



## DRAINAGE POLICY AND STUDY GUIDELINES - APRIL 2020

The purpose of this document is to provide clear guidelines for both feasibility and design level Drainage Study submittals. It includes the most recent Simi Valley public works standards and common engineering/best management practices needed to comply with Federal (NFIP), State (NPDES), City Drainage Requirements, and Flood Damage Ordinance 1268.

Section 1 provides the Drainage Policy Matrix and Summary that identifies instructions, report sections, and checklists. Section 2 Checklists and Instructions should be used to ensure the minimum report, methodology, mitigation, and data are correctly submitted. Section 3 provides links (as of April 2020) to summaries of standards and useful reference information.

The City may have additional development conditions or data requirements depending on the complexity of the existing site and/or proposed project.

For additional questions please contact:

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Prior Drainage Policies and Guidelines were previously outlined in the 1990 City Master Plan of Drainage (MPD). These updates include: adoption of City 2017 Flood Damage Prevention Ordinance 1268, results of the City's 2016 MPD, description of 2017 Ventura Watershed Protection District (VCWPD) updates to their Design Hydrology Manual and VCRat 2.64 software, incorporation of other FEMA-approved software for studies within Simi Valley, and identify references to National Oceanic and Atmospheric Administration (NOAA) Atlas 14 rainfall and improved topography sources.

# 1 Drainage Policy

## 1.1 Stormwater Quantity Mitigation Requirements

Stormwater Quantity Mitigation Requirements were developed to provide an equitable process to design drainage infrastructure used to increase public safety and reduce flood damages. To meet the drainage policy, please include a section in the Drainage Study Report (DSR) that outlines required mitigation applicable for the proposed project. Provide a description/discussion of each proposed facility (by-pass, flow-through, underground detention basin, etc.). Clearly state that the mitigation facilities will be privately owned and maintained by the property owner(s) or homeowner(s) association.

### a. Simplified Peak Flow Mitigation for Projects with Project Area $\leq$ 5acres

Section 2.4 identifies a simplified method that may be used for small projects with area  $\leq$  5 acres regardless of approval dates.

### b. Peak Flow Mitigation for Projects w/Conditions of Approval Before 3/20/2017

100-year post-project/developed flow(s) must be reduced to the 10-year post-project/developed project flow(s). See Section 2.5 hydrology calculation requirements.

### c. Peak Flow Mitigation for Projects w/Conditions of Approval on or After 3/20/2017

100-year post-project/developed flow(s) must be reduced to the 10-year pre-project/existing flow(s). See Section 2.5 hydrology calculation requirements.

## 1.2 Drainage Policy Matrix and Summary

Item	Required Data				Threshold	Instructions /Checklist		
a	Project Name:							
b	Location Description (Street Address, APN, or Tract No.):							
c	Submittal Date:		Previous Submittal Dates and Type:					
d	Preparer's/ Firm Name:							
e	Type of Submittal:	<input type="checkbox"/> <b>Feasibility-Level:</b> Application for Planning Approval (solution must be technically sound, constructible and reasonably feasible) based on Site/Preliminary Grading Plan.			Feasibility	2.2		
		<input type="checkbox"/> <b>Design-Level:</b> Includes fully designed improvement plan. (methodologies/solutions must reflect conditions shown on the designed improvement plan)			Design	2.3		
f	Digital and hardcopy Drainage Study Report (DSR) submitted?			<input type="checkbox"/> Yes <input type="checkbox"/> No		Feasibility and Design	2.1	
g	Is the project entirely within the City of Simi Valley (include location map in report)?			<input type="checkbox"/> Yes <input type="checkbox"/> No				
h	Digital copies of all topography/Lidar used submitted?			<input type="checkbox"/> Yes <input type="checkbox"/> No				
i	Digital calculations/models submitted?			<input type="checkbox"/> Yes <input type="checkbox"/> No				
j	What is the total project area in acres?				<= 5 acres	Feasibility and Design	2.4 or 2.5	
					> 5 acres		2.5	
k	Detailed site hydraulics included?			<input type="checkbox"/> Yes <input type="checkbox"/> No		Design	2.6, 2.9	
l	Administrative, Planning Commission, City Council, Conditions of Approval Dates. Include Dates. [all new projects use Section 1.1.c for Feasibility]				Before 3/20/2017	Design	1.1b	
					On or After 3/20/2017		1.1c	
m	Are there any undeveloped (natural) areas upstream or within the project area that are susceptible to fire and/or are likely to produce sediment and debris?			<input type="checkbox"/> Yes <input type="checkbox"/> No		Feasibility and Design	2.7	
n	Type of Project	<input type="checkbox"/> New <input type="checkbox"/> Redevelopment	Total Disturbed Area:				Feasibility and Design	2.8
			Total Impervious Area:					
			Total New Impervious Area:					
o	Is water quality mitigation required?			<input type="checkbox"/> Yes <input type="checkbox"/> No				
p	Is the project in or adjacent to a FEMA Special Flood Hazard Area (SFHA) (include project location map in report)? <a href="https://www.arcgis.com/apps/webappviewer/index.html?id=8b0adb51996444d4879338b5529aa9cd">https://www.arcgis.com/apps/webappviewer/index.html?id=8b0adb51996444d4879338b5529aa9cd</a> .			<input type="checkbox"/> Yes <input type="checkbox"/> No		Design	2.10	
q	Will a County Watercourse or Encroachment permit be required?	<input type="checkbox"/> Yes, the project will directly drain to a County facility through a modified or new connection. <input type="checkbox"/> No, the project either does not directly drain to a County facility or will do so through an <u>existing, non-modified</u> connection.			Feasibility and Design	2.11		

## 2 Checklists and Instructions

The instructions provided are intended to identify items and processes generally required for drainage study submittal based on the components of the project summarized in Section 1.

### 2.1 Report Sections to be Included for All Studies

All drainage studies must include Drainage Study Reports (DSRs) that include the following basic sections/data:

Item	Report Section	Requirement	Is it included? (Y, N, N/A)
a	Cover Sheet	Title, Name of Developer/Owner, Report/Analysis Preparer Name and PE Stamp, Dates of Original Report and any Revisions	
b	Table of Contents	Main Text Sections/List of Figures/List of Tables with corresponding page numbers and List of Appendices	
c	Executive Summary	A brief description of project scope, purpose and conclusions. Include whether this is "Feasibility or Design" level. Provide a clear description of the project location and limits (using Assessor Parcel Numbers or a legal description of the parcels involved), location and vicinity maps, and overall site plan with a numerical and graphic bar scale.	
d	Background	Detailed scope, purpose, background information and history that provides context for the project. This should include discussion of earlier phases of a development, the current City Master Plan of Drainage (MPD), adjacent major land development project studies, and any other applicable studies or update, as available. Also include statements on whether water quality mitigation will be required, if the project is within or adjacent to a FEMA SFHA, and/or if drainage will directly connect to an existing, new, or modified connection to a Ventura County facility. Include a map/figure showing the project site on the latest, effective National Flood Hazard Layer (NFHL) showing the project site ( <a href="https://www.arcgis.com/apps/webappviewer/index.html?id=8b0adb51996444d4879338b5529aa9cd">https://www.arcgis.com/apps/webappviewer/index.html?id=8b0adb51996444d4879338b5529aa9cd</a> ).	
e	Hydrology	Outline/description of all the hydrologic methodologies, calculations, supporting documentation, and models used.	
f	Mitigation	Outlines required mitigation applicable for the proposed project. Level of detail, including calculations are based on type of submittal (Feasibility or Design).	
g	Appendices	Maps, model input/output, and calculation printouts may be included in the Appendices as long as they are clearly listed in the Table of Contents and referenced in the text of the DSR (ex. "Existing and Proposed subarea delineations are included in Appendix X").	
h	Digital Submittal	Digital copies of the Site/Preliminary Grading Plan or Fully Improved Design Plan calculations, models, and topography are submitted.	

## 2.2 Feasibility Level Submittal – Site/Preliminary Grading Plan

Feasibility Level submittals are applications for Planning Approval (solution must be technically sound, constructible and reasonably feasible). A Site/Preliminary Grading Plan with the following format and drainage related information should be included in the Appendices of the DSR and submitted digitally as a GIS or CAD file.

Item	Requirement	Is it included? (Y, N, N/A)
a	GIS or CAD files submitted in NAD 1983 State Plane CA Zone V (feet) with vertical datum NAVD 1988. Other datums may be accepted with prior City approval.	
b	24 x 36-inch plans sheets as PDF, JPG, or TIF submitted with the Minimum Drainage Data Plotting Requirements identified below. Include name and mailing address of the property owner and that of the engineer, Assessor’s Parcel Numbers (APNs) of all Tax Parcels on which the project is located, and date that the site plan was prepared. It must be signed and stamped by a California Registered Civil Engineer.	
<b>Minimum Drainage Data Plotting Requirements</b>		
c	Existing and proposed contours with enough definition to define the general surface water drainage and detention patterns.	
d	Existing drainage infrastructure including VCWPD, City, and Caltrans facilities (including closest downstream facility used to accept the developed runoff. Clearly identify approximate location of any connections and project drainage to these facilities.	
e	Proposed location(s) of retention, debris, detention and water quality facilities.	
f	If present, plot FEMA100-year Special Flood Hazard Areas (SFHAs) on or adjacent to the project site.	
g	Plot and label existing/proposed subarea boundaries corresponding to hydrologic modeling.	
h	Show proposed landcover. This includes buildings, roads, driveways, walkways, parking, loading areas, landscaping, open spaces, and bioswales. Statistics on the amount of actual/average percent impervious should be included. If specific locations of buildings and other features are not available at the time of the feasibility study (initial road alignments must be shown), then landcover and percent impervious values using categories consistent with Exhibits 14A and 14B in the VCWPD Hydrology Manual can be plotted and used.	

### 2.3 Design Level Submittal – Fully Designed Improvement Plan

Design Level submittals include fully designed improvement plans (methodologies/solutions must reflect conditions shown on the designed improvement plan). The plans must be included in the Appendices of the DSR and submitted digitally as a GIS or CAD file.

Item	Requirement	Is it included? (Y, N, N/A)
a	GIS or CAD files submitted in NAD 1983 State Plane CA Zone V (feet) with vertical datum NAVD 1988. Other datums may be accepted with prior City approval.	
b	24 x 36-inch plans sheets as PDF, JPG, or TIF submitted with the Minimum Drainage Data Plotting Requirements below. Include name and mailing address of the property owner and that of the engineer, Assessor’s Parcel Numbers (APNs) of all Tax Parcels on which the project is located, and date that the site plan was prepared. It must be signed/stamped by a California Registered Civil Engineer.	
c	List of Standard Drawings	
<b>Minimum Drainage Data Plotting Requirements</b>		
d	Mainline shall be labeled as “LINE A”, etc.... and laterals as “LAT. A-1”, “A-2”, etc., consistent between plan and profiles.	
e	Plot drainage system profile and include 10- year Hydraulic Grade Line (HGL). Include proposed ground surface and any utility crossings. Label storm drain stations, size, material, elevations, 10-year HGL and velocity, and Q10. If the storm drain is designed or is shown to carry Q100 (including under pressure), also include the 100-year HGL, velocity, and Q100 on the plot. Ensure 10-yr HGL does not surcharge and 100-yr HGL does not pop manhole covers or impact catch basins.	
f	The extent and path of the flow difference between the storm drain design capacity and Q100 should be plotted to show it can be safely be conveyed to the detention facility.	
g	Show existing ground and finished grade over pipe centerline.	
h	Plot pipe as double line (heavier line width).	
i	Show catch basin tie station, width, V-depth, and local depression.	
j	Show pipe horizontal and vertical curve data.	
k	Call out junction/transition structures design data. Callout “S” station/elevation for laterals.	
l	Plot/call out station/elevations for pipe crossings.	
m	Plot storm drain easement consistent with final map or separate document.	
n	Show typical pipe trench, bedding and backfill details.	
o	Show inlet/outlet structure, energy dissipator, rip-rap, channel details.	
p	Existing/Proposed contours at a minimum 1-foot interval.	
q	Existing drainage infrastructure including VCWPD, City, and Caltrans facilities (including closest downstream facility used to accept the developed runoff. Clearly identify approximate location of any connections and project drainage to these facilities.	
r	If present, plot FEMA100-year Special Flood Hazard Areas (SFHAs)/Floodway on or adjacent to the project site. Also include the items listed in Ordinance 1268 7-5.501(a). Referenced FEMA Technical Bulletins can be found at: <a href="https://www.fema.gov/nfip-technical-bulletins">https://www.fema.gov/nfip-technical-bulletins</a>	
s	Plot and label existing/proposed subarea boundaries corresponding to hydrologic modeling.	

Item	Requirement	Is it included? (Y, N, N/A)
t	Show proposed landcover. This includes buildings, roads, driveways, walkways, parking, loading areas, landscaping, open spaces, and bioswales. Statistics on the amount of <b>actual</b> /average percent impervious should be included.	
u	Identify features that protect the buildings from local drainage flows.	
v	Include location of storm drains (label with size and slope), catch basins (type, length), and debris/detention/water quality facilities (label primary spillway, emergency spillway, 100-year water surface elevation, and debris elevation/volume [if applicable]). Show the extent and direction of the Emergency Path of Travel (equivalent to Q100 flowing over the emergency spillway of the detention basin(s)).	
w	Include location of all public and private wet utilities (water, sewer, storm drain), both existing and proposed.	
x	Label and show location of all easements and public rights-of-way.	
y	Show positive drainage away from the building site(s) to an approved point of collection that does not create a hazard or problem on neighboring properties.	
z	Show location and Lowest Finish Floor Elevation (LFE) of all adjacent structures. <ul style="list-style-type: none"> <li>• Ensure that the LFE of all structures are at least one (1) foot above the highest adjacent street curb.</li> <li>• Ensure that the LFE is one (1) foot above the Base Flood Elevation (BFE) of any adjacent Special Flood Hazard Area (SFHA) zone.</li> <li>• Ensure the LFE is also above 100-year water surface elevation shown in a proposed detention facility.</li> <li>• Ensure a safe path of travel for all flows exceeding the 100-year event.</li> </ul>	

## 2.4 Simplified Method for Small Projects (Area <=5 acres)

For projects 5 acres and smaller in area, please provide appropriate flood storage and detention/retention basin concept for City consideration and approval. The intent is to reduce the post-project condition 100-year runoff flow down to pre-project 10-year level of protection and/or the existing downstream drainage system capacity, whichever is lower.

Alternatively, more detailed hydrologic calculations may be prepared as per Section 2.5. Also, note that any Stormwater Quality Design Volume (SQDV) and Debris Volume must be calculated separately and cannot be used concurrently (Total Detention = Stormwater Quantity Mitigation + SQDV + Debris Volume).

## 2.5 Hydrology

Hydrology methodology should be the same for both Feasibility and Design Level submittals. All calculations/modeling should be consistent with approved methodologies contained in the most recent Ventura County Watershed Protection District (VCWPD) Hydrology Manual (<https://www.vcpbublicworks.org/wpd/hydrologymanual/>). A specific Hydrology section in the DSR should be dedicated to the outline/description of all the hydrologic methodologies, calculations, supporting documentation, and models used.

For most drainage design projects within the City, it is recommended and preferred that the VCWPD VCRat Modified Rational Method (MRM) hydrology model is used. HEC-1/HEC-HMS, HSPF, Stream Frequency Analysis (hand calculations, HEC-FFA, ...), and TUFLOW are also acceptable, but should be discussed with

the City prior to use. Include a description in the DSR outlining how all models were used and relate to each other.

The DSR should include maps/plots (main text or appendices) identifying the extent of the project over parameter data used in the hydrologic modeling. These include, but are not limited to existing and proposed subarea/flowpath delineation overlaid on grading/topography, existing and proposed landcover/imperviousness, soils/infiltration, location of existing drainage facilities, location and extent of proposed facilities/connections, and 10- and 100-year rainfall depths/intensity zones.

Any GIS data files representing the above parameters should be referenced in the DSR and submitted digitally. If using the VCWPD VCRat model, an annotated copy of the map included in the VCWPD Hydrology Manual may be used if the project is clearly shown within a single parameter/zone.

Provide a description/discussion of proposed outlet(s) design and calculations/stage-discharge curves (or reference to their location in an appendix) needed to reduce peak flows to meet mitigation requirements.

NOTE: Any Stormwater Quality Design Volume (SQDV) and Debris Volume must be calculated separately and cannot be used concurrently (Total Detention = Stormwater Quantity Mitigation + SQDV + Debris Volume).

### **VCRat Parameters Legacy (2010) versus Revised (2017)**

A significant change in parameter and corresponding methodology has been implemented in 2017. This includes revisions to rainfall zones/intensities, soil curves, and percent impervious parameters.

Both the Legacy (2010) and Revised (2017, preferred) are acceptable. In the DSR, identify which methodology was used. Calculated parameters should be consistent with the method chosen (no mixing Legacy and Revised) across both the existing and proposed condition calculations.

### **VCRat Fattening (Watershed Yield Adjustment)**

The VCRat MRM produces a short duration peak with corresponding volume less than other typical methods. For detention basin design, the volume below the hydrograph must be adjusted for the proposed condition to match the volume obtained from using the National Resource Conservation Service (NRCS) SCS Curve Number (CN) Method. See VCWPD Hydrology Manual for more details (Sections 3.11, 3.12.13, and Appendix B-10).

NOTE: If the fattening process reduces the volume of the hydrograph, remove it from the model, re-run, and document in the DSR.

NOTE: <https://www.vcpbublicworks.org/wpd/hydrologymanual/> contains data, tools, and training materials.

Item	Report Section	Requirement	Is it included? (Y, N, N/A)
a	Hydrology	Statement that all calculations are consistent with 2017 VCWPD Hydrology Manual.	
b	Hydrology	Description of hydrology model(s)/calculation(s)/method(s) used (ex: "Overall hydrology was modeled using VCRat. Detention basin outlet rating curves were calculated using ...")	
c	Hydrology or Appendices	<p>Maps<sup>1</sup> for existing and proposed conditions showing:</p> <ul style="list-style-type: none"> <li>• Grading/topography/Lidar (publicly available Lidar for download can be found at <a href="https://vcwatershed.net/publicMaps/data/">https://vcwatershed.net/publicMaps/data/</a> and <a href="https://coast.noaa.gov/dataviewer/#/">https://coast.noaa.gov/dataviewer/#/</a>)</li> <li>• Subareas with annotated area (acres) shown for each. Subareas 20-80 acres (min 5, max 300) are recommended for use in VCRat to ensure appropriate time of concentration (Tc) values.</li> <li>• Longest flowpath used for Tc calculation. If VCRat was used: show the contributing area for each flow segment and ensure resulting Tc is between 5 and 30 minutes.</li> <li>• <u>Actual</u> (Measured) Percent Impervious.</li> <li>• VCWPD Soils, Rainfall Zones (<a href="https://vcwatershed.net/publicMaps/data/">https://vcwatershed.net/publicMaps/data/</a>)</li> <li>• NOAA Atlas 14 Rainfall (<a href="https://hdsc.nws.noaa.gov/hdsc/pfds/pfds_map_cont.html">https://hdsc.nws.noaa.gov/hdsc/pfds/pfds_map_cont.html</a>)</li> <li>• Identification where the project will connect to existing drainage facilities.</li> </ul>	
d	Hydrology	Was the incoming hydrograph to the proposed detention basin "fattened" to increase the design volume according to Section 2.5? If not, was reasoning/discussion provided in DSR.	
e	Hydrology	Is the Tc for existing greater than that for the proposed condition? If not, this is likely not appropriate. Include an explanation in the DSR.	
f	Hydrology	All developments must evaluate the 10- and 100-year pre- and post-project events. For projects with City Conditions of Approval before 3/20/2017 (allowing mitigation to Q10 Developed) that drain to VCWPD Facilities (redline channels), the 25- and 50-year pre- and post-project events must also be included.	
g	Hydrology	Detention basin and outlet descriptions should be provided in the DSR. Calculations and corresponding stage-area-discharge curves should be included. An emergency spillway must be provided to be convey the full unattenuated 100-year flow, with its crest located at or above the modeled 100-year water surface elevation in the detention basin. At least one foot of freeboard (difference between head required over emergency spillway and top of dam) should be provided. Similar requirements may apply to underground storage facilities.	

Item	Report Section	Requirement	Is it included? (Y, N, N/A)
h	Hydrology	Downstream facility capacity should be evaluated to determine if additional detention may be necessary for reduction of the discharge rate commensurate with these deficiencies. Include a discussion and any calculations to show on how this was evaluated (review of hydraulic deficiencies identified by the 2016 City MPD ( <a href="https://www.simivalley.org/departments/public-works/master-plan-of-drainage">https://www.simivalley.org/departments/public-works/master-plan-of-drainage</a> ), hydraulic model of storm drains (storm drain atlas included in <a href="https://vcwatershed.net/publicMaps/data/">https://vcwatershed.net/publicMaps/data/</a> ) immediately downstream of project connection using WSPG, SWMM, ...)...	
I	Hydrology	Ensure Stormwater Quality Design Volumes (SQDV) and debris mitigation volumes are not included in the VCRat stage-discharge curves.	
J	Hydrology or Appendices	Calculations and model inputs/outputs printouts are included in the DSR.	
k	Digital Submittal	Digital calculation/model files that can be re-run/replicated by the reviewer are submitted (VCRat, Excel,...).	

<sup>1</sup>If included in Site/Preliminary Grading Plan or Fully Designed Improvement Plan, include reference to location in DSR.

## 2.6 Hydraulics Calculations/Methodology

In general, all calculations and manning's roughness factors should be consistent with the approved methodologies contained in the most recent Ventura County Watershed Protection District (VCWPD) Design Manual (<https://s29422.pcdn.co/wp-content/uploads/2018/05/WPD-VCFCDDesignManual.pdf>).

A specific Hydraulics section in the DSR should be dedicated to the outline/description of all the hydraulic methodologies, calculations, supporting documentation, and models used. The following software with their general applicability is commonly used and accepted: WSPG, EPA-SWMM/PC-SWMM, HEC-2/HEC-RAS, TUFLOW (City preferred for 2D), FLO-2D, and FHWA Hydraulic Toolbox/HY-8.

Item	Report Section	Requirement	Is it included? (Y, N, N/A)
a	Hydraulics	Hydraulic models/calculations should be provided for all drainage facilities corresponding to the required design events. This includes, but is not limited to storm drains/channels (Q10 and Q100), catch basins (Q10 or Q100), streets designed to convey flow to mitigation facilities (difference between storm drain design capacity and Q100), debris/detention basins (Q100), and necessary stabilizer/energy dissipator structures (Q100/Vel100). A summary table should be included in the DSR identifying the events modeled for each conveyance facility.	
b	Hydraulics	Describe the relationship between the hydraulic calculation/modeling method(s) used. For example, " <i>WSPG was used to determine the HGL within the storm drain system and the FHWA Hydraulic Toolbox was used to calculate catch basin capacity.</i> "	
c	Hydraulics	Manning's "n" roughness values are consistent with VCWPD Design Manual. A table identifying the range of values for each material/landcover should be provided in the DSR.	

Item	Report Section	Requirement	Is it included? (Y, N, N/A)
d	Hydraulics	Include a table and discussion of all hydraulic losses and how they were modeled. These include but are not limited to: inlet/outlet, transitions, bends, junctions, and angle points.	
e	Hydraulics	Boundary conditions are clearly stated in the DSR. If draining to a facility having a significantly larger watershed, discuss the timing effect on the boundary condition (if any).	
f	Hydraulics	Include a discussion in the DSR regarding flow regime (sub or supercritical). Models should not be allowed to “default” to critical depth.	
g	Hydraulics	Include a discussion and table providing the range of velocities in the DSR. Extreme (high and low) velocities should be carefully analyzed against design and mitigation criteria	
h	Hydraulics	For two-dimensional models, include a discussion in the DSR of the time steps used and what model conservation errors occur. Identify of the errors are within typical ranges. Provide a table identifying those features with the highest errors.	
i	Hydraulics	Storm drain 10-year HGL is below the soffit (free flowing). 100-year HGL should not pop manholes or impact the function of inlets/catch basins (reverse flow).	
j	Hydraulics and/or Appendices	Calculations and model inputs/outputs printouts are included in the DSR.	
k	Digital Submittal	Digital calculation/model files that can be re-run/replicated by the reviewer are submitted (VCRat, Excel,...).	

## 2.7 Debris Basins (Design Only)

Identify if there are undeveloped (natural) areas upstream or within the project area that are susceptible to fire and/or are likely to produce sediment and debris. If so, include a discussion, debris production estimates and basin sizing calculations using the VCWPD Debris Basin Manual

(<https://www.vcpbublicworks.org/wpd/debrisbasinmanual/>, Sections 3.1-3.3) in the DSR.

NOTE: Stormwater Quality Design Volume (SQDV), Debris Volume, and Peak Flow Detention Volumes cannot occupy the same space within a single facility.

## 2.8 Water Quality

If water quality mitigation is required, include a section in the DSR that includes a summary of water quality calculations, references, and mitigation.

Documentation and design should follow guidance provided in the VCWPD Technical Guidance Manual for Stormwater Quality Control Measures (TGM).

<http://www.vcstormwater.org/index.php/publications/manuals/tech-guide-manual>

Show that steps 2-10 in Section 2 of the TGM were followed, key items are listed below (not all-inclusive):

- Map (to scale) identifying the impervious areas, including proposed Drainage Management Areas (DMAs)
- Discussion and maps (if applicable) of initial Assessment of Site Conditions used to select/design WQ Mitigation. This includes site slopes, Ventura County soil numbers, existing utilities, geology, groundwater, and ESAs. See Section 3 of the TGM for more details.
- If initial Assessment of Site Conditions are suitable for Infiltration BMPs, soils and Infiltration testing must be provided for the actual proposed location(s). If infiltration is not feasible, a detailed technical infeasibility explanation should be provided along with alternative mitigation such as described in the TGM.
- Include appropriate BMP Sizing Worksheets from Appendix E and/or Design Criteria Checklist(s) for Stormwater Runoff BMPs from Appendix G of the TGM.
- Infiltration BMPs – Stormwater Quality Design Volume (SQDV) must be calculated. TGM Section 2.8 provides four calculations methods based on Total Disturbed Area (any area that is altered as a result of land disturbance, such as clearing, grading, grubbing, stockpiling or excavation). Most consultants incorrectly, initially submit SQDV based on Method #3 which uses a 0.75-inch storm event. This is only applicable to projects with Total Disturbed Areas less than 5-acres. Method #1, 85<sup>th</sup> percentile 24-hour runoff event, may be used for projects with Total Disturbed Areas between 5 and 50 acres. Although not explicitly identified, Method #1 is equivalent to Method #3, but uses the 85<sup>th</sup> percentile 24-hour runoff event depth identified in Appendix B. Figure B-3 of the TGM. Also, include calculations for basin drawdown times.

Soils, Lidar, stormwater geodatabase, and 85<sup>th</sup> percentile 24-hour runoff event depth GIS data may be downloaded from: <https://vcwatershed.net/publicMaps/data/> (date of link April 2020).

<b>Item</b>	<b>Report Section</b>	<b>Requirement</b>	<b>Is it included? (Y, N, N/A)</b>
a	Mitigation: Water Quality	Map (to scale) identifying the impervious areas	
b	Mitigation: Water Quality	Discussion of applicability based on TGM due to proposed project included in DSR.	
c	Mitigation: Water Quality	Initial Assessment of Site Conditions based on TGM included in DSR.	
d	Mitigation: Water Quality	The DSR must reference infiltration rates(s) recommended by the project geotechnical consultant.	
e	Mitigation: Water Quality	Appropriate BMPs chosen based on TGM.	
f	Mitigation: Water Quality	If retention is used, clearly identify and show calculations that this volume will not be used for other purposes (i.e. stormwater detention and/or debris storage).	
g	Mitigation: Water Quality or Appendices	Drainage Management Areas (DMAs)draining to each BMP clearly defined and mapped.	
h	Mitigation: Water Quality or Appendices	BMP Sizing Worksheets from TGM included	

## 2.9 Hydraulics Design/Mitigation

In addition to mitigation facilities meant to protect adjacent and downstream areas, the following Hydraulic Design Mitigation summary (not limited to) must be included in the overall design of on-site drainage.

Item	Report Section	Requirement	Is it included? (Y, N, N/A)
a	Mitigation: Hydraulic Design/Mitigation	Will the extent of any watercourse be altered or relocated as a result of proposed development? If so, proof that written notification, on forms furnished by the Floodplain Administrator, was sent prior to any alteration or relocation of the watercourse to all adjacent communities, the California Department of Water Resources (DWR), and FEMA.	
b	Mitigation: Hydraulic Design/Mitigation	For storm drains, ensure that the 10-year HGL does not surcharge and the 100-year HGL does not pop manhole covers or impact catch basins.	
c	Mitigation: Hydraulic Design/Mitigation	Provide a description/discussion in the DSR of any proposed surface flows (those beyond the capacity of the storm drain system). Excess flows must be safely conveyed within the surrounding streets to the mitigation facility (detention basin). Include associated calculations (or reference location in appendix).	
d	Mitigation: Hydraulic Design/Mitigation	Design sump catch basins/inlets for the 100-year event with overflow (secondary outlet). Non-sump catch basins should be designed for the 10-year event. Design calculations should be based on Federal Highway Administration (FHWA) Engineering Circular No. 22 (HEC-22).	
e	Mitigation: Hydraulic Design/Mitigation	Ensure velocities in unlined channels are at or below those shown in Table 314.10 of the VCWPD Design Manual.	
f	Mitigation: Hydraulic Design/Mitigation	Minimum storm drain velocities should be at least 2.5 fps to reduce sedimentation and maintain positive flow.	
g	Mitigation: Hydraulic Design/Mitigation	Provide additional ½" of concrete at the pipe invert for storm drain velocities 20 fps and 1" for 30 fps.	
h	Mitigation: Hydraulic Design/Mitigation	Construct standard energy dissipator at outlets to natural channels consistent with the VCWPD Hydraulic Design Manual and/or FHWA HEC14.	
i	Mitigation: Hydraulic Design/Mitigation	Ensure that the Lowest Floor Elevation (LFE) of all structures are: <ul style="list-style-type: none"> <li>• At least one (1) foot above the highest adjacent street curb.</li> <li>• One (1) foot above the Base Flood Elevation (BFE) of any adjacent Special Flood Hazard Area (SFHA) zone.</li> <li>• Above 100-year water surface elevation shown in a proposed detention facility</li> <li>• At least one foot above any Emergency Path of Travel.</li> </ul>	

Item	Report Section	Requirement	Is it included? (Y, N, N/A)
j	Mitigation: Hydraulic Design/Mitigation	Emergency Path of Travel: Provide a description/discussion, model, and map for potential emergency flood path in the event of outlet failure. Use the unattenuated 100-year peak flow to calculate and show the extent of flooding when it flows over the emergency spillway of the detention basin(s). The path of travel should safely convey these flows through and off the project site. All structure LFEs should be at least one foot above the modeled Emergency Path of Travel 100-year water surface elevations.	
k	Mitigation: Hydraulic Design/Mitigation	Ensure that detention, debris, and water quality volumes necessary for mitigation are separately designed and modeled.	
l	Mitigation: Hydraulic Design/Mitigation	The City standard for public storm drain systems is reinforced concrete pipe (RCP) with a minimum diameter of at least 24-inches for all mainline conduits and at least 18 inches in diameter for connector pipes from catch basins. Private systems may be of smaller diameters using standard materials (although RCP is still recommended) as long as all items in 2.9 can still be met.	

## 2.10 FEMA Special Flood Hazard Area (SFHA)

Flood Damage Ordinance 1268 (Chapter 5) includes provisions for administration, implementation, and enforcement of regulations that promote management strategies to keep developments reasonable safe from flood hazards. This includes administration of Title 44 Code of Federal Regulations (CFR) Chapter 60. This is triggered when a project is in or adjacent to a SFHA. To determine this, a map showing the project site relative to the FEMA SFHAs shown in the National Flood Hazard Layer (NFHL) should be provided: <https://www.arcgis.com/apps/webappviewer/index.html?id=8b0adb51996444d4879338b5529aa9cd>.

The DSR should include a discussion about which SFHA Zones (A, AE, AE with Floodway, AH, and/or AO) may affect the proposed project. If base flood elevations (BFEs) are not established, they must be determined as part of the project submittal. Local agencies (VCWPD, City) should be contacted to determine if locally approved hydrologic and/or hydraulic studies are available. When local agency data is not available, a floodplain study must be performed by a Professional Engineer (PE) establishing the BFE and the floodplain and floodway boundaries.

Once existing BFE's are established, they should be plotted on the detailed topography. Lidar data can be obtained from <https://vcwatershed.net/publicMaps/data/> or <https://coast.noaa.gov/dataviewer/#/>.

All development, including fill, is prohibited within the SFHA. However, the City does support application for a Letter of Map Revision based on Fill (LOMR-Fill) to eliminate the SFHA from the development area. In this case, it must be shown that the post-project condition will not cause an increase in the water surface elevation of the base flood by more than one-tenth of one foot (0.1'). In addition, documentation and calculations certified by a registered professional engineer must demonstrate that proposed encroachments, including fill, redevelopment, new construction, substantial improvement, and other new development shall not result in any increase to established SFHA floodway elevations; this is commonly referred to as "no-net-rise."

The following is a brief summary/excerpt from Ordinance 1268 that highlights some critical land development concepts for proposed projects adjacent or in the SFHA. Compliance with all elements of Ordinance 1268 is required (<https://www.simivalley.org/home/showdocument?id=13329>).

<b>Article 3</b>		<b>General Provisions</b>
<b>7-5.302</b>		Basis for Establishing the Areas of Special Flood Hazard
<b>Article 4</b>		<b>Floodplain Administrator</b>
<b>7-5.402</b>		Duties and Responsibilities of the Floodplain Administrator
	(a)(4)	No Adverse Impacts of Proposed Development
	(c)	Review, Use and Development of Other Base Flood Data
<b>Article 5</b>		<b>Flood Area Development Permits</b>
<b>7-5.501</b>		Establishment of Development Permit
	(a)	Plans and Elevations
	(b)	Certification
	(c)	Foundation Openings
	(d)	All Certifications
	(e)	Watercourse Alteration, Notification, and Engineering Data
	(f)(1)	Site is Reasonably Safe from Flooding
	(f)(2)	No Adverse Impacts (0.1' one-tenth of one foot)
<b>7-5.506</b>		Dedications and Improvements
	(b)	Requirement for the Construction of Drainage and Flood Control Facilities
<b>7-5.507</b>		Mapping Requirements
<b>Article 6</b>		<b>Provisions for Flood Hazard Reduction</b>
<b>7-5.601</b>		Prohibitions
<b>7-5.602</b>		Standards of Construction
	(b)	Lowest Floor Elevation Above the Crown of Street
	(e)	NPDES Stormwater Permit Enforcement
	(f)	Limit Discharge to Pre-Development 10-year
	(f)(1)	Hydrology and Hydraulic Studies and Mitigation
	(f)(2)	Storage Requirement for Projects Less than 10 acres
	(f)(3)	Storage Requirement for Projects Greater than 10 acres
	(f)(4)	Mitigation for Downstream Deficiencies
<b>7.5-603</b>		Standards of Construction Within the SFHA
	(b)(4)	Compliance with ASCE 24
	(d)	Elevation and Floodproofing
	(d)(2)	Residential Construction-Elevated Above BFE plus Freeboard
	(d)(3)	Non-Residential Construction-Elevated or Flood-proofed Above BFE plus Freeboard
	(d)(9)	Critical Facilities
<b>7-5.605</b>		Standards for Subdivisions and Other Proposed Development
	(a)(1)	Future Condition Hydrology and Hydraulics Study, consistent with the most current City Master Plan of Drainage models
	(f)(1)	Street Surfaces at or Above BFE
	(f)(2)	No Commercial and Industrial Development Parking more than one (1) foot below BFE
<b>7-5.609</b>		Floodways

<b>Article 9</b>		<b>Map Amendments</b>
<b>7-5.902</b>		Map Amendments
	(c)	All Studies based on Future Build-out Condition

### **2.11 Ventura County Watershed Protection District (VCWPD) Watercourse or Encroachment Permit**

VCWPD requires a permit for any work or activity in, on, over, under, or across a District channel, or for temporary or long-term use of District easement or property. If the project, or its stormwater discharge, falls into any of these categories, the DSR must include an up-to-date discussion on the status of need and submittal of an application for the permit. Information regarding VCWPD permit requirements can be found at: <https://www.onestoppermits.vcrma.org/departments/watercourse-encroachment>.

### 3 Summary of Standards and Useful Data

<b>Summary of Standards and Useful Data - References sourced April 2020</b> <b>Links are not maintained or guaranteed by the City.</b>		
<b>City of Simi Valley</b>		
City of Simi Valley Flood Damage Prevention Ordinance	Simi Valley Ordinance 1268	<a href="https://www.simivalley.org/home/showdocument?id=13329">https://www.simivalley.org/home/showdocument?id=13329</a>
City of Simi Valley 2016 Master Plan of Drainage (MPD)	Hydrologic evaluation (peak flows, capacities, deficiencies) of City drainage system.	<a href="https://www.simivalley.org/departments/public-works/master-plan-of-drainage">https://www.simivalley.org/departments/public-works/master-plan-of-drainage</a>
MPD 2016 includes the following:		
<b>VOLUME 1 OF 3 - MASTER PLAN OF DRAINAGE</b>		
<b>STUDY REPORT</b>		
<ul style="list-style-type: none"> <li>a) Executive Summary</li> <li>b) Introduction</li> <li>c) Description of Study Area</li> <li>d) Existing Drainage System</li> <li>e) Hydrology</li> <li>f) Watershed Analysis and Comparison</li> <li>g) Drainage System Capital Improvement Plan (CIP)</li> <li>h) MPD Revenue Scenarios &amp; Implementation Options</li> </ul>		
<b>MAPS</b>		
<ul style="list-style-type: none"> <li>a) Cover Sheet and Detailed Legends for All Maps</li> <li>b) Soils and Rainfall Maps</li> <li>c) Hydrologic Land Use Maps (2010 &amp; 2030)</li> <li>d) Hydrology Maps (2010 &amp; 2030) including Average cfs/acre Runoff Rates (10-year/100-year)</li> <li>e) Runoff Yield Maps (2010 and 2030) provide City-wide weighted average runoff rates</li> <li>f) Hydrology Comparison Points Maps corresponding to Table 5 Peak Flow Comparison</li> <li>g) Existing Storm Drain System / Deficiencies Maps</li> <li>h) Recommended System Capital Improvement Plan (CIP)</li> </ul>		
<b>VOLUME 2 OF 3 - TECHNICAL APPENDIX</b>		
<ul style="list-style-type: none"> <li>a) Storm Drain System Inventory and Atlas</li> <li>b) Detention Basin Inventory and Analysis</li> </ul>		
<b>VOLUME 3 OF 3 - STORM DRAIN ATLAS MAP BOOK</b>		

**Summary of Standards and Useful Data - References sourced April 2020**  
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**County of Ventura**

Ventura County Watershed Protection District (VCWPD) Hydrology	Hydrology Manuals, Rainfall/Soils Data, VCRat Hydrology Program, VC Time of Concentration (Tc) Program, VCRat/Tc Excel Calculators, and project examples	<a href="https://www.vcpbublicworks.org/wpd/hydrologymanual/">https://www.vcpbublicworks.org/wpd/hydrologymanual/</a>
Ventura County Watershed Protection District (VCWPD) Hydraulics	Policies and procedures for planning and design of drainage facilities under the jurisdiction of VCWPD	<a href="https://s29422.pcdn.co/wp-content/uploads/2018/05/WPD-VCFCDDesign-Manual.pdf">https://s29422.pcdn.co/wp-content/uploads/2018/05/WPD-VCFCDDesign-Manual.pdf</a>
VCWPD Debris Basin Manual	Debris and Detention Basin Locations/Debris Design Standards	<a href="https://www.vcpbublicworks.org/wpd/debrisbasinmanual/">https://www.vcpbublicworks.org/wpd/debrisbasinmanual/</a>
VCWPD Technical Guidance Manual for Stormwater Quality Control Measures (TGM)	Water Quality Mitigation Design and Standards	<a href="http://www.vcstormwater.org/index.php/publications/manuals/tech-guide-manual">http://www.vcstormwater.org/index.php/publications/manuals/tech-guide-manual</a>
VCWPD One Stop Permitting	Watercourse/ Encroachment Permits Section	<a href="https://www.onestoppermits.vcrma.org/departments/watercourse-encroachment">https://www.onestoppermits.vcrma.org/departments/watercourse-encroachment</a>
Ventura County View	County GIS data such as parcel boundaries, benchmarks, easements, County Redline channels	<a href="https://maps.ventura.org/countyview/">https://maps.ventura.org/countyview/</a>
Watershed Protection District GIS Data	Data Available for Download: Lidar, DEM, County Redline Channels, Stormwater (pipes, channels) Geodatabase, Soils Data, Watershed Boundaries, 85 <sup>th</sup> Percentile 24-hour Storm Geodatabase, Soils Data	<a href="https://vcwatershed.net/publicMaps/data/">https://vcwatershed.net/publicMaps/data/</a>

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**Federal Agencies**

FEMA Letter of Map Changes (LOMC)	MT-1 and MT-2 Forms	<a href="https://www.fema.gov/letter-map-changes">https://www.fema.gov/letter-map-changes</a>
FEMA Technical Bulletins	Guidance for complying with the NFIP's building performance requirements	<a href="https://www.fema.gov/nfip-technical-bulletins">https://www.fema.gov/nfip-technical-bulletins</a>
FEMA National Flood Hazard Layer	Latest FEMA Special Flood Hazard Area (SFHA) maps in PDF or PNG format can be created/downloaded.	<a href="https://www.arcgis.com/apps/webappviewer/index.html?id=8b0adb51996444d4879338b5529aa9cd">https://www.arcgis.com/apps/webappviewer/index.html?id=8b0adb51996444d4879338b5529aa9cd</a>
Federal Highway Administration (FHWA) Hydraulic Engineering Circular (HEC) No. 22	Urban Drainage Design Manual (catch basins, gutters, ...)	<a href="https://www.fhwa.dot.gov/engineering/hydraulics/library_listing.cfm">https://www.fhwa.dot.gov/engineering/hydraulics/library_listing.cfm</a>
Federal Highway Administration (FHWA) Hydraulic Engineering Circular (HEC) No. 14	Hydraulic Design of Energy Dissipators for Culverts and Channels	<a href="https://www.fhwa.dot.gov/engineering/hydraulics/library_listing.cfm">https://www.fhwa.dot.gov/engineering/hydraulics/library_listing.cfm</a>
Federal Highway Administration (FHWA) Hydraulic Engineering Software	HY-8, Hydraulic Toolbox	<a href="https://www.fhwa.dot.gov/engineering/hydraulics/software.cfm">https://www.fhwa.dot.gov/engineering/hydraulics/software.cfm</a>
Environmental Protection Agency (EPA) Stormwater Management Model (SWMM)	EPA-SWMM model and manuals	<a href="https://www.epa.gov/water-research/storm-water-management-model-swmm">https://www.epa.gov/water-research/storm-water-management-model-swmm</a>
US Army Corps of Engineering (USACE) Software	HEC-RAS, HEC-HMS, HEC-FFA,...	<a href="https://www.hec.usace.army.mil/software/default.aspx">https://www.hec.usace.army.mil/software/default.aspx</a>
National Oceanic and Atmospheric Administration (NOAA) Atlas 14	Point precipitation frequency atlas (tables and GIS grids)	<a href="https://hdsc.nws.noaa.gov/hdsc/pfds/pfds_map_cont.html">https://hdsc.nws.noaa.gov/hdsc/pfds/pfds_map_cont.html</a>
NOAA Data Access View	Imagery, Landcover, and Lidar (view and download)	<a href="https://coast.noaa.gov/dataviewer/#/">https://coast.noaa.gov/dataviewer/#/</a>