform Fire Code Article 80 Section 103(b) & (c) 1991, Underground Storage Tank	
Vehicle/Equipment Repair and Maintenance	<p>No vehicle repair or maintenance will be done outdoors.</p> <p>No floor drains allowed in these areas.</p> <p>No tanks, containers or sinks to be used for parts cleaning or rinsing or, if there are, note the agency from which an industrial waste discharge permit will be obtained and that the design meets that agency's requirements.</p>	<p>No person shall dispose of, nor permit the disposal, directly or indirectly of vehicle fluids, hazardous materials, or rinse water from parts cleaning into storm drains.</p> <p>No vehicle fluid removal shall be performed outside a building, nor on asphalt or ground surfaces, whether inside or outside a building, except in such a manner as to ensure that any spilled fluid will be in an area of secondary containment. Leaking vehicle fluids shall be contained or drained from the vehicle immediately.</p> <p>No person shall leave unattended drip parts or other open containers containing vehicle fluid, unless such containers are in use or in an area of secondary containment.</p>
Fire Sprinkler Test Water	Provide a means to drain fire sprinkler test water to the sanitary sewer.	See the note in Fact Sheet SC-41, "Building and Grounds Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com
Driveways, Patios Sidewalks, Parking Areas		Sweep plazas, sidewalks, and parking lots regularly to prevent accumulation of litter and debris. Collect debris from pressure washing to prevent entry into the storm drain system. Collect washwater containing any cleaning agent or degreaser and discharge to the sanitary sewer not to a storm drain.

V. Construction Checklist

Table 7.

Stormwater Control Plan Page #	BMP Description	See Plan Sheet #s
Pgs. 3-5 and pg. 9	Bioretention Basins	TBD - in progress

VI. Certifications

The preliminary design of stormwater treatment facilities and other stormwater pollution control measures in this plan are in accordance with the current edition of the Santa Barbara County Project Clean Water's Stormwater Technical Guide.

Exhibit 1

**Santa Barbara County
Storm Water Control Measure Sizing Calculator**

Central Coast Region Stormwater Control Measure Sizing Calculator

Version: 3/28/2017

1. Project Information

Project name:	WO 1481: Goleta Fire Station #10
Project location:	Hollister Ave., City of Goleta
Tier 2/Tier 3:	Tier 3 - Retention
Design rainfall depth (in):	2.4
Total project area (ft2):	53089
Total DMA area (ft2):	53089
Total new impervious area (ft2):	43952
Total replaced impervious within a USA (ft2):	0
Total replaced impervious not in a USA (ft2):	0
Total pervious/landscape area (ft2):	9137
Total SCM area (ft2):	5400

Check Total DMA and SCM areas to ensure they match total project area

2. DMA Characterization

Name	DMA Type	Area (ft2)	Surface Type	New, Replaced?	Connection
DMA-1	Drains to SCM	26307	Concrete or asphalt	New	SCM-1
DMA-2	Drains to SCM	11054	Concrete or asphalt	New	SCM-2

DMA Summary Area	
Total DMA area (ft2):	37361
New impervious area (ft2):	37361
Replaced impervious within a USA (ft2):	0
Replaced impervious not in a USA (ft2):	0
Total pervious/landscape area (ft2):	0

Check DMA table areas against plan sheet areas

Check DMA table areas against plan sheet areas

Check DMA table areas against plan sheet areas

3. SCM Characterization

Name	SCM Type	Safety Factor	SCM Soil Type	Infiltr. Rate (in/hr)	Area (ft2)	Flow Control	Reservoir
						Orifice?	Depth (in)
SCM-1	Bioretention	1	HSG C/D	0.25	2500	Yes	8
SCM-2	Direct Infiltration	2	HSG C/D	0.25	3000	No	

4. Run SBUH Model

5. SCM Minimum Sizing Requirements

SCM Name	Min. Required Storage Vol. (ft3)	Depth Below Underdrain (ft)	Drain Time (hours)	Orifice Diameter (in)
SCM-1	2994	2.99	47.9	0.39
SCM-2	2655	2.21	20.3	

6. Self-Retaining Area Sizing Checks

Self-Retaining DMA Name	Self-Retaining DMA Area (ft2)	Tributary DMA Name(s)	Eff. Tributary DMA Area (ft2)	Effective Tributary / SRA Area Ratio

Hydrologic Soil Group—Santa Barbara County, California, South Coastal Part
(WO 1481: Goleta Fire Station No. 10)



Map Scale: 1:802 if printed on A landscape (11" x 8.5") sheet.



Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Santa Barbara County, California, South Coastal Part (CA673)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
MeC	Milpitas-Positas fine sandy loams, 2 to 9 percent slopes	D	1.7	100.0%
Totals for Area of Interest			1.7	100.0%

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Exhibit 2

**7952 Hollister Avenue
Storm Water Control Plan
(reduced version)**

1. Project Information

Project name:	WD 1481, Goleta Fire Station #10
Project location:	Hollister Ave., City of Goleta
Year 2/Year 3:	Year 3 - Retention
Design rainfall depth (in):	2.4
Total project area (R2):	13389 <i>Check Total DMA and SCM areas to ensure they match total project area</i>
Total DMA area (R2):	13389
Total new impervious area (R2):	43352
Total replaced impervious within a USA (R2):	0
Total replaced impervious not in a USA (R2):	0
Total pervious/landscape area (R2):	9122
Total SCM area (R2):	8450

2. DMA Characterization

Name	DMA Type	Area (R2)	Surface Type	Repl. Replaced?	Connection
DMA-1	Drains to SCM	25337	Concrete or asphalt	New	SCM-1
DMA-2	Drains to SCM	11054	Concrete or asphalt	New	SCM-2

DMA Summary Area

Total DMA area (R2):	37351	<i>Check DMA table areas against plan sheet areas</i>
New impervious area (R2):	37351	<i>Check DMA table areas against plan sheet areas</i>
Replaced impervious within a USA (R2):	0	
Replaced impervious not in a USA (R2):	0	
Total pervious/landscape area (R2):	0	<i>Check DMA table areas against plan sheet areas</i>

3. SCM Characterization

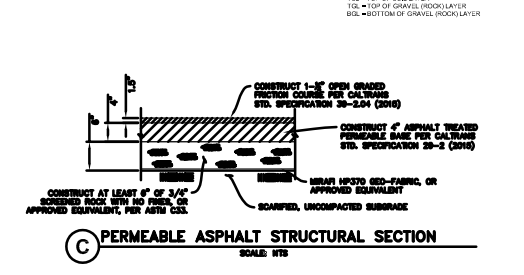
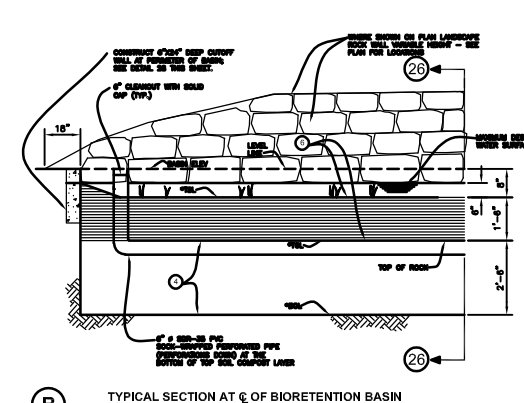
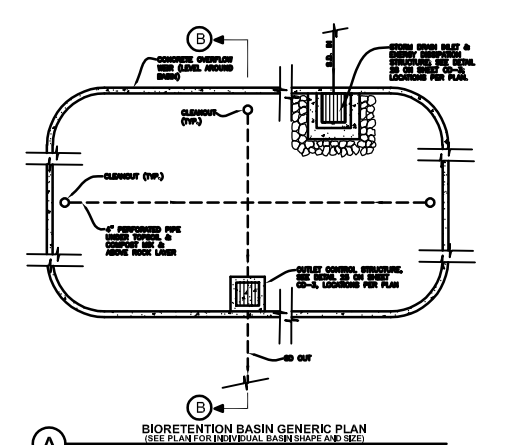
Name	SCM Type	Safety Factor	SCM Sub Type	Infiltr. Rate (in/hr)	Area (R2)	CRFIC?*	Depth (in)
SCM-1	Bioretention	1	HSG C/D	0.25	2500	Yes	0
SCM-2	Direct Infiltration	2	HSG C/D	0.25	3000	No	0

4. Run SBUH Model

Launch Model

5. SCM Minimum Sizing Requirements

SCM Name	Min. Required Storage Vol. (R3)	Depth Below Underdrain (R)	Drain Time (hours)	Crifice Diameter (in)
SCM-1	2994	2.99	47.9	0.79
SCM-2	3655	3.21	50.3	



IMPORTANT NOTICE
ALL EXISTING UTILITY LOCATIONS ARE APPROXIMATE. CONTRACTOR IS TO VERIFY UNDERGROUND SERVICE ALERT TWO WORKING DAYS PRIOR TO STARTING ANY EXCAVATION OR RESURFACING.
CALL TOLL FREE 1-800-422-4133

SCALE: 1" = 10'
GRAPHIC SCALE

PRELIMINARY EARTHWORKS
CUT: 1850 CY
FILL: 2580 CY

GOLETA FIRE STATION 10
STORMWATER CONTROL PLAN
CITY OF GOLETA, CALIFORNIA

FLOWERS & ASSOCIATES, INC.
CIVIL ENGINEERS
281 N. Calle Cesar Chavez, Suite 100 Santa Barbara, CA 93103
Telephone (805) 966-2224
PRELIMINARY
NOT FOR CONSTRUCTION

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