Appendix J

Stormwater Control Plan

Stormwater Control Plan

for

GOLETA BUSINESS PARK

6/21/2024

Sywest Development
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prepared by:
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Stormwater Control Plan Exhibit

Stormwater Control Measures Sizing Calculations

This Stormwater Control Plan was prepared using the template dated January 2017.

I. Project Data

Table 1 - Project Data

Project Name/Project Case Number	Goleta Business Park/Case No.
Project Location	907 South Kellogg Avenue, Goleta, CA APN 071-190-035
Project Phase No.	NA
Project Type and Description	Indoor Warehousing and Storage, Wholesaling and Distribution, Manufacturing, and Construction and Material Storage
New Impervious Surface Area (sf)	Due to weathering of the old drive-in parking lot which was all impervious, the exact extent of existing impervious surfaces is difficult to ascertain. We have assumed 25% existing pervious area. Therefore, the new impervious area is: -4,420 sf
Replaced Impervious Surface Area (sf)	184,543
Pre-Project Impervious Surface Area (sf)	188,963
Post-Project Impervious Surface Area (sf)	184,543
"Net Impervious" Area, if applicable	NA
Watershed Management Zone(s)	1
Tier	Tier 4 with Special Circumstances (historic lake or wetlands)
Design Storm Frequency Used (85^{th} or 95^{th} percentile) and Design Storm Depth (in)	2 x 85^{th} Percentile for treatment only (2 x 1.3 inches = 2.6 inches)
Urban Sustainability Area, if applicable	NA

II. Setting

II.A. Project Location and Description

The project site is located at the lower limits of South Kellogg Avenue at 907 S. Kellogg Avenue. It is the former location of the Twin Screen Drive-In Theater. See Figure A. The more southerly half of the property is currently being used as miscellaneous storage and as a place for the weekly swap meet. The northerly portion is being used as a drive-in theater. The northerly portion will be developed as an industrial storage facility. The southerly portion will remain as-is. No additional parcel development is planned at this time.

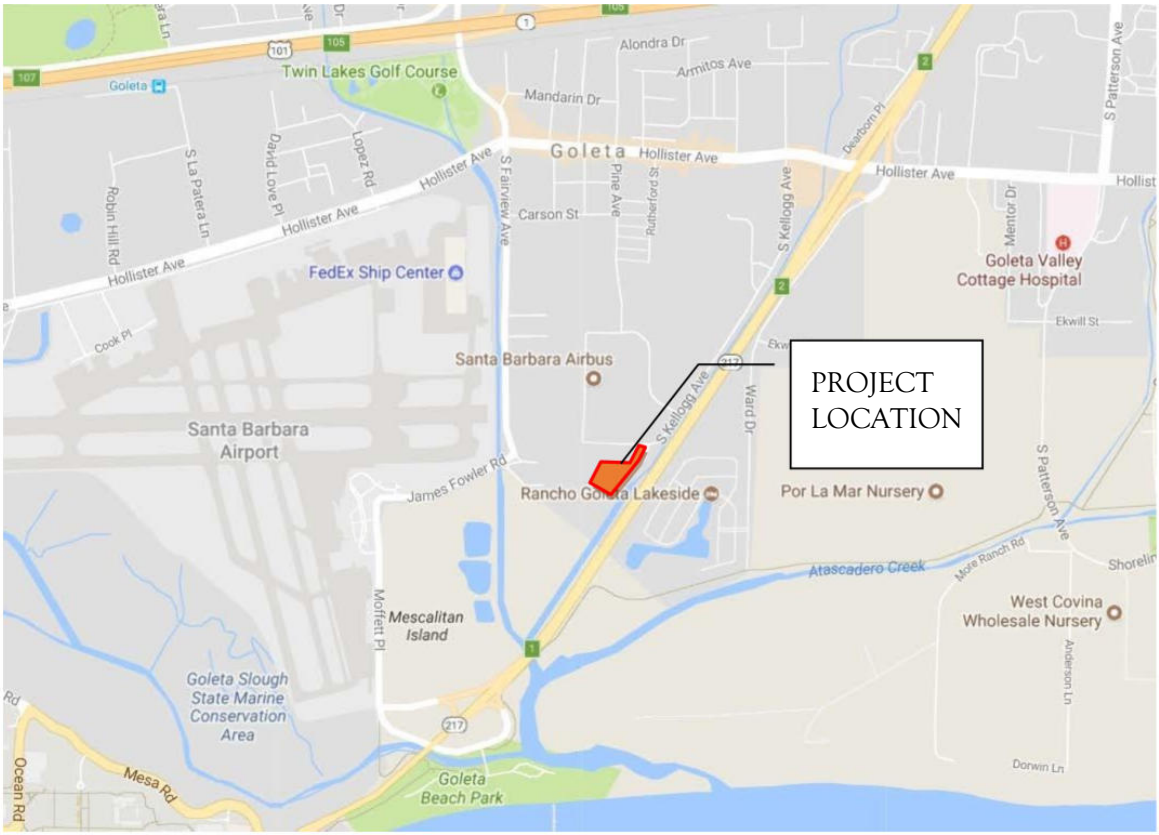


Figure A - Location Map

The existing project site area is generally covered with degraded asphalt with a few scattered buildings and is located in an area generally occupied by commercial/industrial uses. The soils are HSG Type C and groundwater is very high. The ground elevations range from 7 feet at the stormwater pump to 15 feet on the San Jose Creek levee. The proposed project site is currently configured like a bowl with drainage flows directed to a stormwater pump which discharges through the San Jose Creek Channel levee into the San Jose Creek channel. The site will be filled so that drainage flows can be discharged to the San Jose Creek Channel in a storm drain bygravity.

Improvements on the project site will be consistent with M-1 zoning designation. It is also within the Coastal Development Zone. Setbacks from San Jose Creek vary from 50 feet to 100 feet and will be under review as a consideration of this project approval. A metal warehouse of 70,594 square feet will be constructed and served by approximately 103 parking spaces and sufficient driving and loading area to accommodate semi-tractor-trailer movements.

II.B. Existing Site Features and Conditions

The existing project site area is generally covered with degraded asphalt with a few scattered buildings and is located in an area generally occupied by commercial/industrial uses. The soils are HSG Type C and groundwater is very high. The ground elevations range from 7 feet at the stormwater pump to 15 feet on the San Jose Creek levee. The existing condition project site is currently configured like a bowl with drainage flows directed to a stormwater pump which discharges through the San Jose Creek Channel levee into the San Jose Creek channel. The site will be filled so that drainage flows can be discharged to the San Jose Creek Channel in a storm drain by gravity.

San Jose Creek is located immediately adjacent and to the east of the proposed project. Flows in the channel run generally from north to south out to the Pacific Ocean. Old San Jose Creek is located a short distance to the west of the project and wraps around the end of the southerly parcel to discharge into San Jose Creek via two 48 inch culverts with flap gates.

The site is located within the 100-year floodplain (Zone A – 100-year flood elevation not determined) but not within the Regulatory Floodway. See Figure B for the floodplain delineation. It is potentially affected by the floodplains of San Jose Creek, Old San Jose Creek, Atascadero Creek, San Pedro Creek, and Tecolotito Creek as well as being influenced by the Pacific Ocean tidal movements. The site has historically been a part of the Goleta Slough and so an exemption from the retention will be requested from the Central Coast Regional Water Quality Control Board.

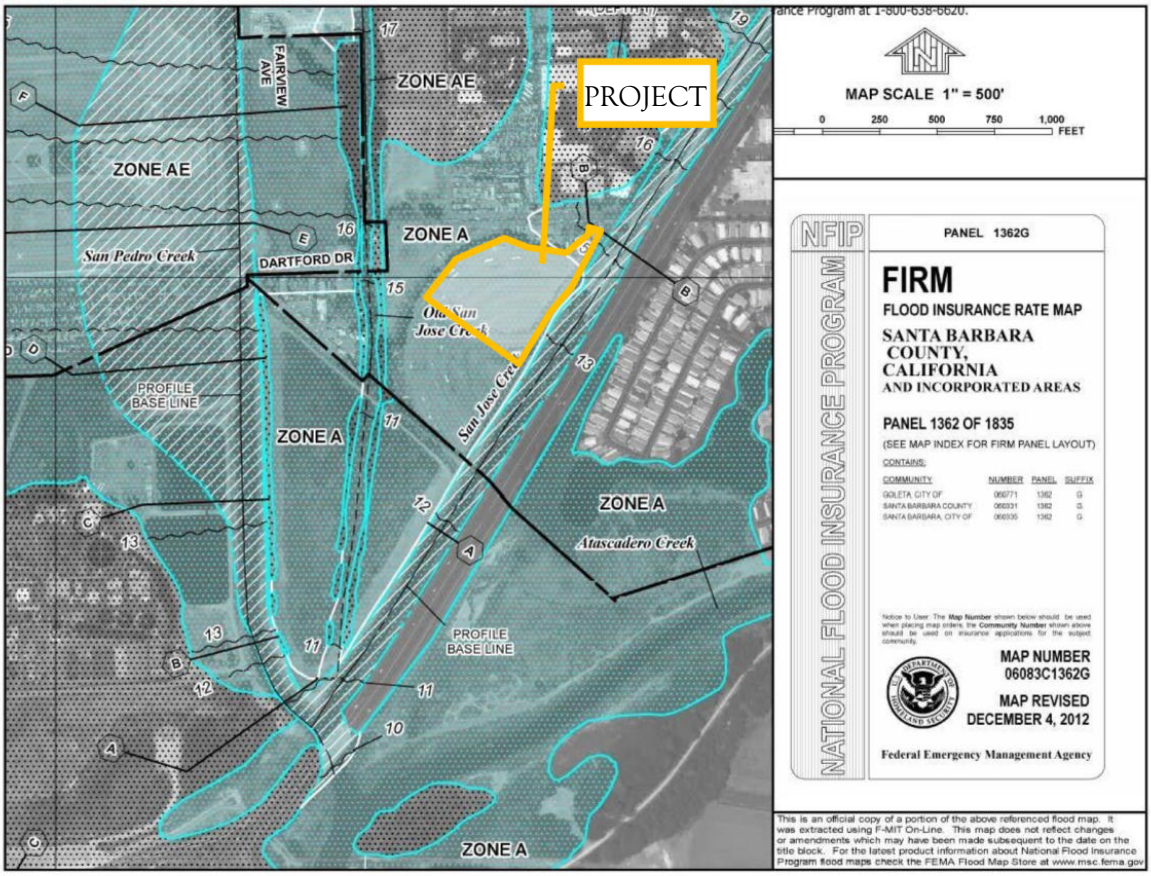


Figure B - FEMA Flood Map

II.C. Opportunities and Constraints for Stormwater Control

Given the low-lying and bowl-shaped nature of the site, significant amounts of fill will be required to raise the site in order to drain by gravity and to be protected from anticipated flood inundation.

Opportunities for stormwater control include:

- Due to site shape, most of the storm water is contained on site for more effective treatment.
- With the filling of the site, treated water can be more easily and effectively discharged to San Jose Creek Channel.

Specific constraints for stormwater control include:

- Potential backwater elevation from San Jose Creek

- High groundwater elevation
- Adjacent San Jose Creek levee (which should not be disturbed or exposed to extended inundation)
- Low permeability soils.

II.D. Summary of Design Approach for Meeting the Post-Construction Requirements

The majority of the site (217,812 sf) will be treated by being directed to a hydrodynamic separator, located downstream of the proposed detention basin, before discharged to the San Jose Creek Channel. It is anticipated that a new outlet will be constructed into the existing concrete channel wall with a flap gate, to discharge to the creek. This connection will be under the purview of the Santa Barbara County Flood Control District. The detention basin has been sized to reduce the peak post-project runoff to less than the peak pre-project runoff for the 2-year, 5-year, 10-year, 25-year, 50-year, and 100-year event.

The northeastern entry portion of the site (14,555 sf) drains to a storm drain outlet to the San Jose Creek. Flows tributary to this outlet will be directed to vegetated drainage swales on either side of the entry road prior to discharge to the storm drain. The treatment provided will be partial filtering. A catchbasin inlet filter will provide the remaining treatment.

A portion of the southerly perimeter of the site (19,584 sf) will drain into the existing adjacent sump. This area includes a slope constructed to match adjacent grade and driveway improvements designed to allow access to the adjacent parcel. Asphalt-covered areas will be constructed of permeable asphalt.

III. Low Impact Development Design Strategies

III.A. Site Design and Runoff Reduction (Performance Requirement No.1)

III.A.1. Limit disturbance to creeks and natural drainage features, if applicable

There are no undisturbed on-site or off-site natural drainage features. Disturbance in San Jose Creek will be limited to construction of a storm drain outlet in an existing concrete channel wall.

III.A.2. Minimize compaction of highly permeable soils, if applicable

Not applicable. Soils are not highly permeable.

III.A.3. Limit of clearing and grading of native vegetation to minimum area needed, if applicable

Not applicable. There is no native vegetation.

III.A.4. Apply setbacks from creeks, wetlands, and riparian habitats, if applicable

None applicable.

III.A.5. Minimize stormwater runoff using one or more of the following site design measures

All runoff from the site will either be directed to vegetated areas away from building foundations and footings or to permeable paved areas.

III.A.6. Consideration of drainage as a design element within the project

III.A.7. Tier 4 projects must include:

A development envelope has been shown on Figure C. The entire site has been disturbed and there are no natural areas remaining. There are no natural landforms and there are no topsoils.

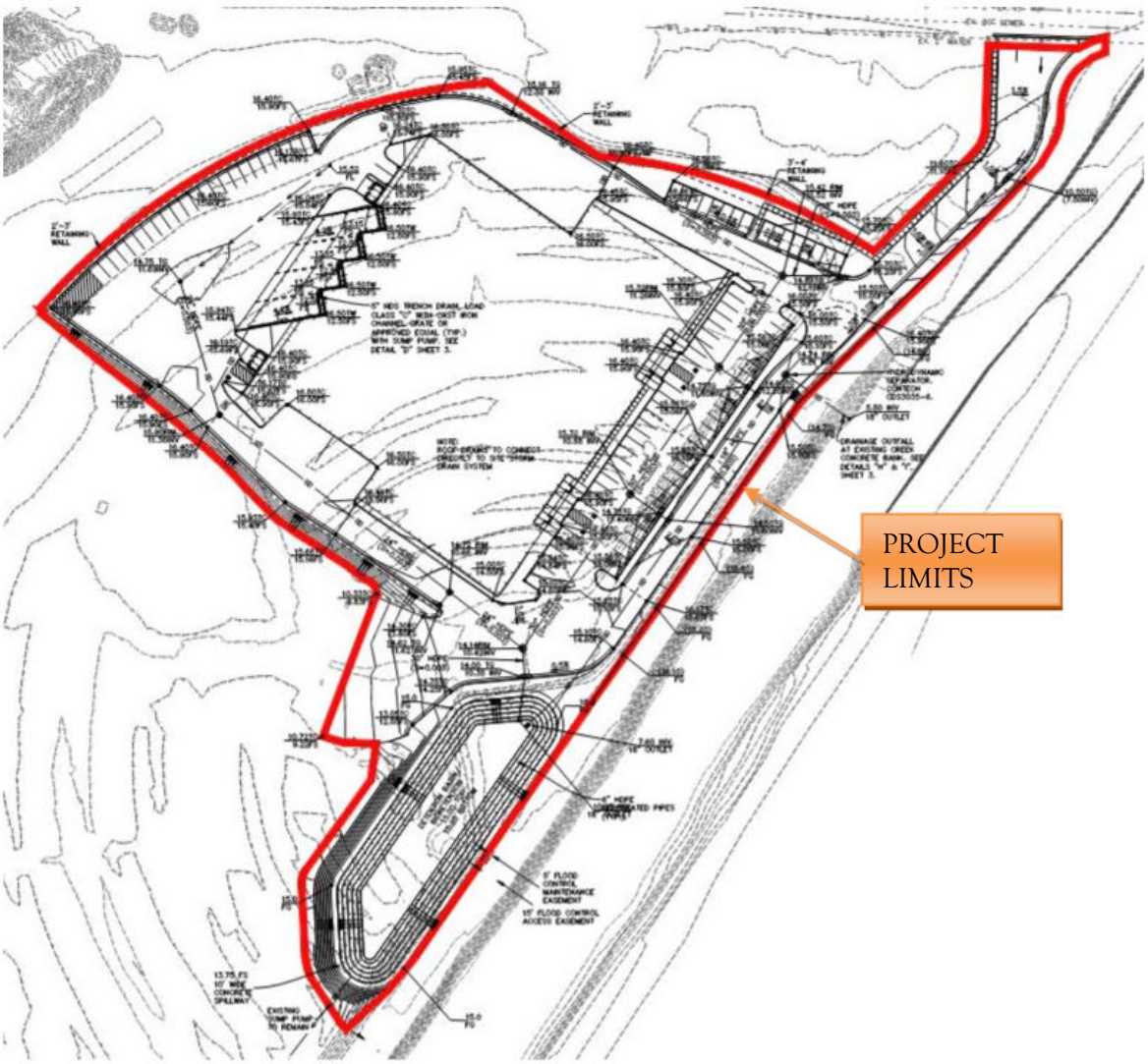


Figure C - Project Limits of Development

III.B. Site Constraints

III.B.1. Limitation of development envelope due to site constraints including:

The entire site is underlain by low permeability soils and high groundwater. The site needs filled in order to comply with floodplain safety regulations.

III.C. Dispersal of Runoff to Pervious Areas

III.C.1. Reduce amount of runoff for which Structural Control Measures are required.

Not applicable.

IV. Documentation of Drainage Design

IV.A. Descriptions of each Drainage Management Area

Table 2 - Drainage Management Areas

DMA Name	DMA Type	Area (sf)	Surface type	Drains to
DMA-1 (Paved)	Surface treatment	9813	Roof and pavement	Inlet discharging to creek.
DMA-1 (Landscape)	Surface treatment	4742	Landscaping	Inlet discharging to creek.
DMA-2 (Paved)	Mechanical treatment	174730	Roof and pavement	To SCM-2 basin
DMA-2 (Landscape)	Mechanical treatment	43082	Landscaping	To SCM-2 basin
DMA-3a (landscape)	Self-treating	4695	Landscaping	Adjacent lot
DMA-3b (Permeable Paving)	Infiltration	7990	Permeable Paving (AC)	Contained
DMA-3c	Self-treating	6899	Landscaping	Adjacent lot

Drainage Management Area Narrative Descriptions

DMA-1 (paved) totaling 9813 square feet, drains pavement areas of the access driveway to the project. DMA-1 (paved) drains to SCM-1 which consists of a catchbasin on the side of the driveway.

DMA-1 (landscape) totaling 4742 square feet, drains landscaped areas along the side of the access driveway. DMA-1 (landscape) drains to SCM-1 which consists of a catchbasin along the side of the driveway.

DMA-2 (paved), totaling 174730 square feet, drains the central parking, storage and loading area of the site. DMA-2 (paved) drains to SCM-2 which is a detention basin. The basin outflow is directed to a hydrodynamic separator where it is treated.

DMA-2 (landscape), totaling 43082 square feet, drains the central parking, storage and loading area of the site. DMA-2 (landscape) drains to SCM-2 which is a combined biofiltration and detention basin. The basin is not suited for infiltration due to the nature of the soils, the high groundwater level and the proximity to the County Flood Control levee.

DMA-3a totaling 4695 square feet, drains a section of landscaped slope which adjusts grades between the proposed project pad and the existing ground level. DMA-3a is self-treating.

DMA-3b, totaling 7990 square feet, drains a driveway connecting the existing southerly lot to the new access driveway. DMA- 3b drains to SCM-3b. The water quality volume is contained within the gravel base of the permeable paving.

DMA-3c, totaling 6899 square feet, drains a landscaped slope adjacent to the southerly access driveway and biofiltration basin. DMA-3c is self-treating. Excess runoff drains to the adjacent lot.

IV.B.Description of each Stormwater Structural Control Measure

SCM-1, totaling 3427 square feet, is a vegetated swale along the easterly side of the entry driveway. SCM-1 partially treats runoff from DMA-1 (paved) and DMA-1(landscape). Treated water and high flow bypass discharges to a catchbasin which flows to San Jose Creek. The catchbasin will be fitted with an appropriate inlet filter to capture pollutants not captured in the vegetated swale.

SCM-2, totaling 8321 square feet, is a detention basin and located at the southeasterly corner of the project. The outflow from the basin is directed to a hydrodynamic separator where it is treated. SCM-2 treats runoff from DMA-2 (paved) and DMA-2 (landscape). Treated water and high flow bypass discharge to San Jose Creek via stormdrains.

SCM-3b, totaling 7990 square feet, is a direct infiltration permeable paving facility and located along the southerly boundary of the project. SCM-3b treats the runoff that falls on it. Treated water is retained and high flow bypass discharge to the adjacent lot.

SCM-3c, totaling 5154 square feet, is a landscaped slope and located along the southeasterly boundary of the project. SCM-3 does not produce pollutants and is therefore self-treating. Treated water and high flow bypass discharge to the adjacent lot.

IV. C. Tabulation and Sizing Calculations for Structural Control Measures

See attached calculations.

V. Source Control Measures

V.A. Site activities and potential sources of pollutants

V.B. Source Control BMPs Table

Table 3 - Source Control BMPs

Potential source of runoff pollutants	Permanent source control BMPs	Operational source control BMPs
On-site storm drain inlets (unauthorized non-stormwater discharges and accidental spills or leaks	Mark all inlets with the words "No Dumping! Flows to Bay" or similar.	Maintain and periodically repaint or replace inlet markings. Provide stormwater pollution prevention information to new site owners, lessees, or operators. See applicable operational BMPs in Fact Sheet SC-44, "Drainage System Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com Include the following in lease agreements: "Tenant shall not allow anyone to discharge

		anything to storm drains or to store or deposit materials so as to create a potential discharge to storm drains."
Need for future indoor & structural pest control	State that final landscape plans will accomplish all of the following. Preserve existing native trees, shrubs, and ground cover to the maximum extent possible. 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. Consider using pest-resistant plants, especially adjacent to hardscape. To insure successful establishment, select plants appropriate to site soils, slopes, climate, sun, wind, rain, land use, air movement, ecological consistency, and plant interactions.	Maintain landscaping using minimum or no pesticides. See applicable operational BMPs in Fact Sheet SC-41, "Building and Grounds Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com Provide IPM information to new owners, lessees and operators.
Landscape/ Outdoor Pesticide Use/Building and Grounds Maintenance	State that final landscape plans will accomplish all of the following. Preserve existing native trees, shrubs, and ground cover to the maximum extent possible. 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	Maintain landscaping using minimum or no pesticides. See applicable operational BMPs in Fact Sheet SC-41, "Building and Grounds Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com Provide IPM information to new owners, lessees and operators.

	to retain or detain stormwater, specify plants that are tolerant of saturated soil conditions. Consider using pest-resistant plants, especially adjacent to hardscape. To insure successful establishment, select plants appropriate to site soils, slopes, climate, sun, wind, rain, land use, air movement, ecological consistency, and plant interactions.	
Refuse areas	State how site refuse will be handled and provide supporting detail to what is shown on plans. State that signs will be posted on or near dumpsters with the words "Do not dump hazardous materials here" or similar.	State how the following will be implemented: Provide adequate number of receptacles. Inspect receptacles regularly; repair or replace leaky receptacles. Keep receptacles covered. Prohibit/prevent dumping of liquid or hazardous wastes. Post "no hazardous materials" signs. Inspect and pick up litter daily and clean up spills immediately. Keep spill control materials available on-site. See Fact Sheet SC-34, "Waste Handling and Disposal" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com
Loading Docks		Move loaded and unloaded items indoors as soon as possible. See Fact Sheet SC-30, "Outdoor Loading and Unloading," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com
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
Miscellaneous Drain or Wash Water or Other Sources	Boiler drain lines shall be directly or indirectly connected to the sanitary sewer system and may	

Boiler drain lines Condensate drain lines Rooftop equipment Drainage sumps Roofing, gutters, and trim. Other sources	not discharge to the storm drain system. Condensate drain lines may discharge to landscaped areas if the flow is small enough that runoff will not occur. Condensate drain lines may not discharge to the storm drain system. Rooftop equipment with potential to produce pollutants shall be roofed and/or have secondary containment. Any drainage sumps on-site shall feature a sediment sump to reduce the quantity of sediment in pumped water. Avoid roofing, gutters, and trim made of copper or other unprotected metals that may leach into runoff. Include controls for other sources as specified by local reviewer.	
Plazas, sidewalks, and parking lots.		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.

VI. Stormwater Facility Maintenance

Structural Control Measures

Vegetated Swale and Catchbasin

- Clear trash and debris from swale weekly
- Inspect plant material to verify it is healthy
- Clean catchbasin filter insert at the beginning of the rainy season and as needed after each storm. Replace if necessary.

Detention Basin

- Clear trash and debris from the surface of the basin weekly
- Check inspection port to verify that basin is draining properly after each storm
- Replace mulch layer as needed (about every other year)
- Check overflow facility after each storm.

Permeable Paving

- Sweep and clean frequently
- Vacuum at least four times a year.

Hydrodynamic Separator (Contech CDS3035-6)

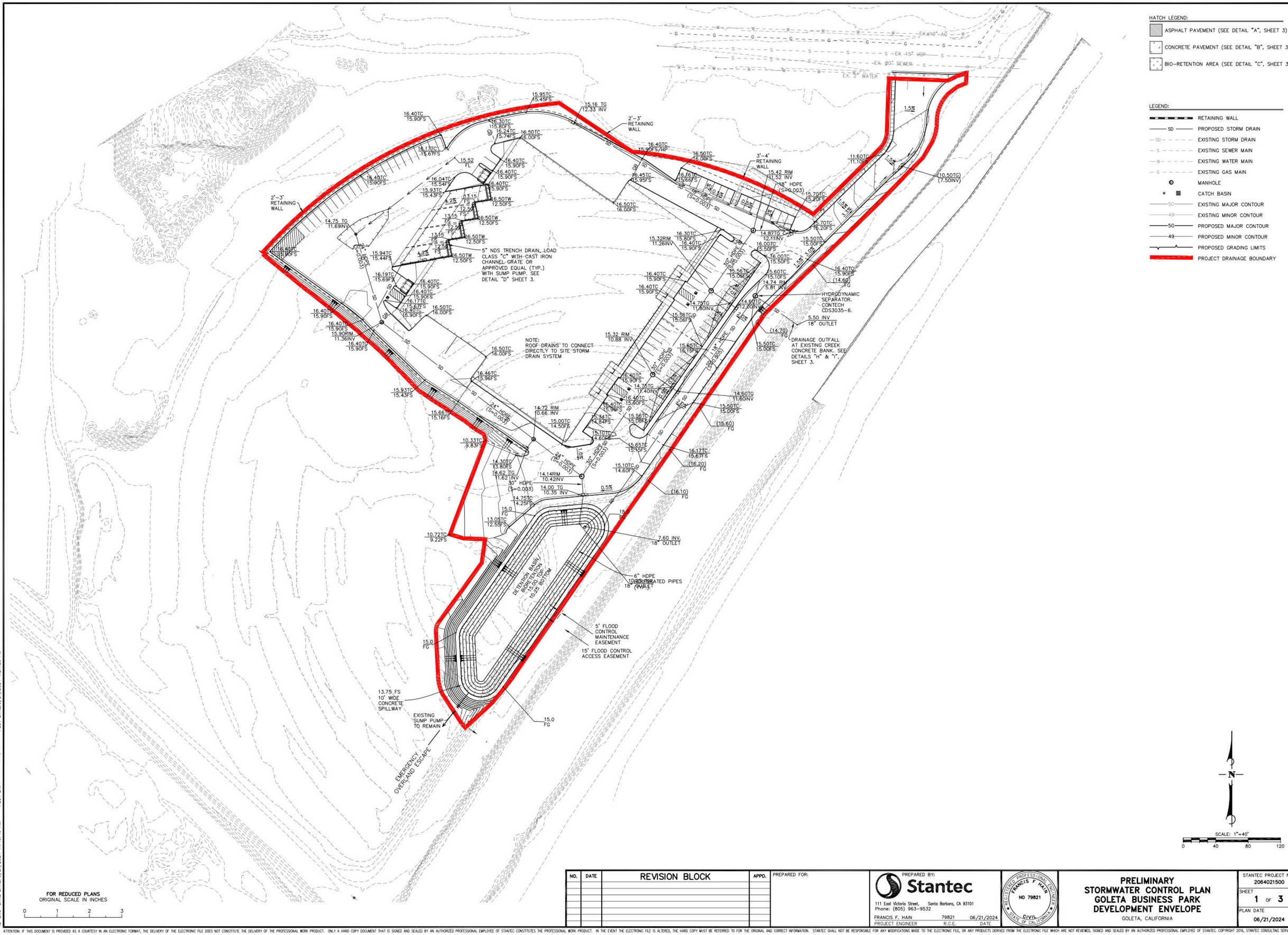
- Visually inspect inlet and separation screen for blockages or obstructions.
- Check for accumulated debris, sediment, litter, and/or potential non-storm water discharges.
- Remove any accumulated wastes and dispose of according to all local, state, and federal regulations.
- Clean structure when the level of sediment has reached 75% of capacity in the isolated sump or when an appreciable level hydrocarbons and trash has accumulated.
- Inspections shall be done twice annually (before and after rainy season) and after storm events larger than 1-inch.

VII. Stormwater Control Plan/Construction Documents Cross-Checklist

This section will be completed as part of the final design plans.

VIII. 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.



FOR REDUCED PLANS
ORIGINAL SCALE IN INCHES
0 1 2 3

NO.	DATE	REVISION BLOCK	APPD.

PREPARED FOR:

PREPARED BY:
Stantec
111 East Victoria Street, Santa Barbara, CA 93101
Phone: (805) 963-9532

FRANCIS F. HAIN	79821	06/21/2024
PROJECT ENGINEER	R.C.E.	DATE

REGISTERED PROFESSIONAL ENGINEER FRANCIS F HAIN NO 79821 CIVIL STATE OF CALIFORNIA

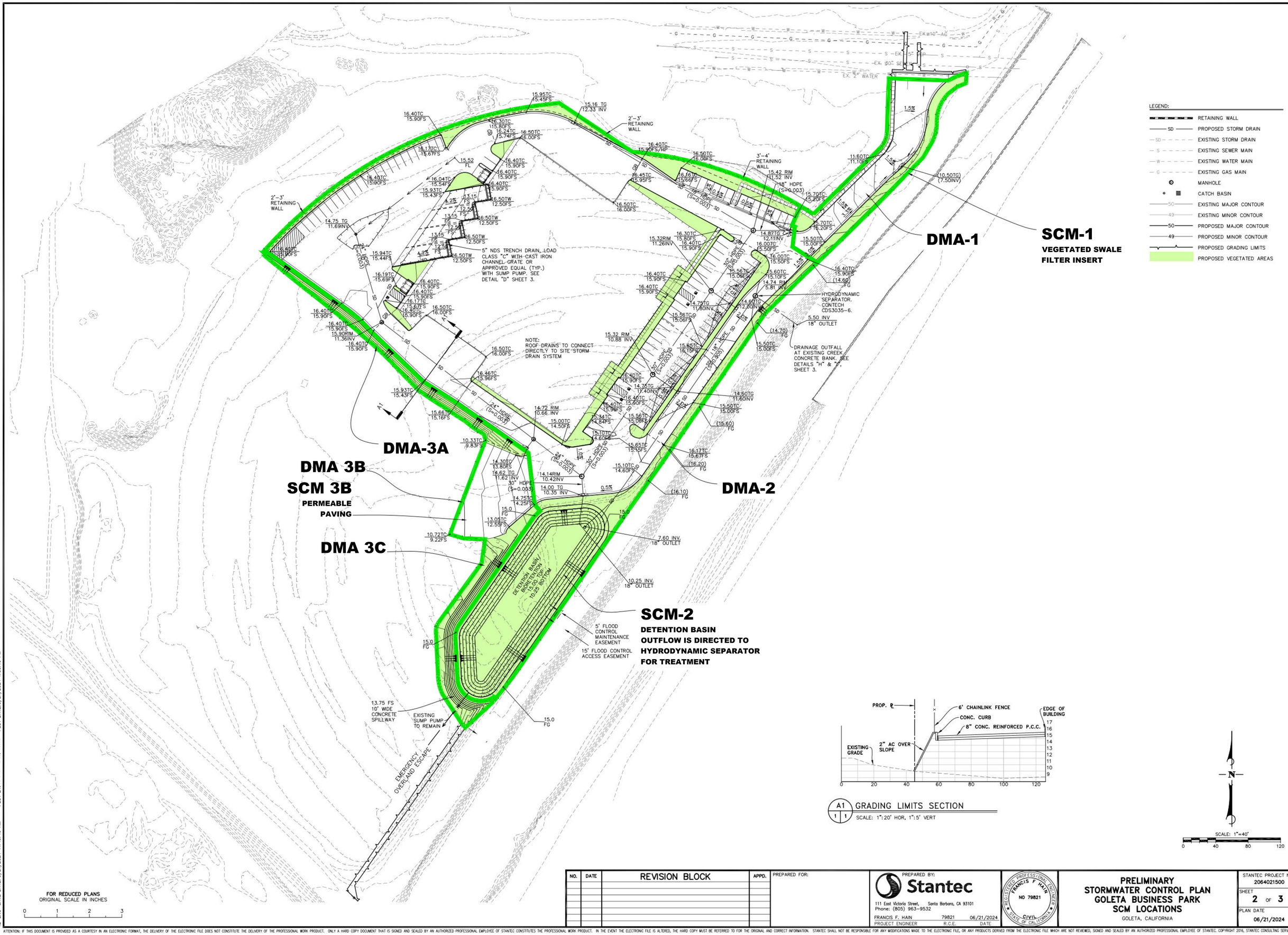
PRELIMINARY STORMWATER CONTROL PLAN GOLETA BUSINESS PARK DEVELOPMENT ENVELOPE

GOLETA, CALIFORNIA

STANTEC PROJECT NO. 2064021500
SHEET 1 OF 3
PLAN DATE 06/21/2024

DESIGN _____ CHECKED _____
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A1 / 1 1 GRADING LIMITS SECTION
SCALE: 1":20' HOR, 1":5' VERT

FOR REDUCED PLANS
ORIGINAL SCALE IN INCHES
0 1 2 3

NO.	DATE	REVISION BLOCK	APPD.

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PREPARED BY:
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111 East Victoria Street, Santa Barbara, CA 93101
Phone: (805) 963-9532

FRANCIS F. HAIN	79821	06/21/2024
PROJECT ENGINEER	R.C.E.	DATE

REGISTERED PROFESSIONAL ENGINEER FRANCIS F HAIN NO 79821 CIVIL STATE OF CALIFORNIA

PRELIMINARY STORMWATER CONTROL PLAN GOLETA BUSINESS PARK SCM LOCATIONS

GOLETA, CALIFORNIA

STANTEC PROJECT NO. 2064021500
SHEET 2 OF 3
PLAN DATE 06/21/2024

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HATCH LEGEND:

- ASPHALT PAVEMENT (SEE DETAIL "A", SHEET 3)
- CONCRETE PAVEMENT (SEE DETAIL "B", SHEET 3)
- BIO-RETENTION AREA (SEE DETAIL "C", SHEET 3)

LEGEND:

- RETAINING WALL
- SD — PROPOSED STORM DRAIN
- SD — EXISTING STORM DRAIN
- S — EXISTING SEWER MAIN
- W — EXISTING WATER MAIN
- G — EXISTING GAS MAIN
- MANHOLE
- CATCH BASIN
- 50 — EXISTING MAJOR CONTOUR
- 49 — EXISTING MINOR CONTOUR
- 50 — PROPOSED MAJOR CONTOUR
- 49 — PROPOSED MINOR CONTOUR
- PROPOSED GRADING LIMITS
- P1 — WATERSHED DESIGNATION FOR HYDROCAD

Return Period	Pre-Project	Post-Project	Difference
year	cfs	cfs	cfs
2x85th%	11.55	4.01	-7.54
2	14.32	5.11	-9.21
5	20.80	7.12	-13.68
10	25.11	8.27	-16.84
25	30.42	9.88	-20.54
50	34.30	12.43	-21.87
100	38.05	13.49	-24.56



Basin Top Elev = 15.0 ft
Weir Overflow Elev = 13.75 ft
100-yr Ponding Elev = 12.13 ft
Basin Bottom Elev = 10.25 ft

SCALE: 1"=40'
0 40 80 120

FOR REDUCED PLANS
ORIGINAL SCALE IN INCHES
0 1 2 3

NO.	DATE	REVISION BLOCK	APPD.

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PRELIMINARY STORMWATER CONTROL PLAN GOLETA BUSINESS PARK STORM DRAINS AND WATERSHEDS

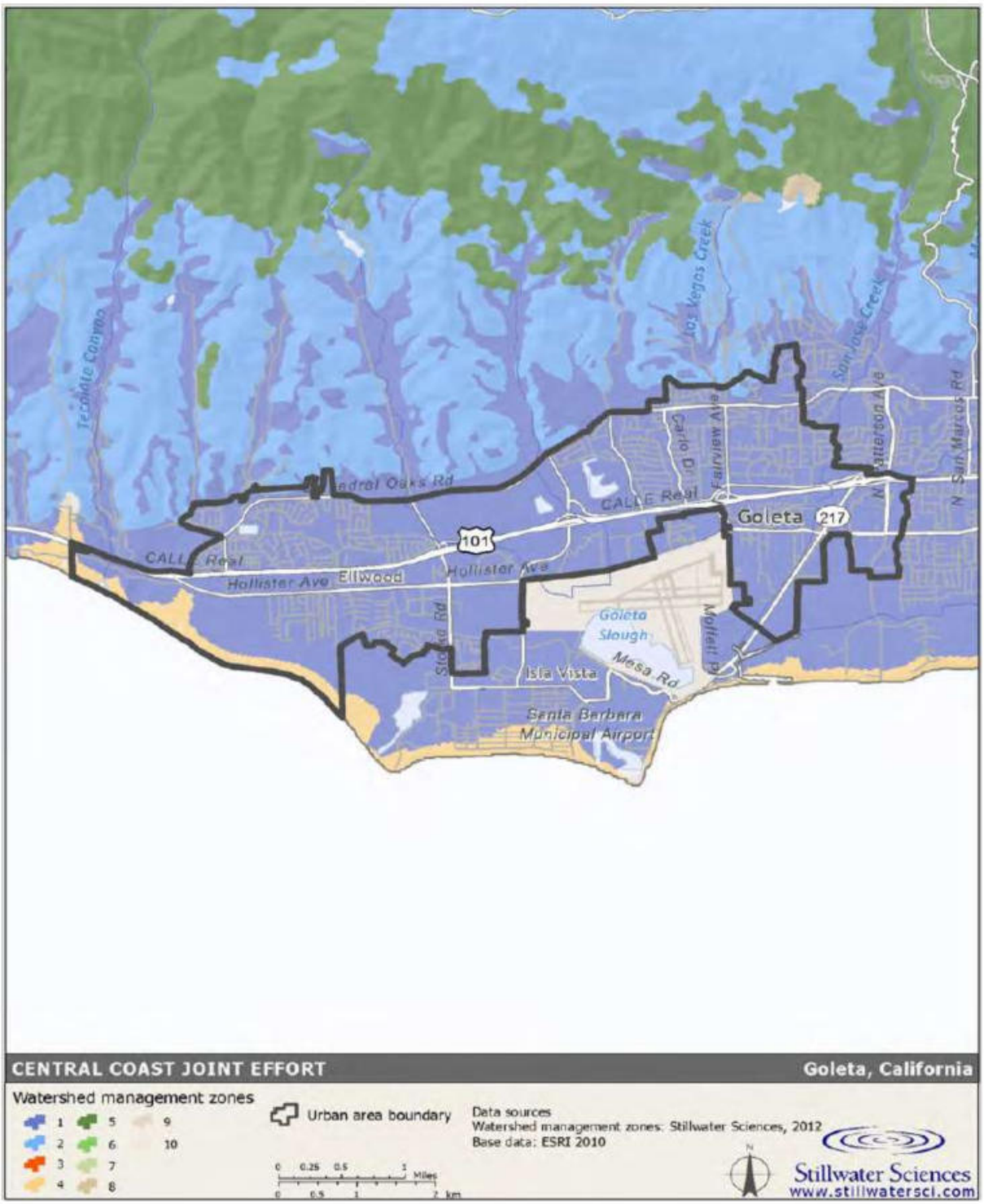
GOLETA, CALIFORNIA

STANTEC PROJECT NO. 2064021500
SHEET 3 OF 3
PLAN DATE 06/21/2024

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STORMWATER QUALITY CRITERIA



WMZ = 1

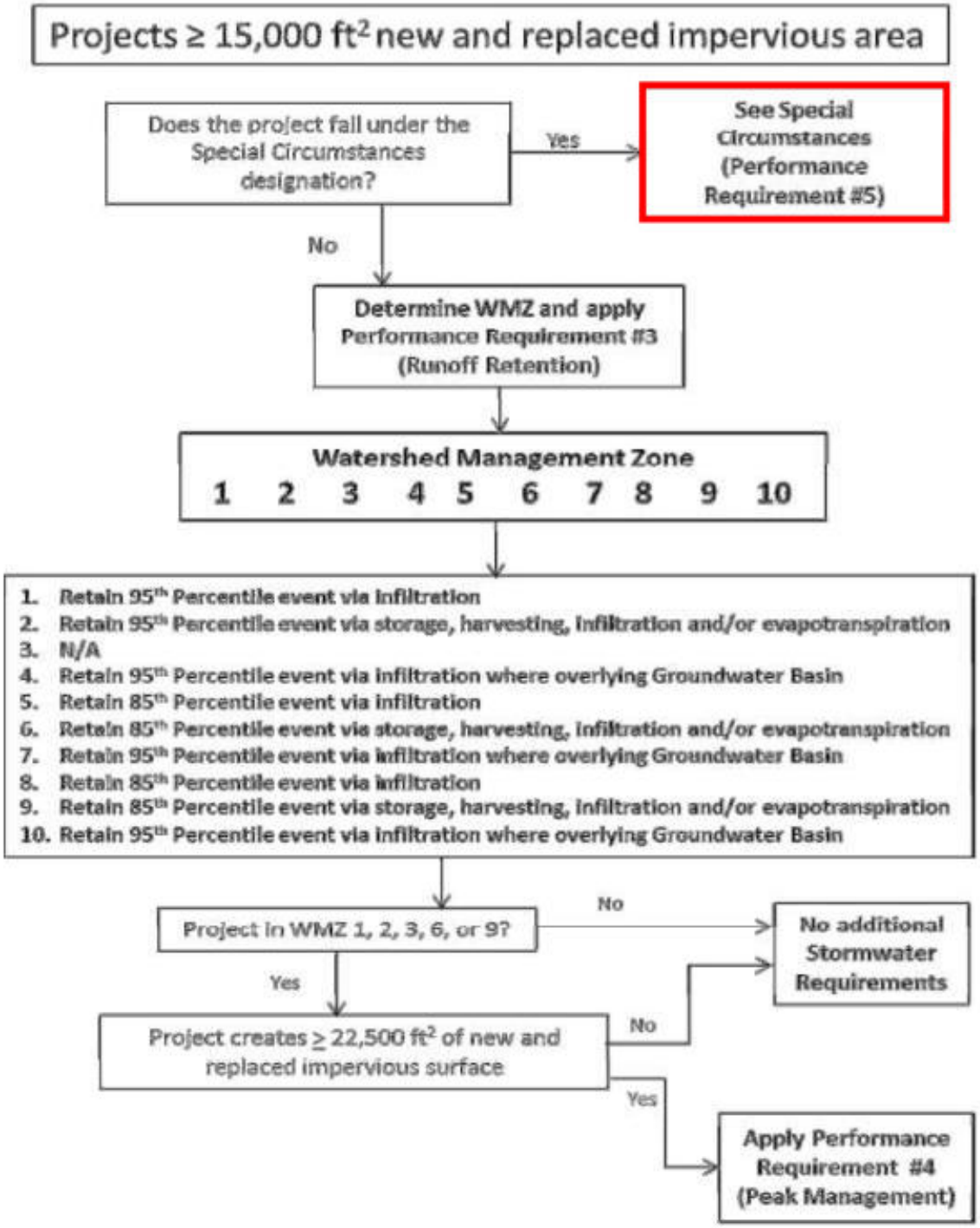


Figure 1c. Requirements for Large Development Projects

6) Performance Requirement No. 5: Special Circumstances

The Joint Effort landscape analysis supporting the designation of WMZs was completed at a scale appropriate to a regional scope and scale of the overall Joint Effort. In any broad-scale characterization of a landscape, general patterns will tend to overwhelm minor variations within broad categories, and ignore uncommon exceptions or outright contradictions. The application of regional-scale data to specific localities always includes potential errors, either with imprecise geographic placement or the loss of detail that may be "insignificant" at a regional scale but quite relevant on a particular location of interest.[51] These Post-Construction Requirements allow the Permittee to designate Regulated Projects as subject to 'Special Circumstances' based on certain site and/or receiving water conditions that were not captured at the regional scale of analysis. The Special Circumstances designations effectively exempt Regulated Projects from Retention and/or Peak Management Performance Requirements where those Performance Requirements would be ineffective or inappropriate to maintaining or restoring beneficial uses of receiving waters. Water Quality Treatment Performance Requirements are not affected by Special Circumstance designations (i.e., no exemptions are available for Performance Requirement 2).

Historic Lake and Wetland Special Circumstance

Over time, California has lost many receiving waters such as lakes, and wetlands, to human land use activities (e.g. reclamation, fill, rerouting of water, etc.). These historic environments had intrinsic value and also provided water quality and hydrologic benefit to downstream waterbodies (e.g., streams). The Joint Effort analysis was conducted at a scale that did not

account for these historic hydrologic features and the resulting WMZs do not address the special circumstance of their occurrence. Consequently, the infiltration requirements indicated for the WMZs may not be appropriate for a development project located where there was once a historic hydrologic feature such as a lake or wetland. In these situations, pre-development hydrologic processes did not include significant infiltration of rainwater but did include filtration, storage, and ponding; resulting in the feature functioning as a detention facility. When the largest rainfall events filled these features, their overflow and release of runoff into downstream receiving waters was attenuated by their storage capacity.

Where the Permittee can provide reasonable documentation of the occurrence and location of historic lakes and wetlands, it may designate projects within such areas as a Special Circumstance for Historic Lake and Wetland. Such projects are then subject to detention and/or peak management Performance Requirements more suited to the historic conditions and sensitivity to downstream receiving waters.

The Permittee may select to undertake the analysis to support the designation of the Special Circumstance for Historic Lake and Wetland on a case-by-case basis as projects are proposed in areas potentially qualifying for the designation. Alternately, the Permittee may pursue an area-wide assessment that supports subsequent project designations. In either case, the Permittee shall submit a proposal to the Water Board Executive Officer for review and shall not grant the Special Circumstance designation until the Water Board Executive Officer has granted approval.

Since this project is within the Goleta Slough, it qualifies as a special circumstance and will not need to meet the retention requirements. The project will be required to meet peak management and treatment requirements.

Peak Management (for both Flood Control and Water Quality

Desgin such that the Post-Project peak flow rate is less than or equal to the Pre-Project peak flow rate for the 2-year, 5-year, 10-year, 25-year, 50-year, and 100-year rainfall events.

Treatment

Required to treat 2 x 85% hourly precipitation

85th Percentile Hourly Precipitation =	1.3	inches/hour
2 x 85th Percentile Hourly Precip =	2.6	inches/hour

DMA SUMMARY

DMA-1

Total Area	14555	sf
Pavement	9813	sf
Landscape	4742	sf

DMA-2

Total Area	217812	sf
Pavement	174730	sf
Landscape	43082	sf

DMA-3

Total Area	19584	sf
Permeable Pavement	7990	sf
Pavement	0	sf
Landscape	11594	sf

Percent Impervious - 73%

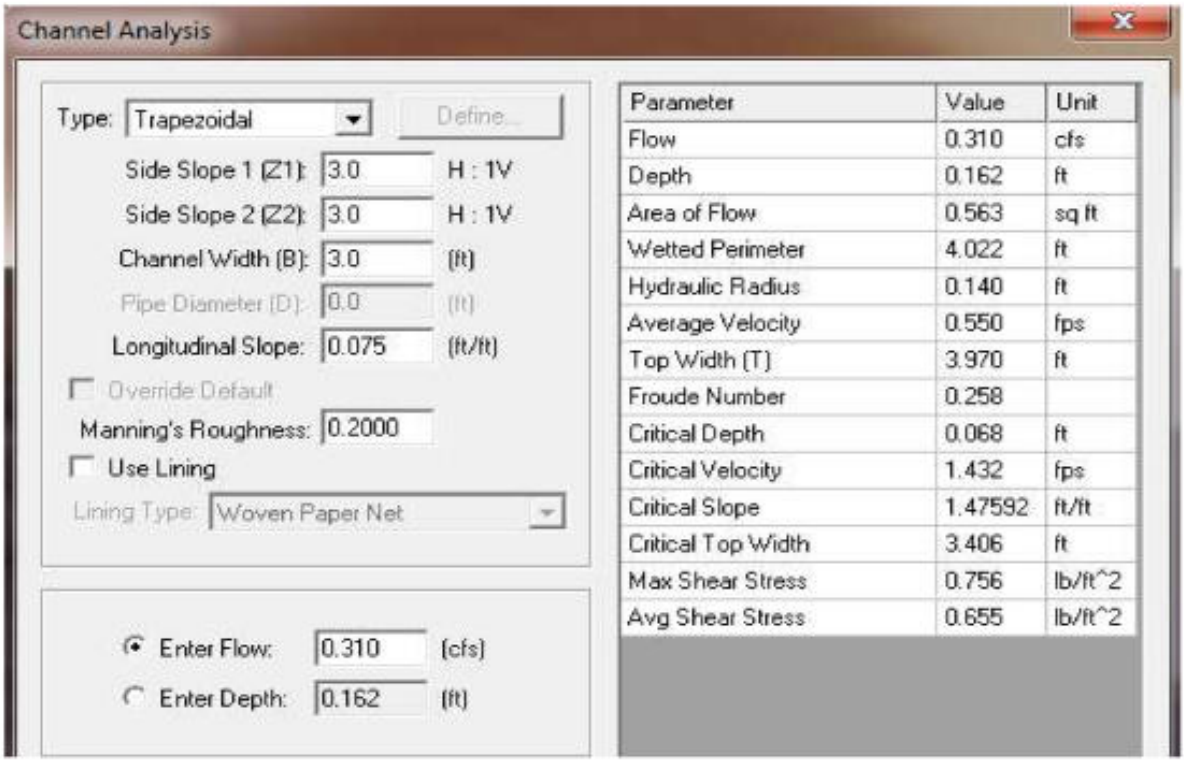
SCM SUMMARY

	Description	% of Site	Analysis
SCM-1	Vegetated Swale and Inlet Insert	6%	HydroCAD
SCM-2	Detention Basin. Outflow is directed to hydrodynamic separator for treatment.	86%	HydroCAD
SCM-3a	AC Lined slope (no treatment)	0%	HydroCAD
SCM-3b	Pervious Pavement	3%	SB County Spreadsheet
SCM-3c	Landscaped slope	5%	HydroCAD

SCM DESIGN

SCM -1 Vegetated Swale

Qwq =	2 x 85th Percentile =	0.31	cfs (total)
So =	Slope =	0.075	ft/ft
SS =	Side Slopes =	3:01	H:V
W =	Bottom Width =	3	ft/ft



Vavg =	0.55	fps <	1 fps, OK
Depth =	0.162	ft <	0.33 ft, OK
L =	108	ft >	100 ft, OK
Tresidence =	3.3	min <	10 min, Not OK

Use Filter Insert in Inlet to complete treatment

SCM-2 Detention basin, outflow to be treated via hydrodynamic separator (Contech CDS3035-6).

SCM-3a Landscaping Self Treating

SCM-3b Pervious Paving

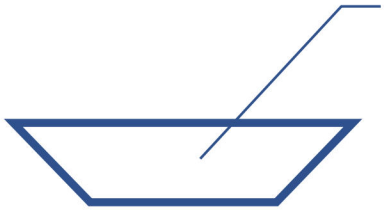
Vwq =	2 x 85th Percentile =	795	cf per hydroCAD
Area of Pervious Paving =		7990	sf
Void Ratio =		40	percent

	Depth of Gravel =		0.25 ft
SCM-3c	Landscaping	Self Treating	

DETENTION DESIGN

Assumes no infiltration or volume below bottom of basin

Return Period	Pre-Project	Post-Project	Difference
year	cfs	cfs	cfs
2x85th%	11.55	4.01	-7.54
2	14.32	5.11	-9.21
5	20.80	7.12	-13.68
10	25.11	8.27	-16.84
25	30.42	9.88	-20.54
50	34.30	12.43	-21.87
100	38.05	13.49	-24.56



Basin Top Elev = 15.0 ft
Weir Overflow Elev = 13.75 ft
100-yr Ponding Elev = 12.13 ft
Basin Bottom Elev = 10.25 ft

STORM DRAIN DESIGN

North and East Storm Drain to Basin

Q_{100} =	9.58	cfs	
Dia =	30	inches	
K =	410		
s_o =	0.000547	ft/ft	
L =	664	ft	
Δh =	0.362888	ft	
TG =	15.16	ft	
HGL @ TG =	14.99	ft	OK

Need 30" storm drain at least to end of first run.

South and West Storm Drain to Basin

Q_{100} =	8.22	cfs	
Dia =	24	inches	
K =	226.2		
s_o =	0.00132	ft/ft	
L =	467	ft	
Δh =	0.62	ft	
TG =	14.75	ft	
HGL @ TG =	14.75	ft	OK

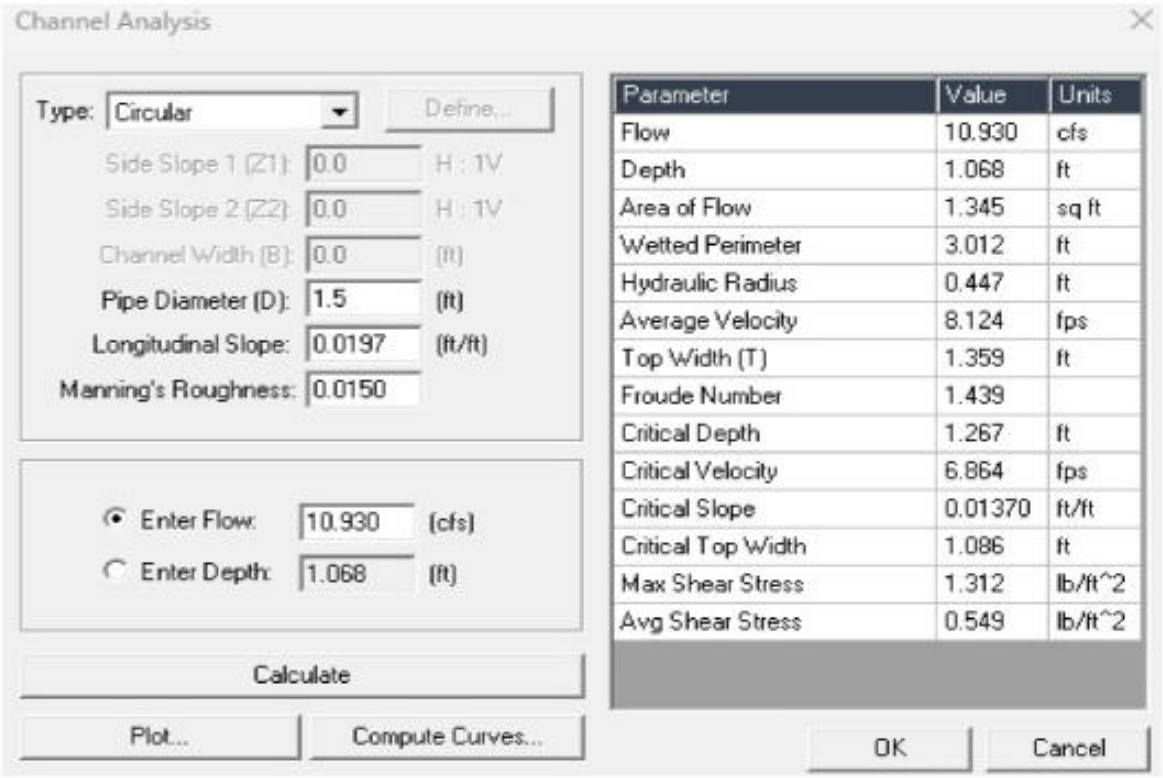
Need 24" storm drain at least to end of first run.

Outlet to Channel

$Q_{into\ basin}$ = 19.65 cfs (Q100)

$Q_{out\ basin}$ = 10.93 cfs (Q100)

Ponding Elevation = 12.13 ft



Parameter	Value	Units
Flow	10.930	cfs
Depth	1.068	ft
Area of Flow	1.345	sq ft
Wetted Perimeter	3.012	ft
Hydraulic Radius	0.447	ft
Average Velocity	8.124	fps
Top Width (T)	1.359	ft
Froude Number	1.439	
Critical Depth	1.267	ft
Critical Velocity	6.864	fps
Critical Slope	0.01370	ft/ft
Critical Top Width	1.086	ft
Max Shear Stress	1.312	lb/ft^2
Avg Shear Stress	0.549	lb/ft^2

L = 412 ft

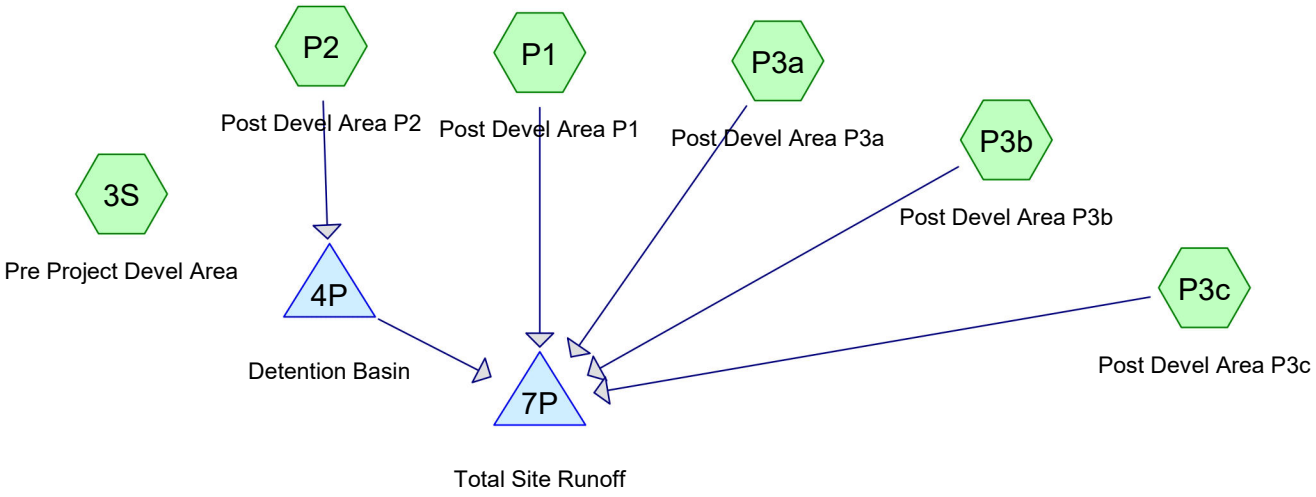
$Inv_{channel}$ = 5.5 ft

Inv_{basin} = 7.6 ft

So = (Ponding elev- Top of Pipe /Length of pipe

0.019733 ft/ft

Conclusion: 18" pipe is OK for outlet.



Subcat Reach Pond Link

Routing Diagram for Prelim Design June 2024 Detention Submittal
Prepared by Stantec Consulting Ltd., Printed 6/21/2024
HydroCAD® 10.10-6a s/n 03040 © 2020 HydroCAD Software Solutions LLC

Area Listing (selected nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
59,418	84	50-75% Grass cover, Fair, HSG D (P1, P2, P3a, P3c)
7,990	89	<50% Grass cover, Poor, HSG D (P3b)
251,951	98	Paved parking, HSG D (3S)
184,543	98	Paved roads w/curbs & sewers, HSG D (P1, P2)

Summary for Subcatchment 3S: Pre Project Devel Area

Runoff = 3.88 cfs @ 9.91 hrs, Volume= 16,606 cf, Depth= 0.79"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
Type I 24-hr 1" Rainfall=1.00"

Area (sf)	CN	Description
251,951	98	Paved parking, HSG D
251,951	98	100.00% Impervious Area

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

Summary for Subcatchment P1: Post Devel Area P1

Runoff = 0.10 cfs @ 10.02 hrs, Volume= 707 cf, Depth= 0.58"
Routed to Pond 7P : Total Site Runoff

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
Type I 24-hr 1" Rainfall=1.00"

Area (sf)	CN	Description
9,813	98	Paved roads w/curbs & sewers, HSG D
4,742	84	50-75% Grass cover, Fair, HSG D
14,555	93	Weighted Average
4,742	84	32.58% Pervious Area
9,813	98	67.42% Impervious Area

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

Summary for Subcatchment P2: Post Devel Area P2

Runoff = 1.72 cfs @ 10.02 hrs, Volume= 12,061 cf, Depth= 0.66"
Routed to Pond 4P : Detention Basin

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
Type I 24-hr 1" Rainfall=1.00"

Area (sf)	CN	Description
174,730	98	Paved roads w/curbs & sewers, HSG D
43,082	84	50-75% Grass cover, Fair, HSG D
217,812	95	Weighted Average
43,082	84	19.78% Pervious Area
174,730	98	80.22% Impervious Area

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

Summary for Subcatchment P3a: Post Devel Area P3a

Runoff = 0.00 cfs @ 10.13 hrs, Volume= 59 cf, Depth= 0.15"
Routed to Pond 7P : Total Site Runoff

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
Type I 24-hr 1" Rainfall=1.00"

Area (sf)	CN	Description
4,695	84	50-75% Grass cover, Fair, HSG D
4,695	84	100.00% Pervious Area

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

Summary for Subcatchment P3b: Post Devel Area P3b

Runoff = 0.02 cfs @ 10.05 hrs, Volume= 190 cf, Depth= 0.28"
Routed to Pond 7P : Total Site Runoff

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
Type I 24-hr 1" Rainfall=1.00"

Area (sf)	CN	Description
7,990	89	<50% Grass cover, Poor, HSG D
7,990	89	100.00% Pervious Area

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

Summary for Subcatchment P3c: Post Devel Area P3c

Runoff = 0.00 cfs @ 10.13 hrs, Volume= 87 cf, Depth= 0.15"
Routed to Pond 7P : Total Site Runoff

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
Type I 24-hr 1" Rainfall=1.00"

Area (sf)	CN	Description
6,899	84	50-75% Grass cover, Fair, HSG D
6,899	84	100.00% Pervious Area

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

Summary for Pond 4P: Detention Basin

Inflow Area = 217,812 sf, 80.22% Impervious, Inflow Depth = 0.66" for 1" event
Inflow = 1.72 cfs @ 10.02 hrs, Volume= 12,061 cf
Outflow = 0.81 cfs @ 10.38 hrs, Volume= 12,061 cf, Atten= 53%, Lag= 21.4 min
Primary = 0.81 cfs @ 10.38 hrs, Volume= 12,061 cf
Routed to Pond 7P : Total Site Runoff
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
Peak Elev= 10.56' @ 10.38 hrs Surf.Area= 8,929 sf Storage= 2,671 cf

Plug-Flow detention time= 90.0 min calculated for 12,045 cf (100% of inflow)
Center-of-Mass det. time= 90.8 min (852.9 - 762.1)

Volume	Invert	Avail.Storage	Storage Description
#1	10.25'	64,075 cf	**Custom Stage Data (Conic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
10.25	8,304	0	0	8,304
11.00	9,855	6,801	6,801	9,876
12.00	12,007	10,913	17,715	12,059
13.00	14,259	13,117	30,832	14,347
14.00	16,611	15,420	46,252	16,740
15.00	19,064	17,823	64,075	19,238

Device	Routing	Invert	Outlet Devices
#1	Primary	7.60'	**18.0" Round Culvert** L= 412.0' RCP, rounded edge headwall, Ke= 0.100 Inlet / Outlet Invert= 7.60' / 5.50' S= 0.0051 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Device 1	10.25'	**16.0" W x 8.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	10.50'	**16.0" W x 6.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 1	11.75'	**20.0" x 20.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Secondary	13.75'	**10.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=0.80 cfs @ 10.38 hrs HW=10.56' (Free Discharge)
└**1=Culvert** (Passes 0.80 cfs of 9.11 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 0.74 cfs @ 1.79 fps)
  ├**3=Orifice/Grate** (Orifice Controls 0.06 cfs @ 0.78 fps)
  └**4=Orifice/Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=10.25' (Free Discharge)
└**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 7P: Total Site Runoff

Inflow Area = 251,951 sf, 73.25% Impervious, Inflow Depth = 0.62" for 1" event
Inflow = 0.88 cfs @ 10.34 hrs, Volume= 13,105 cf
Primary = 0.88 cfs @ 10.34 hrs, Volume= 13,105 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs

Summary for Subcatchment 3S: Pre Project Devel Area

Runoff = 11.16 cfs @ 9.91 hrs, Volume= 49,764 cf, Depth= 2.37"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
Type I 24-hr 85% Rainfall=2.60"

Area (sf)	CN	Description
251,951	98	Paved parking, HSG D
251,951	98	100.00% Impervious Area

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

Summary for Subcatchment P1: Post Devel Area P1

Runoff = 0.34 cfs @ 10.02 hrs, Volume= 2,410 cf, Depth= 1.99"
Routed to Pond 7P : Total Site Runoff

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
Type I 24-hr 85% Rainfall=2.60"

Area (sf)	CN	Description
9,813	98	Paved roads w/curbs & sewers, HSG D
4,742	84	50-75% Grass cover, Fair, HSG D
14,555	93	Weighted Average
4,742	84	32.58% Pervious Area
9,813	98	67.42% Impervious Area

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

Summary for Subcatchment P2: Post Devel Area P2

Runoff = 5.49 cfs @ 10.02 hrs, Volume= 38,799 cf, Depth= 2.14"
Routed to Pond 4P : Detention Basin

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
Type I 24-hr 85% Rainfall=2.60"

Area (sf)	CN	Description
174,730	98	Paved roads w/curbs & sewers, HSG D
43,082	84	50-75% Grass cover, Fair, HSG D
217,812	95	Weighted Average
43,082	84	19.78% Pervious Area
174,730	98	80.22% Impervious Area

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

Summary for Subcatchment P3a: Post Devel Area P3a

Runoff = 0.06 cfs @ 10.03 hrs, Volume= 467 cf, Depth= 1.19"
Routed to Pond 7P : Total Site Runoff

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
Type I 24-hr 85% Rainfall=2.60"

Area (sf)	CN	Description
4,695	84	50-75% Grass cover, Fair, HSG D
4,695	84	100.00% Pervious Area

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

Summary for Subcatchment P3b: Post Devel Area P3b

Runoff = 0.15 cfs @ 10.03 hrs, Volume= 1,027 cf, Depth= 1.54"
Routed to Pond 7P : Total Site Runoff

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
Type I 24-hr 85% Rainfall=2.60"

Area (sf)	CN	Description
7,990	89	<50% Grass cover, Poor, HSG D
7,990	89	100.00% Pervious Area

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

Summary for Subcatchment P3c: Post Devel Area P3c

Runoff = 0.09 cfs @ 10.03 hrs, Volume= 686 cf, Depth= 1.19"
Routed to Pond 7P : Total Site Runoff

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
Type I 24-hr 85% Rainfall=2.60"

Area (sf)	CN	Description
6,899	84	50-75% Grass cover, Fair, HSG D
6,899	84	100.00% Pervious Area

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

Summary for Pond 4P: Detention Basin

Inflow Area = 217,812 sf, 80.22% Impervious, Inflow Depth = 2.14" for 85% event
Inflow = 5.49 cfs @ 10.02 hrs, Volume= 38,799 cf
Outflow = 3.58 cfs @ 10.23 hrs, Volume= 38,799 cf, Atten= 35%, Lag= 12.7 min
Primary = 3.58 cfs @ 10.23 hrs, Volume= 38,799 cf
Routed to Pond 7P : Total Site Runoff
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
Peak Elev= 10.93' @ 10.23 hrs Surf.Area= 9,700 sf Storage= 6,096 cf

Plug-Flow detention time= 60.5 min calculated for 38,745 cf (100% of inflow)
Center-of-Mass det. time= 61.2 min (792.1 - 730.9)

Volume	Invert	Avail.Storage	Storage Description
#1	10.25'	64,075 cf	**Custom Stage Data (Conic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
10.25	8,304	0	0	8,304
11.00	9,855	6,801	6,801	9,876
12.00	12,007	10,913	17,715	12,059
13.00	14,259	13,117	30,832	14,347
14.00	16,611	15,420	46,252	16,740
15.00	19,064	17,823	64,075	19,238

Device	Routing	Invert	Outlet Devices
#1	Primary	7.60'	**18.0" Round Culvert** L= 412.0' RCP, rounded edge headwall, Ke= 0.100 Inlet / Outlet Invert= 7.60' / 5.50' S= 0.0051 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Device 1	10.25'	**16.0" W x 8.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	10.50'	**16.0" W x 6.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 1	11.75'	**20.0" x 20.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Secondary	13.75'	**10.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=3.54 cfs @ 10.23 hrs HW=10.92' (Free Discharge)
└**1=Culvert** (Passes 3.54 cfs of 9.56 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 2.36 cfs @ 2.66 fps)
  ├**3=Orifice/Grate** (Orifice Controls 1.18 cfs @ 2.09 fps)
  └**4=Orifice/Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=10.25' (Free Discharge)
└**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 7P: Total Site Runoff

Inflow Area = 251,951 sf, 73.25% Impervious, Inflow Depth = 2.07" for 85% event
Inflow = 4.01 cfs @ 10.20 hrs, Volume= 43,389 cf
Primary = 4.01 cfs @ 10.20 hrs, Volume= 43,389 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs

Summary for Subcatchment 3S: Pre Project Devel Area

Runoff = 13.84 cfs @ 9.91 hrs, Volume= 62,305 cf, Depth= 2.97"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
Type I 24-hr SC-002yr Rainfall=3.20"

Area (sf)	CN	Description
251,951	98	Paved parking, HSG D
251,951	98	100.00% Impervious Area

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

Summary for Subcatchment P1: Post Devel Area P1

Runoff = 0.44 cfs @ 10.02 hrs, Volume= 3,091 cf, Depth= 2.55"
Routed to Pond 7P : Total Site Runoff

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
Type I 24-hr SC-002yr Rainfall=3.20"

Area (sf)	CN	Description
9,813	98	Paved roads w/curbs & sewers, HSG D
4,742	84	50-75% Grass cover, Fair, HSG D
14,555	93	Weighted Average
4,742	84	32.58% Pervious Area
9,813	98	67.42% Impervious Area

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

Summary for Subcatchment P2: Post Devel Area P2

Runoff = 6.95 cfs @ 10.02 hrs, Volume= 49,249 cf, Depth= 2.71"
Routed to Pond 4P : Detention Basin

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
Type I 24-hr SC-002yr Rainfall=3.20"

Area (sf)	CN	Description
174,730	98	Paved roads w/curbs & sewers, HSG D
43,082	84	50-75% Grass cover, Fair, HSG D
217,812	95	Weighted Average
43,082	84	19.78% Pervious Area
174,730	98	80.22% Impervious Area

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

Summary for Subcatchment P3a: Post Devel Area P3a

Runoff = 0.09 cfs @ 10.03 hrs, Volume= 658 cf, Depth= 1.68"
Routed to Pond 7P : Total Site Runoff

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
Type I 24-hr SC-002yr Rainfall=3.20"

Area (sf)	CN	Description
4,695	84	50-75% Grass cover, Fair, HSG D
4,695	84	100.00% Pervious Area

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

Summary for Subcatchment P3b: Post Devel Area P3b

Runoff = 0.20 cfs @ 10.02 hrs, Volume= 1,386 cf, Depth= 2.08"
Routed to Pond 7P : Total Site Runoff

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
Type I 24-hr SC-002yr Rainfall=3.20"

Area (sf)	CN	Description
7,990	89	<50% Grass cover, Poor, HSG D
7,990	89	100.00% Pervious Area

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

Summary for Subcatchment P3c: Post Devel Area P3c

Runoff = 0.14 cfs @ 10.03 hrs, Volume= 967 cf, Depth= 1.68"
Routed to Pond 7P : Total Site Runoff

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
Type I 24-hr SC-002yr Rainfall=3.20"

Area (sf)	CN	Description
6,899	84	50-75% Grass cover, Fair, HSG D
6,899	84	100.00% Pervious Area

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

Summary for Pond 4P: Detention Basin

Inflow Area = 217,812 sf, 80.22% Impervious, Inflow Depth = 2.71" for SC-002yr event
Inflow = 6.95 cfs @ 10.02 hrs, Volume= 49,249 cf
Outflow = 4.52 cfs @ 10.23 hrs, Volume= 49,249 cf, Atten= 35%, Lag= 12.6 min
Primary = 4.52 cfs @ 10.23 hrs, Volume= 49,249 cf
Routed to Pond 7P : Total Site Runoff
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
Peak Elev= 11.05' @ 10.23 hrs Surf.Area= 9,948 sf Storage= 7,251 cf

Plug-Flow detention time= 55.6 min calculated for 49,181 cf (100% of inflow)
Center-of-Mass det. time= 56.2 min (781.8 - 725.5)

Volume	Invert	Avail.Storage	Storage Description
#1	10.25'	64,075 cf	**Custom Stage Data (Conic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
10.25	8,304	0	0	8,304
11.00	9,855	6,801	6,801	9,876
12.00	12,007	10,913	17,715	12,059
13.00	14,259	13,117	30,832	14,347
14.00	16,611	15,420	46,252	16,740
15.00	19,064	17,823	64,075	19,238

Device	Routing	Invert	Outlet Devices
#1	Primary	7.60'	**18.0" Round Culvert** L= 412.0' RCP, rounded edge headwall, Ke= 0.100 Inlet / Outlet Invert= 7.60' / 5.50' S= 0.0051 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Device 1	10.25'	**16.0" W x 8.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	10.50'	**16.0" W x 6.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 1	11.75'	**20.0" x 20.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Secondary	13.75'	**10.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=4.49 cfs @ 10.23 hrs HW=11.04' (Free Discharge)
└**1=Culvert** (Passes 4.49 cfs of 9.70 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 2.82 cfs @ 3.17 fps)
  ├**3=Orifice/Grate** (Orifice Controls 1.67 cfs @ 2.50 fps)
  └**4=Orifice/Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=10.25' (Free Discharge)
└**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 7P: Total Site Runoff

Inflow Area = 251,951 sf, 73.25% Impervious, Inflow Depth = 2.64" for SC-002yr event
Inflow = 5.11 cfs @ 10.18 hrs, Volume= 55,352 cf
Primary = 5.11 cfs @ 10.18 hrs, Volume= 55,352 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs

Summary for Subcatchment 3S: Pre Project Devel Area

Runoff = 20.12 cfs @ 9.91 hrs, Volume= 91,833 cf, Depth= 4.37"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
Type I 24-hr SC-005yr Rainfall=4.61"

Area (sf)	CN	Description
251,951	98	Paved parking, HSG D
251,951	98	100.00% Impervious Area

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

Summary for Subcatchment P1: Post Devel Area P1

Runoff = 0.67 cfs @ 10.02 hrs, Volume= 4,729 cf, Depth= 3.90"
Routed to Pond 7P : Total Site Runoff

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
Type I 24-hr SC-005yr Rainfall=4.61"

Area (sf)	CN	Description
9,813	98	Paved roads w/curbs & sewers, HSG D
4,742	84	50-75% Grass cover, Fair, HSG D
14,555	93	Weighted Average
4,742	84	32.58% Pervious Area
9,813	98	67.42% Impervious Area

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

Summary for Subcatchment P2: Post Devel Area P2

Runoff = 10.40 cfs @ 10.02 hrs, Volume= 74,155 cf, Depth= 4.09"
Routed to Pond 4P : Detention Basin

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
Type I 24-hr SC-005yr Rainfall=4.61"

Area (sf)	CN	Description
174,730	98	Paved roads w/curbs & sewers, HSG D
43,082	84	50-75% Grass cover, Fair, HSG D
217,812	95	Weighted Average
43,082	84	19.78% Pervious Area
174,730	98	80.22% Impervious Area

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

Summary for Subcatchment P3a: Post Devel Area P3a

Runoff = 0.17 cfs @ 10.03 hrs, Volume= 1,141 cf, Depth= 2.92"
Routed to Pond 7P : Total Site Runoff

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
Type I 24-hr SC-005yr Rainfall=4.61"

Area (sf)	CN	Description
4,695	84	50-75% Grass cover, Fair, HSG D
4,695	84	100.00% Pervious Area

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

Summary for Subcatchment P3b: Post Devel Area P3b

Runoff = 0.34 cfs @ 10.02 hrs, Volume= 2,264 cf, Depth= 3.40"
Routed to Pond 7P : Total Site Runoff

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
Type I 24-hr SC-005yr Rainfall=4.61"

Area (sf)	CN	Description
7,990	89	<50% Grass cover, Poor, HSG D
7,990	89	100.00% Pervious Area

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

Summary for Subcatchment P3c: Post Devel Area P3c

Runoff = 0.25 cfs @ 10.03 hrs, Volume= 1,676 cf, Depth= 2.92"
Routed to Pond 7P : Total Site Runoff

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
Type I 24-hr SC-005yr Rainfall=4.61"

Area (sf)	CN	Description
6,899	84	50-75% Grass cover, Fair, HSG D
6,899	84	100.00% Pervious Area

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

Summary for Pond 4P: Detention Basin

Inflow Area = 217,812 sf, 80.22% Impervious, Inflow Depth = 4.09" for SC-005yr event
Inflow = 10.40 cfs @ 10.02 hrs, Volume= 74,155 cf
Outflow = 6.18 cfs @ 10.26 hrs, Volume= 74,155 cf, Atten= 41%, Lag= 14.3 min
Primary = 6.18 cfs @ 10.26 hrs, Volume= 74,155 cf
Routed to Pond 7P : Total Site Runoff
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
Peak Elev= 11.35' @ 10.26 hrs Surf.Area= 10,582 sf Storage= 10,365 cf

Plug-Flow detention time= 50.4 min calculated for 74,155 cf (100% of inflow)
Center-of-Mass det. time= 49.0 min (766.0 - 717.0)

Volume	Invert	Avail.Storage	Storage Description
#1	10.25'	64,075 cf	**Custom Stage Data (Conic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
10.25	8,304	0	0	8,304
11.00	9,855	6,801	6,801	9,876
12.00	12,007	10,913	17,715	12,059
13.00	14,259	13,117	30,832	14,347
14.00	16,611	15,420	46,252	16,740
15.00	19,064	17,823	64,075	19,238

Device	Routing	Invert	Outlet Devices
#1	Primary	7.60'	**18.0" Round Culvert** L= 412.0' RCP, rounded edge headwall, Ke= 0.100 Inlet / Outlet Invert= 7.60' / 5.50' S= 0.0051 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Device 1	10.25'	**16.0" W x 8.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	10.50'	**16.0" W x 6.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 1	11.75'	**20.0" x 20.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Secondary	13.75'	**10.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=6.16 cfs @ 10.26 hrs HW=11.34' (Free Discharge)
└**1=Culvert** (Passes 6.16 cfs of 10.06 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 3.70 cfs @ 4.16 fps)
  ├**3=Orifice/Grate** (Orifice Controls 2.45 cfs @ 3.68 fps)
  └**4=Orifice/Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=10.25' (Free Discharge)
└**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 7P: Total Site Runoff

Inflow Area = 251,951 sf, 73.25% Impervious, Inflow Depth = 4.00" for SC-005yr event
Inflow = 7.12 cfs @ 10.17 hrs, Volume= 83,964 cf
Primary = 7.12 cfs @ 10.17 hrs, Volume= 83,964 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs

Summary for Subcatchment 3S: Pre Project Devel Area

Runoff = 24.28 cfs @ 9.91 hrs, Volume= 111,539 cf, Depth= 5.31"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
Type I 24-hr SC-010yr Rainfall=5.55"

Area (sf)	CN	Description
251,951	98	Paved parking, HSG D
251,951	98	100.00% Impervious Area

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

Summary for Subcatchment P1: Post Devel Area P1

Runoff = 0.82 cfs @ 10.02 hrs, Volume= 5,837 cf, Depth= 4.81"
Routed to Pond 7P : Total Site Runoff

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
Type I 24-hr SC-010yr Rainfall=5.55"

Area (sf)	CN	Description
9,813	98	Paved roads w/curbs & sewers, HSG D
4,742	84	50-75% Grass cover, Fair, HSG D
14,555	93	Weighted Average
4,742	84	32.58% Pervious Area
9,813	98	67.42% Impervious Area

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

Summary for Subcatchment P2: Post Devel Area P2

Runoff = 12.70 cfs @ 10.02 hrs, Volume= 90,914 cf, Depth= 5.01"
Routed to Pond 4P : Detention Basin

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
Type I 24-hr SC-010yr Rainfall=5.55"

Area (sf)	CN	Description
174,730	98	Paved roads w/curbs & sewers, HSG D
43,082	84	50-75% Grass cover, Fair, HSG D
217,812	95	Weighted Average
43,082	84	19.78% Pervious Area
174,730	98	80.22% Impervious Area

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

Summary for Subcatchment P3a: Post Devel Area P3a

Runoff = 0.22 cfs @ 10.02 hrs, Volume= 1,478 cf, Depth= 3.78"
Routed to Pond 7P : Total Site Runoff

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
Type I 24-hr SC-010yr Rainfall=5.55"

Area (sf)	CN	Description
4,695	84	50-75% Grass cover, Fair, HSG D
4,695	84	100.00% Pervious Area

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

Summary for Subcatchment P3b: Post Devel Area P3b

Runoff = 0.42 cfs @ 10.02 hrs, Volume= 2,863 cf, Depth= 4.30"
Routed to Pond 7P : Total Site Runoff

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
Type I 24-hr SC-010yr Rainfall=5.55"

Area (sf)	CN	Description
7,990	89	<50% Grass cover, Poor, HSG D
7,990	89	100.00% Pervious Area

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

Summary for Subcatchment P3c: Post Devel Area P3c

Runoff = 0.32 cfs @ 10.02 hrs, Volume= 2,172 cf, Depth= 3.78"
Routed to Pond 7P : Total Site Runoff

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
Type I 24-hr SC-010yr Rainfall=5.55"

Area (sf)	CN	Description
6,899	84	50-75% Grass cover, Fair, HSG D
6,899	84	100.00% Pervious Area

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

Summary for Pond 4P: Detention Basin

Inflow Area = 217,812 sf, 80.22% Impervious, Inflow Depth = 5.01" for SC-010yr event
Inflow = 12.70 cfs @ 10.02 hrs, Volume= 90,914 cf
Outflow = 7.12 cfs @ 10.28 hrs, Volume= 90,914 cf, Atten= 44%, Lag= 15.9 min
Primary = 7.12 cfs @ 10.28 hrs, Volume= 90,914 cf
Routed to Pond 7P : Total Site Runoff
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
Peak Elev= 11.57' @ 10.28 hrs Surf.Area= 11,053 sf Storage= 12,745 cf

Plug-Flow detention time= 45.4 min calculated for 90,787 cf (100% of inflow)
Center-of-Mass det. time= 46.0 min (759.1 - 713.1)

Volume	Invert	Avail.Storage	Storage Description
#1	10.25'	64,075 cf	**Custom Stage Data (Conic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
10.25	8,304	0	0	8,304
11.00	9,855	6,801	6,801	9,876
12.00	12,007	10,913	17,715	12,059
13.00	14,259	13,117	30,832	14,347
14.00	16,611	15,420	46,252	16,740
15.00	19,064	17,823	64,075	19,238

Device	Routing	Invert	Outlet Devices
#1	Primary	7.60'	**18.0" Round Culvert** L= 412.0' RCP, rounded edge headwall, Ke= 0.100 Inlet / Outlet Invert= 7.60' / 5.50' S= 0.0051 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Device 1	10.25'	**16.0" W x 8.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	10.50'	**16.0" W x 6.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 1	11.75'	**20.0" x 20.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Secondary	13.75'	**10.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=7.11 cfs @ 10.28 hrs HW=11.57' (Free Discharge)
└**1=Culvert** (Passes 7.11 cfs of 10.31 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 4.22 cfs @ 4.75 fps)
  ├**3=Orifice/Grate** (Orifice Controls 2.89 cfs @ 4.33 fps)
  └**4=Orifice/Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=10.25' (Free Discharge)
└**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 7P: Total Site Runoff

Inflow Area = 251,951 sf, 73.25% Impervious, Inflow Depth = 4.92" for SC-010yr event
Inflow = 8.27 cfs @ 10.17 hrs, Volume= 103,263 cf
Primary = 8.27 cfs @ 10.17 hrs, Volume= 103,263 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs

Summary for Subcatchment 3S: Pre Project Devel Area

Runoff = 29.42 cfs @ 9.91 hrs, Volume= 135,868 cf, Depth= 6.47"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
Type I 24-hr SC-025yr Rainfall=6.71"

Area (sf)	CN	Description
251,951	98	Paved parking, HSG D
251,951	98	100.00% Impervious Area

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

Summary for Subcatchment P1: Post Devel Area P1

Runoff = 1.01 cfs @ 10.02 hrs, Volume= 7,214 cf, Depth= 5.95"
Routed to Pond 7P : Total Site Runoff

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
Type I 24-hr SC-025yr Rainfall=6.71"

Area (sf)	CN	Description
9,813	98	Paved roads w/curbs & sewers, HSG D
4,742	84	50-75% Grass cover, Fair, HSG D
14,555	93	Weighted Average
4,742	84	32.58% Pervious Area
9,813	98	67.42% Impervious Area

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

Summary for Subcatchment P2: Post Devel Area P2

Runoff = 15.55 cfs @ 10.02 hrs, Volume= 111,691 cf, Depth= 6.15"
Routed to Pond 4P : Detention Basin

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
Type I 24-hr SC-025yr Rainfall=6.71"

Area (sf)	CN	Description
174,730	98	Paved roads w/curbs & sewers, HSG D
43,082	84	50-75% Grass cover, Fair, HSG D
217,812	95	Weighted Average
43,082	84	19.78% Pervious Area
174,730	98	80.22% Impervious Area

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

Summary for Subcatchment P3a: Post Devel Area P3a

Runoff = 0.28 cfs @ 10.02 hrs, Volume= 1,903 cf, Depth= 4.86"
Routed to Pond 7P : Total Site Runoff

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
Type I 24-hr SC-025yr Rainfall=6.71"

Area (sf)	CN	Description
4,695	84	50-75% Grass cover, Fair, HSG D
4,695	84	100.00% Pervious Area

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

Summary for Subcatchment P3b: Post Devel Area P3b

Runoff = 0.53 cfs @ 10.02 hrs, Volume= 3,612 cf, Depth= 5.43"
Routed to Pond 7P : Total Site Runoff

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
Type I 24-hr SC-025yr Rainfall=6.71"

Area (sf)	CN	Description
7,990	89	<50% Grass cover, Poor, HSG D
7,990	89	100.00% Pervious Area

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

Summary for Subcatchment P3c: Post Devel Area P3c

Runoff = 0.41 cfs @ 10.02 hrs, Volume= 2,797 cf, Depth= 4.86"
Routed to Pond 7P : Total Site Runoff

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
Type I 24-hr SC-025yr Rainfall=6.71"

Area (sf)	CN	Description
6,899	84	50-75% Grass cover, Fair, HSG D
6,899	84	100.00% Pervious Area

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

Summary for Pond 4P: Detention Basin

Inflow Area = 217,812 sf, 80.22% Impervious, Inflow Depth = 6.15" for SC-025yr event
Inflow = 15.55 cfs @ 10.02 hrs, Volume= 111,691 cf
Outflow = 8.64 cfs @ 10.29 hrs, Volume= 111,691 cf, Atten= 44%, Lag= 16.6 min
Primary = 8.64 cfs @ 10.29 hrs, Volume= 111,691 cf
Routed to Pond 7P : Total Site Runoff
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
Peak Elev= 11.83' @ 10.29 hrs Surf.Area= 11,633 sf Storage= 15,744 cf

Plug-Flow detention time= 44.6 min calculated for 111,691 cf (100% of inflow)
Center-of-Mass det. time= 43.2 min (752.6 - 709.4)

Volume	Invert	Avail.Storage	Storage Description
#1	10.25'	64,075 cf	**Custom Stage Data (Conic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
10.25	8,304	0	0	8,304
11.00	9,855	6,801	6,801	9,876
12.00	12,007	10,913	17,715	12,059
13.00	14,259	13,117	30,832	14,347
14.00	16,611	15,420	46,252	16,740
15.00	19,064	17,823	64,075	19,238

Device	Routing	Invert	Outlet Devices
#1	Primary	7.60'	**18.0" Round Culvert** L= 412.0' RCP, rounded edge headwall, Ke= 0.100 Inlet / Outlet Invert= 7.60' / 5.50' S= 0.0051 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Device 1	10.25'	**16.0" W x 8.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	10.50'	**16.0" W x 6.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 1	11.75'	**20.0" x 20.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Secondary	13.75'	**10.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=8.60 cfs @ 10.29 hrs HW=11.83' (Free Discharge)
└─**1=Culvert** (Passes 8.60 cfs of 10.61 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 4.77 cfs @ 5.36 fps)
  ├─**3=Orifice/Grate** (Orifice Controls 3.33 cfs @ 5.00 fps)
  └─**4=Orifice/Grate** (Weir Controls 0.51 cfs @ 0.93 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=10.25' (Free Discharge)
└─**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 7P: Total Site Runoff

Inflow Area = 251,951 sf, 73.25% Impervious, Inflow Depth = 6.06" for SC-025yr event
Inflow = 9.88 cfs @ 10.24 hrs, Volume= 127,218 cf
Primary = 9.88 cfs @ 10.24 hrs, Volume= 127,218 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs

Summary for Subcatchment 3S: Pre Project Devel Area

Runoff = 33.18 cfs @ 9.91 hrs, Volume= 153,700 cf, Depth= 7.32"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
Type I 24-hr SC-050yr Rainfall=7.56"

Area (sf)	CN	Description
251,951	98	Paved parking, HSG D
251,951	98	100.00% Impervious Area

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

Summary for Subcatchment P1: Post Devel Area P1

Runoff = 1.15 cfs @ 10.02 hrs, Volume= 8,228 cf, Depth= 6.78"
Routed to Pond 7P : Total Site Runoff

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
Type I 24-hr SC-050yr Rainfall=7.56"

Area (sf)	CN	Description
9,813	98	Paved roads w/curbs & sewers, HSG D
4,742	84	50-75% Grass cover, Fair, HSG D
14,555	93	Weighted Average
4,742	84	32.58% Pervious Area
9,813	98	67.42% Impervious Area

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

Summary for Subcatchment P2: Post Devel Area P2

Runoff = 17.64 cfs @ 10.02 hrs, Volume= 126,962 cf, Depth= 6.99"
Routed to Pond 4P : Detention Basin

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
Type I 24-hr SC-050yr Rainfall=7.56"

Area (sf)	CN	Description
174,730	98	Paved roads w/curbs & sewers, HSG D
43,082	84	50-75% Grass cover, Fair, HSG D
217,812	95	Weighted Average
43,082	84	19.78% Pervious Area
174,730	98	80.22% Impervious Area

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

Summary for Subcatchment P3a: Post Devel Area P3a

Runoff = 0.33 cfs @ 10.02 hrs, Volume= 2,220 cf, Depth= 5.67"
Routed to Pond 7P : Total Site Runoff

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
Type I 24-hr SC-050yr Rainfall=7.56"

Area (sf)	CN	Description
4,695	84	50-75% Grass cover, Fair, HSG D
4,695	84	100.00% Pervious Area

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

Summary for Subcatchment P3b: Post Devel Area P3b

Runoff = 0.61 cfs @ 10.02 hrs, Volume= 4,165 cf, Depth= 6.26"
Routed to Pond 7P : Total Site Runoff

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
Type I 24-hr SC-050yr Rainfall=7.56"

Area (sf)	CN	Description
7,990	89	<50% Grass cover, Poor, HSG D
7,990	89	100.00% Pervious Area

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

Summary for Subcatchment P3c: Post Devel Area P3c

Runoff = 0.48 cfs @ 10.02 hrs, Volume= 3,262 cf, Depth= 5.67"
Routed to Pond 7P : Total Site Runoff

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
Type I 24-hr SC-050yr Rainfall=7.56"

Area (sf)	CN	Description
6,899	84	50-75% Grass cover, Fair, HSG D
6,899	84	100.00% Pervious Area

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

Summary for Pond 4P: Detention Basin

Inflow Area = 217,812 sf, 80.22% Impervious, Inflow Depth = 6.99" for SC-050yr event
Inflow = 17.64 cfs @ 10.02 hrs, Volume= 126,962 cf
Outflow = 10.86 cfs @ 10.25 hrs, Volume= 126,962 cf, Atten= 38%, Lag= 13.8 min
Primary = 10.86 cfs @ 10.25 hrs, Volume= 126,962 cf
Routed to Pond 7P : Total Site Runoff
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
Peak Elev= 11.97' @ 10.25 hrs Surf.Area= 11,949 sf Storage= 17,409 cf

Plug-Flow detention time= 40.6 min calculated for 126,786 cf (100% of inflow)
Center-of-Mass det. time= 41.2 min (748.5 - 707.3)

Volume	Invert	Avail.Storage	Storage Description
#1	10.25'	64,075 cf	**Custom Stage Data (Conic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
10.25	8,304	0	0	8,304
11.00	9,855	6,801	6,801	9,876
12.00	12,007	10,913	17,715	12,059
13.00	14,259	13,117	30,832	14,347
14.00	16,611	15,420	46,252	16,740
15.00	19,064	17,823	64,075	19,238

Device	Routing	Invert	Outlet Devices
#1	Primary	7.60'	**18.0" Round Culvert** L= 412.0' RCP, rounded edge headwall, Ke= 0.100 Inlet / Outlet Invert= 7.60' / 5.50' S= 0.0051 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Device 1	10.25'	**16.0" W x 8.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	10.50'	**16.0" W x 6.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 1	11.75'	**20.0" x 20.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Secondary	13.75'	**10.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=10.61 cfs @ 10.25 hrs HW=11.96' (Free Discharge)
└─**1=Culvert** (Passes 10.61 cfs of 10.75 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 5.01 cfs @ 5.63 fps)
  ├─**3=Orifice/Grate** (Orifice Controls 3.52 cfs @ 5.28 fps)
  └─**4=Orifice/Grate** (Weir Controls 2.08 cfs @ 1.49 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=10.25' (Free Discharge)
└─**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 7P: Total Site Runoff

Inflow Area = 251,951 sf, 73.25% Impervious, Inflow Depth = 6.90" for SC-050yr event
Inflow = 12.43 cfs @ 10.23 hrs, Volume= 144,837 cf
Primary = 12.43 cfs @ 10.23 hrs, Volume= 144,837 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs

Summary for Subcatchment 3S: Pre Project Devel Area

Runoff = 36.80 cfs @ 9.91 hrs, Volume= 170,906 cf, Depth= 8.14"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
Type I 24-hr SC-100yr Rainfall=8.38"

Area (sf)	CN	Description
251,951	98	Paved parking, HSG D
251,951	98	100.00% Impervious Area

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

Summary for Subcatchment P1: Post Devel Area P1

Runoff = 1.29 cfs @ 10.02 hrs, Volume= 9,209 cf, Depth= 7.59"
Routed to Pond 7P : Total Site Runoff

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
Type I 24-hr SC-100yr Rainfall=8.38"

Area (sf)	CN	Description
9,813	98	Paved roads w/curbs & sewers, HSG D
4,742	84	50-75% Grass cover, Fair, HSG D
14,555	93	Weighted Average
4,742	84	32.58% Pervious Area
9,813	98	67.42% Impervious Area

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

Summary for Subcatchment P2: Post Devel Area P2

Runoff = 19.65 cfs @ 10.02 hrs, Volume= 141,720 cf, Depth= 7.81"
Routed to Pond 4P : Detention Basin

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
Type I 24-hr SC-100yr Rainfall=8.38"

Area (sf)	CN	Description
174,730	98	Paved roads w/curbs & sewers, HSG D
43,082	84	50-75% Grass cover, Fair, HSG D
217,812	95	Weighted Average
43,082	84	19.78% Pervious Area
174,730	98	80.22% Impervious Area

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

Summary for Subcatchment P3a: Post Devel Area P3a

Runoff = 0.37 cfs @ 10.02 hrs, Volume= 2,528 cf, Depth= 6.46"
Routed to Pond 7P : Total Site Runoff

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
Type I 24-hr SC-100yr Rainfall=8.38"

Area (sf)	CN	Description
4,695	84	50-75% Grass cover, Fair, HSG D
4,695	84	100.00% Pervious Area

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

Summary for Subcatchment P3b: Post Devel Area P3b

Runoff = 0.69 cfs @ 10.02 hrs, Volume= 4,701 cf, Depth= 7.06"
Routed to Pond 7P : Total Site Runoff

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
Type I 24-hr SC-100yr Rainfall=8.38"

Area (sf)	CN	Description
7,990	89	<50% Grass cover, Poor, HSG D
7,990	89	100.00% Pervious Area

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

Summary for Subcatchment P3c: Post Devel Area P3c

Runoff = 0.55 cfs @ 10.02 hrs, Volume= 3,714 cf, Depth= 6.46"
Routed to Pond 7P : Total Site Runoff

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
Type I 24-hr SC-100yr Rainfall=8.38"

Area (sf)	CN	Description
6,899	84	50-75% Grass cover, Fair, HSG D
6,899	84	100.00% Pervious Area

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

Summary for Pond 4P: Detention Basin

Inflow Area = 217,812 sf, 80.22% Impervious, Inflow Depth = 7.81" for SC-100yr event
Inflow = 19.65 cfs @ 10.02 hrs, Volume= 141,720 cf
Outflow = 10.93 cfs @ 10.28 hrs, Volume= 141,720 cf, Atten= 44%, Lag= 15.9 min
Primary = 10.93 cfs @ 10.28 hrs, Volume= 141,720 cf
Routed to Pond 7P : Total Site Runoff
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs
Peak Elev= 12.13' @ 10.28 hrs Surf.Area= 12,291 sf Storage= 19,308 cf

Plug-Flow detention time= 39.2 min calculated for 141,523 cf (100% of inflow)
Center-of-Mass det. time= 39.7 min (745.3 - 705.5)

Volume	Invert	Avail.Storage	Storage Description
#1	10.25'	64,075 cf	**Custom Stage Data (Conic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
10.25	8,304	0	0	8,304
11.00	9,855	6,801	6,801	9,876
12.00	12,007	10,913	17,715	12,059
13.00	14,259	13,117	30,832	14,347
14.00	16,611	15,420	46,252	16,740
15.00	19,064	17,823	64,075	19,238

Device	Routing	Invert	Outlet Devices
#1	Primary	7.60'	**18.0" Round Culvert** L= 412.0' RCP, rounded edge headwall, Ke= 0.100 Inlet / Outlet Invert= 7.60' / 5.50' S= 0.0051 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Device 1	10.25'	**16.0" W x 8.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	10.50'	**16.0" W x 6.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 1	11.75'	**20.0" x 20.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Secondary	13.75'	**10.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

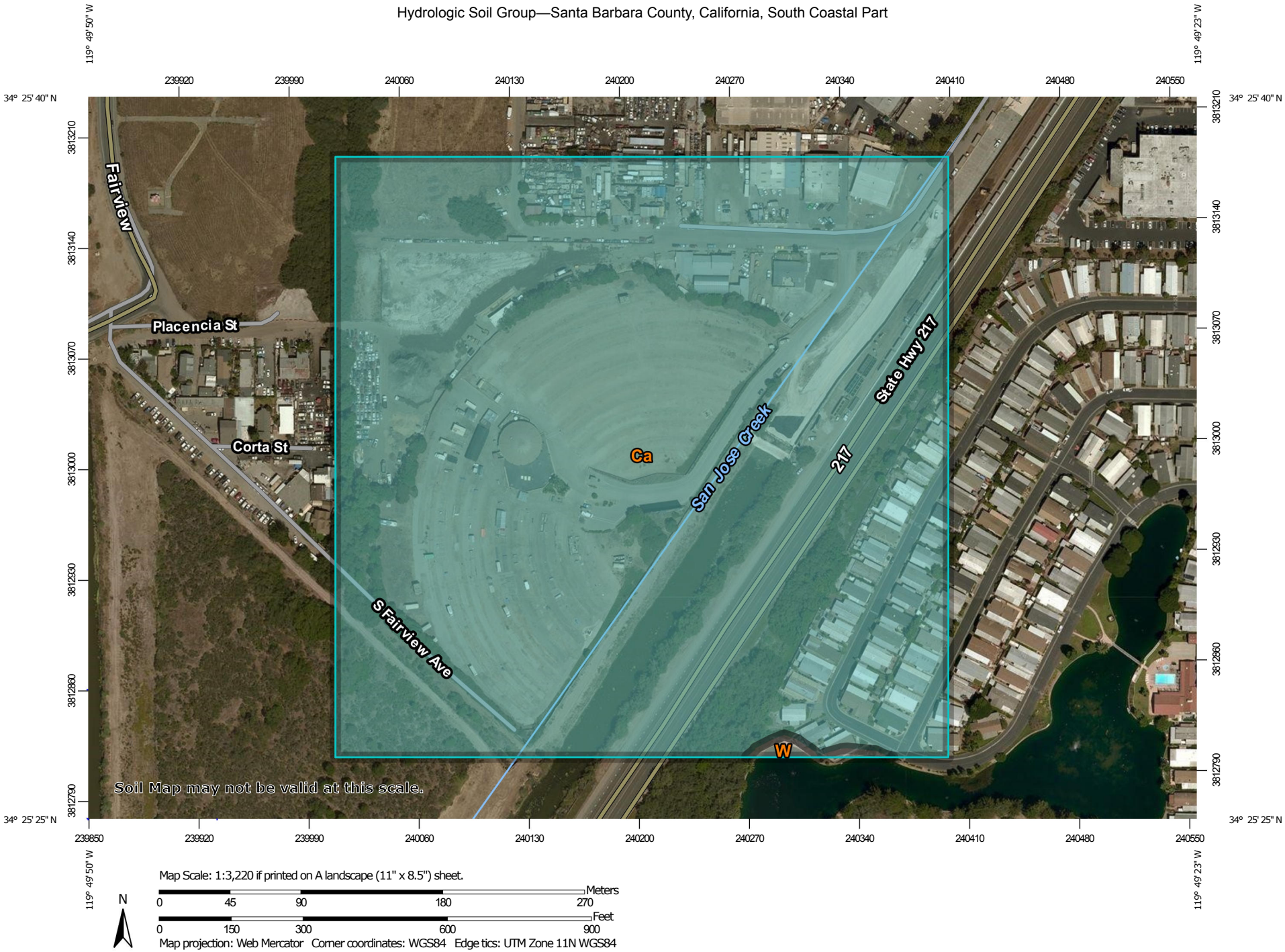
Primary OutFlow Max=10.93 cfs @ 10.28 hrs HW=12.13' (Free Discharge)
└**1=Culvert** (Barrel Controls 10.93 cfs @ 6.18 fps)
  ├**2=Orifice/Grate** (Passes < 5.31 cfs potential flow)
  ├**3=Orifice/Grate** (Passes < 3.76 cfs potential flow)
  └**4=Orifice/Grate** (Passes < 5.03 cfs potential flow)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=10.25' (Free Discharge)
└**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 7P: Total Site Runoff

Inflow Area = 251,951 sf, 73.25% Impervious, Inflow Depth = 7.71" for SC-100yr event
Inflow = 13.49 cfs @ 10.14 hrs, Volume= 161,872 cf
Primary = 13.49 cfs @ 10.14 hrs, Volume= 161,872 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.10 hrs



Map Scale: 1:3,220 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 45 90 180 270

Feet: 0 150 300 600 900

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

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A
A/D
B
B/D
C
C/D
D
Not rated or not available

Soil Rating Lines

A
A/D
B
B/D
C
C/D
D
Not rated or not available

Soil Rating Points

A
A/D
B
B/D
C
C/D
D
Not rated or not available

Water Features

Streams and Canals

Transportation

Rails
Interstate Highways
US Routes
Major Roads
Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Santa Barbara County, California, South Coastal Part
Survey Area Data: Version 9, Sep 12, 2016

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

Date(s) aerial images were photographed: Aug 28, 2013—Sep 14, 2013

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

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**
Ca	Camarillo fine sandy loam	C	36.6	99.6%
W	Water		0.1	0.4%
Totals for Area of Interest			**36.7**	**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

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

WASHINGTON STATE DEPARTMENT OF ECOLOGY

August 2018

GENERAL USE LEVEL DESIGNATION FOR PRETREATMENT (TSS)

For

CONTECH Engineered Solutions CDS® System

Ecology's Decision:

Based on the CONTECH Engineered Solutions (CONTECH) application submissions for the CDS® System, Ecology hereby issues the following use designations for the CDS storm water treatment system:

1. **General Use Level Designation (GULD) for pretreatment use, as defined in Ecology's 2011 *Technical Guidance Manual for Evaluating Emerging Stormwater Treatment Technologies Technology Assessment Protocol – Ecology (TAPE)* Table 2, (a) ahead of infiltration treatment, or (b) to protect and extend the maintenance cycle of a basic, enhanced, or phosphorus treatment device (e.g., sand or media filter). This GULD applies to 2,400 micron screen CDS® units sized per the table below.**

2. **The following table shows flowrates associated with various CDS models:**

		CDS Model	Water Quality Flow cfs	L/s
Precast**	Inline or Offline	CDS 2015-4	0.7	19.8
		CDS 2015-5	0.7	19.8
		CDS 2020-5	1.1	31.2
		CDS2025-5	1.6	45.3
		CDS3020-6	2	56.6
		CDS3030-6	3	85.0
		CDS3035-6	3.8	106.2
		CDS4030-8	4.5	127.4
		CDS4040-8	6	169.9
		CDS4045-8	7.5	212.4
		CDS5640-10	9	254.9
		CDS5653-10	14	396.5
		CDS5668-10	19	538.1
		CDS5678-10	25	7.08
Precast*	Offline Only	CDS3030-V	3	85
		CDS4030-7	4.5	127.4
		CDS4040-7	6	169.9

		CDS4045-7	**7.5**	212.4
		CDS5640-8	**9**	254.9
		CDS5653-8	**14**	396.5
		CDS5668-8	**19**	538.1
		CDS5678-8	**25**	708
		CDS5042	**9**	254.9
		CDS5050	**11**	311.5
		CDS7070	**26**	736.3
		CDS10060	**30**	849.6
		CDS10080	**50**	1416
		CDS100100	**64**	1812.5
Cast In Place		**CDS150134-22**	**148**	4191.4
		CDS200164-26	**270**	7646.6
		CDS240160-32	**300**	8496.2

***Specially Designed CDS Units may be approved by Ecology on a on a site-by-site basis.**
****Contact Contech for updated model numbers if PMIU, PMSU, PSW, PSWC are specified.**

3. **The water quality design flow rates are calculated using the following procedures:**

   - **Western Washington: For treatment installed upstream of detention or retention, the water quality design flow rate is the peak 15-minute flow rate as calculated using the latest version of the Western Washington Hydrology Model or other Ecology-approved continuous runoff model.**

   - **Eastern Washington: For treatment installed upstream of detention or retention, the water quality design flow rate is the peak 15-minute flow rate as calculated using one of the three methods described in Chapter 2.2.5 of the Stormwater Management Manual for Eastern Washington (SWMMEW) or local manual.**

   - **Entire State: For treatment installed downstream of detention, the water quality design flow rate is the full 2-year release rate of the detention facility.**

4. **The pretreatment GULD has no expiration date; however, Ecology may amend or revoke the designation.**

5. **All designations are subject to the conditions specified below.**

6. **Properly designed and operated CDS systems may also have applicability in other situations (example: low-head situations such as bridges or ferry docks), for TSS where, on a case-by-case basis, it is found to be infeasible or impracticable to use any other approved practice. Jurisdictions covered under the Phase I or II municipal stormwater permits should use variance/exception procedures and criteria as required by their NPDES permit.**

7. **Ecology finds that the CDS, sized according to the table above, could also provide water quality benefits in retrofit situations.**

Ecology's Conditions of Use:

CDS systems shall comply with these conditions:

1. **Design, assemble, install, operate, and maintain CDS Systems in accordance with Contech's applicable manuals and documents and the Ecology decision and conditions specified herein. Ecology recommends use of the inspection and maintenance schedule included as Attachment 1.**

2. **Maintenance: The required inspection/maintenance interval for stormwater treatment devices is often dependent upon the efficiency of the device and the degree of pollutant loading from a particular drainage basin. Therefore, Ecology does not endorse or recommend a "one size fits all" maintenance cycle for a particular model/size of manufactured treatment device.**
    - **Owners/operators must inspect the CDS™ System for a minimum of twelve months from the start of post-construction operation to determine site-specific maintenance schedules and requirements. You must conduct inspections monthly during the wet season, and every other month during the dry season. (According to SWMMWW, the wet season for western Washington is October 1 to April 30. According to SWMMEW, the wet season in eastern Washington is October 1 to June 30). After the first year of operation, owners/operators must conduct inspections based on the findings during the first year of inspections.**
    - **Conduct inspections by qualified personnel, follow manufacturer's guidelines, and use methods capable of determining either a decrease in treated effluent flow rate and/or a decrease in pollutant removal ability.**

3. **Discharges from the CDS System shall not cause or contribute to water quality standards violations in receiving waters.**

Applicant: Contech Engineered Solutions

Applicant's Address: 11835 NE Glen Widing Drive
Portland, OR 97220

Application Documents:

- Contech Stormwater Solutions Application to: Washington State Department of Ecology Water Quality Program for General Use Level Designation – Pretreatment Applications and Conditional Use Level Designation – Oil Treatment of the Continuous Deflective Separation (CDS™) Technology (June 2007)

- Strynchuk, Royal, and England, *The Use of a CDS Unit for Sediment Control in Brevard County*.

- Walker, Allison, Wong, and Wootton, *Removal of Suspended Solids and Associated Pollutants by a CDS Gross Pollutant Trap*, Cooperative Research Centre for Catchment Hydrology, Report 99/2, February 1999

- Allison, Walker, Chiew, O'Neill, McMahon, *From Roads to Rivers Gross Pollutant Removal from Urban Waterways*, Cooperative Research Centre for Catchment Hydrology, Report 98/6, May 1998

Applicant's Use Level Request:

- General use level designation as a pretreatment device and conditional use level designation as an oil and grease device in accordance with Ecology's *Stormwater Management Manual for Western Washington.*

Applicant's Performance Claims:

Based on laboratory trials, the CDS™ System will achieve 50% removal of total suspended solids with d_{50} of 50-µm and 80% removal of total suspended solids with d_{50} of 125-µm at 100% design flowrate with typical influent concentration of 200-mg/L.

Ecology's Recommendation:

Ecology finds that:

- The CDS™ system, sized per the table above, should provide, at a minimum, equivalent performance to a presettling basin as defined in the most recent *Stormwater Management Manual for Western Washington, Volume V, Chapter 6*.

Findings of Fact:

1. Laboratory testing was completed on a CDS 2020 unit equipped with 2400-µm screen using OK-110 sand (d_{50} of 106-µm) at flowrates ranging from 100 to 125% of the design flowrate (1.1 cfs) with a target influent of 200 mg/L. Laboratory results for the OK-110 sand showed removal rates from about 65% to 99% removal with 80% removal occurring near 70% of the design flowrate.
2. Laboratory testing was completed on a CDS 2020 unit equipped with 2400-µm screen using "UF" sediment (d_{50} of 20 to 30-µm) at flowrates ranging from 100 to 125% of the design flowrate (1.1 cfs) with a target influent of 200 mg/L. Laboratory results for the "UF" sediment showed removal rates from about 42% to 94% removal with 80% removal occurring at 5% of the design flowrate.

3. Laboratory testing was completed on a CDS 2020 unit equipped with 4700-µm screen using OK-110 sand (d_{50} of 106-µm) at flowrates ranging from 100 to 125% of the design flowrate (1.1 cfs) with a target influent of 200 mg/L. Laboratory results for the OK-110 sand showed removal rates from about 45% to 99% removal with an average removal of 83.1%.
4. Laboratory testing was completed on a CDS 2020 unit equipped with 4700-µm screen using "UF" sediment (d_{50} of 20 to 30-µm) at flowrates ranging from 100 to 125% of the design flowrate (1.1 cfs) with a target influent of 200 mg/L. Laboratory results for the "UF" sediment showed removal rates from about 39% to 88% removal with an average removal of 56.1%.
5. Contech completed laboratory testing on a CDS2020 unit using motor oil at flowrates ranging from 25% to 75% of the design flowrate (1.1 cfs) with influents ranging from 7 to 47 mg/L. Laboratory results showed removal rates from 27% to 92% removal. A spill test was also run at 10% of the design flowrate with an influent of 82,000 mg/L with an average percent capture of 94.5%
6. Independent parties in California, Florida, and Australia completed various field studies. Field studies showed the potential for the unit to remove oils and grease and total suspended solids, and capture 100% gross solids greater than the aperture size of the screen under treatment flow rate.
7. CDS Technology has been widely accepted with over 6,200 installations in the United States and Canada. There are over 1,380 installations in Washington and Oregon.

Technology Description:

Engineers can download a technology description from the company's website.
www.conteches.com

Recommended Research and Development:

Ecology encourages Contech to pursue continuous improvements to the CDS system. To that end, Ecology makes the following recommendations:

1. Conduct testing to quantify the flowrate at which resuspension occurs.
2. Conduct testing on various sized CDS units to verify the sizing technique is appropriate.
3. Test the system under normal operating conditions, pollutants partially filling the swirl concentrator. Results obtained for "clean" systems may not be representative of typical performance.

Contact Information:

Applicant Contact: Jeremiah Lehman
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Applicant website: http://www.conteches.com/

Ecology web link: http://www.ecy.wa.gov/programs/wq/stormwater/newtech/index.html

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Water Quality Program
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Revision History

Date	Revision
July 2008	Original use-level-designation document
February 2010	Reinstate Contech's Oil Control PULD
August 2012	Revised design storm criteria, revised oil control QAPP, TER, and Expiration dates
December 2012	Revised Contech Engineered Solutions Contact Information; Added QAPP for Oil Treatment
May 2013	Revised model numbers in Attachment 1
April 2014	Revised Due dates for QAPP and TER and changed Expiration date
August 2014	Revised Due dates for QAPP and TER and changed Expiration date
July 2016	Updated Oil Control PULD to a CULD based on preliminary field monitoring results
November 2016	Revised Contech Contact person
August 2018	Removed CULD for Oil from document

Attachment 1
CDS Stormwater Treatment Unit Checklist

Frequency	Drainage System Feature	Problem	Conditions to Check For	Recommended Action	Date Inspected*											
					J	F	M	A	M	J	J	A	S	O	N	D
M & S	Inlet Chamber	Accumulation of trash, debris and sediment	Trash blocking inlet throat opening & sediment accumulation exceeds 2 inches	Remove trash, debris, and sediments. Inlet throat opening should not be blocked by any materials.												
A	Screen	Blockage/Damage	Biological growth on the surface of the screen; broken screen or loose screen	Powerwash screen to clean the surface and Contact CSS for screen repair (broken or loose)												
M	Separation Chamber	Trash and floatable debris accumulation	Excessive trash and floatable debris accumulation on the surface in separation chamber	Remove trash or other floatable debris in separation chamber to minimum level												
A	Oil Baffle**	Damaged	Baffles corroding, cracking, warping, and/or showing signs of failure as determined by maintenance/inspection person.	Baffles repaired or replaced to design specifications.												
M & S	Oil sorbent**	Consumed	Change of color in sorbents (fresh sorbents typically appears to be white or light yellow)	Remove spent oil sorbent and replace with new sorbent												
M	Sediment Depth in the Sump	Sediment accumulation	Sediment accumulation exceeds 75-85% sump depth (varies depending on the Model, see attached Table)	Sediment in sump should be removed using vactor truck.												
M	Sediment Depth behind the screen	Sediment accumulation	Sediment accumulation exceeds 2 inches behind the screen	Sediment behind the screen should be removed using vactor truck.												

Frequency	Drainage System Feature	Problem	Conditions to Check For	Recommended Action	Date Inspected*											
					J	F	M	A	M	J	J	A	S	O	N	D
M	Access Cover (MH, Grate, cleanout)	Access cover Damaged/ Not working	One maintenance person cannot remove lid after applying 80 pounds of lift, corrosion of deformation of cover.	Cover repaired to proper working specifications or replaced.												
A	Inlet and Outlet Piping	Damaged Piping/Leaking	Any part of the pipes are crushed or damaged due to corrosion and/or settlement.	Pipe repaired or replaced.												
A	Concrete Structure	Concrete structure (MH or diversion vault) has cracks in wall, bottom, and damage to frame and/or top slab.	Cracks wider than ½ inch or evidence of soil particles entering the structure through the cracks, or maintenance/inspection personnel determine that the structure is not structurally sound.	Structure repaired so that no cracks exist wider than 0.25 inch at the joint of inlet/outlet pipe.												
A	Access Ladder	Ladder rungs unsafe	Maintenance person judges that ladder is unsafe due to missing rungs, misalignment, rust, or cracks. Ladder must be fixed or secured immediately.	Ladder meets design standards and allows maintenance persons safe access.												

*Note dates when maintenance was performed and type of maintenance performed in notes section below.
**May not be present on all units.

(M) Monthly from November through April.
(A) Once in late summer (preferable September)
(S) After any major storm (use 1-inch in 24 hours as a guideline).

If you are unsure whether a problem exists, please contact a Professional Engineer.

Notes:

Maintenance of CDS stormwater treatment unit typically does not require confined space entry. Visual inspections should be performed above ground. If entry is required, it should be performed by qualified personnel.

Refer to CDS Unit Operation & Maintenance Guideline for maintenance details. Typically the CDS unit needs to be inspected before and after the rainfall seasons (November to April), after any major storms (>1-inch within 24 hour) and in the event of chemical spills.

Contact Contech Engineered Solutions (CSS) (800-548-4667) if there is any damage to the internal components of CDS Unit.

CDS Maintenance Indicators and Sediment Storage Capacities

CDS Model	Diameter		Distance from Water Surface to Top of Sediment Pile		Sediment Storage Capacity	
	ft	m	ft	m	yd^3	m^3
CDS2015	5	1.5	3.0	0.9	1.3	1.0
CDS2020	5	1.5	3.5	1.1	1.3	1.0
CDS2025	5	1.5	4.0	1.2	1.3	1.0
CDS3020	6	1.8	4.0	1.2	2.1	1.6
CDS3030	6	1.8	4.6	1.4	2.1	1.6
CDS3035	6	1.8	5.0	1.5	2.1	1.6
CDS4030	8	2.4	4.6	1.4	5.6	4.3
CDS4040	8	2.4	5.7	1.7	5.6	4.3
CDS4045	8	2.4	6.2	1.9	5.6	4.3