MOJAVE RIVER WATERSHED
Water Quality Management Plan

For:

Victorville Connection

NEC of Bear Valley Road and 3rd Avenue, Victorville , CA

PARCEL MAP NO. 17603

Prepared for:

Bear Valley Road & 2nd Ave, LLC and Bear Valley Development Co., LLC

c/o MJM Investment Company, LLC

12300 Wilshire Blvd. Suite 410

Los Angeles , CA 90025

(310) 315-0002

Prepared by:

DRC Engineering, Inc.

6840 Indiana Avenue, Suite 215

Riverside, CA 92506

(714) 685-6860 x307

Submittal Date: May 12, 2021

Revision No. and Date: _____

Final Approval Date:_____

DRC Project No. 20-523D

Project Owner's Certification

This Mojave River Watershed Water Quality Management Plan (WQMP) has been prepared for **Victor Valley Road & 2nd Ave, LLC and Bear Valley Development Company** by **DRC Engineering, Inc.** The WQMP is intended to comply with the requirements of the City of Victorville and the Phase II Small MS4 General Permit for the Mojave River Watershed. The undersigned, while it owns the subject property, is responsible for the implementation of the provisions of this plan and will ensure that this plan is amended as appropriate to reflect up-to-date conditions on the site consistent with the Phase II Small MS4 Permit and the intent of San Bernardino County (unincorporated areas of Phelan, Oak Hills, Spring Valley Lake and Victorville) and the incorporated cities of Barstow and Victorville and the Town of Apple Valley. Once the undersigned transfers its interest in the property, its successors in interest and the city/county/town shall be notified of the transfer. The new owner will be informed of its responsibility under this WQMP. A copy of the approved WQMP shall be available on the subject site in perpetuity.

"I certify under a penalty of law that the provisions (implementation, operation, maintenance, and funding) of the WQMP have been accepted and that the plan will be transferred to future successors."

Project Data			
Permit/Application Number(s):	(TBD)	Grading Permit Number(s):	(TBD)
Tract/Parcel Map Number(s):	Parcel Map No. 17603	Building Permit Number(s):	(TBD)
CUP, SUP, and/or APN (Specify Lot Numbers if Portions of Tract):			Parcel Map No. 17603, Pcls 1-8 & 10-19

Owner's Signature		
Owner Name: Michael Asheghian		
Title	Development Manager	
Company	Bear Valley Road & 2nd Ave, LLC and Bear Valley Development Company, LLC	
Address	c/o MJM Investment Company, 12300 Wilshire Blvd. Suite 410, Los Angeles, CA 90025	
Email	michael@mjminvestco.com	
Telephone #	310-315-0002	
Signature	Date	

Preparer's Certification

Project Data			
Permit/Application Number(s):	(TBD)	Grading Permit Number(s):	(TBD)
Tract/Parcel Map Number(s):	Parcel Map No. TBD	Building Permit Number(s):	(TBD)
CUP, SUP, and/or APN (Specify Lot Numbers if Portions of Tract):			Parcel Map No. 17603 (Parcels 1-8 & 10-19)

"The selection, sizing and design of stormwater treatment and other stormwater quality and quantity control measures in this plan were prepared under my oversight and meet the requirements of the California State Water Resources Control Board Order No. 2013-0001-DWQ.

Engineer: Ronald W. Sklepko, PE		PE Stamp Below
Title	Project Manager	
Company	DRC Engineering, Inc.	
Address	6840 Indiana Ave, Suite 215 Riverside, CA 92506	
Email	rsklepko@drc-eng.com	
Telephone #	(714) 685-6860 x307	
Signature	Ronald W. Sklepko	
Date	5-12-2021	

REGISTERED PROFESSIONAL ENGINEER
RONALD W. SKLEPKO
No. C46216
Exp. 12-31-2022
CIVIL
STATE OF CALIFORNIA

Table of Contents

Appendices

Forms

Section 1 Discretionary Permit(s)

Form 1-1 Project Information

Project Name	Victorville Connection				
Project Owner Contact Name:	Michael Asheghian				
Mailing Address:	12300 Wilshire Blvd. Suite 410 Los Angeles, CA 90025	E-mail Address:	michael@mjminvestco.com	Telephone:	(310) 315-0002
Permit/Application Number(s):	(TBD)		Tract/Parcel Map Number(s):	PM 17603, PMB 230, PGS 13-14, Pcls 1-8 & 10-19	
Additional Information/ Comments:	As shown on the Vicinity Map in Appendix A, the project site is located at NEC of Bear Valley Road and 3nd Avenue, in City of Victorville, County of San Bernardino, State of California. It is bounded by vacant land and 3nd Avenue on the west, SF residential to the north, offices, hospital and 2nd Avenue on the east and Bear Valley Road on the south.				
Description of Project:	The project site consists of approximately 35.94 acres of mixed used development. The development consists of new retail buildings, medical/office buildings, a self-storage facility and a 376 unit apartment complex. The proposed gas station and convenience store (approx. 2.32 AC) located at southwest corner and the drive-thru restaurant (1.25 AC) at the southeast corner of the site are excluded from this report. These sites will address their own stormwater quality BMPs. Construction activities will include construction of a new buildings, paved access drives, parking lot pavement, ribbon gutters, driveways, walkways, landscaping planters and related utilities as shown on the Site Plan exhibit in Appendix A. Four (4) underground infiltration chamber systems are proposed to capture and treat stormwater from the drainage areas of the project. Activities on the site shall be in conformance with this WQMP, the Conditions, Covenants and Restrictions (CCRs), and City of Victorville PUD and zoning ordinance and standards. Any solid and liquid waste generated from the proposed development will be handled and disposed of properly, ensuring that it will not pollute the storm water. Outdoor trash receptacles will be inspected and emptied on a regular basis to prevent overflowing.				
Provide summary of Conceptual WQMP conditions (if previously submitted and approved). Attach complete copy.	Not applicable				

Section 2 Project Description

2.1 Project Information

The project consists of approximately 35.94 acres of mixed used development. The development consists of new retail buildings, medical/office buildings, a self-storage facility and a 376 unit apartment complex. The proposed gas station and convenience store (2.32 AC) located at southwest corner and the drive-thru restaurant at the southeast corner (1.25 AC) of the site will address their own stormwater quality BMPs. Construction activities will include construction of a new buildings, paved access drives, parking lot pavement, ribbon gutters, driveways, walkways, landscaping planters and related utilities.

2.1.1 Project Sizing Categorization

If the Project is greater than 5,000 square feet, and not on the excluded list as found on Section 1.4 of the TGD, the Project is a Regulated Development Project.

If the Project is creating and/or replacing greater than 2,500 square feet but less than 5,000 square feet of impervious surface area, then it is considered a Site Design Only project. This criterion is applicable to all development types including detached single-family homes that create and/or replace greater than 2,500 square feet of impervious area and are not part of a larger plan of development.

Form 2.1-1 Description of Proposed Project

1 Regulated Development Project Category (Select all that apply):

☒ #1 New development involving the creation of 5,000 ft^2 or more of impervious surface collectively over entire site	☐ #2 Significant re-development involving the addition or replacement of 5,000 ft^2 or more of impervious surface on an already developed site	☐ #3 Road Project – any road, sidewalk, or bicycle lane project that creates greater than 5,000 square feet of contiguous impervious surface	☐ #4 LUPs – linear underground/overhead projects that has a discrete location with 5,000 sq. ft. or more new constructed impervious surface

☐ Site Design Only (Project Total Square Feet > 2,500 but < 5,000 sq.ft.) *Will require source control Site Design Measures. Use the "PCMP" Template. Do not use this WQMP Template.*

2 Project Area (ft^2):	1,555,090	**3** Number of Dwelling Units:	376	**4** SIC Code:	5541, 4225

5 Is Project going to be phased? Yes ☒ No ☐ *If yes, ensure that the WQMP evaluates each phase as a distinct DA, requiring LID BMPs to address runoff at time of completion.* (NOTE: Initial phases will construct the full treatment BMP systems.)

2.2 Property Ownership/Management

Form 2.2-1 Property Ownership/Management

Describe property ownership/management responsible for long-term maintenance of WQMP stormwater facilities:

The property owner's legal responsible person, Bear Valley Road & 2nd Ave, LLC (retail, office, self-storage), and Bear Valley Road Development Company, LLC (apartment complex) will be responsible for the long-term maintenance of the project stormwater facilities.

2.3 Potential Stormwater Pollutants

Form 2.3-1 Pollutants of Concern

Pollutant	Please check: E=Expected, N=Not Expected		Additional Information and Comments
Pathogens (Bacterial / Virus)	E ☒	N ☐	Bacteria and viruses are ubiquitous microorganisms that thrive under certain environmental conditions. Their proliferation is typically caused by the transport of animal or human fecal wastes from the watershed. Water, containing excessive bacteria and viruses, can alter the aquatic habitat and create a harmful environment for humans and aquatic life. Also, the decomposition of excess organic waste causes increased growth of undesirable organisms in the water.
Nutrients - Phosphorous	E ☒	N ☐	Nutrients are inorganic substances. Excessive discharge of nutrients to water bodies and streams causes entrophication, where aquatic plants and algae growth can lead to excessive decay of organic matter in the water body, loss of oxygen in the water, release of toxins in sediment, and the eventual depth of aquatic organisms. Primary sources of nutrients in urban runoff are fertilizers and eroded soils.
Nutrients - Nitrogen	E ☒	N ☐	(See Nutrients - Phosphorous)
Noxious Aquatic Plants	E ☐	N ☒	Not Applicable
Sediment	E ☒	N ☐	Sediments are solid materials that are eroded from the land surface. Sediments can increase turbidity, clog fish gills, reduce spawning habitat, lower survival rates of young aquatic organisms, smother botthem dwelling organisms, and suppress aquatic vegetation growth.
Metals	E ☒	N ☐	Not expected until thThe primary source of metal pollution in stormwater is typically commercially available metals and metal products, as well as emissions from brake pad and tire tread wear associated with driving.
Oil and Grease	E ☒	N ☐	Oil and grease in water bodies decreases the aesthetic value of the water body, as well as the water quality. Primary sources of oil and grease are petroleum hydrocarbon products, motor products from leaking vehicles, esters, oils, fats, waxes, and high molecular-weight fatty acids.
Trash/Debris	E ☒	N ☐	Trash (such as paper, plastic, polystyrene packing foam, and aluminum materials) and biodegradable organic matter (such as leaves, grass cuttings, and food waste) are general waste products on the landscape. The presence of trash and debris may have a significant impact on the recreational value of a water body and aquatic habitat. Trash also impacts water quality by increasing biochemical oxygen demand.
Pesticides / Herbicides	E ☒	N ☐	Pesticides and herbicides are organic compounds used to destroy, prevent, mitigate insects, rodents, fungi, weeds, and other undesirable pests. Pesticides and herbicides can be washed off urban landscapes and buildings during storm events.

Organic Compounds	E ☐	N ☒	Organic compounds are carbon-based. Commercially available or nautrally occurring organic compounds are found in solvents and hydrocarbons. Organic compounds can, at certain concentrations, indirectly or directly constitute a hazard to life or health. When rinsing off objects, toxic levels of solvents and cleaning compounds can be discharged to storm drains. Dirt, grease, and grime retained in the cleaning fluid or rinse water may also absorb levels of organic compounds that are harmful or hazardous to aquatic life. Sources of organic compounds may include waste handling areas and vehicle or landscape maintenance areas.
Other:	E ☐	N ☐	
Other:	E ☐	N ☐	
Other:	E ☐	N ☐	

Section 3 Site and Watershed Description

Form 3-1 Site Location and Hydrologic Features			
Site coordinates *take GPS measurement at approximate center of site*	Latitude 34.4709°	Longitude -117.2992°	Thomas Bros Map page 3759
1 San Bernardino County climatic region: ☒ Desert			
2 Existing Condition: Does the site have more than one drainage area (DA): Yes☐ No☒ *If no, proceed to Form 3-2. If yes, then use this form to show a conceptual schematic describing DMAs and hydrologic feature connecting DMAs to the site outlet(s).*			
Conveyance	Surface drainage to low point at 2nd Avenue		
3 Proposed Condition: Does the site have more than one drainage area (DA): Yes☒ No☐			
Conveyance	Stormwater flows to proposed inlets / catch basins and pipeline to four (4) underground infiltration chamber systems.		

Form 3-2 Existing Hydrologic Characteristics for Project Site

For Project's sub-watershed DMA, provide the following characteristics	DMA-A	DMA-B	DMA-C	DMA-D
1 DMA drainage area (ft^2)	378,100	133,730	148,105	785,825
2 Existing site impervious area (ft^2)	0	0	0	0
3 Antecedent moisture condition *For desert areas, use http://www.sbcounty.gov/dpw/floodcontrol/pdf/20100412_map.pdf*	I	I	I	I
4 Hydrologic soil group *Refer to County Hydrology Manual Addendum for Arid Regions – http://www.sbcounty.gov/dpw/floodcontrol/pdf/20100412_addendum.pdf*	C	C	C	C
5 Longest flowpath length (ft)	1,000	450	600	1450
6 Longest flowpath slope (ft/ft)	0.015	0.037	0.020	0.019
7 Current land cover type(s) *Select from Fig C-3 of Hydrology Manual*	Previouly Mass Graded	Previouly Mass Graded	Previouly Mass Graded	Previouly Mass Graded
8 Pre-developed pervious area condition: *Based on the extent of wet season vegetated cover good >75%; Fair 50-75%; Poor <50%* ***Attach photos of site to support rating***	Poor	Poor	Poor	Poor

Form 3-3 Watershed Description for Drainage Area

Receiving waters Refer to SWRCB site: http://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtml	Mojave River
Applicable TMDLs *http://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtml*	**Mojave River (below Lower Narrows, HU 628.50)** – Ammonia, Chloride, Sulfates, Tetrachloroethylene/PCE, Trichloroethylene/TCE
303(d) listed impairments *http://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtml*	**Mojave River (below Lower Narrows, HU 628.50)** – None
Environmentally Sensitive Areas (ESA) *Refer to Watershed Mapping Tool –* *http://sbcounty.permitrack.com/WAP*	Desert Tortoise Habitat CAT 3, Mojave Ground Squrrel
Hydromodification Assessment	☒ Yes *Complete Hydromodification Assessment. Include Forms 4.2-2 through Form 4.2-5 and Hydromodification BMP Form 4.3-9 in submittal* ☐ No

Section 4 Best Management Practices (BMP)

4.1 Source Control BMPs and Site Design BMP Measures

4.1.1 Source Control BMPs

Non-structural and structural source control BMP are required to be incorporated into all new development and significant redevelopment projects. Form 4.1-1 and 4.1-2 are used to describe specific source control BMPs used in the WQMP or to explain why a certain BMP is not applicable. Table 7-3 of the TGD for WQMP provides a list of applicable source control BMP for projects with specific types of potential pollutant sources or activities. The source control BMP in this table must be implemented for projects with these specific types of potential pollutant sources or activities.

The preparers of this WQMP have reviewed the source control BMP requirements for new development and significant redevelopment projects. The preparers have also reviewed the specific BMP required for project as specified in Forms 4.1-1 and 4.1-2. All applicable non-structural and structural source control BMP shall be implemented in the project.

The identified list of source control BMPs correspond to the CASQA Stormwater BMP Handbook for New Development and Redevelopment.

Form 4.1-1 Non-Structural Source Control BMPs

Identifier	Name	Check One		Describe BMP Implementation OR, if not applicable, state reason
		Included	Not Applicable	
N1	Education of Property Owners, Tenants and Occupants on Stormwater BMPs	☒	☐	The property owner shall provide environmental awareness education materials. The property owner shall provide the educational materials to tenants.
N2	Activity Restrictions	☒	☐	Conditions, Covenants, and Restriction (CC&Rs) shall be required for the purpose of water quality protection. Pesticide application in common areas must be performed by an applicator certified by the California Department of Pesticide Regulation.
N3	Landscape Management BMPs	☒	☐	Project plan designs should conserve natural areas to the extent possible, maximize natural water storage and infiltration opportunities, and protect slopes and channels. Plants should be grouped with similar water requirements in order to reduce excess irrigation runoff and promote surface filtration. Landscaping shall correlate to the climate, soil, related natural resources and existing vegetation of the site, as well as the type of development proposed. Ongoing maintenance consistent with County Administrative Design Guidelines (available at http://www.co.san-bernardino.ca.us/landuseservices/InformationalHandouts/Adminstrative DesignGuidelines-Jan2002.pdf) or local equivalent, plus fertilizer and pesticide usage consistent with the instructions contained on product labels and with the regulations administered by the State Department of Pesticide Regulation shall be implemented. Hillside areas shall be landscaped with deep-rooted, drought tolerant plant species for erosion control, satisfactory to the local permitting authority. For additional information, see CASQA BMP SD-10, Site Design & Landscape Planning, and SD-12, Efficient Irrigation, included in Attachment F and the Inspection and Maintenance Program table in Section 4.0 for details.

Form 4.1-1 Non-Structural Source Control BMPs

Identifier	Name	Check One		Describe BMP Implementation OR, If not applicable, state reason
		Included	Not Applicable	
N4	BMP Maintenance	☒	☐	The entity or individual indicated in Section 2.2 of this document shall be responsible for the implementation and maintenance of all structural BMP facilities.
N5	Title 22 CCR Compliance (How development will comply)	☒	☐	Compliance with Title 22 of California Code of Regulations (CCR) and relevant sections of the California Health & Safety Code regarding the hazardous waste management is enforced by County Envoronmental Health on behalf of the State. See N9, Hazardous Materials Disclosure Compliance, for how the development will comply with the applicable hazardous waste management section(s) of Title 22.
N6	Local Water Quality Ordinances	☒	☐	The Permittees, under the Water Quality Ordinance, may issue permits to ensure clean stormwater discharges from areas of concern to public properties.
N7	Spill Contingency Plan	☒	☐	Tenants should follow City of Victorville's requirement on hazardous waste handling. See BMP SC-11, Spill Prevention, Control, and Cleanup.
N8	Underground Storage Tank Compliance	☐	☒	Not present on this site.
N9	Hazardous Materials Disclosure Compliance	☒	☐	The City of Victorville and San Bernardino County Fire Hazmat enforce and coordinate the management of hazardous materials.
N10	Uniform Fire Code Implementation	☒	☐	Compliance with Article 80 of the Uniform Fire Code enforced by fire protection agency.
N11	Litter/Debris Control Program	☒	☐	Tenants shall be responsible for contracting a company to provide sweeping the private street and parking lot at least twice annually, prior to the storm season in the late summer or early fall, to reduce the amount of sediment, garden waste, and trash, entering the storm drain systems. For additional information, see CASQA BMP SC-34, Waste Handling and Disposal, and SC-43, Parking/Storage Area Maintenance, included in Attachment F and the Inspection and Maintenance Program table in Section 4.0.
N12	Employee Training	☒	☐	Owner to provide training to employees periodically.

Form 4.1-1 Non-Structural Source Control BMPs

Identifier	Name	Check One		Describe BMP Implementation OR, if not applicable, state reason
		Included	Not Applicable	
N13	Housekeeping of Loading Docks	☒	☐	See CASDA BMP SD-31 Maintenance Bays and Loading Docks in Attachement F.
N14	Catch Basin Inspection Program	☒	☐	Drainage facilities (inlets and basins) must be inspected annually, in the late summer or early fall, and cleaned as needed, or if accumulated sediment/debris fills 25% or more of the sediment/debris storage capacity of the facility. The property owner shall contract a maintenance company to evaluate all portions of the drainage facilities annually to determine the adequacy of the inspection and maintenance frequency, and report the evaluation findings to the City of Victorville. See CASQA BMP SC-44, Drainage System Maintenance in Attachment F and the Inspection and Maintenance Program table in Section 4.0.
N15	Vacuum Sweeping of Private Streets and Parking Lots	☒	☐	The management team shall be responsible for contracting a company to provide sweeping the private street and parking lot at least twice annually, prior to the storm season in the late summer or early fall, to reduce the amount of sediment, garden waste, and trash entering the storm drain systems. For additional information, see CASQA BMP SC-34, Waste Handling and Disposal, and SC-43, Parking/Storage Area Maintenance, included in Attachment F and the Inspection and Maintenance Program table in Section 4.0.
N16	Other Non-structural Measures for Public Agency Projects	☐	☒	There are no other non-structural measures.
N17	Comply with all other applicable NPDES permits	☒	☐	

Form 4.1-2 Structural Source Control BMPs

Identifier	Name	Check One		Describe BMP Implementation OR, If not applicable, state reason
		Included	Not Applicable	
S1	Provide storm drain system stencilling and signage (CASQA New Development BMP Handbook SD-13)	☒	☐	Signage such as notices regarding discharge prohibitions at storm drain inlets to eliminate or reduce dumping and littering are required. The phrase "No Dumping – Flows to Creek," or an equally effective phrase as approved by the NPDES General Committee, must be stenciled on catch basins and inlets to alert the public as to the destination of pollutants discharged into storm drains. This signage must be maintained in accordance with Section 4.0 of this WQMP.
S2	Design and construct outdoor material storage areas to reduce pollution introduction (CASQA New Development BMP Handbook SD-34)	☐	☒	Not a feature of the site.
S3	Design and construct trash and waste storage areas to reduce pollution introduction (CASQA New Development BMP Handbook SD-32)	☒	☐	Trash container (dumpster) areas shall have drainage from adjoining roofs and pavements diverted around the areas. Dumpsters shall be leak proof and have attached workable covers. The property owner / tenants are required to implement trash management and litter control procedures in the common areas aimed at reducing pollution of storm water. The property owner may contract with their landscape maintenance firms to provide this service during regularly scheduled maintenance, which should consist of litter patrol, proper disposal of pet litter, emptying of trash receptacles in common areas, and noting trash disposal violations by homeowners and reporting the violations to the Association. For additional information, see BMP SC-41, Building & Grounds Maintenance, SC-43, Parking/Storage Area Maintenance, and SD-32, Trash Enclosures, included in Attachment F and the Inspection and Maintenance Program table in Section 4.0 for details.

Form 4.1-2 Structural Source Control BMPs

Identifier	Name	Check One		Describe BMP Implementation OR, If not applicable, state reason
		Included	Not Applicable	
S4	Use efficient irrigation systems & landscape design, water conservation, smart controllers, and source control (Statewide Model Landscape Ordinance; CASQA New Development BMP Handbook SD-12)	☒	☐	Irrigation methods should be utilized to minimize runoff of excess irrigation water across imperious surface and into the storm drain system. Such measures include employing rain-triggered shutoff devices to eliminate or reduce irrigation during and immediately after precipitation, using mulches (such as wood chips) to minimize sediment in runoff and to maintain soil infiltration capacity, and coordinating design of the irrigation system and landscape to minimize overspray and runoff. Irrigation systems should consider the use of flow reducers or shutoff valves triggered by a pressure drop to control water loss in the event of broken sprinkler heads or water supply lines. Water conservation devices such as programmable irrigation timers and soil moisture sensors should also be considered. For additional information, see BMP SD-12, Efficient Irrigation, included in Attachment F and the Inspection and Maintenance Program table in Section 4.0 for details.
S5	Finish grade of landscaped areas at a minimum of 1-2 inches below top of curb, sidewalk, or pavement	☒	☐	See CASDA BMP SD-10 Site Design & Landscape Planning in Attachement F.
S6	Protect slopes and channels and provide energy dissipation (CASQA New Development BMP Handbook SD-10)	☒	☐	Energy dissipators such as riprap or other effective materials shall be installed at the outlets of new storm drains that enter unlined channels in accordance with applicable Agency specifications, and shall be installed in such a way as to minimize impacts to receiving waters.
S7	Covered dock areas (CASQA New Development BMP Handbook SD-31)	☒	☐	See CASDA SD-31 in Attachment F.
S8	Covered maintenance bays with spill containment plans (CASQA New Development BMP Handbook SD-31)	☐	☒	Not a feature of the site.
S9	Vehicle wash areas with spill containment plans (CASQA New Development BMP Handbook SD-33)	☐	☒	Not Applicable.

Form 4.1-2 Structural Source Control BMPs

Identifier	Name	Check One		Describe BMP Implementation OR, If not applicable, state reason
		Included	Not Applicable	
S10	Covered outdoor processing areas (CASQA New Development BMP Handbook SD-36)	☐	☒	Not present on this commerical / retail site.
S11	Equipment wash areas with spill containment plans (CASQA New Development BMP Handbook SD-33)	☐	☒	Not present on this commerical / retail site.
S12	Fueling areas (CASQA New Development BMP Handbook SD-30)	☒	☐	See CASDA SD-30 in Attachment F.
S13	Hillside landscaping (CASQA New Development BMP Handbook SD-10)	☐	☒	Not present on this commerical / retail site.
S14	Wash water control for food preparation areas	☒	☐	For restaurants and other food preparation food service operations, show location (indoor or in a covered area outdoors) of a floor sink or other area for cleaning floor mats containers and equipment.
S15	Community car wash racks (CASQA New Development BMP Handbook SD-33)	☐	☒	Not present on this commerical / retail site.

4.1.2 Site Design BMPs

As part of the planning phase of a project, the site design practices associated with new LID requirements in the Phase II Small MS4 Permit must be considered. Site design BMP measures can result in smaller Design Capture Volume (DCV) to be managed by both LID and hydromodification control BMPs by reducing runoff generation.

As is stated in the Permit, it is necessary to evaluate site conditions such as soil type(s), existing vegetation and flow paths will influence the overall site design.

Refer to Section 5.2 of the TGD for WQMP for more details.

Form 4.1-3 Site Design Practices Checklist
Site Design Practices *If yes, explain how preventative site design practice is addressed in project site plan. If no, other LID BMPs must be selected to meet targets*
Minimize impervious areas: Yes ☒ No ☐ Explanation: Permeable area is maximized on this commerical / retail site by proposing landscaped areas around the parking lot and perimeter.
Maximize natural infiltration capacity; Including improvement and maintenance of soil: Yes ☒ No ☐ Explanation: Infiltration BMPs are used for water quality treatment.
Preserve existing drainage patterns and time of concentration: Yes ☒ No ☐ Explanation: The project site drainage pattern and time of concentration will be essentially the same as existing condition. Stormwater will be captured and treated by the proposed infiltration BMPs prior to overflow leaving the site.
Disconnect impervious areas. Including rerouting of rooftop drainage pipes to drain stormwater to storage or infiltration BMPs instead of to storm drain : Yes ☒ No ☐ Explanation: Runoff from rooftops and most of the pavement areas will be collected by storm drain pipes then conveyed to the proposed infiltration BMPs prior to overflow leaving the site.
Use of Porous Pavement.: Yes ☐ No ☒ Explanation: Infiltration BMPs are proposed in lieu of porous pavement.
Protect existing vegetation and sensitive areas: Yes ☐ No ☒ Explanation: The site was previously mass graded and vegetation removed.
Re-vegetate disturbed areas. Including planting and preservation of drought tolerant vegetation. : Yes ☒ No ☐ Explanation: The development will be landscaped planters scattered over the site with drought tolerant vegetation.
Minimize unnecessary compaction in stormwater retention/infiltration basin/trench areas: Yes ☒ No ☐ Explanation: Compaction in the infiltration BMPs area will be minimized per soil's engineer and manufacturer's recommendations.
Utilize naturalized/rock-lined drainage swales in place of underground piping or imperviously lined swales: Yes ☒ No ☐ Explanation: Implemented natural drainage swales in landscape areas.

Form 4.1-3 Site Design Practices Checklist

Stake off areas that will be used for landscaping to minimize compaction during construction: Yes ☒ No ☐ Explanation: Compaction in landscaped areas will be minimized.
Use of Rain Barrels and Cisterns, Including the use of on-site water collection systems.: Yes ☐ No ☒ Explanation: Infiltration BMPs are implemented instead of re-using the stormwater runoff.
Stream Setbacks. Includes a specified distance from an adjacent steam: Yes ☐ No ☒ Explanation: Not applicable.

It is noted that, in the Phase II Small MS4 Permit, site design elements for green roofs and vegetative swales are required. Due to the local climatology in the Mojave River Watershed, proactive measures are taken to maximize the amount of drought tolerant vegetation. It is not practical in this region to have green roofs or vegetative swales. As part of site design the project proponent should utilize locally recommended vegetation types for landscaping. Typical landscaping recommendations are found in following local references:

San Bernardino County Special Districts:

Guide to High Desert Landscaping -
http://www.specialdistricts.org/Modules/ShowDocument.aspx?documentid=795

Recommended High-Desert Plants -
http://www.specialdistricts.org/modules/showdocument.aspx?documentid=553

Mojave Water Agency:

Desert Ranch: http://www.mojavewater.org/files/desertranchgardenprototype.pdf

Summertree: http://www.mojavewater.org/files/Summertree-Native-Plant-Brochure.pdf

Thornless Garden: http://www.mojavewater.org/files/thornlessgardenprototype.pdf

Mediterranean Garden: http://www.mojavewater.org/files/mediterraneangardenprototype.pdf

Lush and Efficient Garden: http://www.mojavewater.org/files/lushandefficientgardenprototype.pdf

Alliance for Water Awareness and Conservation (AWAC) outdoor tips – http://hdawac.org/save-outdoors.html

4.2 Treatment BMPs

After implementation and design of both Source Control BMPs and Site Design BMP measures, any remaining runoff from impervious DMAs must be directed to one or more on-site, treatment BMPs (LID or biotreatment) designed to infiltrate, evaportranspire, and/or bio-retain the amount of runoff specified in Permit Section E.12.e (ii)(c) Numeric Sizing Criteria for Storm Water Retention and Treatment.

4.2.1 Project Specific Hydrology Characterization

The purpose of this section of the Project WQMP is to establish targets for post-development hydrology based on performance criteria specified in Section E.12.e.ii.c and Section E.12.f of the Phase II Small MS4 Permit. These targets include runoff volume for water quality control (referred to as LID design capture volume), and runoff volume, time of concentration, and peak runoff for protection from hydromodification.

If the project has more than one outlet for stormwater runoff, then complete additional versions of these forms for each DA / outlet.

It is noted that in the Phase II Small MS4 Permit jurisdictions, the LID BMP Design Capture Volume criteria is based on the 2-year rain event. The hydromodification performance criterion is based on the 10-year rain event.

Methods applied in the following forms include:

- For LID BMP Design Capture Volume (DCV), San Bernardino County requires use of the P_6 method (Form 4.2-1) For pre- and post-development hydrologic calculation, San Bernardino County requires the use of the Rational Method (San Bernardino County Hydrology Manual Section D). Forms 4.2-2 through Form 4.2-5 calculate hydrologic variables including runoff volume, time of concentration, and peak runoff from the project site pre- and post-development using the Hydrology Manual Rational Method approach. For projects greater than 640 acres (1.0 mi^2), the Rational Method and these forms should not be used. For such projects, the Unit Hydrograph Method (San Bernardino County Hydrology Manual Section E) shall be applied for hydrologic calculations for hydromodification performance criteria.

Form 4.2-1 LID BMP Performance Criteria for Design Capture Volume (DMA-1)		
1 Project area DA 1A (ft^2): 378,100	**2** Imperviousness after applying preventative site design practices (Imp%): 88%	**3** Runoff Coefficient (Rc): 0.702 *$R_c = 0.858(Imp\%)^{\wedge 3}-0.78(Imp\%)^{\wedge 2}+0.774(Imp\%)+0.04$*
4 Determine 1-hour rainfall depth for a 2-year return period $P_{2yr\text{-}1hr}$ (in): 0.375 *http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html*		
5 Compute P_6, Mean 6-hr Precipitation (inches): 0.46 *P_6 = Item 4 *C_1, where C_1 is a function of site climatic region specified in Form 3-1 Item 1 (Desert = 1.2371)*		
6 Drawdown Rate *Use 48 hours as the default condition. Selection and use of the 24 hour drawdown time condition is subject to approval by the local jurisdiction. The necessary BMP footprint is a function of drawdown time. While shorter drawdown times reduce the performance criteria for LID BMP design capture volume, the depth of water that can be stored is also reduced.*		24-hrs ☐ 48-hrs ☒
7 Compute design capture volume, DCV (ft^3): 20,137 *DCV = 1/12 * [Item 1* Item 3 *Item 5 * C_2], where C_2 is a function of drawdown rate (24-hr = 1.582; 48-hr = 1.963)* *Compute separate DCV for each outlet from the project site per schematic drawn in Form 3-1 Item 2*		

Form 4.2-1 LID BMP Performance Criteria for Design Capture Volume (DMA-2)		
1 Project area DA 1A (ft^2): 133,730	**2** Imperviousness after applying preventative site design practices (Imp%): 88%	**3** Runoff Coefficient (Rc): 0.702 *$R_c = 0.858(Imp\%)^{\wedge 3}-0.78(Imp\%)^{\wedge 2}+0.774(Imp\%)+0.04$*
4 Determine 1-hour rainfall depth for a 2-year return period $P_{2yr\text{-}1hr}$ (in): 0.375 *http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html*		
5 Compute P_6, Mean 6-hr Precipitation (inches): 0.46 *P_6 = Item 4 *C_1, where C_1 is a function of site climatic region specified in Form 3-1 Item 1 (Desert = 1.2371)*		
6 Drawdown Rate *Use 48 hours as the default condition. Selection and use of the 24 hour drawdown time condition is subject to approval by the local jurisdiction. The necessary BMP footprint is a function of drawdown time. While shorter drawdown times reduce the performance criteria for LID BMP design capture volume, the depth of water that can be stored is also reduced.*		24-hrs ☐ 48-hrs ☒
7 Compute design capture volume, DCV (ft^3): 7,122 *DCV = 1/12 * [Item 1* Item 3 *Item 5 * C_2], where C_2 is a function of drawdown rate (24-hr = 1.582; 48-hr = 1.963)* *Compute separate DCV for each outlet from the project site per schematic drawn in Form 3-1 Item 2*		

Form 4.2-1 LID BMP Performance Criteria for Design Capture Volume (DMA-3)		
1 Project area DA 1A (ft^2): 148,105	**2** Imperviousness after applying preventative site design practices (Imp%): 88%	**3** Runoff Coefficient (Rc): 0.702 *$R_c = 0.858(Imp\%)^{\wedge 3}-0.78(Imp\%)^{\wedge 2}+0.774(Imp\%)+0.04$*
4 Determine 1-hour rainfall depth for a 2-year return period $P_{2yr\text{-}1hr}$ (in): 0.375 *http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html*		
5 Compute P_6, Mean 6-hr Precipitation (inches): 0.46 *P_6 = Item 4 *C_1, where C_1 is a function of site climatic region specified in Form 3-1 Item 1 (Desert = 1.2371)*		
6 Drawdown Rate *Use 48 hours as the default condition. Selection and use of the 24 hour drawdown time condition is subject to approval by the local jurisdiction. The necessary BMP footprint is a function of drawdown time. While shorter drawdown times reduce the performance criteria for LID BMP design capture volume, the depth of water that can be stored is also reduced.*		24-hrs ☐ 48-hrs ☒
7 Compute design capture volume, DCV (ft^3): 7,888 *DCV = 1/12 * [Item 1* Item 3 *Item 5 * C_2], where C_2 is a function of drawdown rate (24-hr = 1.582; 48-hr = 1.963)* *Compute separate DCV for each outlet from the project site per schematic drawn in Form 3-1 Item 2*		

Form 4.2-1 LID BMP Performance Criteria for Design Capture Volume (DMA-4)		
1 Project area DA 1A (ft^2): 785,825	**2** Imperviousness after applying preventative site design practices (Imp%): 88%	**3** Runoff Coefficient (Rc): 0.702 *$R_c = 0.858(Imp\%)^{\wedge 3}-0.78(Imp\%)^{\wedge 2}+0.774(Imp\%)+0.04$*
4 Determine 1-hour rainfall depth for a 2-year return period $P_{2yr\text{-}1hr}$ (in): 0.375 *http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html*		
5 Compute P_6, Mean 6-hr Precipitation (inches): 0.46 *P_6 = Item 4 *C_1, where C_1 is a function of site climatic region specified in Form 3-1 Item 1 (Desert = 1.2371)*		
6 Drawdown Rate *Use 48 hours as the default condition. Selection and use of the 24 hour drawdown time condition is subject to approval by the local jurisdiction. The necessary BMP footprint is a function of drawdown time. While shorter drawdown times reduce the performance criteria for LID BMP design capture volume, the depth of water that can be stored is also reduced.*		24-hrs ☐ 48-hrs ☒
7 Compute design capture volume, DCV (ft^3): 35,739 *DCV = 1/12 * [Item 1* Item 3 *Item 5 * C_2], where C_2 is a function of drawdown rate (24-hr = 1.582; 48-hr = 1.963)* *Compute separate DCV for each outlet from the project site per schematic drawn in Form 3-1 Item 2*		

Form 4.2-2 Summary of Hydromodification Assessment (DMA-1)

Is there change in post- and pre- condition flows captured on-site? : Yes ☒ No ☐

If "Yes", then complete Hydromodification assessment of site hydrology for 10yr storm event using Forms 4.2-3 through 4.2-5 and insert results below *(Forms 4.2-3 through 4.2-5 may be replaced by computer software analysis based on the San Bernardino County Hydrology Manual- Addendum 1)*, If "No," then proceed to Section 4.3 BMP Selection and Sizing

Condition	Runoff Volume (ft^3)	Time of Concentration (min)	Peak Runoff (cfs)
Pre-developed	**1** 32,583 *Form 4.2-3 Item 12*	**2** 5.62 *Form 4.2-4 Item 13*	**3** 15.67 *Form 4.2-5 Item 10*
Post-developed	**4** 63,772 *Form 4.2-3 Item 13*	**5** 5.00 *Form 4.2-4 Item 14*	**6** 15.21 *Form 4.2-5 Item 14*
Difference	**7** 31,189 *Item 4 – Item 1*	**8** 0.62 *Item 2 – Item 5*	**9** 0.46 *Item 6 – Item 3*
Difference (as % of pre-developed)	**10** 48.9% *Item 7 / Item 1*	**11** 12.4% *Item 8 / Item 2*	**12** -3.0% *Item 9 / Item 3*

Form 4.2-2 Summary of Hydromodification Assessment (DMA-2)

Is there change in post- and pre- condition flows captured on-site? : Yes ☒ No ☐

If "Yes", then complete Hydromodification assessment of site hydrology for 10yr storm event using Forms 4.2-3 through 4.2-5 and insert results below *(Forms 4.2-3 through 4.2-5 may be replaced by computer software analysis based on the San Bernardino County Hydrology Manual- Addendum 1)*, If "No," then proceed to Section 4.3 BMP Selection and Sizing

Condition	Runoff Volume (ft^3)	Time of Concentration (min)	Peak Runoff (cfs)
Pre-developed	**1** 11,535 *Form 4.2-3 Item 12*	**2** 5.00 *Form 4.2-4 Item 13*	**3** 5.66 *Form 4.2-5 Item 10*
Post-developed	**4** 22,564 *Form 4.2-3 Item 13*	**5** 5.00 *Form 4.2-4 Item 14*	**6** 8.50 *Form 4.2-5 Item 14*
Difference	**7** 11,029 *Item 4 – Item 1*	**8** 0 *Item 2 – Item 5*	**9** 2.84 *Item 6 – Item 3*
Difference (as % of pre-developed)	**10** 48.9% *Item 7 / Item 1*	**11** 0% *Item 8 / Item 2*	**12** 33.4% *Item 9 / Item 3*

Form 4.2-2 Summary of Hydromodification Assessment (DMA-3)

Is there change in post- and pre- condition flows captured on-site? : Yes ☒ No ☐

If "Yes", then complete Hydromodification assessment of site hydrology for 10yr storm event using Forms 4.2-3 through 4.2-5 and insert results below *(Forms 4.2-3 through 4.2-5 may be replaced by computer software analysis based on the San Bernardino County Hydrology Manual- Addendum 1)*, If "No," then proceed to Section 4.3 BMP Selection and Sizing

Condition	Runoff Volume (ft^3)	Time of Concentration (min)	Peak Runoff (cfs)
Pre-developed	**1** 12,772 *Form 4.2-3 Item 12*	**2** 5.00 *Form 4.2-4 Item 13*	**3** 5.82 *Form 4.2-5 Item 10*
Post-developed	**4** 24,672 *Form 4.2-3 Item 13*	**5** 5.00 *Form 4.2-4 Item 14*	**6** 9.82 *Form 4.2-5 Item 14*
Difference	**7** 11,900 *Item 4 – Item 1*	**8** 0 *Item 2 – Item 5*	**9** 4.00 *Item 6 – Item 3*
Difference (as % of pre-developed)	**10** 48.2% *Item 7 / Item 1*	**11** 0% *Item 8 / Item 2*	**12** 40.7% *Item 9 / Item 3*

Form 4.2-2 Summary of Hydromodification Assessment (DMA-4)

Is there change in post- and pre- condition flows captured on-site? : Yes ☒ No ☐

If "Yes", then complete Hydromodification assessment of site hydrology for 10yr storm event using Forms 4.2-3 through 4.2-5 and insert results below *(Forms 4.2-3 through 4.2-5 may be replaced by computer software analysis based on the San Bernardino County Hydrology Manual- Addendum 1)*, If "No," then proceed to Section 4.3 BMP Selection and Sizing

Condition	Runoff Volume (ft^3)	Time of Concentration (min)	Peak Runoff (cfs)
Pre-developed	**1** 67,688 *Form 4.2-3 Item 12*	**2** 6.75 *Form 4.2-4 Item 13*	**3** 32.05 *Form 4.2-5 Item 10*
Post-developed	**4** 120,234 *Form 4.2-3 Item 13*	**5** 5.40 *Form 4.2-4 Item 14*	**6** 36.13 *Form 4.2-5 Item 14*
Difference	**7** 52,546 *Item 4 – Item 1*	**8** 1.35 *Item 2 – Item 5*	**9** 4.08 *Item 6 – Item 3*
Difference (as % of pre-developed)	**10** 43.7% *Item 7 / Item 1*	**11** 20.0% *Item 8 / Item 2*	**12** 1.13% *Item 9 / Item 3*

Above calculations were based on 10-year 24-hour unit hydrograph calculations using computer software analysis per San Bernardino County Hydrology Manual – Addendum 1. See Appendix B for supporting calculations.

Refer to Section 4.3.6 Hydromodification Control BMP for proposed calculations.

4.3 BMP Selection and Sizing

For the LID DCV, the forms are ordered according to hierarchy of BMP selection as required by the Phase II Small MS4 Permit (see Section 5.3 in the TGD for WQMP). The forms compute the following for on-site LID BMP:

- Site Design Measures (Form 4.3-2)
- Retention and Infiltration BMPs (Form 4.3-3) or
- Biotreatment BMPs (Form 4.3-4).

4.3.1 Exceptions to Requirements for Bioretention Facilities

Contingent on a demonstration that use of bioretention or a facility of equivalent effectiveness is infeasible, other types of biotreatment or media filters (such as tree-box-type biofilters or in-vault media filters) may be used for the following categories of Regulated Projects:

1) Projects creating or replacing an acre or less of impervious area, and located in a designated pedestrian-oriented commercial district (i.e., smart growth projects), and having at least 85% of the entire project site covered by permanent structures;

2) Facilities receiving runoff solely from existing (pre-project) impervious areas; and

3) Historic sites, structures or landscapes that cannot alter their original configuration in order to maintain their historic integrity.

Form 4.3-1 Infiltration BMP Feasibility (DMA-1, 2 and 3)

Feasibility Criterion – Complete evaluation for each DA on the Project Site

[1] Would infiltration BMP pose significant risk for groundwater related concerns? Yes ☐ No ☒
Refer to Section 5.3.2.1 of the TGD for WQMP

If Yes, Provide basis: N/A

[2] Would installation of infiltration BMP significantly increase the risk of geotechnical hazards? Yes ☐ No ☒
(Yes, if the answer to any of the following questions is yes, as established by a geotechnical expert):

- The location is less than 50 feet away from slopes steeper than 15 percent
- The location is less than ten feet from building foundations or an alternative setback.
- A study certified by a geotechnical professional or an available watershed study determines that stormwater infiltration would result in significantly increased risks of geotechnical hazards.

If Yes, Provide basis: N/A

[3] Would infiltration of runoff on a Project site violate downstream water rights? Yes ☐ No ☒

If Yes, Provide basis: N/A

[4] Is proposed infiltration facility located on hydrologic soil group (HSG) D soils or does the site geotechnical investigation indicate presence of soil characteristics, which support categorization as D soils? Yes ☐ No ☒

If Yes, Provide basis: N/A

[5] Is the design infiltration rate, after accounting for safety factor of 2.0, below proposed facility less than 0.3 in/hr (accounting for soil amendments)? Yes ☐ No ☒

If Yes, Provide basis: N/A

[6] Would on-site infiltration or reduction of runoff over pre-developed conditions be partially or fully inconsistent with watershed management strategies as defined in the WAP, or impair beneficial uses? Yes ☐ No ☒
See Section 3.5 of the TGD for WQMP and WAP

If Yes, Provide basis: N/A

[7] Any answer from Item 1 through Item 3 is "Yes": Yes ☐ No ☒
If yes, infiltration of any volume is not feasible onsite. Proceed to Form 4.3-4, Selection and Evaluation of Biotreatment BMP.
If no, then proceed to Item 8 below.

[8] Any answer from Item 4 through Item 6 is "Yes": Yes ☐ No ☒
If yes, infiltration is permissible but is not required to be considered. Proceed to Form 4.3-2, Site Design BMP.
If no, then proceed to Item 9, below.

[9] All answers to Item 1 through Item 6 are "No":
Infiltration of the full DCV is potentially feasible, LID infiltration BMP must be designed to infiltrate the full DCV to the MEP.
Proceed to Form 4.3-2, Site Design BMPs.

4.3.2 Site Design BMP

Section E.12.e. of the Small Phase II MS4 Permit emphasizes the use of LID preventative measures; and the use of Site Design Measures reduces the portion of the DCV that must be addressed in downstream BMPs. Therefore, all applicable Site Design Measures shall be provided except where they are mutually exclusive with each other, or with other BMPs. Mutual exclusivity may result from overlapping BMP footprints such that either would be potentially feasible by itself, but both could not be implemented. Please note that while there are no numeric standards regarding the use of Site Design BMPs. If a project cannot feasibly meet BMP sizing requirements or cannot fully address hydromodification, feasibility of all applicable Site Design BMPs must be part of demonstrating that the BMP system has been designed to retain the maximum feasible portion of the DCV. Complete Form 4.3-2 to identify and calculate estimated retention volume from implementing site design BMP. Refer to Section 5.4 in the TGD for more detailed guidance.

Form 4.3-2 Site Design BMPs

1 Implementation of Impervious Area Dispersion BMP (i.e. routing runoff from impervious to pervious areas), excluding impervious areas planned for routing to on-lot infiltration BMP: Yes ☐ No ☒ *If yes, complete Items 2-5; If no, proceed to Item 6*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
2 Total impervious area draining to pervious area (ft^2)			
3 Ratio of pervious area receiving runoff to impervious area			
4 Retention volume achieved from impervious area dispersion (ft^3) *V = Item2 * Item 3 * (0.5/12), assuming retention of 0.5 inches of runoff*			
5 Sum of retention volume achieved from impervious area dispersion (ft^3):	$V_{retention}$ *=Sum of Item 4 for all BMPs*		
6 Implementation of Localized On-lot Infiltration BMPs (e.g. on-lot rain gardens): Yes ☐ No ☒ *If yes, complete Items 7-13 for aggregate of all on-lot infiltration BMP in each DA; If no, proceed to Item 14*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
7 Ponding surface area (ft^2)			
8 Ponding depth (ft) (min. 0.5 ft.)			
9 Surface area of amended soil/gravel (ft^2)			
10 Average depth of amended soil/gravel (ft) (min. 1 ft.)			
11 Average porosity of amended soil/gravel			
12 Retention volume achieved from on-lot infiltration (ft^3) $V_{retention}$ *= (Item 7 *Item 8) + (Item 9 * Item 10 * Item 11)*			
13 Runoff volume retention from on-lot infiltration (ft^3):	$V_{retention}$ *=Sum of Item 12 for all BMPs*		

Form 4.3-2 cont. Site Design BMPs

14 Implementation of Street Trees: Yes ☐ No ☒ *If yes, complete Items 14-18. If no, proceed to Item 19*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
15 Number of Street Trees			
16 Average canopy cover over impervious area (ft^2)			
17 Runoff volume retention from street trees (ft^3) *$V_{retention}$ = Item 15 * Item 16 * (0.05/12) assume runoff retention of 0.05 inches*			
18 Runoff volume retention from street tree BMPs (ft^3): *$V_{retention}$ = Sum of Item 17 for all BMPs*			
19 Total Retention Volume from Site Design BMPs: *Sum of Items 5, 13 and 18*			

4.3.3 Infiltration BMPs

Use Form 4.3-3 to compute on-site retention of runoff from proposed retention and infiltration BMPs. Volume retention estimates are sensitive to the percolation rate used, which determines the amount of runoff that can be infiltrated within the specified drawdown time. The infiltration safety factor reduces field measured percolation to account for potential inaccuracy associated with field measurements, declining BMP performance over time, and compaction during construction. Appendix C of the TGD for WQMP provides guidance on estimating an appropriate safety factor to use in Form 4.3-3.

If site constraints limit the use of BMPs to a single type and implementation of retention and infiltration BMPs mitigate no more than 40% of the DCV, then they are considered infeasible and the Project Proponent may evaluate the effectiveness of BMPs lower in the LID hierarchy of use (Section 5.5 of the TGD for WQMP)

If implementation of infiltrations BMPs is feasible as determined using Form 4.3-1, then LID infiltration BMPs shall be implemented to the MEP (section 4.1 of the TGD for WQMP).

See Appendix D for the sizing of proposed retention basins using City of Victorville's design standard of 13.5 cubic feet minimum retention per 100 square feet of impervious area in the respective drainage management area.

4.3.3.1 Allowed Variations for Special Site Conditions

The bioretention system design parameters of this Section may be adjusted for the following special site conditions:

1) Facilities located within 10 feet of structures or other potential geotechnical hazards established by the geotechnical expert for the project may incorporate an impervious cutoff wall between the bioretention facility and the structure or other geotechnical hazard.

2) Facilities with documented high concentrations of pollutants in underlying soil or groundwater, facilities located where infiltration could contribute to a geotechnical hazard, and facilities located on elevated plazas or other structures may incorporate an impervious liner and may locate the underdrain discharge at the bottom of the subsurface drainage/storage layer (this configuration is commonly known as a "flow-through planter").

3) Facilities located in areas of high groundwater, highly infiltrative soils or where connection of underdrain to a surface drain or to a subsurface storm drain are infeasible, may omit the underdrain.

4) Facilities serving high-risk areas such as fueling stations, truck stops, auto repairs, and heavy industrial sites may be required to provide adequate pretreatment to address pollutants of concern unless these high-risk areas are isolated from storm water runoff or bioretention areas with no chance of spill migration.

Form 4.3-3 Infiltration LID BMP - including underground BMPs

1 Remaining LID DCV not met by site design BMP (ft^3): 70,886 CF (all 4 DMAs Combined)
V_{unmet} = Form 4.2-1 Item 7 - Form 4.3-2 Item19

BMP Type *Use columns to the right to compute runoff volume retention from proposed infiltration BMP (select BMP from Table 5-4 in TGD for WQMP) - Use additional forms for more BMPs*	DMA -1	DMA -2	DMA -3	DMA -4
2 Infiltration rate of underlying soils (in/hr) *See Section 5.4.2 and Appendix C of the TGD for WQMP for minimum requirements for assessment methods*	2.0	2.0	2.0	2.0
3 Infiltration safety factor *See TGD Section 5.4.2 and Appendix D*	2.0	2.0	2.0	2.0
4 Design percolation rate (in/hr) *P_{design} = Item 2 / Item 3*	1.0	1.0	1.0	1.0
5 Ponded water drawdown time (hr) *Copy Item 6 in Form 4.2-1*	48	48	48	48
6 Maximum ponding depth (ft) *BMP specific, see Table 5-4 of the TGD for WQMP for BMP design details*	n/a	n/a	n/a	n/a
7 Ponding Depth (ft) *d_{BMP} = Minimum of (1/12*Item 4*Item 5) or Item 6*	n/a	n/a	n/a	n/a
8 Infiltrating surface area, *SA_{BMP}* (ft^2) *the lesser of the area needed for infiltration of full DCV or minimum space requirements from Table 5.7 of the TGD for WQMP*	n/a	n/a	n/a	n/a
9 Amended soil depth, *d_{media}* (ft) *Only included in certain BMP types, see Table 5-4 in the TGD for WQMP for reference to BMP design details*	n/a	n/a	n/a	n/a
10 Amended soil porosity	n/a	n/a	n/a	n/a
11 Gravel depth, *d_{media}* (ft) *Only included in certain BMP types, see Table 5-4 of the TGD for WQMP for BMP design details*	n/a	n/a	n/a	n/a
12 Gravel porosity	n/a	n/a	n/a	n/a
13 Duration of storm as basin is filling (hrs) *Typical ~ 3hrs*	3	3	3	3
14 Above Ground Retention Volume (ft^3) *$V_{retention}$ = Item 8 * [Item7 + (Item 9 * Item 10) + (Item 11 * Item 12) + (Item 13 * (Item 4 / 12))]*	n/a	n/a	n/a	n/a
15 Underground Retention Volume (ft^3) *Volume determined using manufacturer's specifications and calculations*	20,169 (see Appendix D for Calculation)	7,146 (see Appendix D for Calculation)	7,972 (see Appendix D for Calculation)	36,215 (see Appendix D for Calculation)

16 Total Retention Volume from LID Infiltration BMPs: 71,502 *(Sum of Items 14 and 15 for all infiltration BMP included in plan)*

17 Fraction of DCV achieved with infiltration BMP: 101% *Retention% = Item 16 / Form 4.2-1 Item 7*

18 Is full LID DCV retained onsite with combination of hydrologic source control and LID retention/infiltration BMPs? Yes ☒ No ☐

If yes, demonstrate conformance using Form 4.3-8; If no, then reduce Item 3, Factor of Safety to 2.0 and increase Item 8, Infiltrating Surface Area, such that the portion of the site area used for retention and infiltration BMPs equals or exceeds the minimum effective area thresholds (Table 5-7 of the TGD for WQMP) for the applicable category of development and repeat all above calculations.

4.3.4 Biotreatment BMP

The full LID DCV is met with infiltration BMP.

Biotreatment BMPs may be considered if the full LID DCV cannot be met by maximizing retention and infiltration. A key consideration when using biotreatment BMP is the effectiveness of the proposed BMP in addressing the pollutants of concern for the project (see Table 5-5 of the TGD for WQMP).

Below Table is Not Applicable. Full Infiltration BMP used.

Form 4.3-4 Selection and Evaluation of Biotreatment BMP (DMA 1, 2 and 3)

1 Remaining LID DCV not met by site design , or infiltration, BMP for potential biotreatment (ft^3): 0 *Form 4.2-1 Item 7 - Form 4.3-2 Item 19 – Form 4.3-3 Item 16*	List pollutants of concern *Copy from Form 2.3-1.*	
2 Biotreatment BMP Selected *(Select biotreatment BMP(s) necessary to ensure all pollutants of concern are addressed through Unit Operations and Processes, described in Table 5-5 of the TGD for WQMP)*	Volume-based biotreatment *Use Forms 4.3-5 and 4.3-6 to compute treated volume*	Flow-based biotreatment *Use Form 4.3-7 to compute treated flow*
	☐ Bioretention with underdrain ☐ Planter box with underdrain ☐ Constructed wetlands ☐ Wet extended detention ☐ Dry extended detention	☐ Vegetated swale ☐ Vegetated filter strip ☐ Proprietary biotreatment
3 Volume biotreated in volume based biotreatment BMP (ft^3): *Form 4.3-5 Item 15 + Form 4.3-6 Item 13*	**4** Compute remaining LID DCV with implementation of volume based biotreatment BMP (ft^3): *Item 1 – Item 3*	**5** Remaining fraction of LID DCV for sizing flow based biotreatment BMP: % *Item 4 / Item 1*
6 Flow-based biotreatment BMP capacity provided (cfs): *Use Figure 5-2 of the TGD for WQMP to determine flow capacity required to provide biotreatment of remaining percentage of unmet LID DCV (Item 5), for the project's precipitation zone (Form 3-1 Item 1)*		
7 Metrics for MEP determination: • Provided a WQMP with the portion of site area used for suite of LID BMP equal to minimum thresholds in Table 5-7 of the TGD for WQMP for the proposed category of development: ☐ *If maximized on-site retention BMPs is feasible for partial capture, then LID BMP implementation must be optimized to retain and infiltrate the maximum portion of the DCV possible within the prescribed minimum effective area. The remaining portion of the DCV shall then be mitigated using biotreatment BMP.*		

Below Table is Not Applicable. Full Infiltration BMP used.

Form 4.3-5 Volume Based Biotreatment (DMA 1, 2 and 3) – Bioretention and Planter Boxes with Underdrains

Biotreatment BMP Type *(Bioretention w/underdrain, planter box w/underdrain, other comparable BMP)*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
1 Pollutants addressed with BMP *List all pollutant of concern that will be effectively reduced through specific Unit Operations and Processes described in Table 5-5 of the TGD for WQMP*			
2 Amended soil infiltration rate *Typical ~ 5.0*			
3 Amended soil infiltration safety factor *Typical ~ 2.0*			
4 Amended soil design percolation rate (in/hr) P_{design} *= Item 2 / Item 3*			
5 Ponded water drawdown time (hr) *Copy Item 6 from Form 4.2-1*			
6 Maximum ponding depth (ft) *see Table 5-6 of the TGD for WQMP for reference to BMP design details*			
7 Ponding Depth (ft) d_{BMP} *= Minimum of (1/12 * Item 4 * Item 5) or Item 6*			
8 Amended soil surface area (ft^2)			
9 Amended soil depth (ft) *see Table 5-6 of the TGD for WQMP for reference to BMP design details*			
10 Amended soil porosity, *n*			
11 Gravel depth (ft) *see Table 5-6 of the TGD for WQMP for reference to BMP design details*			
12 Gravel porosity, *n*			
13 Duration of storm as basin is filling (hrs) *Typical ~ 3hrs*			
14 Biotreated Volume (ft^3) $V_{biotreated}$ *= Item 8 * [(Item 7/2) + (Item 9 * Item 10) +(Item 11 * Item 12) + (Item 13 * (Item 4 / 12))]*			
15 Total biotreated volume from bioretention and/or planter box with underdrains BMP: *Sum of Item 14 for all volume-based BMPs included in this form*			

Below Table is Not Applicable. Full Infiltration BMP used.

Form 4.3-6 Volume Based Biotreatment (DMA 1, 2 and 3) – Constructed Wetlands and Extended Detention

Biotreatment BMP Type *Constructed wetlands, extended wet detention, extended dry detention, or other comparable proprietary BMP. If BMP includes multiple modules (E.g. forebay and main basin), provide separate estimates for storage and pollutants treated in each module.*	DA DMA BMP Type		DA DMA BMP Type *(Use additional forms for more BMPs)*	
	Forebay	Basin	Forebay	Basin
1 Pollutants addressed with BMP forebay and basin *List all pollutant of concern that will be effectively reduced through specific Unit Operations and Processes described in Table 5-5 of the TGD for WQMP*				
2 Bottom width (ft)				
3 Bottom length (ft)				
4 Bottom area (ft^2) A_{bottom} = *Item 2 * Item 3*				
5 Side slope (ft/ft)				
6 Depth of storage (ft)				
7 Water surface area (ft^2) $A_{surface}$ =*(Item 2 + (2 * Item 5 * Item 6)) * (Item 3 + (2 * Item 5 * Item 6))*				
8 Storage volume (ft^3) *For BMP with a forebay, ensure fraction of total storage is within ranges specified in BMP specific fact sheets, see Table 5-6 of the TGD for WQMP for reference to BMP design details* V =*Item 6 / 3 * [Item 4 + Item 7 + (Item 4 * Item 7)^0.5]*				
9 Drawdown Time (hrs) *Copy Item 6 from Form 2.1*				
10 Outflow rate (cfs) Q_{BMP} = *(Item* $8_{forebay}$ *+ Item* 8_{basin}*) / (Item 9 * 3600)*				
11 Duration of design storm event (hrs)				
12 Biotreated Volume (ft^3) $V_{biotreated}$ = *(Item* $8_{forebay}$ *+ Item* 8_{basin}*) +(Item 10 * Item 11 * 3600)*				
13 Total biotreated volume from constructed wetlands, extended dry detention, or extended wet detention : *(Sum of Item 12 for all BMP included in plan)*				

Below Table is Not Applicable. Full Infiltration BMP used.

Form 4.3-7 Flow Based Biotreatment (DMA 1, 2 and 3)

Biotreatment BMP Type *Vegetated swale, vegetated filter strip, or other comparable proprietary BMP*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
1 Pollutants addressed with BMP *List all pollutant of concern that will be effectively reduced through specific Unit Operations and Processes described in TGD Table 5-5*			
2 Flow depth for water quality treatment (ft) *BMP specific, see Table 5-6 of the TGD for WQMP for reference to BMP design details*			
3 Bed slope (ft/ft) *BMP specific, see Table 5-6 of the TGD for WQMP for reference to BMP design details*			
4 Manning's roughness coefficient			
5 Bottom width (ft) b_w *= (Form 4.3-5 Item 6 * Item 4) / (1.49 * Item 2^1.67 * Item 3^0.5)*			
6 Side Slope (ft/ft) *BMP specific, see Table 5-6 of the TGD for WQMP for reference to BMP design details*			
7 Cross sectional area (ft^2) *A = (Item 5 * Item 2) + (Item 6 * Item 2^2)*			
8 Water quality flow velocity (ft/sec) *V = Form 4.3-5 Item 6 / Item 7*			
9 Hydraulic residence time (min) *Pollutant specific, see Table 5-6 of the TGD for WQMP for reference to BMP design details*			
10 Length of flow based BMP (ft) *L = Item 8 * Item 9 * 60*			
11 Water surface area at water quality flow depth (ft^2) SA_{top} *= (Item 5 + (2 * Item 2 * Item 6)) * Item 10*			

4.3.5 Conformance Summary

Complete Form 4.3-8 to demonstrate how on-site LID DCV is met with proposed site design, infiltration, and/or biotreatment BMP. The bottom line of the form is used to describe the basis for infeasibility determination for on-site LID BMP to achieve full LID DCV, and provides methods for computing remaining volume to be addressed in an alternative compliance plan. If the project has more than one outlet, then complete additional versions of this form for each outlet.

Form 4.3-8 Conformance Summary and Alternative Compliance Volume Estimate (DMA-1, 2 and 3)

1 Total LID DCV for the Project (ft^3): 70,886 CF (all 4 DMAs Combined)
Copy Item 7 in Form 4.2-1

2 On-site retention with site design BMP (ft^3): N/A *Copy Item18 in Form 4.3-2*

3 On-site retention with LID infiltration BMP (ft^3): 71,502 CF *Copy Item 16 in Form 4.3-3*

4 On-site biotreatment with volume based biotreatment BMP (ft^3): N/A *Copy Item 3 in Form 4.3-4*

5 Flow capacity provided by flow based biotreatment BMP (cfs): N/A *Copy Item 6 in Form 4.3-4*

6 LID BMP performance criteria are achieved if answer to any of the following is "Yes":

- Full retention of LID DCV with site design or infiltration BMP: Yes ☒ No ☐
  If yes, sum of Items 2, 3, and 4 is greater than Item 1
- Combination of on-site retention BMPs for a portion of the LID DCV and volume-based biotreatment BMP that address all pollutants of concern for the remaining LID DCV: Yes ☐ No ☒
  If yes, a) sum of Items 2, 3, 4, and 5 is greater than Item 1, and Items 2, 3 and 4 are maximized; or b) Item 6 is greater than Form 4.3--5 Item 6 and Items 2, 3 and 4 are maximized
- On-site retention and infiltration is determined to be infeasible; therefore biotreatment BMP provides biotreatment for all pollutants of concern for full LID DCV: Yes ☐ No ☒
  If yes, Form 4.3-1 Items 7 and 8 were both checked yes

7 If the LID DCV is not achieved by any of these means, then the project may be allowed to develop an alternative compliance plan. Check box that describes the scenario which caused the need for alternative compliance:

- Combination of Site Design, retention and infiltration, , and biotreatment BMPs provide less than full LID DCV capture: ☐
  Checked yes if Form 4.3-4 Item 7is checked yes, Form 4.3-4 Item 6 is zero, and sum of Items 2, 3, 4, and 5 is less than Item 1. If so, apply water quality credits and calculate volume for alternative compliance, V_{alt} *= (Item 1 – Item 2 – Item 3 – Item 4 – Item 5) * (100 - Form 2.4-1 Item 2)%*

- Facilities, or a combination of facilities, of a different design than in Section E.12.e.(ii)(f) may be permitted if all of the following Phase II Small MS4 General Permit 2013-0001-DWQ 55 February 5, 2013 measures of equivalent effectiveness are demonstrated:
  1) Equal or greater amount of runoff infiltrated or evapotranspired; ☐
  2) Equal or lower pollutant concentrations in runoff that is discharged after biotreatment; ☐
  3) Equal or greater protection against shock loadings and spills; ☐
  4) Equal or greater accessibility and ease of inspection and maintenance. ☐

4.3.6 Hydromodification Control BMP

Use Form 4.3-9 to compute the remaining runoff volume retention, after Site Design BMPs are implemented, needed to address hydromodification, and the increase in time of concentration and decrease in peak runoff necessary to meet targets for protection of waterbodies with a potential hydromodification. Describe the proposed hydromodification treatment control BMP. Section 5.6 of the TGD for WQMP provides additional details on selection and evaluation of hydromodification control BMP.

Form 4.3-9 Hydromodification Control BMPs (DMA-1)

1 Volume reduction needed for hydromodification performance criteria (ft^3): 28,000 *(Form 4.2-2 Item 4 * 0.95) – Form 4.2-2 Item 1*	**2** On-site retention with site design and infiltration, BMP (ft^3): 28,000 *Sum of Form 4.3-8 Items 2, 3, and 4. Evaluate option to increase implementation of on-site retention in Forms 4.3-2, 4.3-3, and 4.3-4 in excess of LID DCV toward achieving hydromodification volume reduction*
3 Remaining volume for hydromodification volume capture (ft^3): 0 *Item 1 – Item 2*	**4** Volume capture provided by incorporating additional on-site BMPs (ft^3): N/A

5 Is Form 4.2-2 Item 11 less than or equal to 5%: Yes ☒ No ☐

If yes, hydromodification performance criteria is achieved. If no, select one or more mitigation options below:

- Demonstrate increase in time of concentration achieved by proposed LID site design, LID BMP, and additional on-site BMP ☐
- Increase time of concentration by preserving pre-developed flow path and/or increase travel time by reducing slope and increasing cross-sectional area and roughness for proposed on-site conveyance facilities ☐

6 Form 4.2-2 Item 12 less than or equal to 5%: Yes ☐ No ☒

If yes, hydromodification performance criteria is achieved. If no, select one or more mitigation options below:

- Demonstrate reduction in peak runoff achieved by proposed LID site design, LID BMPs, and additional on-site retention BMPs ☒

Outflow control which will only allow Qpeak existing for 10-year 24-hour and 100-year 1-hour storm events to leave the site.

See Appendix D.

Form 4.3-9 Hydromodification Control BMPs (DMA-2)

1 Volume reduction needed for hydromodification performance criteria (ft^3): 9,900
*(Form 4.2-2 Item 4 * 0.95) – Form 4.2-2 Item 1*

2 On-site retention with site design and infiltration, BMP (ft^3): 9,950 *Sum of Form 4.3-8 Items 2, 3, and 4. Evaluate option to increase implementation of on-site retention in Forms 4.3-2, 4.3-3, and 4.3-4 in excess of LID DCV toward achieving hydromodification volume reduction*

3 Remaining volume for hydromodification volume capture (ft^3): 0 *Item 1 – Item 2*

4 Volume capture provided by incorporating additional on-site BMPs (ft^3): N/A

5 Is Form 4.2-2 Item 11 less than or equal to 5%: Yes ☒ No ☐

If yes, hydromodification performance criteria is achieved. If no, select one or more mitigation options below:

- Demonstrate increase in time of concentration achieved by proposed LID site design, LID BMP, and additional on-site BMP ☐
- Increase time of concentration by preserving pre-developed flow path and/or increase travel time by reducing slope and increasing cross-sectional area and roughness for proposed on-site conveyance facilities ☐

6 Form 4.2-2 Item 12 less than or equal to 5%: Yes ☐ No ☒

If yes, hydromodification performance criteria is achieved. If no, select one or more mitigation options below:

- Demonstrate reduction in peak runoff achieved by proposed LID site design, LID BMPs, and additional on-site retention BMPs ☐

Outflow control which will only allow Qpeak existing for 10-year 24-hour and 100-year 1-hour storm events to leave the site.

See Appendix D.

Form 4.3-9 Hydromodification Control BMPs (DMA-3)

1 Volume reduction needed for hydromodification performance criteria (ft^3): 10,666 *(Form 4.2-2 Item 4 * 0.95) – Form 4.2-2 Item 1*	**2** On-site retention with site design and infiltration, BMP (ft^3): 10,700 *Sum of Form 4.3-8 Items 2, 3, and 4. Evaluate option to increase implementation of on-site retention in Forms 4.3-2, 4.3-3, and 4.3-4 in excess of LID DCV toward achieving hydromodification volume reduction*
3 Remaining volume for hydromodification volume capture (ft^3): 0 *Item 1 – Item 2*	**4** Volume capture provided by incorporating additional on-site BMPs (ft^3): N/A

5 Is Form 4.2-2 Item 11 less than or equal to 5%: Yes ☒ No ☐

If yes, hydromodification performance criteria is achieved. If no, select one or more mitigation options below:

- Demonstrate increase in time of concentration achieved by proposed LID site design, LID BMP, and additional on-site BMP ☐
- Increase time of concentration by preserving pre-developed flow path and/or increase travel time by reducing slope and increasing cross-sectional area and roughness for proposed on-site conveyance facilities ☐

6 Form 4.2-2 Item 12 less than or equal to 5%: Yes ☐ No ☒

If yes, hydromodification performance criteria is achieved. If no, select one or more mitigation options below:

- Demonstrate reduction in peak runoff achieved by proposed LID site design, LID BMPs, and additional on-site retention BMPs ☐

Outflow control which will only allow Qpeak existing for 10-year 24-hour and 100-year 1-hour storm events to leave the site.

See Appendix D.

Form 4.3-9 Hydromodification Control BMPs (DMA-4)

1 Volume reduction needed for hydromodification performance criteria (ft^3): 46,534
*(Form 4.2-2 Item 4 * 0.95) – Form 4.2-2 Item 1*

2 On-site retention with site design and infiltration, BMP (ft^3): 46,600 *Sum of Form 4.3-8 Items 2, 3, and 4. Evaluate option to increase implementation of on-site retention in Forms 4.3-2, 4.3-3, and 4.3-4 in excess of LID DCV toward achieving hydromodification volume reduction*

3 Remaining volume for hydromodification volume capture (ft^3): 0 *Item 1 – Item 2*

4 Volume capture provided by incorporating additional on-site BMPs (ft^3): N/A

5 Is Form 4.2-2 Item 11 less than or equal to 5%: Yes ☒ No ☐

If yes, hydromodification performance criteria is achieved. If no, select one or more mitigation options below:

- Demonstrate increase in time of concentration achieved by proposed LID site design, LID BMP, and additional on-site BMP ☐
- Increase time of concentration by preserving pre-developed flow path and/or increase travel time by reducing slope and increasing cross-sectional area and roughness for proposed on-site conveyance facilities ☐

6 Form 4.2-2 Item 12 less than or equal to 5%: Yes ☐ No ☒

If yes, hydromodification performance criteria is achieved. If no, select one or more mitigation options below:

- Demonstrate reduction in peak runoff achieved by proposed LID site design, LID BMPs, and additional on-site retention BMPs ☐

Outflow control which will only allow Qpeak existing for 10-year 24-hour and 100-year 1-hour storm events to leave the site.

See Appendix D.

4.4 Alternative Compliance Plan (if applicable)

Not applicable. The infiltration BMP proposed can fully infiltrate the DCV.

For projects not fully able to infiltrate, or biotreat the DCV via on-site LID practices, a project proponent must develop an alternative compliance plan to address the remainder of the LID DCV. Depending on project type some projects may qualify for water quality credits that can be applied to reduce the DCV that must be treated prior to development of an alternative compliance plan (see Form 2.4-1, Water Quality Credits). Form 4.3-9 Item 8 includes instructions on how to apply water quality credits when computing the DCV that must be met through alternative compliance.

Alternative Designs — Facilities, or a combination of facilities, of a different design than in Permit Section E.12.e.(ii)(f) may be permitted if all of the following measures of equivalent effectiveness are demonstrated:

1) Equal or greater amount of runoff infiltrated or evapotranspired;

2) Equal or lower pollutant concentrations in runoff that is discharged after biotreatment;

3) Equal or greater protection against shock loadings and spills;

4) Equal or greater accessibility and ease of inspection and maintenance.

The Project Proponent will need to obtain written approval for an alternative design from the Lahontan Regional Water Board Executive Officer (see Section 6 of the TGD for WQMP).

Section 5 Inspection and Maintenance Responsibility for Post Construction BMP

All BMPs included as part of the project WQMP are required to be maintained through regular scheduled inspection and maintenance (refer to Section 8, Post Construction BMP Requirements, in the TGD for WQMP). Fully complete Form 5-1 summarizing all BMP included in the WQMP. Attach additional forms as needed. The WQMP shall also include a detailed Operation and Maintenance Plan for all BMP and a Maintenance Agreement. The Maintenance Agreement must also be attached to the WQMP.

Note that at time of Project construction completion, the Maintenance Agreement must be completed, signed, notarized and submitted to the County Stormwater Department

Form 5-1 BMP Inspection and Maintenance

BMP	Reponsible Party(s)	Inspection/ Maintenance Activities Required	Minimum Frequency of Activities
S1 - Provide storm drain system stenciling and signage	Bear Valley Road & 2nd Ave, LLC & Bear Valley Devel. Co.	Spray or install storm drain stencils that contain a brief statement of that prohibits the dumping of improper materials into the municipal storm drain system.	Three (3) times a year and repair as necessary.
S3 - Design and construct trash and waste storage areas to reduce pollution introduction	Bear Valley Road & 2nd Ave, LLC & Bear Valley Devel. Co.	The integrity of structural elements that are subject to damage (i.e., screens, covers, and signs) must be maintained by the owner/operator.	Monthly
S4 - Use efficient irrigation systems & landscape design, water conservation, smart controllers, and source control	Bear Valley Road & 2nd Ave, LLC & Bear Valley Devel. Co.	Inspect irrigation equipment. Adjust irrigation heads and timing as necessary. All conditions of National Pollution Discharge Elimination System (NPDES) must be complied with at all times.	Monthly
S5 - Finish grade of landscaped areas at a minimum of 1-2 inches below top of curb, sidewalk, or pavement	Bear Valley Road & 2nd Ave, LLC& Bear Valley Devel. Co.	Maintain the finish grade at all landscape pockets, fingers, and parkway strips at a minimum of 1-2 inches bwlow top of curb or sidewalk for increased retention/infiltration of stormwater and irrigation water.	Monthly

Form 5-1 BMP Inspection and Maintenance

BMP	Reponsible Party(s)	Inspection/ Maintenance Activities Required	Minimum Frequency of Activities
S6 - Protect slopes and channels and provide energy dissipation	Bear Valley Road & 2nd Ave, LLC & Bear Valley Devel. Co.	Inspect for erosion of slopes.	Monthly and after storm events.
S13 - Hillside landscaping	Bear Valley Road & 2nd Ave, LLC & Bear Valley Devel. Co.	Hillside areas that are disturbed by project development shall be landscaped with deep-rooted, drought tolerant plant species selected for erosion control, satisfactory to the local permitting authority. Inspect the condition of the landscaping. Maintain hillside landscaping at the same frequency as the landscaping for the rest of the project site.	Weekly
Infiltration Basins	Bear Valley Road & 2nd Ave, LLC& Bear Valley Devel. Co.	• Inspections and maintenance to ensure that water infiltrates into the subsurface completely and that vegetation is carefully managed to prevent creating mosquito and other vector habitats. • Observe drain time for the design storm after completion or modification of the facility to confirm that the desired drain time (48 hours) has been obtained. • Schedule semiannual inspections for beginning and end of the wet season to identify potential problems such as erosion of the basin side slopes and invert, standing water, trash and debris, and sediment accumulation. • Remove accumulated trash and debris in the basin at the start and end of the wet season. • Inspect for standing water at the end of the wet season. • Trim vegetation at the beginning and end of the wet season to prevent establishment of woody vegetation and for aesthetic and vector reasons. • Remove accumulated sediment and regrade when the accumulated sediment volume exceeds 10% of the basin. • If erosion is occurring within the basin, revegetate immediately and stabilize with an erosion control mulch or mat until vegetation cover is established.	Twice a year, before and after the wet season

Section 6 WQMP Attachments

6.1. Site Plan and Drainage Plan

A site plan and drainage exhibits containing the following minimum information are included in Appendix A and B of this document.

- Project location
- Site boundary
- Land uses and land covers, as applicable
- Suitability/feasibility constraints
- Structural Source Control BMP locations
- Site Design Hydrologic Source Control BMP locations
- LID BMP details
- Drainage delineations and flow information
- Drainage connections

6.2 Electronic Data Submittal

Minimum requirements include submittal of PDF exhibits in addition to hard copies. Format must not require specialized software to open. If the local jurisdiction requires specialized electronic document formats (as described in their Local Implementation Plan), this section will describe the contents (e.g., layering, nomenclature, geo-referencing, etc.) of these documents so that they may be interpreted efficiently and accurately.

6.3 Post Construction

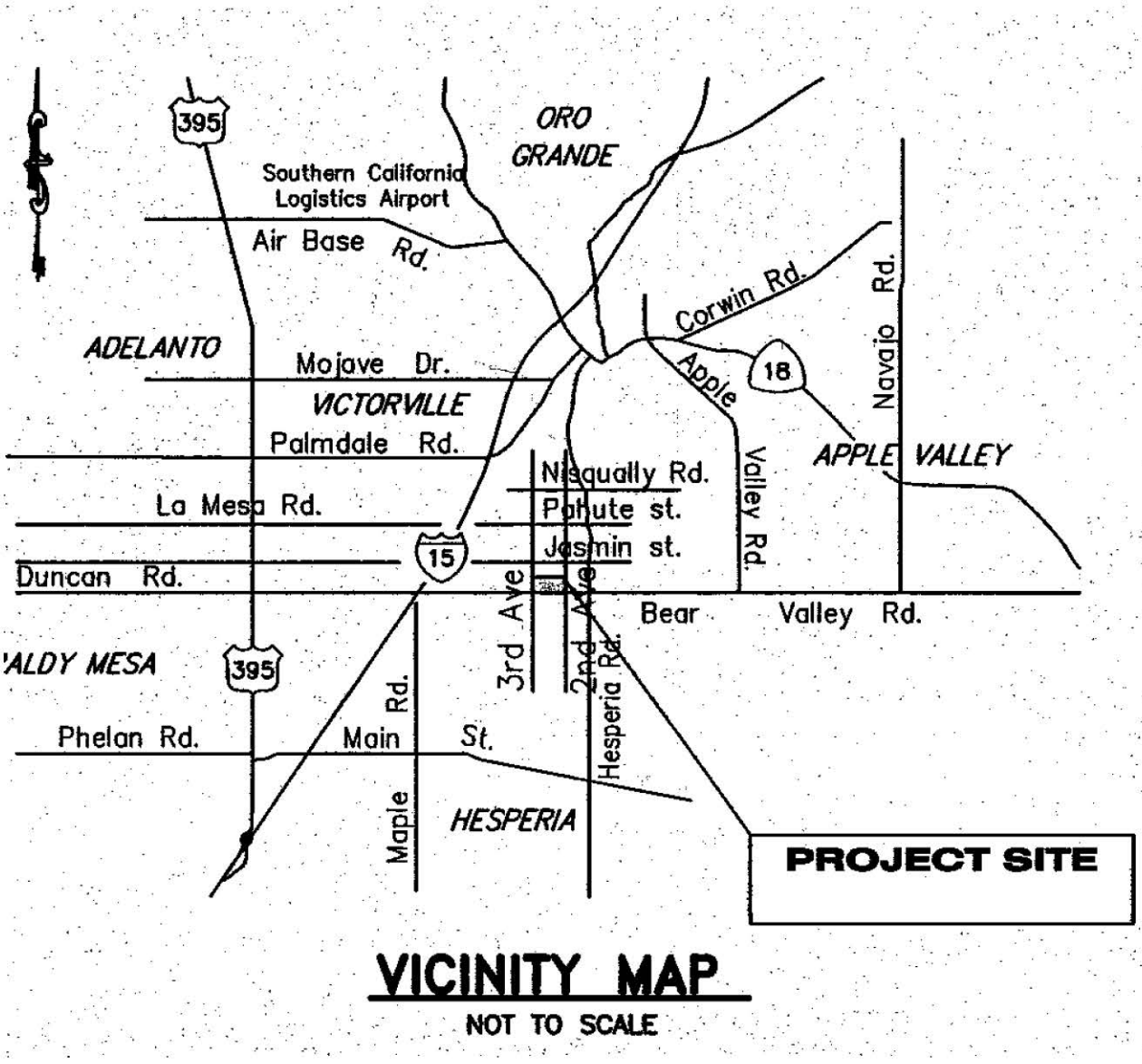
Operation and Maintenance (O&M) Plans and Maintenance Agreements for BMP are included in Appendix F of this document.

6.4 Other Supporting Documentation

- BMP Educational Materials – Included as Appendix E of this document.

Appendix A

- Vicinity Map
- Receiving Water Map
- WQMP Site Plan (Full Size, 24”x36”)

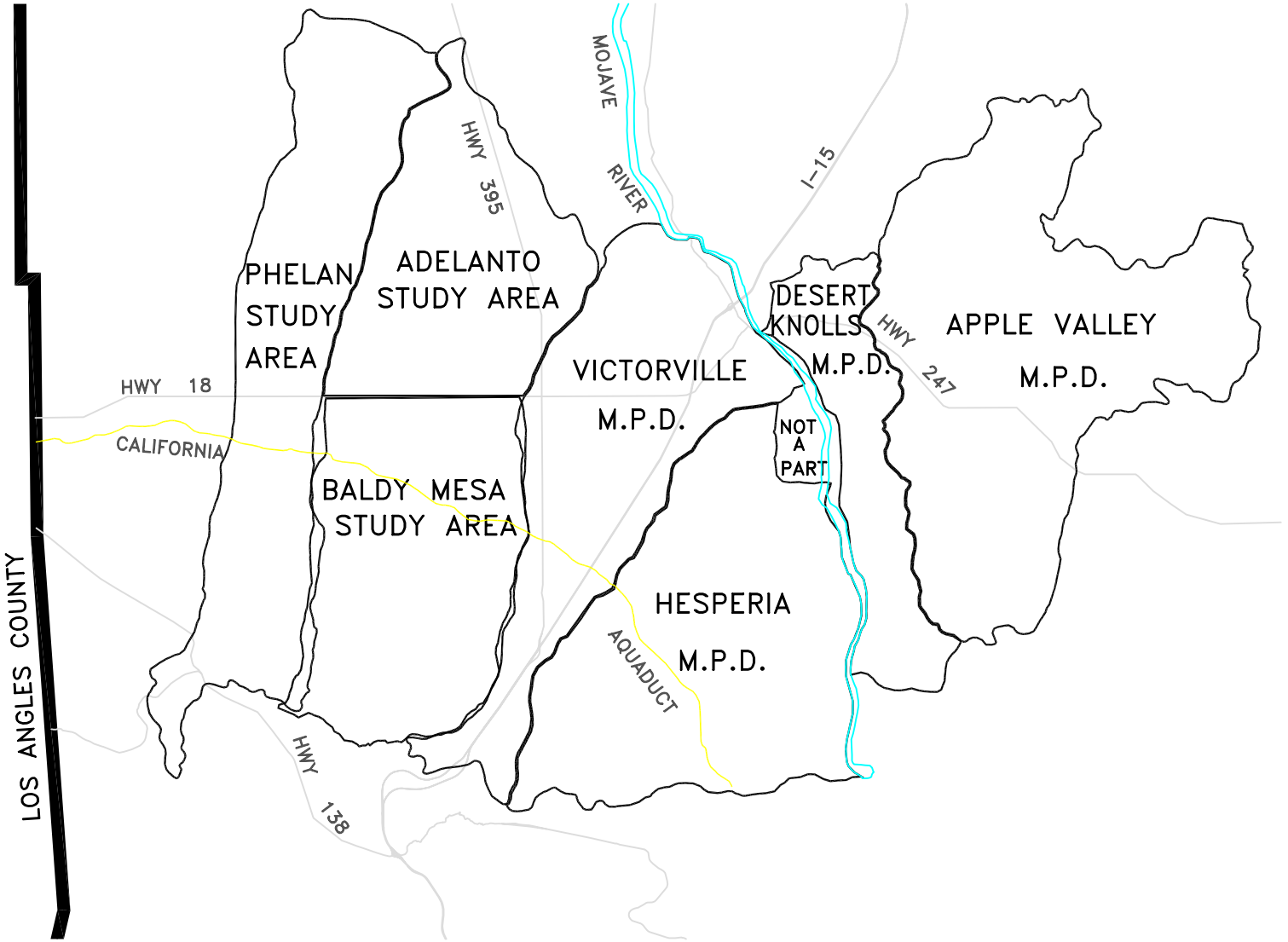


VICINITY MAP

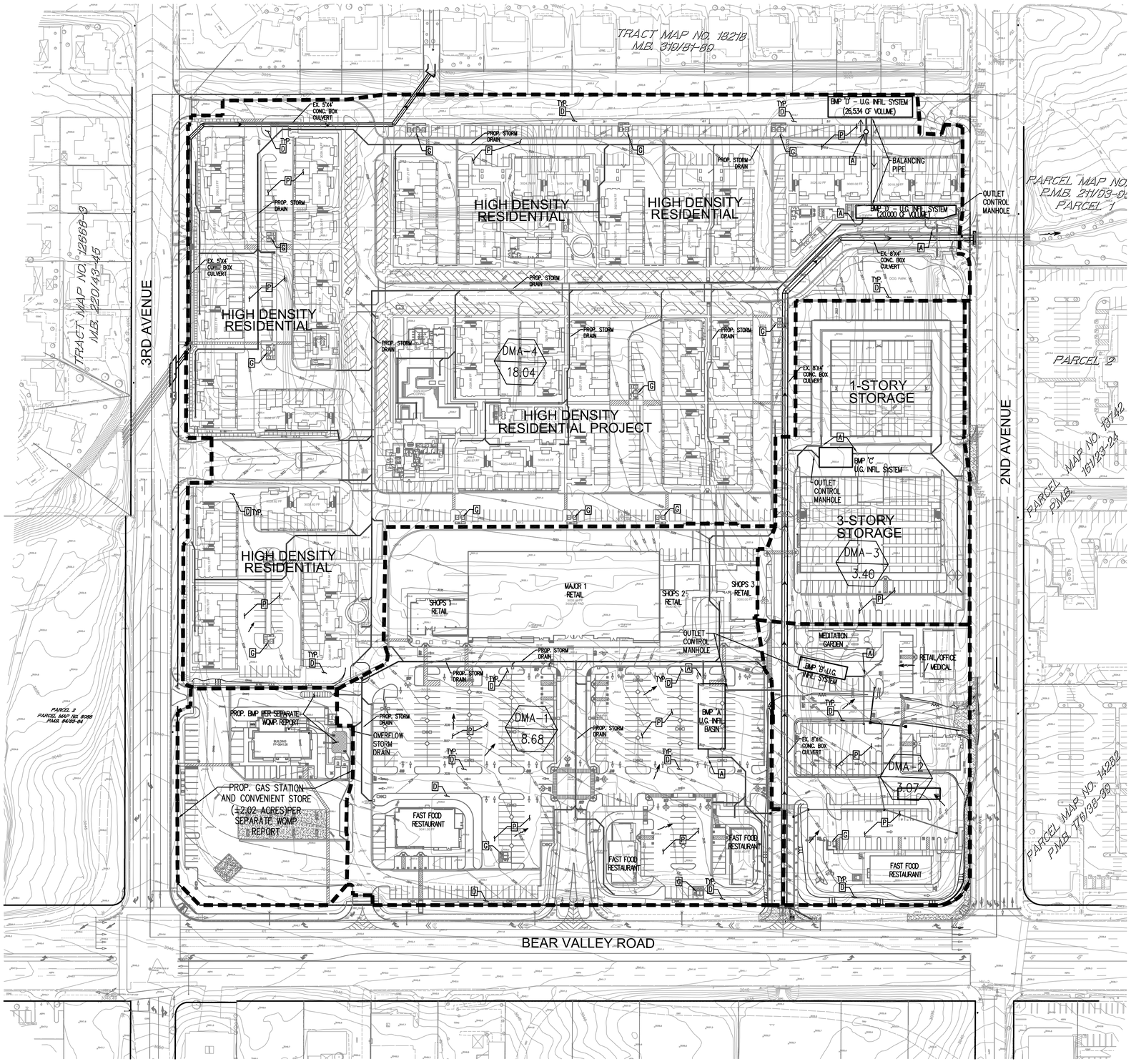
NOT TO SCALE

STATISTICS

Area	20,105 Sq. Mi.
Width	210 Mi
Length	135 Mi
Max. Elev.	11,502 Ft.
Min. Elev.	Sea Level



SAN BERNARDINO COUNTY
FLOOD CONTROL DISTRICT
HIGH DESERT VICTORVILLE AREA



LEGEND:

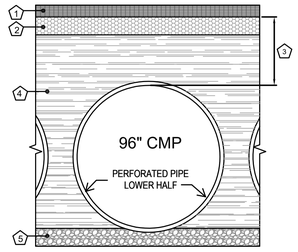
- DA-1 / 1.00 — TREATMENT AREA DESIGNATION / ACREAGE
- FLOW PATH
- DMA AREA BOUNDARY

SOURCE CONTROL BMPS:

- [A] *HYDRO-DYNAMIC SEPARATOR*
- [D] *LANDSCAPE/OUTDOOR PESTICIDE USE*
- [G] REFUSE AREAS
  NOTE: TRASH ENCLOSURES ARE GRADED TO PREVENT RUNOFF AND RUNON.
- [P] *PLAZA, SIDEWALKS, AND PARKING LOTS*

WQMP NOTES:

1. ALL STRUCTURAL BMPs SHALL BE ACCESSIBLE FOR INSPECTION AND MAINTENANCE AND SHALL BEAR A "NO DUMPING – DRAINS TO OCEAN" PAINT PER DETAIL HEREIN. STENCILS ARE AVAILABLE AT THE LOCAL BUILDING AND SAFETY DISTRICT OFFICE.
2. ALL TRASH BINS SHALL BE COVERED.
3. ALL DOWNSPOUTS TO DRAIN TO PROPOSED BMPs.



KEY

1. RIGID OR FLEXIBLE PAVEMENT
2. GRANULAR ROAD BASE
3. 12" MIN. FOR DIAMETERS THROUGH 96" 18" MIN. FOR DIAMETERS FROM 102" AND LARGER MEASURED TO TOP OF RIGID OR BOTTOM OF FLEXIBLE PAVEMENT.
4. SELECT GRANULAR FILL PER AASHTO M145 A1, A2 OR A3, OR APPROVED EQUAL. PLACED IN 8" LIFTS (COMPACTED TO MIN. 90% STANDARD DENSITY PER AASHTO T99.)
5. ¾" CLEAN GRAVEL OR #57 STONE , ROUGHLY SHAPED TO FIT THE BOTTOM OF PIPE, 12" IN DEPTH

UNDERGROUND INFILTRATION/DETENTION SYSTEM DETAIL

NOT TO SCALE

Drainage Area	Area (ac)	Vbmp* (CF)	10-Year 24-hour Peak Flow Rate Pre (CFS)	10-Year 24-hour Peak Flow Rate Post and Mitigated Flow Rate (CFS)	100-Year 1-hour Peak Flow Rate Pre (CFS)	100-Year 1-hour Peak Flow Rate Post and Mitigated Flow Rate (CFS)	Required Storage Volume ** Volume (CF)	Basin Volume Provided (CF)
A	10.74	20,137	15.67	40.32 Post 21.91 Mitigated 15.21 Post 15.21 Mitigated	37.91		28,000	28,150
B	3.04	7,122	5.66	8.50 Post 4.95 Mitigated	12.95	8.50 Post 5.57 Mitigated	9,900	10,450
C	3.39	7,888	5.82	9.82 Post 5.50 Mitigated	14.85	9.82 Post 7.51 Mitigated	10,666	10,779
D	18.04	35,739	32.05	36.13 Post 30.95 Mitigated	57.76	61.11 Post 56.94 Mitigated	46,534	46,845

*Refer to Form 4.2-1 LID BMP Perfomance Criteria for Design Capture Volume per PWQMP Report.
**Difference Between 10-year 24-hour pre- and post- development volume. Refer to Form 4.2-2 Summary of Hydromodification Assessment per PWQMP Report.

80' 0' 80' 120' 240'

GRAPHIC SCALE: 1"=80'

PREPARED BY:
DRC Engineering, Inc.
Civil Engineering/Land Surveying/Land Planning
4649 Brockton Ave.
Riverside, CA 92506
714-685-6860
RONALD W. SKLEPKO R.C.E. 46216 DATE

REGISTERED PROFESSIONAL ENGINEER * RONALD W. SKLEPKO * No. C46216 Exp. 12-31-2019 * CIVIL * STATE OF CALIFORNIA

NO: REVISION: DATE:

PROJECT:
VICTORVILLE CONNECTION
BEAR VALLEY ROAD & 3RD AVE.
VICTORVILLE, CA
DRAWING NAME: **WQMP SITE PLAN**

ISSUE:	PRELIMINARY
DATE:	03-18-20
CHECKED: RWS	DRAWN: YH
DRAWING FILE:	20523WQMP
PROJECT NO.:	20-523
SHEET NUMBER:	1
OF	1 SHEETS
SCALE:	AS SHOWN

EXTERNAL REFERENCES: 20523_A101 20523_pgmon101 20-523_C1 01 20523 of A101-wxc-working 20523_SDMA01 20523_SMA01 20523_MA02 20523_C101 20523_MA01 20523_C0M01
FILENAME: M:\2020\20-523 WesternCRE Victorville Bear Vly Rd\WQMP\20523 WQMP SITE.dwg, LAST SAVED ON: May 18 2021 8:55am PLOTTED BY: YANG, ON: May 18 2021 9:06am, CFG:

Appendix B
Unit Hydrograph Calculations

NOAA Atlas 14, Volume 6, Version 2
Location name: Victorville, California, USA*
Latitude: 34.4709°, Longitude: -117.2992°
Elevation: 3039.38 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.089** (0.073-0.108)	**0.124** (0.102-0.152)	**0.172** (0.142-0.212)	**0.214** (0.174-0.264)	**0.272** (0.215-0.348)	**0.319** (0.247-0.417)	**0.369** (0.279-0.494)	**0.423** (0.310-0.582)	**0.499** (0.351-0.715)	**0.561** (0.381-0.832)
10-min	**0.127** (0.105-0.155)	**0.178** (0.147-0.217)	**0.247** (0.203-0.303)	**0.306** (0.250-0.379)	**0.390** (0.308-0.499)	**0.458** (0.354-0.598)	**0.529** (0.400-0.708)	**0.606** (0.445-0.834)	**0.715** (0.504-1.02)	**0.803** (0.547-1.19)
15-min	**0.153** (0.127-0.188)	**0.215** (0.177-0.263)	**0.299** (0.246-0.367)	**0.370** (0.302-0.458)	**0.472** (0.373-0.603)	**0.554** (0.428-0.723)	**0.640** (0.483-0.857)	**0.733** (0.538-1.01)	**0.865** (0.609-1.24)	**0.972** (0.661-1.44)
30-min	**0.214** (0.177-0.261)	**0.299** (0.247-0.366)	**0.416** (0.343-0.511)	**0.516** (0.421-0.638)	**0.657** (0.519-0.841)	**0.771** (0.596-1.01)	**0.892** (0.673-1.19)	**1.02** (0.749-1.41)	**1.20** (0.848-1.73)	**1.35** (0.921-2.01)
60-min	**0.268** (0.221-0.327)	**0.375** (0.309-0.459)	**0.522** (0.429-0.640)	**0.646** (0.527-0.799)	**0.823** (0.650-1.05)	**0.966** (0.747-1.26)	**1.12** (0.843-1.50)	**1.28** (0.939-1.76)	**1.51** (1.06-2.16)	**1.70** (1.15-2.52)
2-hr	**0.378** (0.313-0.463)	**0.509** (0.421-0.624)	**0.690** (0.568-0.847)	**0.843** (0.688-1.04)	**1.06** (0.838-1.36)	**1.24** (0.957-1.62)	**1.42** (1.07-1.91)	**1.62** (1.19-2.23)	**1.90** (1.34-2.73)	**2.13** (1.45-3.16)
3-hr	**0.462** (0.382-0.565)	**0.614** (0.507-0.752)	**0.824** (0.678-1.01)	**1.00** (0.818-1.24)	**1.25** (0.991-1.61)	**1.46** (1.13-1.91)	**1.68** (1.26-2.24)	**1.91** (1.40-2.62)	**2.23** (1.57-3.20)	**2.50** (1.70-3.70)
6-hr	**0.632** (0.522-0.773)	**0.834** (0.689-1.02)	**1.11** (0.914-1.36)	**1.35** (1.10-1.67)	**1.68** (1.33-2.15)	**1.95** (1.51-2.54)	**2.23** (1.68-2.98)	**2.53** (1.86-3.48)	**2.96** (2.08-4.24)	**3.30** (2.25-4.90)
12-hr	**0.810** (0.669-0.990)	**1.09** (0.897-1.33)	**1.46** (1.20-1.79)	**1.78** (1.45-2.20)	**2.22** (1.76-2.84)	**2.58** (1.99-3.36)	**2.95** (2.23-3.94)	**3.34** (2.45-4.60)	**3.89** (2.74-5.59)	**4.34** (2.95-6.44)
24-hr	**1.07** (0.952-1.24)	**1.47** (1.31-1.70)	**2.01** (1.78-2.33)	**2.46** (2.16-2.87)	**3.09** (2.62-3.72)	**3.59** (2.98-4.41)	**4.11** (3.33-5.17)	**4.66** (3.67-6.03)	**5.42** (4.10-7.32)	**6.04** (4.41-8.43)
2-day	**1.22** (1.08-1.40)	**1.69** (1.50-1.95)	**2.33** (2.06-2.70)	**2.87** (2.51-3.34)	**3.62** (3.07-4.36)	**4.22** (3.50-5.18)	**4.84** (3.92-6.10)	**5.50** (4.33-7.12)	**6.43** (4.86-8.68)	**7.17** (5.24-10.0)
3-day	**1.32** (1.17-1.52)	**1.84** (1.63-2.12)	**2.55** (2.25-2.94)	**3.14** (2.75-3.66)	**3.97** (3.36-4.78)	**4.63** (3.84-5.69)	**5.32** (4.31-6.70)	**6.06** (4.77-7.85)	**7.10** (5.36-9.58)	**7.93** (5.80-11.1)
4-day	**1.41** (1.25-1.62)	**1.97** (1.74-2.26)	**2.72** (2.40-3.15)	**3.36** (2.94-3.91)	**4.25** (3.60-5.11)	**4.95** (4.11-6.09)	**5.69** (4.61-7.17)	**6.48** (5.11-8.39)	**7.59** (5.74-10.2)	**8.48** (6.20-11.9)
7-day	**1.53** (1.36-1.76)	**2.12** (1.88-2.45)	**2.93** (2.59-3.38)	**3.60** (3.15-4.19)	**4.54** (3.85-5.47)	**5.29** (4.39-6.50)	**6.07** (4.92-7.64)	**6.89** (5.43-8.93)	**8.05** (6.09-10.9)	**8.98** (6.56-12.5)
10-day	**1.63** (1.44-1.87)	**2.25** (1.99-2.59)	**3.09** (2.73-3.57)	**3.79** (3.32-4.42)	**4.78** (4.05-5.75)	**5.56** (4.61-6.83)	**6.37** (5.16-8.03)	**7.23** (5.70-9.37)	**8.44** (6.38-11.4)	**9.41** (6.87-13.1)
20-day	**1.90** (1.68-2.18)	**2.63** (2.33-3.03)	**3.63** (3.20-4.19)	**4.47** (3.91-5.20)	**5.65** (4.79-6.80)	**6.59** (5.47-8.10)	**7.57** (6.13-9.54)	**8.61** (6.79-11.2)	**10.1** (7.61-13.6)	**11.2** (8.21-15.7)
30-day	**2.17** (1.92-2.50)	**3.01** (2.67-3.47)	**4.18** (3.69-4.82)	**5.16** (4.52-6.01)	**6.56** (5.56-7.90)	**7.68** (6.37-9.44)	**8.85** (7.17-11.1)	**10.1** (7.96-13.1)	**11.9** (8.96-16.0)	**13.3** (9.69-18.5)
45-day	**2.54** (2.26-2.93)	**3.53** (3.13-4.07)	**4.91** (4.34-5.67)	**6.09** (5.34-7.10)	**7.80** (6.61-9.39)	**9.18** (7.62-11.3)	**10.6** (8.62-13.4)	**12.2** (9.61-15.8)	**14.4** (10.9-19.5)	**16.2** (11.8-22.6)
60-day	**2.81** (2.49-3.24)	**3.89** (3.44-4.48)	**5.40** (4.77-6.24)	**6.72** (5.89-7.83)	**8.63** (7.32-10.4)	**10.2** (8.47-12.5)	**11.9** (9.63-15.0)	**13.7** (10.8-17.7)	**16.3** (12.3-22.0)	**18.4** (13.5-25.8)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

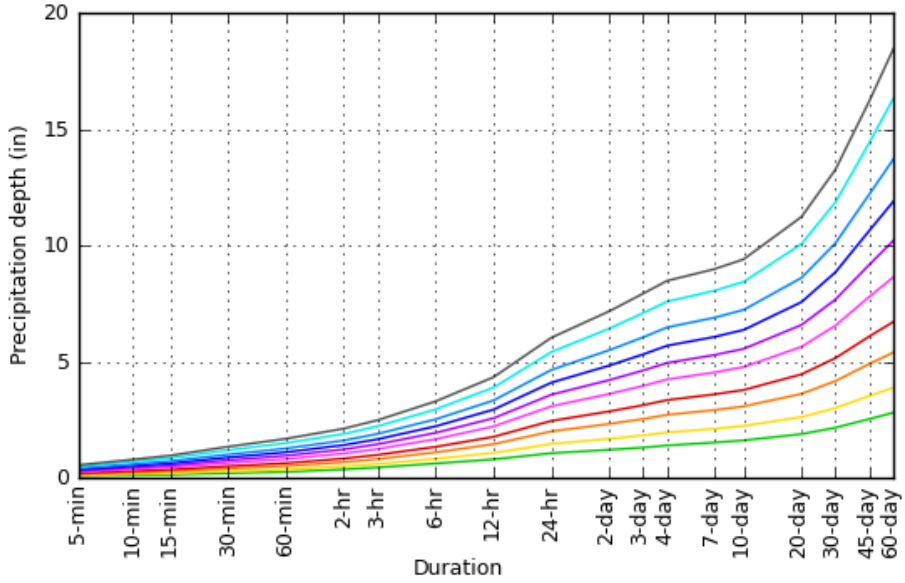
Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

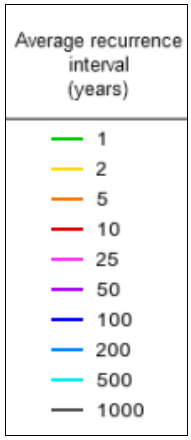
Please refer to NOAA Atlas 14 document for more information.

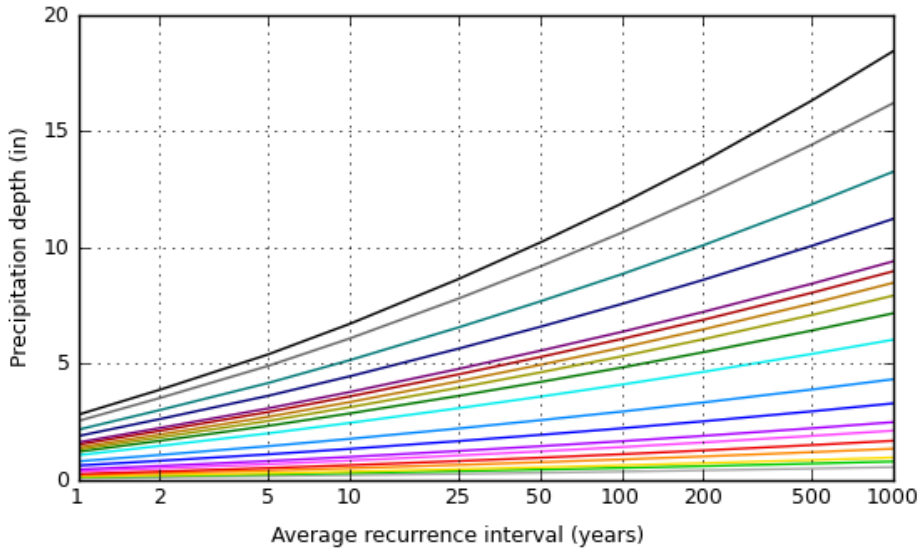
Back to Top

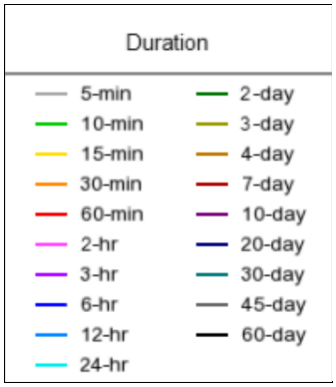
PF graphical

PDS-based depth-duration-frequency (DDF) curves
Latitude: 34.4709°, Longitude: -117.2992°









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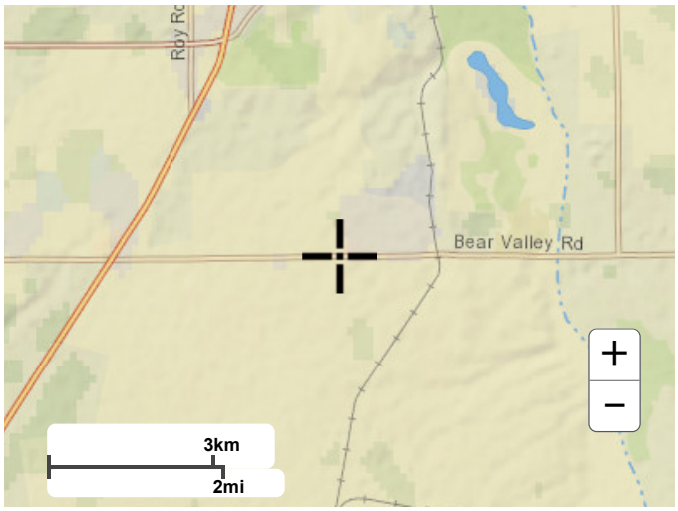
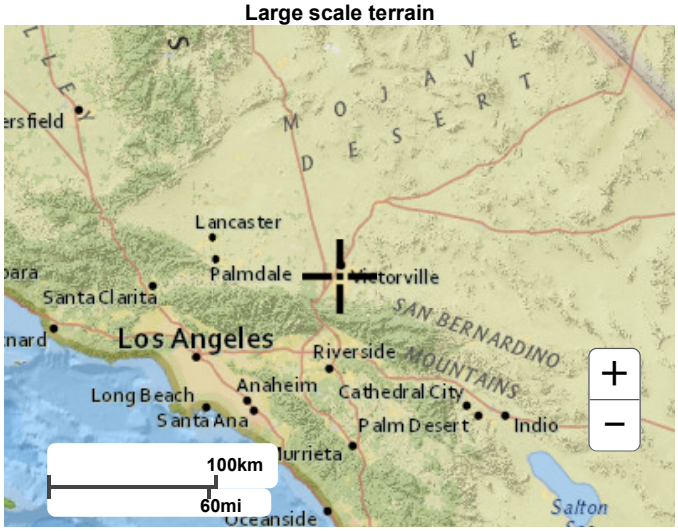
Back to Top

Maps & aerials

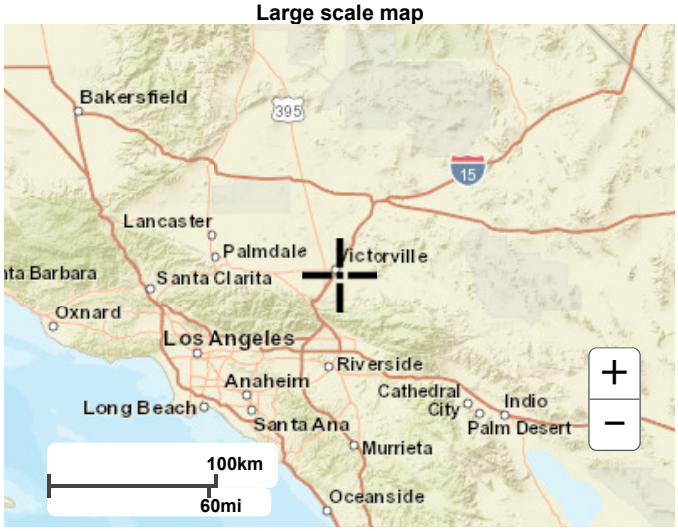
Small scale terrain



Large scale terrain



Large scale map



Large scale aerial

Back to Top

US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Disclaimer

Figure ADD-1
Antecedent Moisture Condition (AMC)

5-day Rainfall - NOAA Atlas 14
(50% of Total Rainfall Prior to Peak)*

*1/2 (11-day - 1-day) =
1/2 (([10-day] + (1/10 ([20-day] - [10-day]))) - [1-day])

5 0 5 10 15
Miles

N
W E
S

Growing Season
- AMC I
- AMC II
- AMC III

Boron
Ridgecrest
Searles Valley
STATE HWY 127
I-15
US HWY 395
Barstow
I-40
Needles
Adelanto
George AFB
Victorville
Apple Valley
Mountain View Acres
Hesperia
STATE HWY 247
Wrightwood
Crestline
Lake Arrowhead
Running Springs
Big Bear City
Big Bear Lake
Twentynine Palms
Joshua Tree
Yucca Valley
Morongo Valley
STATE HWY 62
Claremont
Havasu Lake
Big River

EXISING CONDITION UNIT HYDROGRAPH CALCULATIONS

10-YEAR 24-HOUR

DMA -1

U n i t H y d r o g r a p h A n a l y s i s

Study date 05/07/21

++

San Bernardino County Synthetic Unit Hydrology Method
Manual date - August 1986

Program License Serial Number 6310

20-523 BEAR VALLY CONNECTION PROJECT
EXISTING CONDITION, DMA-1

Storm Event Year = 10

Antecedent Moisture Condition = 1

English (in-lb) Input Units Used

English Rainfall Data (Inches) Input Values Used

English Units used in output format

Area averaged rainfall intensity isohyetal data:

Sub-Area (Ac.)	Duration (hours)	Isohyetal (In)
Rainfall data for year 10		
8.68	1	0.65
Rainfall data for year 10		
8.68	6	1.35
Rainfall data for year 10		
8.68	24	2.46

++

******** Area-averaged max loss rate, Fm ********

SCS curve No.(AMCII)	SCS curve NO.(AMC 1)	Area (Ac.)	Area Fraction	Fp(Fig C6) (In/Hr)	Ap (dec.)	Fm (In/Hr)
91.0	79.8	8.68	1.000	0.373	1.000	0.373

Area-averaged adjusted loss rate Fm (In/Hr) = 0.373

********* Area-Averaged low loss rate fraction, Yb **********

Area (Ac.)	Area Fract	SCS CN (AMC2)	SCS CN (AMC1)	S	Pervious Yield Fr
8.68	1.000	91.0	79.8	2.53	0.346

Area-averaged catchment yield fraction, Y = 0.346
Area-averaged low loss fraction, Yb = 0.654
++
Watercourse length = 1000.00(Ft.)
Length from concentration point to centroid = 650.00(Ft.)
Elevation difference along watercourse = 15.00(Ft.)
Mannings friction factor along watercourse = 0.030
Watershed area = 8.68(Ac.)
Catchment Lag time = 0.075 hours
Unit interval = 5.000 minutes
Unit interval percentage of lag time = 110.7997
Hydrograph baseflow = 0.00(CFS)
Average maximum watershed loss rate(Fm) = 0.373(In/Hr)

Lag=0.8 x Tc; Tc=5.62 Min.

Average low loss rate fraction (Yb) = 0.654 (decimal)
DESERT S-Graph Selected
Computed peak 5-minute rainfall = 0.307(In)
Computed peak 30-minute rainfall = 0.525(In)
Specified peak 1-hour rainfall = 0.646(In)
Computed peak 3-hour rainfall = 1.015(In)
Specified peak 6-hour rainfall = 1.350(In)
Specified peak 24-hour rainfall = 2.460(In)

Rainfall depth area reduction factors:
Using a total area of 8.68(Ac.) (Ref: fig. E-4)

5-minute factor = 1.000 Adjusted rainfall = 0.306(In)
30-minute factor = 1.000 Adjusted rainfall = 0.525(In)
1-hour factor = 1.000 Adjusted rainfall = 0.646(In)
3-hour factor = 1.000 Adjusted rainfall = 1.015(In)
6-hour factor = 1.000 Adjusted rainfall = 1.350(In)
24-hour factor = 1.000 Adjusted rainfall = 2.460(In)

U n i t H y d r o g r a p h

Interval Number	'S' Graph Mean values	Unit Hydrograph ((CFS))
	(K = 104.97 (CFS))	
1	20.705	21.734
2	71.016	52.814
3	86.513	16.268
4	93.235	7.056
5	96.756	3.696
6	98.432	1.759
7	99.594	1.220
8	100.000	0.426

Peak Unit Number	Adjusted mass rainfall (In)	Unit rainfall (In)
1	0.3064	0.3064
2	0.3772	0.0708
3	0.4260	0.0488
4	0.4644	0.0384
5	0.4966	0.0322
6	0.5245	0.0279
7	0.5493	0.0248
8	0.5718	0.0225
9	0.5923	0.0206
10	0.6114	0.0190
11	0.6291	0.0177
12	0.6457	0.0166
13	0.6674	0.0216
14	0.6880	0.0207
15	0.7079	0.0198
16	0.7269	0.0191
17	0.7453	0.0184
18	0.7630	0.0177
19	0.7802	0.0172
20	0.7969	0.0167
21	0.8130	0.0162
22	0.8288	0.0157
23	0.8441	0.0153
24	0.8590	0.0149
25	0.8735	0.0146
26	0.8878	0.0142
27	0.9017	0.0139
28	0.9153	0.0136
29	0.9286	0.0133
30	0.9416	0.0131
31	0.9544	0.0128
32	0.9670	0.0126
33	0.9793	0.0123
34	0.9914	0.0121
35	1.0033	0.0119
36	1.0150	0.0117
37	1.0265	0.0115
38	1.0379	0.0113
39	1.0490	0.0112
40	1.0600	0.0110

41	1.0708	0.0108
42	1.0815	0.0107
43	1.0920	0.0105
44	1.1024	0.0104
45	1.1126	0.0102
46	1.1227	0.0101
47	1.1327	0.0100
48	1.1426	0.0099
49	1.1523	0.0097
50	1.1619	0.0096
51	1.1714	0.0095
52	1.1808	0.0094
53	1.1901	0.0093
54	1.1993	0.0092
55	1.2084	0.0091
56	1.2174	0.0090
57	1.2263	0.0089
58	1.2351	0.0088
59	1.2438	0.0087
60	1.2524	0.0086
61	1.2610	0.0085
62	1.2694	0.0085
63	1.2778	0.0084
64	1.2861	0.0083
65	1.2943	0.0082
66	1.3025	0.0082
67	1.3106	0.0081
68	1.3186	0.0080
69	1.3265	0.0079
70	1.3344	0.0079
71	1.3422	0.0078
72	1.3500	0.0077
73	1.3580	0.0081
74	1.3661	0.0080
75	1.3740	0.0080
76	1.3819	0.0079
77	1.3898	0.0078
78	1.3976	0.0078
79	1.4053	0.0077
80	1.4130	0.0077
81	1.4206	0.0076
82	1.4281	0.0076
83	1.4357	0.0075
84	1.4431	0.0075
85	1.4505	0.0074
86	1.4579	0.0074
87	1.4652	0.0073
88	1.4725	0.0073
89	1.4797	0.0072
90	1.4869	0.0072
91	1.4940	0.0071
92	1.5011	0.0071
93	1.5081	0.0070
94	1.5151	0.0070
95	1.5221	0.0070
96	1.5290	0.0069
97	1.5359	0.0069
98	1.5427	0.0068
99	1.5495	0.0068
100	1.5562	0.0068
101	1.5630	0.0067
102	1.5696	0.0067
103	1.5763	0.0066
104	1.5829	0.0066
105	1.5895	0.0066
106	1.5960	0.0065
107	1.6025	0.0065
108	1.6090	0.0065
109	1.6154	0.0064
110	1.6218	0.0064
111	1.6282	0.0064
112	1.6345	0.0063
113	1.6408	0.0063
114	1.6471	0.0063
115	1.6533	0.0062
116	1.6595	0.0062
117	1.6657	0.0062
118	1.6718	0.0061
119	1.6779	0.0061

120	1.6840	0.0061
121	1.6901	0.0061
122	1.6961	0.0060
123	1.7021	0.0060
124	1.7081	0.0060
125	1.7141	0.0059
126	1.7200	0.0059
127	1.7259	0.0059
128	1.7317	0.0059
129	1.7376	0.0058
130	1.7434	0.0058
131	1.7492	0.0058
132	1.7550	0.0058
133	1.7607	0.0057
134	1.7664	0.0057
135	1.7721	0.0057
136	1.7778	0.0057
137	1.7834	0.0056
138	1.7891	0.0056
139	1.7947	0.0056
140	1.8002	0.0056
141	1.8058	0.0056
142	1.8113	0.0055
143	1.8168	0.0055
144	1.8223	0.0055
145	1.8278	0.0055
146	1.8332	0.0054
147	1.8387	0.0054
148	1.8441	0.0054
149	1.8495	0.0054
150	1.8548	0.0054
151	1.8602	0.0053
152	1.8655	0.0053
153	1.8708	0.0053
154	1.8761	0.0053
155	1.8813	0.0053
156	1.8866	0.0052
157	1.8918	0.0052
158	1.8970	0.0052
159	1.9022	0.0052
160	1.9074	0.0052
161	1.9125	0.0052
162	1.9176	0.0051
163	1.9228	0.0051
164	1.9279	0.0051
165	1.9329	0.0051
166	1.9380	0.0051
167	1.9430	0.0050
168	1.9481	0.0050
169	1.9531	0.0050
170	1.9581	0.0050
171	1.9631	0.0050
172	1.9680	0.0050
173	1.9730	0.0049
174	1.9779	0.0049
175	1.9828	0.0049
176	1.9877	0.0049
177	1.9926	0.0049
178	1.9974	0.0049
179	2.0023	0.0048
180	2.0071	0.0048
181	2.0119	0.0048
182	2.0167	0.0048
183	2.0215	0.0048
184	2.0263	0.0048
185	2.0311	0.0048
186	2.0358	0.0047
187	2.0405	0.0047
188	2.0453	0.0047
189	2.0500	0.0047
190	2.0547	0.0047
191	2.0593	0.0047
192	2.0640	0.0047
193	2.0686	0.0046
194	2.0733	0.0046
195	2.0779	0.0046
196	2.0825	0.0046
197	2.0871	0.0046
198	2.0917	0.0046

199	2.0962	0.0046
200	2.1008	0.0046
201	2.1053	0.0045
202	2.1099	0.0045
203	2.1144	0.0045
204	2.1189	0.0045
205	2.1234	0.0045
206	2.1278	0.0045
207	2.1323	0.0045
208	2.1368	0.0045
209	2.1412	0.0044
210	2.1456	0.0044
211	2.1500	0.0044
212	2.1544	0.0044
213	2.1588	0.0044
214	2.1632	0.0044
215	2.1676	0.0044
216	2.1719	0.0044
217	2.1763	0.0043
218	2.1806	0.0043
219	2.1850	0.0043
220	2.1893	0.0043
221	2.1936	0.0043
222	2.1979	0.0043
223	2.2021	0.0043
224	2.2064	0.0043
225	2.2107	0.0043
226	2.2149	0.0042
227	2.2192	0.0042
228	2.2234	0.0042
229	2.2276	0.0042
230	2.2318	0.0042
231	2.2360	0.0042
232	2.2402	0.0042
233	2.2444	0.0042
234	2.2485	0.0042
235	2.2527	0.0042
236	2.2568	0.0041
237	2.2610	0.0041
238	2.2651	0.0041
239	2.2692	0.0041
240	2.2733	0.0041
241	2.2774	0.0041
242	2.2815	0.0041
243	2.2856	0.0041
244	2.2896	0.0041
245	2.2937	0.0041
246	2.2977	0.0040
247	2.3018	0.0040
248	2.3058	0.0040
249	2.3098	0.0040
250	2.3138	0.0040
251	2.3178	0.0040
252	2.3218	0.0040
253	2.3258	0.0040
254	2.3298	0.0040
255	2.3337	0.0040
256	2.3377	0.0040
257	2.3416	0.0039
258	2.3456	0.0039
259	2.3495	0.0039
260	2.3534	0.0039
261	2.3574	0.0039
262	2.3613	0.0039
263	2.3652	0.0039
264	2.3690	0.0039
265	2.3729	0.0039
266	2.3768	0.0039
267	2.3807	0.0039
268	2.3845	0.0039
269	2.3884	0.0038
270	2.3922	0.0038
271	2.3960	0.0038
272	2.3999	0.0038
273	2.4037	0.0038
274	2.4075	0.0038
275	2.4113	0.0038
276	2.4151	0.0038
277	2.4189	0.0038

278	2.4226	0.0038
279	2.4264	0.0038
280	2.4302	0.0038
281	2.4339	0.0038
282	2.4377	0.0037
283	2.4414	0.0037
284	2.4451	0.0037
285	2.4488	0.0037
286	2.4526	0.0037
287	2.4563	0.0037
288	2.4600	0.0037

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0037	0.0024	0.0013
2	0.0037	0.0024	0.0013
3	0.0037	0.0024	0.0013
4	0.0037	0.0024	0.0013
5	0.0037	0.0024	0.0013
6	0.0038	0.0025	0.0013
7	0.0038	0.0025	0.0013
8	0.0038	0.0025	0.0013
9	0.0038	0.0025	0.0013
10	0.0038	0.0025	0.0013
11	0.0038	0.0025	0.0013
12	0.0038	0.0025	0.0013
13	0.0038	0.0025	0.0013
14	0.0038	0.0025	0.0013
15	0.0039	0.0025	0.0013
16	0.0039	0.0025	0.0013
17	0.0039	0.0025	0.0013
18	0.0039	0.0025	0.0013
19	0.0039	0.0026	0.0014
20	0.0039	0.0026	0.0014
21	0.0039	0.0026	0.0014
22	0.0039	0.0026	0.0014
23	0.0040	0.0026	0.0014
24	0.0040	0.0026	0.0014
25	0.0040	0.0026	0.0014
26	0.0040	0.0026	0.0014
27	0.0040	0.0026	0.0014
28	0.0040	0.0026	0.0014
29	0.0040	0.0026	0.0014
30	0.0041	0.0027	0.0014
31	0.0041	0.0027	0.0014
32	0.0041	0.0027	0.0014
33	0.0041	0.0027	0.0014
34	0.0041	0.0027	0.0014
35	0.0041	0.0027	0.0014
36	0.0041	0.0027	0.0014
37	0.0042	0.0027	0.0014
38	0.0042	0.0027	0.0014
39	0.0042	0.0027	0.0015
40	0.0042	0.0028	0.0015
41	0.0042	0.0028	0.0015
42	0.0042	0.0028	0.0015
43	0.0043	0.0028	0.0015
44	0.0043	0.0028	0.0015
45	0.0043	0.0028	0.0015
46	0.0043	0.0028	0.0015
47	0.0043	0.0028	0.0015
48	0.0043	0.0028	0.0015
49	0.0044	0.0029	0.0015
50	0.0044	0.0029	0.0015
51	0.0044	0.0029	0.0015
52	0.0044	0.0029	0.0015
53	0.0044	0.0029	0.0015
54	0.0044	0.0029	0.0015
55	0.0045	0.0029	0.0015
56	0.0045	0.0029	0.0015
57	0.0045	0.0029	0.0016
58	0.0045	0.0030	0.0016
59	0.0045	0.0030	0.0016
60	0.0046	0.0030	0.0016
61	0.0046	0.0030	0.0016
62	0.0046	0.0030	0.0016
63	0.0046	0.0030	0.0016

64	0.0046	0.0030	0.0016
65	0.0047	0.0030	0.0016
66	0.0047	0.0031	0.0016
67	0.0047	0.0031	0.0016
68	0.0047	0.0031	0.0016
69	0.0047	0.0031	0.0016
70	0.0048	0.0031	0.0016
71	0.0048	0.0031	0.0017
72	0.0048	0.0031	0.0017
73	0.0048	0.0032	0.0017
74	0.0048	0.0032	0.0017
75	0.0049	0.0032	0.0017
76	0.0049	0.0032	0.0017
77	0.0049	0.0032	0.0017
78	0.0049	0.0032	0.0017
79	0.0050	0.0033	0.0017
80	0.0050	0.0033	0.0017
81	0.0050	0.0033	0.0017
82	0.0050	0.0033	0.0017
83	0.0051	0.0033	0.0018
84	0.0051	0.0033	0.0018
85	0.0051	0.0034	0.0018
86	0.0052	0.0034	0.0018
87	0.0052	0.0034	0.0018
88	0.0052	0.0034	0.0018
89	0.0052	0.0034	0.0018
90	0.0053	0.0034	0.0018
91	0.0053	0.0035	0.0018
92	0.0053	0.0035	0.0018
93	0.0054	0.0035	0.0019
94	0.0054	0.0035	0.0019
95	0.0054	0.0035	0.0019
96	0.0054	0.0036	0.0019
97	0.0055	0.0036	0.0019
98	0.0055	0.0036	0.0019
99	0.0056	0.0036	0.0019
100	0.0056	0.0036	0.0019
101	0.0056	0.0037	0.0019
102	0.0056	0.0037	0.0020
103	0.0057	0.0037	0.0020
104	0.0057	0.0037	0.0020
105	0.0058	0.0038	0.0020
106	0.0058	0.0038	0.0020
107	0.0058	0.0038	0.0020
108	0.0059	0.0038	0.0020
109	0.0059	0.0039	0.0020
110	0.0059	0.0039	0.0021
111	0.0060	0.0039	0.0021
112	0.0060	0.0039	0.0021
113	0.0061	0.0040	0.0021
114	0.0061	0.0040	0.0021
115	0.0062	0.0040	0.0021
116	0.0062	0.0041	0.0021
117	0.0063	0.0041	0.0022
118	0.0063	0.0041	0.0022
119	0.0064	0.0042	0.0022
120	0.0064	0.0042	0.0022
121	0.0065	0.0042	0.0022
122	0.0065	0.0043	0.0022
123	0.0066	0.0043	0.0023
124	0.0066	0.0043	0.0023
125	0.0067	0.0044	0.0023
126	0.0067	0.0044	0.0023
127	0.0068	0.0044	0.0024
128	0.0068	0.0045	0.0024
129	0.0069	0.0045	0.0024
130	0.0070	0.0045	0.0024
131	0.0070	0.0046	0.0024
132	0.0071	0.0046	0.0025
133	0.0072	0.0047	0.0025
134	0.0072	0.0047	0.0025
135	0.0073	0.0048	0.0025
136	0.0074	0.0048	0.0025
137	0.0075	0.0049	0.0026
138	0.0075	0.0049	0.0026
139	0.0076	0.0050	0.0026
140	0.0077	0.0050	0.0027
141	0.0078	0.0051	0.0027
142	0.0078	0.0051	0.0027

143	0.0080	0.0052	0.0028
144	0.0080	0.0052	0.0028
145	0.0077	0.0051	0.0027
146	0.0078	0.0051	0.0027
147	0.0079	0.0052	0.0027
148	0.0080	0.0052	0.0028
149	0.0082	0.0053	0.0028
150	0.0082	0.0054	0.0028
151	0.0084	0.0055	0.0029
152	0.0085	0.0055	0.0029
153	0.0086	0.0056	0.0030
154	0.0087	0.0057	0.0030
155	0.0089	0.0058	0.0031
156	0.0090	0.0059	0.0031
157	0.0092	0.0060	0.0032
158	0.0093	0.0061	0.0032
159	0.0095	0.0062	0.0033
160	0.0096	0.0063	0.0033
161	0.0099	0.0064	0.0034
162	0.0100	0.0065	0.0035
163	0.0102	0.0067	0.0035
164	0.0104	0.0068	0.0036
165	0.0107	0.0070	0.0037
166	0.0108	0.0071	0.0037
167	0.0112	0.0073	0.0039
168	0.0113	0.0074	0.0039
169	0.0117	0.0077	0.0040
170	0.0119	0.0078	0.0041
171	0.0123	0.0081	0.0043
172	0.0126	0.0082	0.0043
173	0.0131	0.0085	0.0045
174	0.0133	0.0087	0.0046
175	0.0139	0.0091	0.0048
176	0.0142	0.0093	0.0049
177	0.0149	0.0098	0.0052
178	0.0153	0.0100	0.0053
179	0.0162	0.0106	0.0056
180	0.0167	0.0109	0.0058
181	0.0177	0.0116	0.0061
182	0.0184	0.0120	0.0064
183	0.0198	0.0130	0.0069
184	0.0207	0.0135	0.0072
185	0.0166	0.0109	0.0058
186	0.0177	0.0116	0.0061
187	0.0206	0.0135	0.0071
188	0.0225	0.0147	0.0078
189	0.0279	0.0183	0.0097
190	0.0322	0.0210	0.0111
191	0.0488	0.0311	0.0177
192	0.0708	0.0311	0.0397
193	0.3064	0.0311	0.2753
194	0.0384	0.0251	0.0133
195	0.0248	0.0162	0.0086
196	0.0190	0.0124	0.0066
197	0.0216	0.0141	0.0075
198	0.0191	0.0125	0.0066
199	0.0172	0.0112	0.0059
200	0.0157	0.0103	0.0054
201	0.0146	0.0095	0.0050
202	0.0136	0.0089	0.0047
203	0.0128	0.0084	0.0044
204	0.0121	0.0079	0.0042
205	0.0115	0.0075	0.0040
206	0.0110	0.0072	0.0038
207	0.0105	0.0069	0.0036
208	0.0101	0.0066	0.0035
209	0.0097	0.0064	0.0034
210	0.0094	0.0061	0.0033
211	0.0091	0.0059	0.0031
212	0.0088	0.0058	0.0030
213	0.0085	0.0056	0.0030
214	0.0083	0.0054	0.0029
215	0.0081	0.0053	0.0028
216	0.0079	0.0052	0.0027
217	0.0081	0.0053	0.0028
218	0.0079	0.0052	0.0027
219	0.0077	0.0051	0.0027
220	0.0076	0.0049	0.0026
221	0.0074	0.0048	0.0026

222	0.0073	0.0048	0.0025
223	0.0071	0.0047	0.0025
224	0.0070	0.0046	0.0024
225	0.0069	0.0045	0.0024
226	0.0068	0.0044	0.0023
227	0.0066	0.0043	0.0023
228	0.0065	0.0043	0.0023
229	0.0064	0.0042	0.0022
230	0.0063	0.0041	0.0022
231	0.0062	0.0041	0.0022
232	0.0061	0.0040	0.0021
233	0.0061	0.0040	0.0021
234	0.0060	0.0039	0.0021
235	0.0059	0.0039	0.0020
236	0.0058	0.0038	0.0020
237	0.0057	0.0038	0.0020
238	0.0057	0.0037	0.0020
239	0.0056	0.0037	0.0019
240	0.0055	0.0036	0.0019
241	0.0055	0.0036	0.0019
242	0.0054	0.0035	0.0019
243	0.0053	0.0035	0.0018
244	0.0053	0.0035	0.0018
245	0.0052	0.0034	0.0018
246	0.0052	0.0034	0.0018
247	0.0051	0.0033	0.0018
248	0.0051	0.0033	0.0018
249	0.0050	0.0033	0.0017
250	0.0050	0.0032	0.0017
251	0.0049	0.0032	0.0017
252	0.0049	0.0032	0.0017
253	0.0048	0.0032	0.0017
254	0.0048	0.0031	0.0017
255	0.0047	0.0031	0.0016
256	0.0047	0.0031	0.0016
257	0.0046	0.0030	0.0016
258	0.0046	0.0030	0.0016
259	0.0046	0.0030	0.0016
260	0.0045	0.0030	0.0016
261	0.0045	0.0029	0.0016
262	0.0045	0.0029	0.0015
263	0.0044	0.0029	0.0015
264	0.0044	0.0029	0.0015
265	0.0043	0.0028	0.0015
266	0.0043	0.0028	0.0015
267	0.0043	0.0028	0.0015
268	0.0042	0.0028	0.0015
269	0.0042	0.0028	0.0015
270	0.0042	0.0027	0.0014
271	0.0042	0.0027	0.0014
272	0.0041	0.0027	0.0014
273	0.0041	0.0027	0.0014
274	0.0041	0.0027	0.0014
275	0.0040	0.0026	0.0014
276	0.0040	0.0026	0.0014
277	0.0040	0.0026	0.0014
278	0.0040	0.0026	0.0014
279	0.0039	0.0026	0.0014
280	0.0039	0.0026	0.0014
281	0.0039	0.0025	0.0013
282	0.0039	0.0025	0.0013
283	0.0038	0.0025	0.0013
284	0.0038	0.0025	0.0013
285	0.0038	0.0025	0.0013
286	0.0038	0.0025	0.0013
287	0.0037	0.0024	0.0013
288	0.0037	0.0024	0.0013

Total soil rain loss = 1.42(In)
Total effective rainfall = 1.04(In)
Peak flow rate in flood hydrograph = 15.67(CFS)

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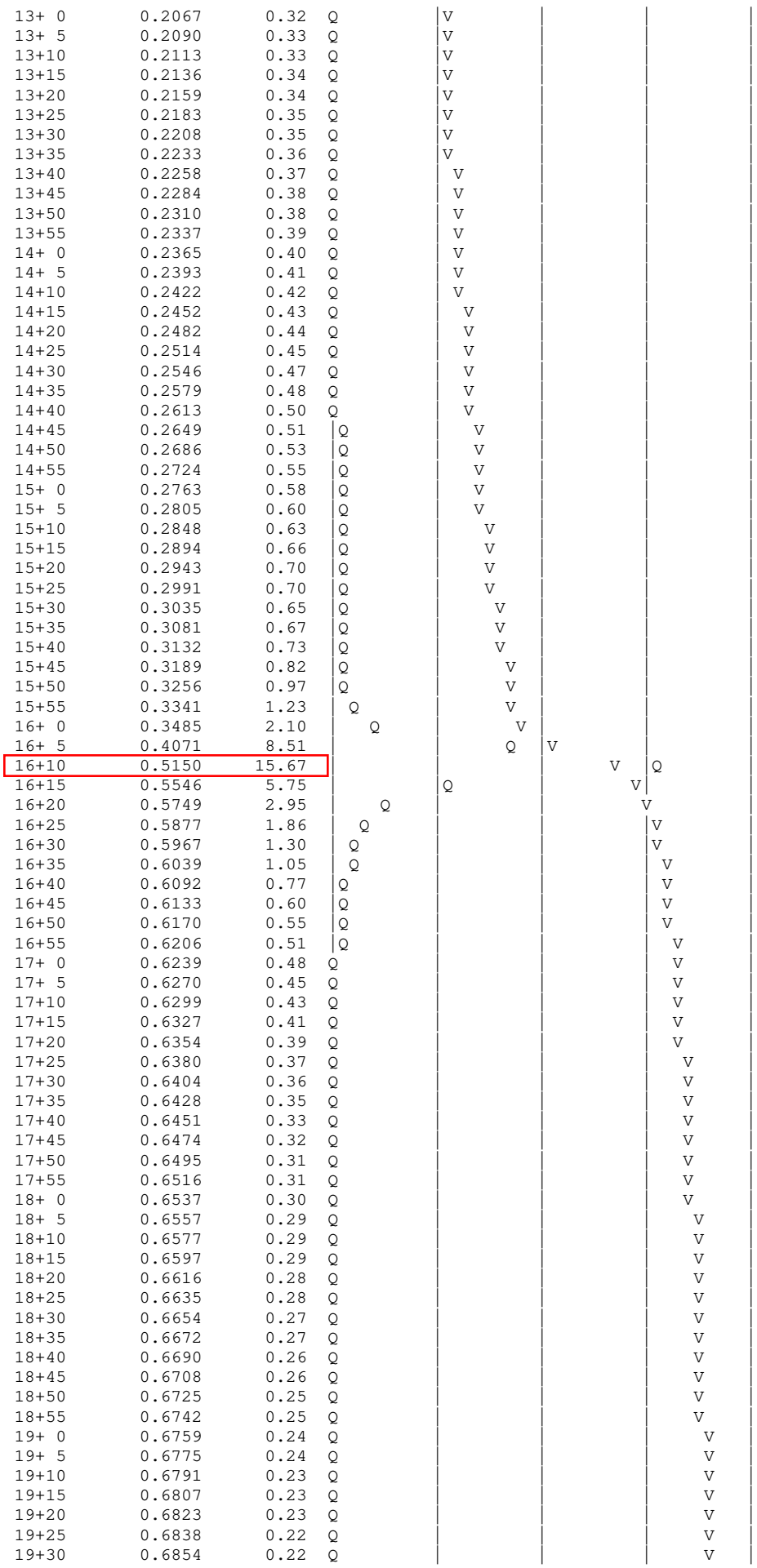
24 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	5.0	10.0	15.0	20.0
0+ 5	0.0002	0.03	Q				
0+10	0.0008	0.10	Q				
0+15	0.0017	0.12	Q				
0+20	0.0025	0.13	Q				
0+25	0.0034	0.13	Q				
0+30	0.0043	0.13	Q				
0+35	0.0053	0.14	Q				
0+40	0.0062	0.14	Q				
0+45	0.0072	0.14	Q				
0+50	0.0081	0.14	Q				
0+55	0.0091	0.14	Q				
1+ 0	0.0100	0.14	Q				
1+ 5	0.0110	0.14	Q				
1+10	0.0119	0.14	Q				
1+15	0.0129	0.14	Q				
1+20	0.0139	0.14	Q				
1+25	0.0148	0.14	Q				
1+30	0.0158	0.14	Q				
1+35	0.0168	0.14	Q				
1+40	0.0177	0.14	Q				
1+45	0.0187	0.14	Q				
1+50	0.0197	0.14	QV				
1+55	0.0207	0.14	QV				
2+ 0	0.0217	0.14	QV				
2+ 5	0.0227	0.14	QV				
2+10	0.0237	0.14	QV				
2+15	0.0247	0.15	QV				
2+20	0.0257	0.15	QV				
2+25	0.0267	0.15	QV				
2+30	0.0277	0.15	QV				
2+35	0.0287	0.15	QV				
2+40	0.0297	0.15	QV				
2+45	0.0308	0.15	QV				
2+50	0.0318	0.15	QV				
2+55	0.0328	0.15	QV				
3+ 0	0.0338	0.15	QV				
3+ 5	0.0349	0.15	QV				
3+10	0.0359	0.15	QV				
3+15	0.0370	0.15	QV				
3+20	0.0380	0.15	Q V				
3+25	0.0391	0.15	Q V				
3+30	0.0401	0.15	Q V				
3+35	0.0412	0.15	Q V				
3+40	0.0422	0.15	Q V				
3+45	0.0433	0.15	Q V				
3+50	0.0444	0.16	Q V				
3+55	0.0454	0.16	Q V				
4+ 0	0.0465	0.16	Q V				
4+ 5	0.0476	0.16	Q V				
4+10	0.0487	0.16	Q V				
4+15	0.0498	0.16	Q V				
4+20	0.0509	0.16	Q V				
4+25	0.0520	0.16	Q V				
4+30	0.0531	0.16	Q V				
4+35	0.0542	0.16	Q V				
4+40	0.0553	0.16	Q V				
4+45	0.0564	0.16	Q V				
4+50	0.0576	0.16	Q V				
4+55	0.0587	0.16	Q V				
5+ 0	0.0598	0.16	Q V				
5+ 5	0.0610	0.17	Q V				
5+10	0.0621	0.17	Q V				
5+15	0.0632	0.17	Q V				
5+20	0.0644	0.17	Q V				
5+25	0.0656	0.17	Q V				
5+30	0.0667	0.17	Q V				
5+35	0.0679	0.17	Q V				
5+40	0.0691	0.17	Q V				
5+45	0.0702	0.17	Q V				
5+50	0.0714	0.17	Q V				
5+55	0.0726	0.17	Q V				
6+ 0	0.0738	0.17	Q V				
6+ 5	0.0750	0.17	Q V				
6+10	0.0762	0.18	Q V				
6+15	0.0774	0.18	Q V				
6+20	0.0786	0.18	Q V				

6+25	0.0799	0.18	Q	V				
6+30	0.0811	0.18	Q	V				
6+35	0.0823	0.18	Q	V				
6+40	0.0836	0.18	Q	V				
6+45	0.0848	0.18	Q	V				
6+50	0.0861	0.18	Q	V				
6+55	0.0873	0.18	Q	V				
7+ 0	0.0886	0.18	Q	V				
7+ 5	0.0899	0.18	Q	V				
7+10	0.0912	0.19	Q	V				
7+15	0.0925	0.19	Q	V				
7+20	0.0937	0.19	Q	V				
7+25	0.0950	0.19	Q	V				
7+30	0.0964	0.19	Q	V				
7+35	0.0977	0.19	Q	V				
7+40	0.0990	0.19	Q	V				
7+45	0.1003	0.19	Q	V				
7+50	0.1017	0.19	Q	V				
7+55	0.1030	0.20	Q	V				
8+ 0	0.1044	0.20	Q	V				
8+ 5	0.1057	0.20	Q	V				
8+10	0.1071	0.20	Q	V				
8+15	0.1085	0.20	Q	V				
8+20	0.1099	0.20	Q	V				
8+25	0.1112	0.20	Q	V				
8+30	0.1126	0.20	Q	V				
8+35	0.1141	0.20	Q	V				
8+40	0.1155	0.21	Q	V				
8+45	0.1169	0.21	Q	V				
8+50	0.1183	0.21	Q	V				
8+55	0.1198	0.21	Q	V				
9+ 0	0.1212	0.21	Q	V				
9+ 5	0.1227	0.21	Q	V				
9+10	0.1242	0.21	Q	V				
9+15	0.1257	0.22	Q	V				
9+20	0.1272	0.22	Q	V				
9+25	0.1287	0.22	Q	V				
9+30	0.1302	0.22	Q	V				
9+35	0.1317	0.22	Q	V				
9+40	0.1333	0.22	Q	V				
9+45	0.1348	0.23	Q	V				
9+50	0.1364	0.23	Q	V				
9+55	0.1380	0.23	Q	V				
10+ 0	0.1395	0.23	Q	V				
10+ 5	0.1411	0.23	Q	V				
10+10	0.1428	0.23	Q	V				
10+15	0.1444	0.24	Q	V				
10+20	0.1460	0.24	Q	V				
10+25	0.1477	0.24	Q	V				
10+30	0.1493	0.24	Q	V				
10+35	0.1510	0.24	Q	V				
10+40	0.1527	0.25	Q	V				
10+45	0.1544	0.25	Q	V				
10+50	0.1561	0.25	Q	V				
10+55	0.1579	0.25	Q	V				
11+ 0	0.1596	0.25	Q	V				
11+ 5	0.1614	0.26	Q	V				
11+10	0.1632	0.26	Q	V				
11+15	0.1650	0.26	Q	V				
11+20	0.1668	0.26	Q	V				
11+25	0.1686	0.27	Q	V				
11+30	0.1705	0.27	Q	V				
11+35	0.1724	0.27	Q	V				
11+40	0.1743	0.28	Q	V				
11+45	0.1762	0.28	Q	V				
11+50	0.1781	0.28	Q	V				
11+55	0.1801	0.28	Q	V				
12+ 0	0.1821	0.29	Q	V				
12+ 5	0.1840	0.29	Q	V				
12+10	0.1860	0.28	Q	V				
12+15	0.1880	0.28	Q	V				
12+20	0.1899	0.29	Q	V				
12+25	0.1919	0.29	Q	V				
12+30	0.1940	0.29	Q	V				
12+35	0.1960	0.30	Q	V				
12+40	0.1981	0.30	Q	V				
12+45	0.2002	0.31	Q	V				
12+50	0.2024	0.31	Q	V				
12+55	0.2045	0.32	Q	V				



19+35	0.6869	0.22	Q			V	
19+40	0.6884	0.22	Q			V	
19+45	0.6898	0.21	Q			V	
19+50	0.6913	0.21	Q			V	
19+55	0.6927	0.21	Q			V	
20+ 0	0.6941	0.20	Q			V	
20+ 5	0.6955	0.20	Q			V	
20+10	0.6969	0.20	Q			V	
20+15	0.6982	0.20	Q			V	
20+20	0.6996	0.19	Q			V	
20+25	0.7009	0.19	Q			V	
20+30	0.7022	0.19	Q			V	
20+35	0.7035	0.19	Q			V	
20+40	0.7048	0.19	Q			V	
20+45	0.7060	0.18	Q			V	
20+50	0.7073	0.18	Q			V	
20+55	0.7086	0.18	Q			V	
21+ 0	0.7098	0.18	Q			V	
21+ 5	0.7110	0.18	Q			V	
21+10	0.7122	0.18	Q			V	
21+15	0.7134	0.17	Q			V	
21+20	0.7146	0.17	Q			V	
21+25	0.7158	0.17	Q			V	
21+30	0.7169	0.17	Q			V	
21+35	0.7181	0.17	Q			V	
21+40	0.7192	0.17	Q			V	
21+45	0.7204	0.16	Q			V	
21+50	0.7215	0.16	Q			V	
21+55	0.7226	0.16	Q			V	
22+ 0	0.7237	0.16	Q			V	
22+ 5	0.7248	0.16	Q			V	
22+10	0.7259	0.16	Q			V	
22+15	0.7270	0.16	Q			V	
22+20	0.7281	0.16	Q			V	
22+25	0.7291	0.15	Q			V	
22+30	0.7302	0.15	Q			V	
22+35	0.7312	0.15	Q			V	
22+40	0.7323	0.15	Q			V	
22+45	0.7333	0.15	Q			V	
22+50	0.7343	0.15	Q			V	
22+55	0.7354	0.15	Q			V	
23+ 0	0.7364	0.15	Q			V	
23+ 5	0.7374	0.15	Q			V	
23+10	0.7384	0.15	Q			V	
23+15	0.7394	0.14	Q			V	
23+20	0.7404	0.14	Q			V	
23+25	0.7413	0.14	Q			V	
23+30	0.7423	0.14	Q			V	
23+35	0.7433	0.14	Q			V	
23+40	0.7442	0.14	Q			V	
23+45	0.7452	0.14	Q			V	
23+50	0.7461	0.14	Q			V	
23+55	0.7471	0.14	Q			V	
24+ 0	0.7480	0.14	Q			V	

Volume=32,583 CF

DMA -2

```
        U n i t   H y d r o g r a p h   A n a l y s i s

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                Study date  05/07/21

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
------------------------------------------------------------------------------

San Bernardino County Synthetic Unit Hydrology Method
                Manual date - August 1986


Program License Serial Number 6310

------------------------------------------------------------------------
20-523 BEAR VALLEY CONNECTION
EXISTING CONDITION, DMA-2


------------------------------------------------------------------------

        Storm Event Year = 10

        Antecedent Moisture Condition = 1

 English (in-lb) Input Units Used

 English Rainfall Data (Inches) Input Values Used

 English Units used in output format



Area averaged rainfall intensity isohyetal data:
        Sub-Area        Duration        Isohyetal
        (Ac.)             (hours)         (In)
Rainfall data for year 10
             3.07            1           0.65
------------------------------------------------------------------------
Rainfall data for year 10
             3.07            6           1.35
------------------------------------------------------------------------
Rainfall data for year 10
             3.07           24           2.46
------------------------------------------------------------------------
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

******** Area-averaged max loss rate, Fm ********


SCS curve  SCS curve     Area     Area     Fp(Fig C6)    Ap       Fm
No.(AMCII) NO.(AMC 1)    (Ac.)    Fraction     (In/Hr)  (dec.)   (In/Hr)
 91.0       79.8          3.07      1.000     0.373    1.000    0.373

Area-averaged adjusted loss rate Fm (In/Hr) =  0.373

********* Area-Averaged low loss rate fraction, Yb **********

Area        Area          SCS CN    SCS CN      S     Pervious
 (Ac.)       Fract          (AMC2)    (AMC1)           Yield Fr
     3.07    1.000          91.0      79.8       2.53     0.346

Area-averaged catchment yield fraction, Y =  0.346
Area-averaged low loss fraction, Yb =  0.654
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Watercourse length =     450.00(Ft.)
Length from concentration point to centroid =     300.00(Ft.)
Elevation difference along watercourse =      17.00(Ft.)
Mannings friction factor along watercourse =  0.030
Watershed area =       3.07(Ac.)
Catchment Lag time =   0.035 hours
Unit interval =   5.000 minutes
Unit interval percentage of lag time = 239.9587
Hydrograph baseflow =     0.00(CFS)
Average maximum watershed loss rate(Fm) =  0.373(In/Hr)
```

Lag=0.8 x Tc; Tc=2.63 Min.
Note: 5 minute minimum

Average low loss rate fraction (Yb) = 0.654 (decimal)
DESERT S-Graph Selected
Computed peak 5-minute rainfall = 0.307(In)
Computed peak 30-minute rainfall = 0.525(In)
Specified peak 1-hour rainfall = 0.646(In)
Computed peak 3-hour rainfall = 1.015(In)
Specified peak 6-hour rainfall = 1.350(In)
Specified peak 24-hour rainfall = 2.460(In)

Rainfall depth area reduction factors:
Using a total area of 3.07(Ac.) (Ref: fig. E-4)

5-minute factor = 1.000 Adjusted rainfall = 0.306(In)
30-minute factor = 1.000 Adjusted rainfall = 0.525(In)
1-hour factor = 1.000 Adjusted rainfall = 0.646(In)
3-hour factor = 1.000 Adjusted rainfall = 1.015(In)
6-hour factor = 1.000 Adjusted rainfall = 1.350(In)
24-hour factor = 1.000 Adjusted rainfall = 2.460(In)

U n i t H y d r o g r a p h

Interval Number	'S' Graph Mean values	Unit Hydrograph ((CFS))
(K = 37.13 (CFS))		
1	48.642	18.060
2	91.381	15.868
3	98.266	2.556
4	100.000	0.644

Peak Unit Number	Adjusted mass rainfall (In)	Unit rainfall (In)
1	0.3065	0.3065
2	0.3773	0.0708
3	0.4261	0.0488
4	0.4646	0.0384
5	0.4967	0.0322
6	0.5246	0.0279
7	0.5495	0.0248
8	0.5719	0.0225
9	0.5925	0.0206
10	0.6115	0.0190
11	0.6293	0.0177
12	0.6459	0.0166
13	0.6675	0.0216
14	0.6882	0.0207
15	0.7080	0.0198
16	0.7271	0.0191
17	0.7454	0.0184
18	0.7632	0.0177
19	0.7803	0.0172
20	0.7970	0.0166
21	0.8132	0.0162
22	0.8289	0.0157
23	0.8442	0.0153
24	0.8591	0.0149
25	0.8736	0.0146
26	0.8879	0.0142
27	0.9017	0.0139
28	0.9153	0.0136
29	0.9287	0.0133
30	0.9417	0.0130
31	0.9545	0.0128
32	0.9670	0.0126
33	0.9794	0.0123
34	0.9915	0.0121
35	1.0034	0.0119
36	1.0151	0.0117
37	1.0266	0.0115
38	1.0379	0.0113
39	1.0490	0.0112
40	1.0600	0.0110
41	1.0709	0.0108
42	1.0815	0.0107
43	1.0920	0.0105
44	1.1024	0.0104

45	1.1127	0.0102
46	1.1228	0.0101
47	1.1327	0.0100
48	1.1426	0.0099
49	1.1523	0.0097
50	1.1619	0.0096
51	1.1714	0.0095
52	1.1808	0.0094
53	1.1901	0.0093
54	1.1993	0.0092
55	1.2084	0.0091
56	1.2174	0.0090
57	1.2263	0.0089
58	1.2351	0.0088
59	1.2438	0.0087
60	1.2524	0.0086
61	1.2610	0.0085
62	1.2694	0.0085
63	1.2778	0.0084
64	1.2861	0.0083
65	1.2944	0.0082
66	1.3025	0.0082
67	1.3106	0.0081
68	1.3186	0.0080
69	1.3266	0.0079
70	1.3344	0.0079
71	1.3422	0.0078
72	1.3500	0.0077
73	1.3581	0.0081
74	1.3661	0.0080
75	1.3741	0.0080
76	1.3820	0.0079
77	1.3898	0.0078
78	1.3976	0.0078
79	1.4053	0.0077
80	1.4130	0.0077
81	1.4206	0.0076
82	1.4282	0.0076
83	1.4357	0.0075
84	1.4431	0.0075
85	1.4505	0.0074
86	1.4579	0.0074
87	1.4652	0.0073
88	1.4725	0.0073
89	1.4797	0.0072
90	1.4869	0.0072
91	1.4940	0.0071
92	1.5011	0.0071
93	1.5081	0.0070
94	1.5151	0.0070
95	1.5221	0.0070
96	1.5290	0.0069
97	1.5359	0.0069
98	1.5427	0.0068
99	1.5495	0.0068
100	1.5563	0.0068
101	1.5630	0.0067
102	1.5697	0.0067
103	1.5763	0.0066
104	1.5829	0.0066
105	1.5895	0.0066
106	1.5960	0.0065
107	1.6025	0.0065
108	1.6090	0.0065
109	1.6154	0.0064
110	1.6218	0.0064
111	1.6282	0.0064
112	1.6345	0.0063
113	1.6408	0.0063
114	1.6471	0.0063
115	1.6533	0.0062
116	1.6595	0.0062
117	1.6657	0.0062
118	1.6719	0.0061
119	1.6780	0.0061
120	1.6841	0.0061
121	1.6901	0.0061
122	1.6962	0.0060
123	1.7022	0.0060

124	1.7081	0.0060
125	1.7141	0.0059
126	1.7200	0.0059
127	1.7259	0.0059
128	1.7318	0.0059
129	1.7376	0.0058
130	1.7434	0.0058
131	1.7492	0.0058
132	1.7550	0.0058
133	1.7607	0.0057
134	1.7665	0.0057
135	1.7721	0.0057
136	1.7778	0.0057
137	1.7835	0.0056
138	1.7891	0.0056
139	1.7947	0.0056
140	1.8003	0.0056
141	1.8058	0.0056
142	1.8113	0.0055
143	1.8169	0.0055
144	1.8223	0.0055
145	1.8278	0.0055
146	1.8333	0.0054
147	1.8387	0.0054
148	1.8441	0.0054
149	1.8495	0.0054
150	1.8548	0.0054
151	1.8602	0.0053
152	1.8655	0.0053
153	1.8708	0.0053
154	1.8761	0.0053
155	1.8813	0.0053
156	1.8866	0.0052
157	1.8918	0.0052
158	1.8970	0.0052
159	1.9022	0.0052
160	1.9074	0.0052
161	1.9125	0.0052
162	1.9177	0.0051
163	1.9228	0.0051
164	1.9279	0.0051
165	1.9330	0.0051
166	1.9380	0.0051
167	1.9431	0.0050
168	1.9481	0.0050
169	1.9531	0.0050
170	1.9581	0.0050
171	1.9631	0.0050
172	1.9680	0.0050
173	1.9730	0.0049
174	1.9779	0.0049
175	1.9828	0.0049
176	1.9877	0.0049
177	1.9926	0.0049
178	1.9975	0.0049
179	2.0023	0.0048
180	2.0071	0.0048
181	2.0120	0.0048
182	2.0168	0.0048
183	2.0216	0.0048
184	2.0263	0.0048
185	2.0311	0.0048
186	2.0358	0.0047
187	2.0406	0.0047
188	2.0453	0.0047
189	2.0500	0.0047
190	2.0547	0.0047
191	2.0593	0.0047
192	2.0640	0.0047
193	2.0687	0.0046
194	2.0733	0.0046
195	2.0779	0.0046
196	2.0825	0.0046
197	2.0871	0.0046
198	2.0917	0.0046
199	2.0963	0.0046
200	2.1008	0.0046
201	2.1053	0.0045
202	2.1099	0.0045

203	2.1144	0.0045
204	2.1189	0.0045
205	2.1234	0.0045
206	2.1279	0.0045
207	2.1323	0.0045
208	2.1368	0.0045
209	2.1412	0.0044
210	2.1456	0.0044
211	2.1501	0.0044
212	2.1545	0.0044
213	2.1589	0.0044
214	2.1632	0.0044
215	2.1676	0.0044
216	2.1720	0.0044
217	2.1763	0.0043
218	2.1806	0.0043
219	2.1850	0.0043
220	2.1893	0.0043
221	2.1936	0.0043
222	2.1979	0.0043
223	2.2022	0.0043
224	2.2064	0.0043
225	2.2107	0.0043
226	2.2149	0.0042
227	2.2192	0.0042
228	2.2234	0.0042
229	2.2276	0.0042
230	2.2318	0.0042
231	2.2360	0.0042
232	2.2402	0.0042
233	2.2444	0.0042
234	2.2485	0.0042
235	2.2527	0.0042
236	2.2568	0.0041
237	2.2610	0.0041
238	2.2651	0.0041
239	2.2692	0.0041
240	2.2733	0.0041
241	2.2774	0.0041
242	2.2815	0.0041
243	2.2856	0.0041
244	2.2896	0.0041
245	2.2937	0.0041
246	2.2977	0.0040
247	2.3018	0.0040
248	2.3058	0.0040
249	2.3098	0.0040
250	2.3138	0.0040
251	2.3178	0.0040
252	2.3218	0.0040
253	2.3258	0.0040
254	2.3298	0.0040
255	2.3338	0.0040
256	2.3377	0.0040
257	2.3417	0.0039
258	2.3456	0.0039
259	2.3495	0.0039
260	2.3535	0.0039
261	2.3574	0.0039
262	2.3613	0.0039
263	2.3652	0.0039
264	2.3691	0.0039
265	2.3729	0.0039
266	2.3768	0.0039
267	2.3807	0.0039
268	2.3845	0.0039
269	2.3884	0.0038
270	2.3922	0.0038
271	2.3961	0.0038
272	2.3999	0.0038
273	2.4037	0.0038
274	2.4075	0.0038
275	2.4113	0.0038
276	2.4151	0.0038
277	2.4189	0.0038
278	2.4226	0.0038
279	2.4264	0.0038
280	2.4302	0.0038
281	2.4339	0.0038

282	2.4377	0.0037
283	2.4414	0.0037
284	2.4451	0.0037
285	2.4489	0.0037
286	2.4526	0.0037
287	2.4563	0.0037
288	2.4600	0.0037

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0037	0.0024	0.0013
2	0.0037	0.0024	0.0013
3	0.0037	0.0024	0.0013
4	0.0037	0.0024	0.0013
5	0.0037	0.0024	0.0013
6	0.0038	0.0025	0.0013
7	0.0038	0.0025	0.0013
8	0.0038	0.0025	0.0013
9	0.0038	0.0025	0.0013
10	0.0038	0.0025	0.0013
11	0.0038	0.0025	0.0013
12	0.0038	0.0025	0.0013
13	0.0038	0.0025	0.0013
14	0.0038	0.0025	0.0013
15	0.0039	0.0025	0.0013
16	0.0039	0.0025	0.0013
17	0.0039	0.0025	0.0013
18	0.0039	0.0025	0.0013
19	0.0039	0.0026	0.0014
20	0.0039	0.0026	0.0014
21	0.0039	0.0026	0.0014
22	0.0039	0.0026	0.0014
23	0.0040	0.0026	0.0014
24	0.0040	0.0026	0.0014
25	0.0040	0.0026	0.0014
26	0.0040	0.0026	0.0014
27	0.0040	0.0026	0.0014
28	0.0040	0.0026	0.0014
29	0.0040	0.0026	0.0014
30	0.0041	0.0027	0.0014
31	0.0041	0.0027	0.0014
32	0.0041	0.0027	0.0014
33	0.0041	0.0027	0.0014
34	0.0041	0.0027	0.0014
35	0.0041	0.0027	0.0014
36	0.0041	0.0027	0.0014
37	0.0042	0.0027	0.0014
38	0.0042	0.0027	0.0014
39	0.0042	0.0027	0.0015
40	0.0042	0.0028	0.0015
41	0.0042	0.0028	0.0015
42	0.0042	0.0028	0.0015
43	0.0043	0.0028	0.0015
44	0.0043	0.0028	0.0015
45	0.0043	0.0028	0.0015
46	0.0043	0.0028	0.0015
47	0.0043	0.0028	0.0015
48	0.0043	0.0028	0.0015
49	0.0044	0.0029	0.0015
50	0.0044	0.0029	0.0015
51	0.0044	0.0029	0.0015
52	0.0044	0.0029	0.0015
53	0.0044	0.0029	0.0015
54	0.0044	0.0029	0.0015
55	0.0045	0.0029	0.0015
56	0.0045	0.0029	0.0015
57	0.0045	0.0029	0.0016
58	0.0045	0.0030	0.0016
59	0.0045	0.0030	0.0016
60	0.0046	0.0030	0.0016
61	0.0046	0.0030	0.0016
62	0.0046	0.0030	0.0016
63	0.0046	0.0030	0.0016
64	0.0046	0.0030	0.0016
65	0.0047	0.0030	0.0016
66	0.0047	0.0031	0.0016
67	0.0047	0.0031	0.0016

68	0.0047	0.0031	0.0016
69	0.0047	0.0031	0.0016
70	0.0048	0.0031	0.0016
71	0.0048	0.0031	0.0017
72	0.0048	0.0031	0.0017
73	0.0048	0.0032	0.0017
74	0.0048	0.0032	0.0017
75	0.0049	0.0032	0.0017
76	0.0049	0.0032	0.0017
77	0.0049	0.0032	0.0017
78	0.0049	0.0032	0.0017
79	0.0050	0.0033	0.0017
80	0.0050	0.0033	0.0017
81	0.0050	0.0033	0.0017
82	0.0050	0.0033	0.0017
83	0.0051	0.0033	0.0018
84	0.0051	0.0033	0.0018
85	0.0051	0.0034	0.0018
86	0.0052	0.0034	0.0018
87	0.0052	0.0034	0.0018
88	0.0052	0.0034	0.0018
89	0.0052	0.0034	0.0018
90	0.0053	0.0034	0.0018
91	0.0053	0.0035	0.0018
92	0.0053	0.0035	0.0018
93	0.0054	0.0035	0.0019
94	0.0054	0.0035	0.0019
95	0.0054	0.0035	0.0019
96	0.0054	0.0036	0.0019
97	0.0055	0.0036	0.0019
98	0.0055	0.0036	0.0019
99	0.0056	0.0036	0.0019
100	0.0056	0.0036	0.0019
101	0.0056	0.0037	0.0019
102	0.0056	0.0037	0.0020
103	0.0057	0.0037	0.0020
104	0.0057	0.0037	0.0020
105	0.0058	0.0038	0.0020
106	0.0058	0.0038	0.0020
107	0.0058	0.0038	0.0020
108	0.0059	0.0038	0.0020
109	0.0059	0.0039	0.0020
110	0.0059	0.0039	0.0021
111	0.0060	0.0039	0.0021
112	0.0060	0.0039	0.0021
113	0.0061	0.0040	0.0021
114	0.0061	0.0040	0.0021
115	0.0062	0.0040	0.0021
116	0.0062	0.0041	0.0021
117	0.0063	0.0041	0.0022
118	0.0063	0.0041	0.0022
119	0.0064	0.0042	0.0022
120	0.0064	0.0042	0.0022
121	0.0065	0.0042	0.0022
122	0.0065	0.0043	0.0022
123	0.0066	0.0043	0.0023
124	0.0066	0.0043	0.0023
125	0.0067	0.0044	0.0023
126	0.0067	0.0044	0.0023
127	0.0068	0.0044	0.0024
128	0.0068	0.0045	0.0024
129	0.0069	0.0045	0.0024
130	0.0070	0.0045	0.0024
131	0.0070	0.0046	0.0024
132	0.0071	0.0046	0.0025
133	0.0072	0.0047	0.0025
134	0.0072	0.0047	0.0025
135	0.0073	0.0048	0.0025
136	0.0074	0.0048	0.0025
137	0.0075	0.0049	0.0026
138	0.0075	0.0049	0.0026
139	0.0076	0.0050	0.0026
140	0.0077	0.0050	0.0027
141	0.0078	0.0051	0.0027
142	0.0078	0.0051	0.0027
143	0.0080	0.0052	0.0028
144	0.0080	0.0052	0.0028
145	0.0077	0.0051	0.0027
146	0.0078	0.0051	0.0027

147	0.0079	0.0052	0.0027
148	0.0080	0.0052	0.0028
149	0.0082	0.0053	0.0028
150	0.0082	0.0054	0.0028
151	0.0084	0.0055	0.0029
152	0.0085	0.0055	0.0029
153	0.0086	0.0056	0.0030
154	0.0087	0.0057	0.0030
155	0.0089	0.0058	0.0031
156	0.0090	0.0059	0.0031
157	0.0092	0.0060	0.0032
158	0.0093	0.0061	0.0032
159	0.0095	0.0062	0.0033
160	0.0096	0.0063	0.0033
161	0.0099	0.0064	0.0034
162	0.0100	0.0065	0.0035
163	0.0102	0.0067	0.0035
164	0.0104	0.0068	0.0036
165	0.0107	0.0070	0.0037
166	0.0108	0.0071	0.0037
167	0.0112	0.0073	0.0039
168	0.0113	0.0074	0.0039
169	0.0117	0.0077	0.0040
170	0.0119	0.0078	0.0041
171	0.0123	0.0081	0.0043
172	0.0126	0.0082	0.0043
173	0.0130	0.0085	0.0045
174	0.0133	0.0087	0.0046
175	0.0139	0.0091	0.0048
176	0.0142	0.0093	0.0049
177	0.0149	0.0098	0.0052
178	0.0153	0.0100	0.0053
179	0.0162	0.0106	0.0056
180	0.0166	0.0109	0.0058
181	0.0177	0.0116	0.0061
182	0.0184	0.0120	0.0064
183	0.0198	0.0130	0.0069
184	0.0207	0.0135	0.0072
185	0.0166	0.0109	0.0058
186	0.0177	0.0116	0.0061
187	0.0206	0.0135	0.0071
188	0.0225	0.0147	0.0078
189	0.0279	0.0183	0.0097
190	0.0322	0.0210	0.0111
191	0.0488	0.0311	0.0177
192	0.0708	0.0311	0.0397
193	0.3065	0.0311	0.2754
194	0.0384	0.0251	0.0133
195	0.0248	0.0162	0.0086
196	0.0190	0.0124	0.0066
197	0.0216	0.0141	0.0075
198	0.0191	0.0125	0.0066
199	0.0172	0.0112	0.0059
200	0.0157	0.0103	0.0054
201	0.0146	0.0095	0.0050
202	0.0136	0.0089	0.0047
203	0.0128	0.0084	0.0044
204	0.0121	0.0079	0.0042
205	0.0115	0.0075	0.0040
206	0.0110	0.0072	0.0038
207	0.0105	0.0069	0.0036
208	0.0101	0.0066	0.0035
209	0.0097	0.0064	0.0034
210	0.0094	0.0061	0.0033
211	0.0091	0.0059	0.0031
212	0.0088	0.0058	0.0030
213	0.0085	0.0056	0.0030
214	0.0083	0.0054	0.0029
215	0.0081	0.0053	0.0028
216	0.0079	0.0052	0.0027
217	0.0081	0.0053	0.0028
218	0.0079	0.0052	0.0027
219	0.0077	0.0051	0.0027
220	0.0076	0.0049	0.0026
221	0.0074	0.0048	0.0026
222	0.0073	0.0048	0.0025
223	0.0071	0.0047	0.0025
224	0.0070	0.0046	0.0024
225	0.0069	0.0045	0.0024

226	0.0068	0.0044	0.0023
227	0.0066	0.0043	0.0023
228	0.0065	0.0043	0.0023
229	0.0064	0.0042	0.0022
230	0.0063	0.0041	0.0022
231	0.0062	0.0041	0.0022
232	0.0061	0.0040	0.0021
233	0.0061	0.0040	0.0021
234	0.0060	0.0039	0.0021
235	0.0059	0.0039	0.0020
236	0.0058	0.0038	0.0020
237	0.0057	0.0038	0.0020
238	0.0057	0.0037	0.0020
239	0.0056	0.0037	0.0019
240	0.0055	0.0036	0.0019
241	0.0055	0.0036	0.0019
242	0.0054	0.0035	0.0019
243	0.0053	0.0035	0.0018
244	0.0053	0.0035	0.0018
245	0.0052	0.0034	0.0018
246	0.0052	0.0034	0.0018
247	0.0051	0.0033	0.0018
248	0.0051	0.0033	0.0018
249	0.0050	0.0033	0.0017
250	0.0050	0.0032	0.0017
251	0.0049	0.0032	0.0017
252	0.0049	0.0032	0.0017
253	0.0048	0.0032	0.0017
254	0.0048	0.0031	0.0017
255	0.0047	0.0031	0.0016
256	0.0047	0.0031	0.0016
257	0.0046	0.0030	0.0016
258	0.0046	0.0030	0.0016
259	0.0046	0.0030	0.0016
260	0.0045	0.0030	0.0016
261	0.0045	0.0029	0.0016
262	0.0045	0.0029	0.0015
263	0.0044	0.0029	0.0015
264	0.0044	0.0029	0.0015
265	0.0043	0.0028	0.0015
266	0.0043	0.0028	0.0015
267	0.0043	0.0028	0.0015
268	0.0042	0.0028	0.0015
269	0.0042	0.0028	0.0015
270	0.0042	0.0027	0.0014
271	0.0042	0.0027	0.0014
272	0.0041	0.0027	0.0014
273	0.0041	0.0027	0.0014
274	0.0041	0.0027	0.0014
275	0.0040	0.0026	0.0014
276	0.0040	0.0026	0.0014
277	0.0040	0.0026	0.0014
278	0.0040	0.0026	0.0014
279	0.0039	0.0026	0.0014
280	0.0039	0.0026	0.0014
281	0.0039	0.0025	0.0013
282	0.0039	0.0025	0.0013
283	0.0038	0.0025	0.0013
284	0.0038	0.0025	0.0013
285	0.0038	0.0025	0.0013
286	0.0038	0.0025	0.0013
287	0.0037	0.0024	0.0013
288	0.0037	0.0024	0.0013

Total soil rain loss = 1.42(In)
Total effective rainfall = 1.04(In)
Peak flow rate in flood hydrograph = 5.66(CFS)

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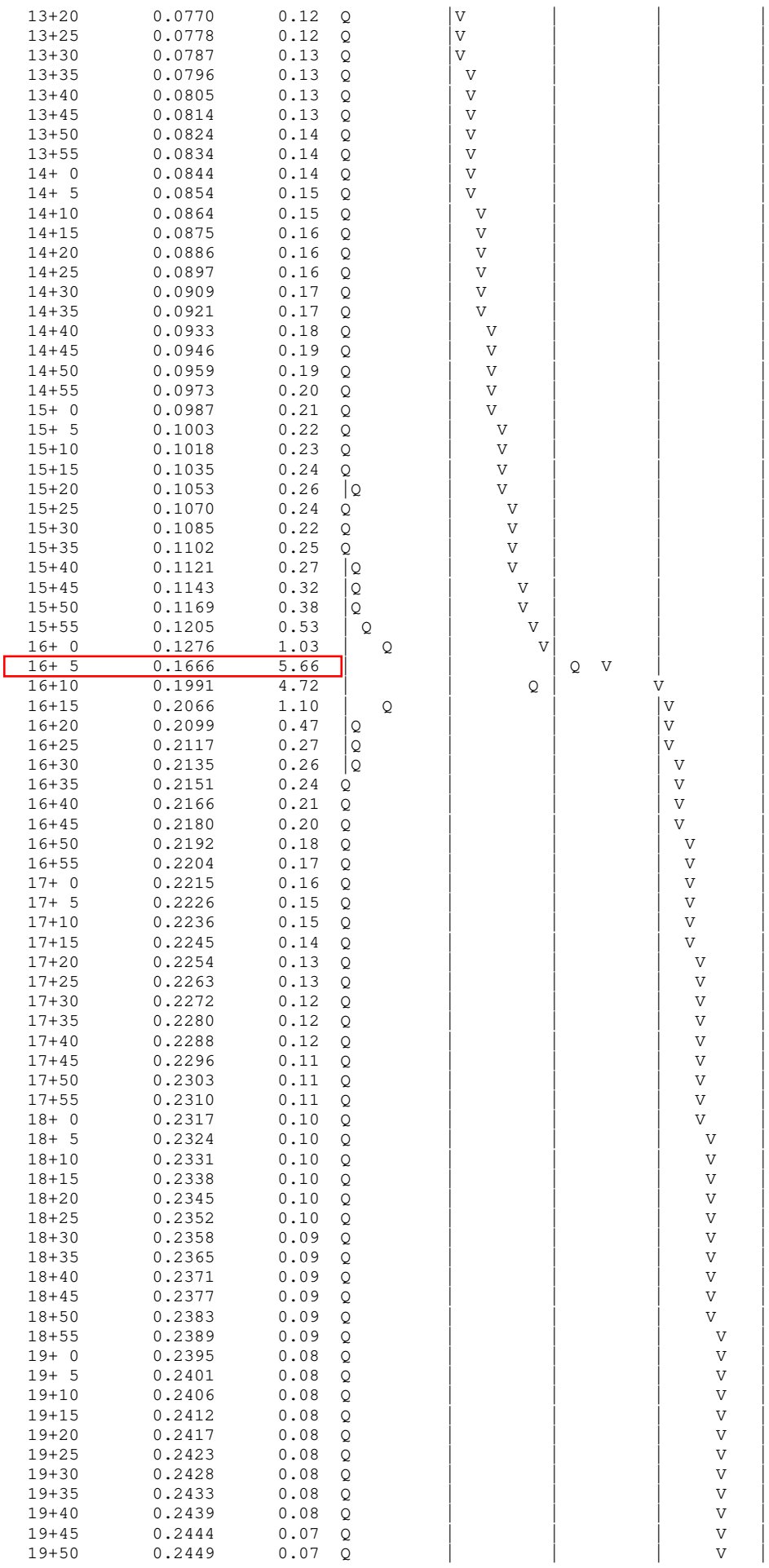
24 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	2.5	5.0	7.5	10.0
0+ 5	0.0002	0.02	Q	|	|	|	|

0+10	0.0005	0.04	Q				
0+15	0.0008	0.05	Q				
0+20	0.0011	0.05	Q				
0+25	0.0014	0.05	Q				
0+30	0.0018	0.05	Q				
0+35	0.0021	0.05	Q				
0+40	0.0024	0.05	Q				
0+45	0.0028	0.05	Q				
0+50	0.0031	0.05	Q				
0+55	0.0034	0.05	Q				
1+ 0	0.0038	0.05	Q				
1+ 5	0.0041	0.05	Q				
1+10	0.0045	0.05	Q				
1+15	0.0048	0.05	Q				
1+20	0.0051	0.05	Q				
1+25	0.0055	0.05	Q				
1+30	0.0058	0.05	Q				
1+35	0.0062	0.05	Q				
1+40	0.0065	0.05	Q				
1+45	0.0069	0.05	QV				
1+50	0.0072	0.05	QV				
1+55	0.0076	0.05	QV				
2+ 0	0.0079	0.05	QV				
2+ 5	0.0083	0.05	QV				
2+10	0.0086	0.05	QV				
2+15	0.0090	0.05	QV				
2+20	0.0093	0.05	QV				
2+25	0.0097	0.05	QV				
2+30	0.0101	0.05	QV				
2+35	0.0104	0.05	QV				
2+40	0.0108	0.05	QV				
2+45	0.0111	0.05	QV				
2+50	0.0115	0.05	QV				
2+55	0.0119	0.05	QV				
3+ 0	0.0122	0.05	QV				
3+ 5	0.0126	0.05	QV				
3+10	0.0130	0.05	QV				
3+15	0.0133	0.05	Q V				
3+20	0.0137	0.05	Q V				
3+25	0.0141	0.05	Q V				
3+30	0.0145	0.05	Q V				
3+35	0.0148	0.05	Q V				
3+40	0.0152	0.05	Q V				
3+45	0.0156	0.05	Q V				
3+50	0.0160	0.06	Q V				
3+55	0.0163	0.06	Q V				
4+ 0	0.0167	0.06	Q V				
4+ 5	0.0171	0.06	Q V				
4+10	0.0175	0.06	Q V				
4+15	0.0179	0.06	Q V				
4+20	0.0183	0.06	Q V				
4+25	0.0187	0.06	Q V				
4+30	0.0191	0.06	Q V				
4+35	0.0195	0.06	Q V				
4+40	0.0198	0.06	Q V				
4+45	0.0202	0.06	Q V				
4+50	0.0206	0.06	Q V				
4+55	0.0210	0.06	Q V				
5+ 0	0.0214	0.06	Q V				
5+ 5	0.0219	0.06	Q V				
5+10	0.0223	0.06	Q V				
5+15	0.0227	0.06	Q V				
5+20	0.0231	0.06	Q V				
5+25	0.0235	0.06	Q V				
5+30	0.0239	0.06	Q V				
5+35	0.0243	0.06	Q V				
5+40	0.0247	0.06	Q V				
5+45	0.0251	0.06	Q V				
5+50	0.0256	0.06	Q V				
5+55	0.0260	0.06	Q V				
6+ 0	0.0264	0.06	Q V				
6+ 5	0.0268	0.06	Q V				
6+10	0.0273	0.06	Q V				
6+15	0.0277	0.06	Q V				
6+20	0.0281	0.06	Q V				
6+25	0.0286	0.06	Q V				
6+30	0.0290	0.06	Q V				
6+35	0.0294	0.06	Q V				
6+40	0.0299	0.06	Q V				

6+45	0.0303	0.06	Q	V	|	|	|	|
6+50	0.0308	0.06	Q	V	|	|	|	|
6+55	0.0312	0.06	Q	V	|	|	|	|
7+ 0	0.0317	0.07	Q	V	|	|	|	|
7+ 5	0.0321	0.07	Q	V	|	|	|	|
7+10	0.0326	0.07	Q	V	|	|	|	|
7+15	0.0330	0.07	Q	V	|	|	|	|
7+20	0.0335	0.07	Q	V	|	|	|	|
7+25	0.0339	0.07	Q	V	|	|	|	|
7+30	0.0344	0.07	Q	V	|	|	|	|
7+35	0.0349	0.07	Q	V	|	|	|	|
7+40	0.0353	0.07	Q	V	|	|	|	|
7+45	0.0358	0.07	Q	V	|	|	|	|
7+50	0.0363	0.07	Q	V	|	|	|	|
7+55	0.0368	0.07	Q	V	|	|	|	|
8+ 0	0.0373	0.07	Q	V	|	|	|	|
8+ 5	0.0377	0.07	Q	V	|	|	|	|
8+10	0.0382	0.07	Q	V	|	|	|	|
8+15	0.0387	0.07	Q	V	|	|	|	|
8+20	0.0392	0.07	Q	V	|	|	|	|
8+25	0.0397	0.07	Q	V	|	|	|	|
8+30	0.0402	0.07	Q	V	|	|	|	|
8+35	0.0407	0.07	Q	V	|	|	|	|
8+40	0.0412	0.07	Q	V	|	|	|	|
8+45	0.0417	0.07	Q	V	|	|	|	|
8+50	0.0422	0.07	Q	V	|	|	|	|
8+55	0.0427	0.07	Q	V	|	|	|	|
9+ 0	0.0433	0.08	Q	V	|	|	|	|
9+ 5	0.0438	0.08	Q	V	|	|	|	|
9+10	0.0443	0.08	Q	V	|	|	|	|
9+15	0.0448	0.08	Q	V	|	|	|	|
9+20	0.0454	0.08	Q	V	|	|	|	|
9+25	0.0459	0.08	Q	V	|	|	|	|
9+30	0.0464	0.08	Q	V	|	|	|	|
9+35	0.0470	0.08	Q	V	|	|	|	|
9+40	0.0475	0.08	Q	V	|	|	|	|
9+45	0.0481	0.08	Q	V	|	|	|	|
9+50	0.0486	0.08	Q	V	|	|	|	|
9+55	0.0492	0.08	Q	V	|	|	|	|
10+ 0	0.0498	0.08	Q	V	|	|	|	|
10+ 5	0.0503	0.08	Q	V	|	|	|	|
10+10	0.0509	0.08	Q	V	|	|	|	|
10+15	0.0515	0.08	Q	V	|	|	|	|
10+20	0.0521	0.08	Q	V	|	|	|	|
10+25	0.0526	0.09	Q	V	|	|	|	|
10+30	0.0532	0.09	Q	V	|	|	|	|
10+35	0.0538	0.09	Q	V	|	|	|	|
10+40	0.0544	0.09	Q	V	|	|	|	|
10+45	0.0550	0.09	Q	V	|	|	|	|
10+50	0.0557	0.09	Q	V	|	|	|	|
10+55	0.0563	0.09	Q	V	|	|	|	|
11+ 0	0.0569	0.09	Q	V	|	|	|	|
11+ 5	0.0575	0.09	Q	V	|	|	|	|
11+10	0.0582	0.09	Q	V	|	|	|	|
11+15	0.0588	0.09	Q	V	|	|	|	|
11+20	0.0595	0.09	Q	V	|	|	|	|
11+25	0.0601	0.10	Q	V	|	|	|	|
11+30	0.0608	0.10	Q	V	|	|	|	|
11+35	0.0614	0.10	Q	V	|	|	|	|
11+40	0.0621	0.10	Q	V	|	|	|	|
11+45	0.0628	0.10	Q	V	|	|	|	|
11+50	0.0635	0.10	Q	V	|	|	|	|
11+55	0.0642	0.10	Q	V	|	|	|	|
12+ 0	0.0649	0.10	Q	V	|	|	|	|
12+ 5	0.0656	0.10	Q	V	|	|	|	|
12+10	0.0663	0.10	Q	V	|	|	|	|
12+15	0.0670	0.10	Q	V	|	|	|	|
12+20	0.0677	0.10	Q	V	|	|	|	|
12+25	0.0684	0.10	Q	V	|	|	|	|
12+30	0.0691	0.11	Q	V	|	|	|	|
12+35	0.0699	0.11	Q	V	|	|	|	|
12+40	0.0706	0.11	Q	V	|	|	|	|
12+45	0.0714	0.11	Q	V	|	|	|	|
12+50	0.0721	0.11	Q	V	|	|	|	|
12+55	0.0729	0.11	Q	V	|	|	|	|
13+ 0	0.0737	0.11	Q	V	|	|	|	|
13+ 5	0.0745	0.12	Q	V	|	|	|	|
13+10	0.0753	0.12	Q	V	|	|	|	|
13+15	0.0761	0.12	Q	V	|	|	|	|



19+55	0.2454	0.07	Q				V
20+ 0	0.2459	0.07	Q				V
20+ 5	0.2464	0.07	Q				V
20+10	0.2468	0.07	Q				V
20+15	0.2473	0.07	Q				V
20+20	0.2478	0.07	Q				V
20+25	0.2483	0.07	Q				V
20+30	0.2487	0.07	Q				V
20+35	0.2492	0.07	Q				V
20+40	0.2496	0.07	Q				V
20+45	0.2501	0.06	Q				V
20+50	0.2505	0.06	Q				V
20+55	0.2509	0.06	Q				V
21+ 0	0.2514	0.06	Q				V
21+ 5	0.2518	0.06	Q				V
21+10	0.2522	0.06	Q				V
21+15	0.2526	0.06	Q				V
21+20	0.2531	0.06	Q				V
21+25	0.2535	0.06	Q				V
21+30	0.2539	0.06	Q				V
21+35	0.2543	0.06	Q				V
21+40	0.2547	0.06	Q				V
21+45	0.2551	0.06	Q				V
21+50	0.2555	0.06	Q				V
21+55	0.2559	0.06	Q				V
22+ 0	0.2563	0.06	Q				V
22+ 5	0.2567	0.06	Q				V
22+10	0.2570	0.06	Q				V
22+15	0.2574	0.06	Q				V
22+20	0.2578	0.05	Q				V
22+25	0.2582	0.05	Q				V
22+30	0.2586	0.05	Q				V
22+35	0.2589	0.05	Q				V
22+40	0.2593	0.05	Q				V
22+45	0.2596	0.05	Q				V
22+50	0.2600	0.05	Q				V
22+55	0.2604	0.05	Q				V
23+ 0	0.2607	0.05	Q				V
23+ 5	0.2611	0.05	Q				V
23+10	0.2614	0.05	Q				V
23+15	0.2618	0.05	Q				V
23+20	0.2621	0.05	Q				V
23+25	0.2625	0.05	Q				V
23+30	0.2628	0.05	Q				V
23+35	0.2632	0.05	Q				V
23+40	0.2635	0.05	Q				V
23+45	0.2638	0.05	Q				V
23+50	0.2642	0.05	Q				V
23+55	0.2645	0.05	Q				V
24+ 0	0.2648	0.05	Q				V

Volume=11,535 CF

DMA -3

```
        U n i t   H y d r o g r a p h   A n a l y s i s

        Copyright (c) CIVILCADD/CIVILDESIGN, 1989 - 2012, Version 7.1

                Study date  05/07/21

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San Bernardino County Synthetic Unit Hydrology Method
                Manual date - August 1986


Program License Serial Number 6310

------------------------------------------------------------------------
20-523 BEAR VALLEY CONNECTION
EXISTING CONDITION, DMA-3


------------------------------------------------------------------------

        Storm Event Year = 10

        Antecedent Moisture Condition = 1

 English (in-lb) Input Units Used

 English Rainfall Data (Inches) Input Values Used

 English Units used in output format



Area averaged rainfall intensity isohyetal data:
        Sub-Area        Duration        Isohyetal
        (Ac.)             (hours)         (In)
Rainfall data for year 10
             3.40            1           0.65
------------------------------------------------------------------------
Rainfall data for year 10
             3.40            6           1.35
------------------------------------------------------------------------
Rainfall data for year 10
             3.40           24           2.46
------------------------------------------------------------------------
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

******** Area-averaged max loss rate, Fm ********


SCS curve  SCS curve     Area     Area     Fp(Fig C6)    Ap       Fm
No.(AMCII) NO.(AMC 1)    (Ac.)    Fraction     (In/Hr)  (dec.)   (In/Hr)
 91.0       79.8          3.40      1.000     0.373    1.000    0.373

Area-averaged adjusted loss rate Fm (In/Hr) =  0.373

********* Area-Averaged low loss rate fraction, Yb **********

Area        Area          SCS CN    SCS CN      S     Pervious
 (Ac.)       Fract         (AMC2)    (AMC1)          Yield Fr
     3.40    1.000          91.0      79.8       2.53     0.346

Area-averaged catchment yield fraction, Y =  0.346
Area-averaged low loss fraction, Yb =  0.654
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Watercourse length =     600.00(Ft.)
Length from concentration point to centroid =     380.00(Ft.)
Elevation difference along watercourse =      10.00(Ft.)
Mannings friction factor along watercourse =  0.030
Watershed area =       3.40(Ac.)
Catchment Lag time =   0.050 hours
Unit interval =   5.000 minutes
Unit interval percentage of lag time = 168.3157
Hydrograph baseflow =     0.00(CFS)
Average maximum watershed loss rate(Fm) =  0.373(In/Hr)
```

Lag=0.8 x Tc; Tc=3.75 Min.
Note: 5 minute minimum

Average low loss rate fraction (Yb) = 0.654 (decimal)
DESERT S-Graph Selected
Computed peak 5-minute rainfall = 0.307(In)
Computed peak 30-minute rainfall = 0.525(In)
Specified peak 1-hour rainfall = 0.646(In)
Computed peak 3-hour rainfall = 1.015(In)
Specified peak 6-hour rainfall = 1.350(In)
Specified peak 24-hour rainfall = 2.460(In)

Rainfall depth area reduction factors:
Using a total area of 3.40(Ac.) (Ref: fig. E-4)

5-minute factor = 1.000 Adjusted rainfall = 0.306(In)
30-minute factor = 1.000 Adjusted rainfall = 0.525(In)
1-hour factor = 1.000 Adjusted rainfall = 0.646(In)
3-hour factor = 1.000 Adjusted rainfall = 1.015(In)
6-hour factor = 1.000 Adjusted rainfall = 1.350(In)
24-hour factor = 1.000 Adjusted rainfall = 2.460(In)

U n i t H y d r o g r a p h

Interval Number	'S' Graph Mean values	Unit Hydrograph ((CFS))
(K = 41.12 (CFS))		
1	35.921	14.770
2	83.689	19.642
3	94.393	4.401
4	98.175	1.555
5	100.000	0.751

Peak Unit Number	Adjusted mass rainfall (In)	Unit rainfall (In)
1	0.3065	0.3065
2	0.3773	0.0708
3	0.4261	0.0488
4	0.4645	0.0384
5	0.4967	0.0322
6	0.5246	0.0279
7	0.5495	0.0248
8	0.5719	0.0225
9	0.5925	0.0206
10	0.6115	0.0190
11	0.6293	0.0177
12	0.6459	0.0166
13	0.6675	0.0216
14	0.6882	0.0207
15	0.7080	0.0198
16	0.7271	0.0191
17	0.7454	0.0184
18	0.7632	0.0177
19	0.7803	0.0172
20	0.7970	0.0166
21	0.8131	0.0162
22	0.8289	0.0157
23	0.8442	0.0153
24	0.8591	0.0149
25	0.8736	0.0146
26	0.8878	0.0142
27	0.9017	0.0139
28	0.9153	0.0136
29	0.9287	0.0133
30	0.9417	0.0130
31	0.9545	0.0128
32	0.9670	0.0126
33	0.9794	0.0123
34	0.9915	0.0121
35	1.0034	0.0119
36	1.0151	0.0117
37	1.0266	0.0115
38	1.0379	0.0113
39	1.0490	0.0112
40	1.0600	0.0110
41	1.0708	0.0108
42	1.0815	0.0107
43	1.0920	0.0105

44	1.1024	0.0104
45	1.1127	0.0102
46	1.1228	0.0101
47	1.1327	0.0100
48	1.1426	0.0099
49	1.1523	0.0097
50	1.1619	0.0096
51	1.1714	0.0095
52	1.1808	0.0094
53	1.1901	0.0093
54	1.1993	0.0092
55	1.2084	0.0091
56	1.2174	0.0090
57	1.2263	0.0089
58	1.2351	0.0088
59	1.2438	0.0087
60	1.2524	0.0086
61	1.2610	0.0085
62	1.2694	0.0085
63	1.2778	0.0084
64	1.2861	0.0083
65	1.2944	0.0082
66	1.3025	0.0082
67	1.3106	0.0081
68	1.3186	0.0080
69	1.3266	0.0079
70	1.3344	0.0079
71	1.3422	0.0078
72	1.3500	0.0077
73	1.3581	0.0081
74	1.3661	0.0080
75	1.3741	0.0080
76	1.3820	0.0079
77	1.3898	0.0078
78	1.3976	0.0078
79	1.4053	0.0077
80	1.4130	0.0077
81	1.4206	0.0076
82	1.4282	0.0076
83	1.4357	0.0075
84	1.4431	0.0075
85	1.4505	0.0074
86	1.4579	0.0074
87	1.4652	0.0073
88	1.4725	0.0073
89	1.4797	0.0072
90	1.4869	0.0072
91	1.4940	0.0071
92	1.5011	0.0071
93	1.5081	0.0070
94	1.5151	0.0070
95	1.5221	0.0070
96	1.5290	0.0069
97	1.5359	0.0069
98	1.5427	0.0068
99	1.5495	0.0068
100	1.5563	0.0068
101	1.5630	0.0067
102	1.5697	0.0067
103	1.5763	0.0066
104	1.5829	0.0066
105	1.5895	0.0066
106	1.5960	0.0065
107	1.6025	0.0065
108	1.6090	0.0065
109	1.6154	0.0064
110	1.6218	0.0064
111	1.6282	0.0064
112	1.6345	0.0063
113	1.6408	0.0063
114	1.6471	0.0063
115	1.6533	0.0062
116	1.6595	0.0062
117	1.6657	0.0062
118	1.6719	0.0061
119	1.6780	0.0061
120	1.6841	0.0061
121	1.6901	0.0061
122	1.6962	0.0060

123	1.7022	0.0060
124	1.7081	0.0060
125	1.7141	0.0059
126	1.7200	0.0059
127	1.7259	0.0059
128	1.7318	0.0059
129	1.7376	0.0058
130	1.7434	0.0058
131	1.7492	0.0058
132	1.7550	0.0058
133	1.7607	0.0057
134	1.7664	0.0057
135	1.7721	0.0057
136	1.7778	0.0057
137	1.7835	0.0056
138	1.7891	0.0056
139	1.7947	0.0056
140	1.8003	0.0056
141	1.8058	0.0056
142	1.8113	0.0055
143	1.8169	0.0055
144	1.8223	0.0055
145	1.8278	0.0055
146	1.8333	0.0054
147	1.8387	0.0054
148	1.8441	0.0054
149	1.8495	0.0054
150	1.8548	0.0054
151	1.8602	0.0053
152	1.8655	0.0053
153	1.8708	0.0053
154	1.8761	0.0053
155	1.8813	0.0053
156	1.8866	0.0052
157	1.8918	0.0052
158	1.8970	0.0052
159	1.9022	0.0052
160	1.9074	0.0052
161	1.9125	0.0052
162	1.9177	0.0051
163	1.9228	0.0051
164	1.9279	0.0051
165	1.9330	0.0051
166	1.9380	0.0051
167	1.9431	0.0050
168	1.9481	0.0050
169	1.9531	0.0050
170	1.9581	0.0050
171	1.9631	0.0050
172	1.9680	0.0050
173	1.9730	0.0049
174	1.9779	0.0049
175	1.9828	0.0049
176	1.9877	0.0049
177	1.9926	0.0049
178	1.9975	0.0049
179	2.0023	0.0048
180	2.0071	0.0048
181	2.0120	0.0048
182	2.0168	0.0048
183	2.0216	0.0048
184	2.0263	0.0048
185	2.0311	0.0048
186	2.0358	0.0047
187	2.0406	0.0047
188	2.0453	0.0047
189	2.0500	0.0047
190	2.0547	0.0047
191	2.0593	0.0047
192	2.0640	0.0047
193	2.0687	0.0046
194	2.0733	0.0046
195	2.0779	0.0046
196	2.0825	0.0046
197	2.0871	0.0046
198	2.0917	0.0046
199	2.0963	0.0046
200	2.1008	0.0046
201	2.1053	0.0045

202	2.1099	0.0045
203	2.1144	0.0045
204	2.1189	0.0045
205	2.1234	0.0045
206	2.1279	0.0045
207	2.1323	0.0045
208	2.1368	0.0045
209	2.1412	0.0044
210	2.1456	0.0044
211	2.1501	0.0044
212	2.1545	0.0044
213	2.1589	0.0044
214	2.1632	0.0044
215	2.1676	0.0044
216	2.1720	0.0044
217	2.1763	0.0043
218	2.1806	0.0043
219	2.1850	0.0043
220	2.1893	0.0043
221	2.1936	0.0043
222	2.1979	0.0043
223	2.2022	0.0043
224	2.2064	0.0043
225	2.2107	0.0043
226	2.2149	0.0042
227	2.2192	0.0042
228	2.2234	0.0042
229	2.2276	0.0042
230	2.2318	0.0042
231	2.2360	0.0042
232	2.2402	0.0042
233	2.2444	0.0042
234	2.2485	0.0042
235	2.2527	0.0042
236	2.2568	0.0041
237	2.2610	0.0041
238	2.2651	0.0041
239	2.2692	0.0041
240	2.2733	0.0041
241	2.2774	0.0041
242	2.2815	0.0041
243	2.2856	0.0041
244	2.2896	0.0041
245	2.2937	0.0041
246	2.2977	0.0040
247	2.3018	0.0040
248	2.3058	0.0040
249	2.3098	0.0040
250	2.3138	0.0040
251	2.3178	0.0040
252	2.3218	0.0040
253	2.3258	0.0040
254	2.3298	0.0040
255	2.3338	0.0040
256	2.3377	0.0040
257	2.3417	0.0039
258	2.3456	0.0039
259	2.3495	0.0039
260	2.3535	0.0039
261	2.3574	0.0039
262	2.3613	0.0039
263	2.3652	0.0039
264	2.3691	0.0039
265	2.3729	0.0039
266	2.3768	0.0039
267	2.3807	0.0039
268	2.3845	0.0039
269	2.3884	0.0038
270	2.3922	0.0038
271	2.3960	0.0038
272	2.3999	0.0038
273	2.4037	0.0038
274	2.4075	0.0038
275	2.4113	0.0038
276	2.4151	0.0038
277	2.4189	0.0038
278	2.4226	0.0038
279	2.4264	0.0038
280	2.4302	0.0038

281	2.4339	0.0038
282	2.4377	0.0037
283	2.4414	0.0037
284	2.4451	0.0037
285	2.4489	0.0037
286	2.4526	0.0037
287	2.4563	0.0037
288	2.4600	0.0037

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0037	0.0024	0.0013
2	0.0037	0.0024	0.0013
3	0.0037	0.0024	0.0013
4	0.0037	0.0024	0.0013
5	0.0037	0.0024	0.0013
6	0.0038	0.0025	0.0013
7	0.0038	0.0025	0.0013
8	0.0038	0.0025	0.0013
9	0.0038	0.0025	0.0013
10	0.0038	0.0025	0.0013
11	0.0038	0.0025	0.0013
12	0.0038	0.0025	0.0013
13	0.0038	0.0025	0.0013
14	0.0038	0.0025	0.0013
15	0.0039	0.0025	0.0013
16	0.0039	0.0025	0.0013
17	0.0039	0.0025	0.0013
18	0.0039	0.0025	0.0013
19	0.0039	0.0026	0.0014
20	0.0039	0.0026	0.0014
21	0.0039	0.0026	0.0014
22	0.0039	0.0026	0.0014
23	0.0040	0.0026	0.0014
24	0.0040	0.0026	0.0014
25	0.0040	0.0026	0.0014
26	0.0040	0.0026	0.0014
27	0.0040	0.0026	0.0014
28	0.0040	0.0026	0.0014
29	0.0040	0.0026	0.0014
30	0.0041	0.0027	0.0014
31	0.0041	0.0027	0.0014
32	0.0041	0.0027	0.0014
33	0.0041	0.0027	0.0014
34	0.0041	0.0027	0.0014
35	0.0041	0.0027	0.0014
36	0.0041	0.0027	0.0014
37	0.0042	0.0027	0.0014
38	0.0042	0.0027	0.0014
39	0.0042	0.0027	0.0015
40	0.0042	0.0028	0.0015
41	0.0042	0.0028	0.0015
42	0.0042	0.0028	0.0015
43	0.0043	0.0028	0.0015
44	0.0043	0.0028	0.0015
45	0.0043	0.0028	0.0015
46	0.0043	0.0028	0.0015
47	0.0043	0.0028	0.0015
48	0.0043	0.0028	0.0015
49	0.0044	0.0029	0.0015
50	0.0044	0.0029	0.0015
51	0.0044	0.0029	0.0015
52	0.0044	0.0029	0.0015
53	0.0044	0.0029	0.0015
54	0.0044	0.0029	0.0015
55	0.0045	0.0029	0.0015
56	0.0045	0.0029	0.0015
57	0.0045	0.0029	0.0016
58	0.0045	0.0030	0.0016
59	0.0045	0.0030	0.0016
60	0.0046	0.0030	0.0016
61	0.0046	0.0030	0.0016
62	0.0046	0.0030	0.0016
63	0.0046	0.0030	0.0016
64	0.0046	0.0030	0.0016
65	0.0047	0.0030	0.0016
66	0.0047	0.0031	0.0016

67	0.0047	0.0031	0.0016
68	0.0047	0.0031	0.0016
69	0.0047	0.0031	0.0016
70	0.0048	0.0031	0.0016
71	0.0048	0.0031	0.0017
72	0.0048	0.0031	0.0017
73	0.0048	0.0032	0.0017
74	0.0048	0.0032	0.0017
75	0.0049	0.0032	0.0017
76	0.0049	0.0032	0.0017
77	0.0049	0.0032	0.0017
78	0.0049	0.0032	0.0017
79	0.0050	0.0033	0.0017
80	0.0050	0.0033	0.0017
81	0.0050	0.0033	0.0017
82	0.0050	0.0033	0.0017
83	0.0051	0.0033	0.0018
84	0.0051	0.0033	0.0018
85	0.0051	0.0034	0.0018
86	0.0052	0.0034	0.0018
87	0.0052	0.0034	0.0018
88	0.0052	0.0034	0.0018
89	0.0052	0.0034	0.0018
90	0.0053	0.0034	0.0018
91	0.0053	0.0035	0.0018
92	0.0053	0.0035	0.0018
93	0.0054	0.0035	0.0019
94	0.0054	0.0035	0.0019
95	0.0054	0.0035	0.0019
96	0.0054	0.0036	0.0019
97	0.0055	0.0036	0.0019
98	0.0055	0.0036	0.0019
99	0.0056	0.0036	0.0019
100	0.0056	0.0036	0.0019
101	0.0056	0.0037	0.0019
102	0.0056	0.0037	0.0020
103	0.0057	0.0037	0.0020
104	0.0057	0.0037	0.0020
105	0.0058	0.0038	0.0020
106	0.0058	0.0038	0.0020
107	0.0058	0.0038	0.0020
108	0.0059	0.0038	0.0020
109	0.0059	0.0039	0.0020
110	0.0059	0.0039	0.0021
111	0.0060	0.0039	0.0021
112	0.0060	0.0039	0.0021
113	0.0061	0.0040	0.0021
114	0.0061	0.0040	0.0021
115	0.0062	0.0040	0.0021
116	0.0062	0.0041	0.0021
117	0.0063	0.0041	0.0022
118	0.0063	0.0041	0.0022
119	0.0064	0.0042	0.0022
120	0.0064	0.0042	0.0022
121	0.0065	0.0042	0.0022
122	0.0065	0.0043	0.0022
123	0.0066	0.0043	0.0023
124	0.0066	0.0043	0.0023
125	0.0067	0.0044	0.0023
126	0.0067	0.0044	0.0023
127	0.0068	0.0044	0.0024
128	0.0068	0.0045	0.0024
129	0.0069	0.0045	0.0024
130	0.0070	0.0045	0.0024
131	0.0070	0.0046	0.0024
132	0.0071	0.0046	0.0025
133	0.0072	0.0047	0.0025
134	0.0072	0.0047	0.0025
135	0.0073	0.0048	0.0025
136	0.0074	0.0048	0.0025
137	0.0075	0.0049	0.0026
138	0.0075	0.0049	0.0026
139	0.0076	0.0050	0.0026
140	0.0077	0.0050	0.0027
141	0.0078	0.0051	0.0027
142	0.0078	0.0051	0.0027
143	0.0080	0.0052	0.0028
144	0.0080	0.0052	0.0028
145	0.0077	0.0051	0.0027

146	0.0078	0.0051	0.0027
147	0.0079	0.0052	0.0027
148	0.0080	0.0052	0.0028
149	0.0082	0.0053	0.0028
150	0.0082	0.0054	0.0028
151	0.0084	0.0055	0.0029
152	0.0085	0.0055	0.0029
153	0.0086	0.0056	0.0030
154	0.0087	0.0057	0.0030
155	0.0089	0.0058	0.0031
156	0.0090	0.0059	0.0031
157	0.0092	0.0060	0.0032
158	0.0093	0.0061	0.0032
159	0.0095	0.0062	0.0033
160	0.0096	0.0063	0.0033
161	0.0099	0.0064	0.0034
162	0.0100	0.0065	0.0035
163	0.0102	0.0067	0.0035
164	0.0104	0.0068	0.0036
165	0.0107	0.0070	0.0037
166	0.0108	0.0071	0.0037
167	0.0112	0.0073	0.0039
168	0.0113	0.0074	0.0039
169	0.0117	0.0077	0.0040
170	0.0119	0.0078	0.0041
171	0.0123	0.0081	0.0043
172	0.0126	0.0082	0.0043
173	0.0130	0.0085	0.0045
174	0.0133	0.0087	0.0046
175	0.0139	0.0091	0.0048
176	0.0142	0.0093	0.0049
177	0.0149	0.0098	0.0052
178	0.0153	0.0100	0.0053
179	0.0162	0.0106	0.0056
180	0.0166	0.0109	0.0058
181	0.0177	0.0116	0.0061
182	0.0184	0.0120	0.0064
183	0.0198	0.0130	0.0069
184	0.0207	0.0135	0.0072
185	0.0166	0.0109	0.0058
186	0.0177	0.0116	0.0061
187	0.0206	0.0135	0.0071
188	0.0225	0.0147	0.0078
189	0.0279	0.0183	0.0097
190	0.0322	0.0210	0.0111
191	0.0488	0.0311	0.0177
192	0.0708	0.0311	0.0397
193	0.3065	0.0311	0.2754
194	0.0384	0.0251	0.0133
195	0.0248	0.0162	0.0086
196	0.0190	0.0124	0.0066
197	0.0216	0.0141	0.0075
198	0.0191	0.0125	0.0066
199	0.0172	0.0112	0.0059
200	0.0157	0.0103	0.0054
201	0.0146	0.0095	0.0050
202	0.0136	0.0089	0.0047
203	0.0128	0.0084	0.0044
204	0.0121	0.0079	0.0042
205	0.0115	0.0075	0.0040
206	0.0110	0.0072	0.0038
207	0.0105	0.0069	0.0036
208	0.0101	0.0066	0.0035
209	0.0097	0.0064	0.0034
210	0.0094	0.0061	0.0033
211	0.0091	0.0059	0.0031
212	0.0088	0.0058	0.0030
213	0.0085	0.0056	0.0030
214	0.0083	0.0054	0.0029
215	0.0081	0.0053	0.0028
216	0.0079	0.0052	0.0027
217	0.0081	0.0053	0.0028
218	0.0079	0.0052	0.0027
219	0.0077	0.0051	0.0027
220	0.0076	0.0049	0.0026
221	0.0074	0.0048	0.0026
222	0.0073	0.0048	0.0025
223	0.0071	0.0047	0.0025
224	0.0070	0.0046	0.0024

225	0.0069	0.0045	0.0024
226	0.0068	0.0044	0.0023
227	0.0066	0.0043	0.0023
228	0.0065	0.0043	0.0023
229	0.0064	0.0042	0.0022
230	0.0063	0.0041	0.0022
231	0.0062	0.0041	0.0022
232	0.0061	0.0040	0.0021
233	0.0061	0.0040	0.0021
234	0.0060	0.0039	0.0021
235	0.0059	0.0039	0.0020
236	0.0058	0.0038	0.0020
237	0.0057	0.0038	0.0020
238	0.0057	0.0037	0.0020
239	0.0056	0.0037	0.0019
240	0.0055	0.0036	0.0019
241	0.0055	0.0036	0.0019
242	0.0054	0.0035	0.0019
243	0.0053	0.0035	0.0018
244	0.0053	0.0035	0.0018
245	0.0052	0.0034	0.0018
246	0.0052	0.0034	0.0018
247	0.0051	0.0033	0.0018
248	0.0051	0.0033	0.0018
249	0.0050	0.0033	0.0017
250	0.0050	0.0032	0.0017
251	0.0049	0.0032	0.0017
252	0.0049	0.0032	0.0017
253	0.0048	0.0032	0.0017
254	0.0048	0.0031	0.0017
255	0.0047	0.0031	0.0016
256	0.0047	0.0031	0.0016
257	0.0046	0.0030	0.0016
258	0.0046	0.0030	0.0016
259	0.0046	0.0030	0.0016
260	0.0045	0.0030	0.0016
261	0.0045	0.0029	0.0016
262	0.0045	0.0029	0.0015
263	0.0044	0.0029	0.0015
264	0.0044	0.0029	0.0015
265	0.0043	0.0028	0.0015
266	0.0043	0.0028	0.0015
267	0.0043	0.0028	0.0015
268	0.0042	0.0028	0.0015
269	0.0042	0.0028	0.0015
270	0.0042	0.0027	0.0014
271	0.0042	0.0027	0.0014
272	0.0041	0.0027	0.0014
273	0.0041	0.0027	0.0014
274	0.0041	0.0027	0.0014
275	0.0040	0.0026	0.0014
276	0.0040	0.0026	0.0014
277	0.0040	0.0026	0.0014
278	0.0040	0.0026	0.0014
279	0.0039	0.0026	0.0014
280	0.0039	0.0026	0.0014
281	0.0039	0.0025	0.0013
282	0.0039	0.0025	0.0013
283	0.0038	0.0025	0.0013
284	0.0038	0.0025	0.0013
285	0.0038	0.0025	0.0013
286	0.0038	0.0025	0.0013
287	0.0037	0.0024	0.0013
288	0.0037	0.0024	0.0013

Total soil rain loss = 1.42(In)
Total effective rainfall = 1.04(In)
Peak flow rate in flood hydrograph = 5.82(CFS)

++

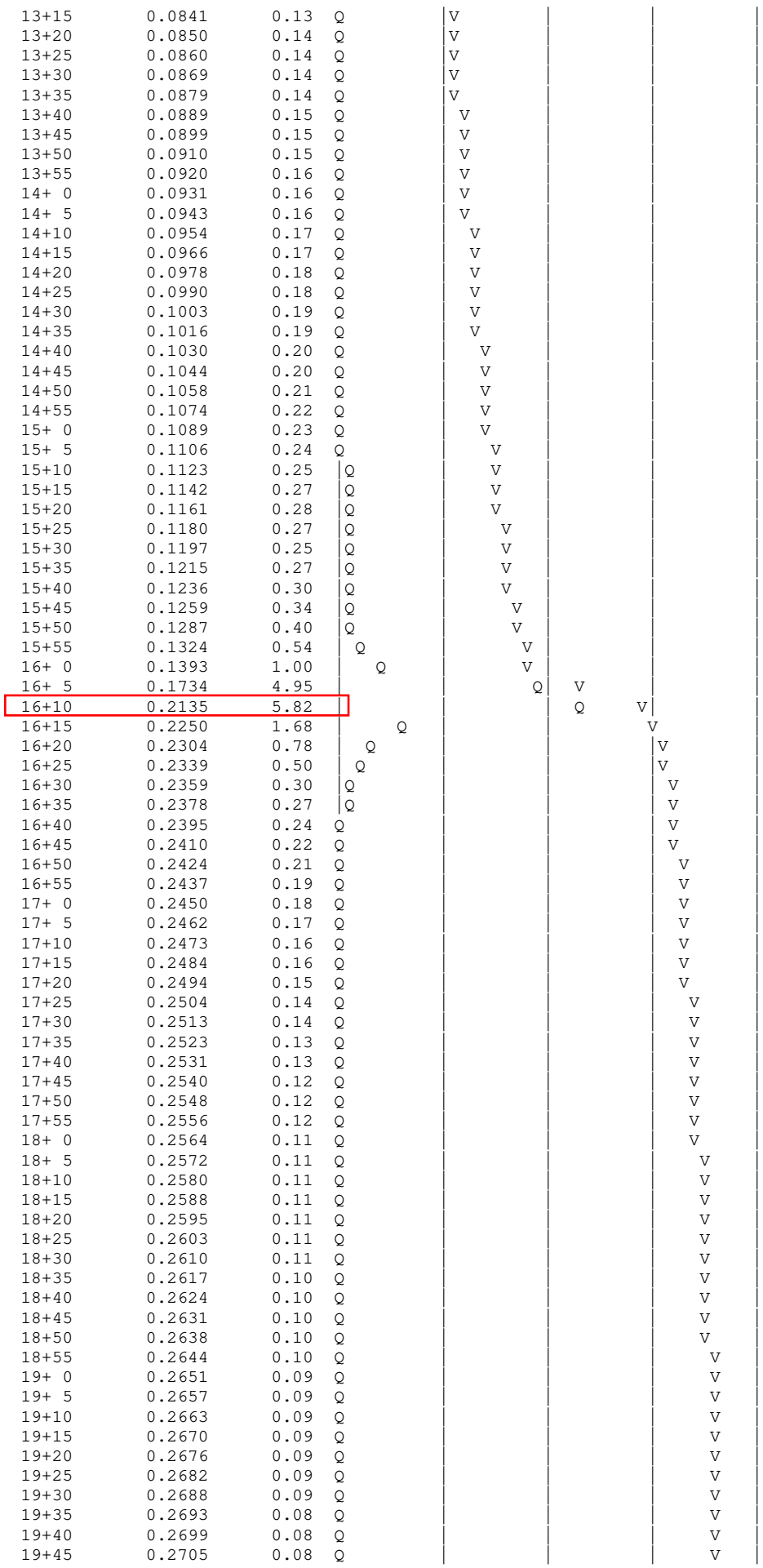
24 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	2.5	5.0	7.5	10.0

0+ 5	0.0001	0.02	Q				
0+10	0.0004	0.04	Q				
0+15	0.0008	0.05	Q				
0+20	0.0011	0.05	Q				
0+25	0.0015	0.05	Q				
0+30	0.0019	0.05	Q				
0+35	0.0022	0.05	Q				
0+40	0.0026	0.05	Q				
0+45	0.0030	0.05	Q				
0+50	0.0033	0.05	Q				
0+55	0.0037	0.05	Q				
1+ 0	0.0041	0.05	Q				
1+ 5	0.0045	0.05	Q				
1+10	0.0048	0.05	Q				
1+15	0.0052	0.05	Q				
1+20	0.0056	0.05	Q				
1+25	0.0060	0.06	Q				
1+30	0.0064	0.06	Q				
1+35	0.0067	0.06	Q				
1+40	0.0071	0.06	Q				
1+45	0.0075	0.06	QV				
1+50	0.0079	0.06	QV				
1+55	0.0083	0.06	QV				
2+ 0	0.0087	0.06	QV				
2+ 5	0.0091	0.06	QV				
2+10	0.0095	0.06	QV				
2+15	0.0098	0.06	QV				
2+20	0.0102	0.06	QV				
2+25	0.0106	0.06	QV				
2+30	0.0110	0.06	QV				
2+35	0.0114	0.06	QV				
2+40	0.0118	0.06	QV				
2+45	0.0122	0.06	QV				
2+50	0.0126	0.06	QV				
2+55	0.0130	0.06	QV				
3+ 0	0.0134	0.06	QV				
3+ 5	0.0138	0.06	QV				
3+10	0.0143	0.06	QV				
3+15	0.0147	0.06	QV				
3+20	0.0151	0.06	Q V				
3+25	0.0155	0.06	Q V				
3+30	0.0159	0.06	Q V				
3+35	0.0163	0.06	Q V				
3+40	0.0167	0.06	Q V				
3+45	0.0172	0.06	Q V				
3+50	0.0176	0.06	Q V				
3+55	0.0180	0.06	Q V				
4+ 0	0.0184	0.06	Q V				
4+ 5	0.0188	0.06	Q V				
4+10	0.0193	0.06	Q V				
4+15	0.0197	0.06	Q V				
4+20	0.0201	0.06	Q V				
4+25	0.0206	0.06	Q V				
4+30	0.0210	0.06	Q V				
4+35	0.0214	0.06	Q V				
4+40	0.0219	0.06	Q V				
4+45	0.0223	0.06	Q V				
4+50	0.0227	0.06	Q V				
4+55	0.0232	0.06	Q V				
5+ 0	0.0236	0.06	Q V				
5+ 5	0.0241	0.06	Q V				
5+10	0.0245	0.07	Q V				
5+15	0.0250	0.07	Q V				
5+20	0.0254	0.07	Q V				
5+25	0.0259	0.07	Q V				
5+30	0.0263	0.07	Q V				
5+35	0.0268	0.07	Q V				
5+40	0.0273	0.07	Q V				
5+45	0.0277	0.07	Q V				
5+50	0.0282	0.07	Q V				
5+55	0.0287	0.07	Q V				
6+ 0	0.0291	0.07	Q V				
6+ 5	0.0296	0.07	Q V				
6+10	0.0301	0.07	Q V				
6+15	0.0305	0.07	Q V				
6+20	0.0310	0.07	Q V				
6+25	0.0315	0.07	Q V				
6+30	0.0320	0.07	Q V				
6+35	0.0325	0.07	Q V				

6+40	0.0330	0.07	Q	V	|	|	|	|
6+45	0.0335	0.07	Q	V	|	|	|	|
6+50	0.0339	0.07	Q	V	|	|	|	|
6+55	0.0344	0.07	Q	V	|	|	|	|
7+ 0	0.0349	0.07	Q	V	|	|	|	|
7+ 5	0.0354	0.07	Q	V	|	|	|	|
7+10	0.0359	0.07	Q	V	|	|	|	|
7+15	0.0364	0.07	Q	V	|	|	|	|
7+20	0.0370	0.07	Q	V	|	|	|	|
7+25	0.0375	0.07	Q	V	|	|	|	|
7+30	0.0380	0.07	Q	V	|	|	|	|
7+35	0.0385	0.07	Q	V	|	|	|	|
7+40	0.0390	0.08	Q	V	|	|	|	|
7+45	0.0395	0.08	Q	V	|	|	|	|
7+50	0.0401	0.08	Q	V	|	|	|	|
7+55	0.0406	0.08	Q	V	|	|	|	|
8+ 0	0.0411	0.08	Q	V	|	|	|	|
8+ 5	0.0417	0.08	Q	V	|	|	|	|
8+10	0.0422	0.08	Q	V	|	|	|	|
8+15	0.0427	0.08	Q	V	|	|	|	|
8+20	0.0433	0.08	Q	V	|	|	|	|
8+25	0.0438	0.08	Q	V	|	|	|	|
8+30	0.0444	0.08	Q	V	|	|	|	|
8+35	0.0449	0.08	Q	V	|	|	|	|
8+40	0.0455	0.08	Q	V	|	|	|	|
8+45	0.0460	0.08	Q	V	|	|	|	|
8+50	0.0466	0.08	Q	V	|	|	|	|
8+55	0.0472	0.08	Q	V	|	|	|	|
9+ 0	0.0478	0.08	Q	V	|	|	|	|
9+ 5	0.0483	0.08	Q	V	|	|	|	|
9+10	0.0489	0.08	Q	V	|	|	|	|
9+15	0.0495	0.08	Q	V	|	|	|	|
9+20	0.0501	0.09	Q	V	|	|	|	|
9+25	0.0507	0.09	Q	V	|	|	|	|
9+30	0.0513	0.09	Q	V	|	|	|	|
9+35	0.0519	0.09	Q	V	|	|	|	|
9+40	0.0525	0.09	Q	V	|	|	|	|
9+45	0.0531	0.09	Q	V	|	|	|	|
9+50	0.0537	0.09	Q	V	|	|	|	|
9+55	0.0543	0.09	Q	V	|	|	|	|
10+ 0	0.0549	0.09	Q	V	|	|	|	|
10+ 5	0.0556	0.09	Q	V	|	|	|	|
10+10	0.0562	0.09	Q	V	|	|	|	|
10+15	0.0568	0.09	Q	V	|	|	|	|
10+20	0.0575	0.09	Q	V	|	|	|	|
10+25	0.0581	0.09	Q	V	|	|	|	|
10+30	0.0588	0.09	Q	V	|	|	|	|
10+35	0.0595	0.10	Q	V	|	|	|	|
10+40	0.0601	0.10	Q	V	|	|	|	|
10+45	0.0608	0.10	Q	V	|	|	|	|
10+50	0.0615	0.10	Q	V	|	|	|	|
10+55	0.0621	0.10	Q	V	|	|	|	|
11+ 0	0.0628	0.10	Q	V	|	|	|	|
11+ 5	0.0635	0.10	Q	V	|	|	|	|
11+10	0.0642	0.10	Q	V	|	|	|	|
11+15	0.0649	0.10	Q	V	|	|	|	|
11+20	0.0657	0.10	Q	V	|	|	|	|
11+25	0.0664	0.11	Q	V	|	|	|	|
11+30	0.0671	0.11	Q	V	|	|	|	|
11+35	0.0679	0.11	Q	V	|	|	|	|
11+40	0.0686	0.11	Q	V	|	|	|	|
11+45	0.0694	0.11	Q	V	|	|	|	|
11+50	0.0701	0.11	Q	V	|	|	|	|
11+55	0.0709	0.11	Q	V	|	|	|	|
12+ 0	0.0717	0.11	Q	V	|	|	|	|
12+ 5	0.0724	0.11	Q	V	|	|	|	|
12+10	0.0732	0.11	Q	V	|	|	|	|
12+15	0.0740	0.11	Q	V	|	|	|	|
12+20	0.0748	0.11	Q	V	|	|	|	|
12+25	0.0755	0.11	Q	V	|	|	|	|
12+30	0.0763	0.12	Q	V	|	|	|	|
12+35	0.0772	0.12	Q	V	|	|	|	|
12+40	0.0780	0.12	Q	V	|	|	|	|
12+45	0.0788	0.12	Q	V	|	|	|	|
12+50	0.0797	0.12	Q	V	|	|	|	|
12+55	0.0805	0.12	Q	V	|	|	|	|
13+ 0	0.0814	0.13	Q	V	|	|	|	|
13+ 5	0.0823	0.13	Q	V	|	|	|	|
13+10	0.0832	0.13	Q	V	|	|	|	|



```
  19+50       0.2711      0.08  Q          |          |          |     V    |
  19+55       0.2716      0.08  Q          |          |          |      V   |
  20+ 0       0.2722      0.08  Q          |          |          |      V   |
  20+ 5       0.2727      0.08  Q          |          |          |      V   |
  20+10       0.2732      0.08  Q          |          |          |      V   |
  20+15       0.2738      0.08  Q          |          |          |      V   |
  20+20       0.2743      0.08  Q          |          |          |      V   |
  20+25       0.2748      0.08  Q          |          |          |      V   |
  20+30       0.2753      0.07  Q          |          |          |      V   |
  20+35       0.2758      0.07  Q          |          |          |      V   |
  20+40       0.2763      0.07  Q          |          |          |      V   |
  20+45       0.2768      0.07  Q          |          |          |      V   |
  20+50       0.2773      0.07  Q          |          |          |      V   |
  20+55       0.2778      0.07  Q          |          |          |      V   |
  21+ 0       0.2783      0.07  Q          |          |          |      V   |
  21+ 5       0.2787      0.07  Q          |          |          |      V   |
  21+10       0.2792      0.07  Q          |          |          |       V  |
  21+15       0.2797      0.07  Q          |          |          |       V  |
  21+20       0.2801      0.07  Q          |          |          |       V  |
  21+25       0.2806      0.07  Q          |          |          |       V  |
  21+30       0.2811      0.07  Q          |          |          |       V  |
  21+35       0.2815      0.07  Q          |          |          |       V  |
  21+40       0.2820      0.06  Q          |          |          |       V  |
  21+45       0.2824      0.06  Q          |          |          |       V  |
  21+50       0.2828      0.06  Q          |          |          |       V  |
  21+55       0.2833      0.06  Q          |          |          |       V  |
  22+ 0       0.2837      0.06  Q          |          |          |       V  |
  22+ 5       0.2841      0.06  Q          |          |          |       V  |
  22+10       0.2846      0.06  Q          |          |          |       V  |
  22+15       0.2850      0.06  Q          |          |          |       V  |
  22+20       0.2854      0.06  Q          |          |          |       V  |
  22+25       0.2858      0.06  Q          |          |          |       V  |
  22+30       0.2862      0.06  Q          |          |          |        V |
  22+35       0.2866      0.06  Q          |          |          |        V |
  22+40       0.2870      0.06  Q          |          |          |        V |
  22+45       0.2875      0.06  Q          |          |          |        V |
  22+50       0.2879      0.06  Q          |          |          |        V |
  22+55       0.2883      0.06  Q          |          |          |        V |
  23+ 0       0.2886      0.06  Q          |          |          |        V |
  23+ 5       0.2890      0.06  Q          |          |          |        V |
  23+10       0.2894      0.06  Q          |          |          |        V |
  23+15       0.2898      0.06  Q          |          |          |        V |
  23+20       0.2902      0.06  Q          |          |          |        V |
  23+25       0.2906      0.06  Q          |          |          |        V |
  23+30       0.2910      0.06  Q          |          |          |        V |
  23+35       0.2913      0.05  Q          |          |          |        V |
  23+40       0.2917      0.05  Q          |          |          |        V |
  23+45       0.2921      0.05  Q          |          |          |        V |
  23+50       0.2925      0.05  Q          |          |          |        V |
  23+55       0.2928      0.05  Q          |          |          |        V |
  24+ 0       0.2932      0.05  Q          |          |          |        V |
-------------------------------------------------------------------------------
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Volume=12,772 CF

DMA -4

U n i t H y d r o g r a p h A n a l y s i s

Study date 05/07/21

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San Bernardino County Synthetic Unit Hydrology Method
Manual date - August 1986

Program License Serial Number 6310

20-523 BEAR VALLEY CONNECTION
EXISTING CONDITION, DMA-4

Storm Event Year = 10

Antecedent Moisture Condition = 1

English (in-lb) Input Units Used

English Rainfall Data (Inches) Input Values Used

English Units used in output format

Area averaged rainfall intensity isohyetal data:

Sub-Area (Ac.)	Duration (hours)	Isohyetal (In)
Rainfall data for year 10		
18.04	1	0.65
Rainfall data for year 10		
18.04	6	1.35
Rainfall data for year 10		
18.04	24	2.46

++

******** Area-averaged max loss rate, Fm ********

SCS curve No.(AMCII)	SCS curve NO.(AMC 1)	Area (Ac.)	Area Fraction	Fp(Fig C6) (In/Hr)	Ap (dec.)	Fm (In/Hr)
91.0	79.8	18.04	1.000	0.373	1.000	0.373

Area-averaged adjusted loss rate Fm (In/Hr) = 0.373

********* Area-Averaged low loss rate fraction, Yb **********

Area (Ac.)	Area Fract	SCS CN (AMC2)	SCS CN (AMC1)	S	Pervious Yield Fr
18.04	1.000	91.0	79.8	2.53	0.346

Area-averaged catchment yield fraction, Y = 0.346
Area-averaged low loss fraction, Yb = 0.654

++
Watercourse length = 1450.00(Ft.)
Length from concentration point to centroid = 800.00(Ft.)
Elevation difference along watercourse = 27.00(Ft.)
Mannings friction factor along watercourse = 0.030
Watershed area = 18.04(Ac.)
Catchment Lag time = 0.090 hours Lag=0.8 x Tc; Tc=6.75 Min.
Unit interval = 5.000 minutes
Unit interval percentage of lag time = 92.6390
Hydrograph baseflow = 0.00(CFS)
Average maximum watershed loss rate(Fm) = 0.373(In/Hr)

Average low loss rate fraction (Yb) = 0.654 (decimal)
DESERT S-Graph Selected
Computed peak 5-minute rainfall = 0.307(In)
Computed peak 30-minute rainfall = 0.525(In)
Specified peak 1-hour rainfall = 0.646(In)
Computed peak 3-hour rainfall = 1.015(In)
Specified peak 6-hour rainfall = 1.350(In)
Specified peak 24-hour rainfall = 2.460(In)

Rainfall depth area reduction factors:
Using a total area of 18.04(Ac.) (Ref: fig. E-4)

5-minute factor = 0.999 Adjusted rainfall = 0.306(In)
30-minute factor = 0.999 Adjusted rainfall = 0.524(In)
1-hour factor = 0.999 Adjusted rainfall = 0.645(In)
3-hour factor = 1.000 Adjusted rainfall = 1.015(In)
6-hour factor = 1.000 Adjusted rainfall = 1.350(In)
24-hour factor = 1.000 Adjusted rainfall = 2.460(In)

U n i t H y d r o g r a p h

Interval Number	'S' Graph Mean values	Unit Hydrograph ((CFS))
(K = 218.17 (CFS))		
1	14.821	32.336
2	64.045	107.392
3	82.015	39.204
4	90.038	17.506
5	94.419	9.557
6	97.011	5.656
7	98.347	2.914
8	99.385	2.265
9	100.000	1.342

Peak Unit Number	Adjusted mass rainfall (In)	Unit rainfall (In)
1	0.3063	0.3063
2	0.3771	0.0708
3	0.4258	0.0488
4	0.4642	0.0384
5	0.4964	0.0321
6	0.5243	0.0279
7	0.5491	0.0248
8	0.5715	0.0224
9	0.5921	0.0206
10	0.6111	0.0190
11	0.6288	0.0177
12	0.6455	0.0166
13	0.6671	0.0216
14	0.6878	0.0207
15	0.7076	0.0198
16	0.7267	0.0191
17	0.7451	0.0184
18	0.7628	0.0178
19	0.7800	0.0172
20	0.7967	0.0167
21	0.8128	0.0162
22	0.8286	0.0157
23	0.8439	0.0153
24	0.8588	0.0149
25	0.8734	0.0146
26	0.8876	0.0142
27	0.9015	0.0139
28	0.9151	0.0136
29	0.9285	0.0133
30	0.9415	0.0131
31	0.9543	0.0128
32	0.9669	0.0126
33	0.9792	0.0123
34	0.9914	0.0121
35	1.0033	0.0119
36	1.0150	0.0117
37	1.0265	0.0115
38	1.0378	0.0113
39	1.0490	0.0112

40	1.0599	0.0110
41	1.0708	0.0108
42	1.0814	0.0107
43	1.0920	0.0105
44	1.1023	0.0104
45	1.1126	0.0102
46	1.1227	0.0101
47	1.1327	0.0100
48	1.1425	0.0099
49	1.1522	0.0097
50	1.1619	0.0096
51	1.1714	0.0095
52	1.1808	0.0094
53	1.1900	0.0093
54	1.1992	0.0092
55	1.2083	0.0091
56	1.2173	0.0090
57	1.2262	0.0089
58	1.2350	0.0088
59	1.2437	0.0087
60	1.2524	0.0086
61	1.2609	0.0085
62	1.2694	0.0085
63	1.2778	0.0084
64	1.2861	0.0083
65	1.2943	0.0082
66	1.3025	0.0082
67	1.3105	0.0081
68	1.3185	0.0080
69	1.3265	0.0079
70	1.3344	0.0079
71	1.3422	0.0078
72	1.3499	0.0077
73	1.3580	0.0081
74	1.3660	0.0080
75	1.3740	0.0080
76	1.3819	0.0079
77	1.3897	0.0078
78	1.3975	0.0078
79	1.4052	0.0077
80	1.4129	0.0077
81	1.4205	0.0076
82	1.4281	0.0076
83	1.4356	0.0075
84	1.4431	0.0075
85	1.4505	0.0074
86	1.4578	0.0074
87	1.4652	0.0073
88	1.4724	0.0073
89	1.4796	0.0072
90	1.4868	0.0072
91	1.4940	0.0071
92	1.5010	0.0071
93	1.5081	0.0070
94	1.5151	0.0070
95	1.5220	0.0070
96	1.5289	0.0069
97	1.5358	0.0069
98	1.5427	0.0068
99	1.5494	0.0068
100	1.5562	0.0068
101	1.5629	0.0067
102	1.5696	0.0067
103	1.5762	0.0066
104	1.5828	0.0066
105	1.5894	0.0066
106	1.5960	0.0065
107	1.6025	0.0065
108	1.6089	0.0065
109	1.6154	0.0064
110	1.6218	0.0064
111	1.6281	0.0064
112	1.6344	0.0063
113	1.6408	0.0063
114	1.6470	0.0063
115	1.6533	0.0062
116	1.6595	0.0062
117	1.6656	0.0062
118	1.6718	0.0061

119	1.6779	0.0061
120	1.6840	0.0061
121	1.6901	0.0061
122	1.6961	0.0060
123	1.7021	0.0060
124	1.7081	0.0060
125	1.7140	0.0059
126	1.7199	0.0059
127	1.7258	0.0059
128	1.7317	0.0059
129	1.7376	0.0058
130	1.7434	0.0058
131	1.7492	0.0058
132	1.7549	0.0058
133	1.7607	0.0057
134	1.7664	0.0057
135	1.7721	0.0057
136	1.7778	0.0057
137	1.7834	0.0056
138	1.7890	0.0056
139	1.7946	0.0056
140	1.8002	0.0056
141	1.8058	0.0056
142	1.8113	0.0055
143	1.8168	0.0055
144	1.8223	0.0055
145	1.8278	0.0055
146	1.8332	0.0054
147	1.8386	0.0054
148	1.8440	0.0054
149	1.8494	0.0054
150	1.8548	0.0054
151	1.8601	0.0053
152	1.8654	0.0053
153	1.8707	0.0053
154	1.8760	0.0053
155	1.8813	0.0053
156	1.8865	0.0052
157	1.8918	0.0052
158	1.8970	0.0052
159	1.9022	0.0052
160	1.9073	0.0052
161	1.9125	0.0052
162	1.9176	0.0051
163	1.9227	0.0051
164	1.9278	0.0051
165	1.9329	0.0051
166	1.9380	0.0051
167	1.9430	0.0050
168	1.9480	0.0050
169	1.9530	0.0050
170	1.9580	0.0050
171	1.9630	0.0050
172	1.9680	0.0050
173	1.9729	0.0049
174	1.9779	0.0049
175	1.9828	0.0049
176	1.9877	0.0049
177	1.9925	0.0049
178	1.9974	0.0049
179	2.0023	0.0048
180	2.0071	0.0048
181	2.0119	0.0048
182	2.0167	0.0048
183	2.0215	0.0048
184	2.0263	0.0048
185	2.0310	0.0048
186	2.0358	0.0047
187	2.0405	0.0047
188	2.0452	0.0047
189	2.0499	0.0047
190	2.0546	0.0047
191	2.0593	0.0047
192	2.0640	0.0047
193	2.0686	0.0046
194	2.0732	0.0046
195	2.0779	0.0046
196	2.0825	0.0046
197	2.0871	0.0046

198	2.0916	0.0046
199	2.0962	0.0046
200	2.1007	0.0046
201	2.1053	0.0045
202	2.1098	0.0045
203	2.1143	0.0045
204	2.1188	0.0045
205	2.1233	0.0045
206	2.1278	0.0045
207	2.1323	0.0045
208	2.1367	0.0045
209	2.1412	0.0044
210	2.1456	0.0044
211	2.1500	0.0044
212	2.1544	0.0044
213	2.1588	0.0044
214	2.1632	0.0044
215	2.1676	0.0044
216	2.1719	0.0044
217	2.1763	0.0043
218	2.1806	0.0043
219	2.1849	0.0043
220	2.1892	0.0043
221	2.1935	0.0043
222	2.1978	0.0043
223	2.2021	0.0043
224	2.2064	0.0043
225	2.2106	0.0043
226	2.2149	0.0042
227	2.2191	0.0042
228	2.2233	0.0042
229	2.2276	0.0042
230	2.2318	0.0042
231	2.2360	0.0042
232	2.2401	0.0042
233	2.2443	0.0042
234	2.2485	0.0042
235	2.2526	0.0042
236	2.2568	0.0041
237	2.2609	0.0041
238	2.2650	0.0041
239	2.2692	0.0041
240	2.2733	0.0041
241	2.2774	0.0041
242	2.2814	0.0041
243	2.2855	0.0041
244	2.2896	0.0041
245	2.2936	0.0041
246	2.2977	0.0040
247	2.3017	0.0040
248	2.3058	0.0040
249	2.3098	0.0040
250	2.3138	0.0040
251	2.3178	0.0040
252	2.3218	0.0040
253	2.3258	0.0040
254	2.3297	0.0040
255	2.3337	0.0040
256	2.3377	0.0040
257	2.3416	0.0039
258	2.3456	0.0039
259	2.3495	0.0039
260	2.3534	0.0039
261	2.3573	0.0039
262	2.3612	0.0039
263	2.3651	0.0039
264	2.3690	0.0039
265	2.3729	0.0039
266	2.3768	0.0039
267	2.3806	0.0039
268	2.3845	0.0039
269	2.3883	0.0038
270	2.3922	0.0038
271	2.3960	0.0038
272	2.3998	0.0038
273	2.4036	0.0038
274	2.4074	0.0038
275	2.4112	0.0038
276	2.4150	0.0038

277	2.4188	0.0038
278	2.4226	0.0038
279	2.4264	0.0038
280	2.4301	0.0038
281	2.4339	0.0038
282	2.4376	0.0037
283	2.4414	0.0037
284	2.4451	0.0037
285	2.4488	0.0037
286	2.4525	0.0037
287	2.4562	0.0037
288	2.4599	0.0037

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0037	0.0024	0.0013
2	0.0037	0.0024	0.0013
3	0.0037	0.0024	0.0013
4	0.0037	0.0024	0.0013
5	0.0037	0.0024	0.0013
6	0.0038	0.0025	0.0013
7	0.0038	0.0025	0.0013
8	0.0038	0.0025	0.0013
9	0.0038	0.0025	0.0013
10	0.0038	0.0025	0.0013
11	0.0038	0.0025	0.0013
12	0.0038	0.0025	0.0013
13	0.0038	0.0025	0.0013
14	0.0038	0.0025	0.0013
15	0.0039	0.0025	0.0013
16	0.0039	0.0025	0.0013
17	0.0039	0.0025	0.0013
18	0.0039	0.0025	0.0013
19	0.0039	0.0026	0.0014
20	0.0039	0.0026	0.0014
21	0.0039	0.0026	0.0014
22	0.0039	0.0026	0.0014
23	0.0040	0.0026	0.0014
24	0.0040	0.0026	0.0014
25	0.0040	0.0026	0.0014
26	0.0040	0.0026	0.0014
27	0.0040	0.0026	0.0014
28	0.0040	0.0026	0.0014
29	0.0040	0.0026	0.0014
30	0.0041	0.0027	0.0014
31	0.0041	0.0027	0.0014
32	0.0041	0.0027	0.0014
33	0.0041	0.0027	0.0014
34	0.0041	0.0027	0.0014
35	0.0041	0.0027	0.0014
36	0.0041	0.0027	0.0014
37	0.0042	0.0027	0.0014
38	0.0042	0.0027	0.0014
39	0.0042	0.0027	0.0015
40	0.0042	0.0028	0.0015
41	0.0042	0.0028	0.0015
42	0.0042	0.0028	0.0015
43	0.0043	0.0028	0.0015
44	0.0043	0.0028	0.0015
45	0.0043	0.0028	0.0015
46	0.0043	0.0028	0.0015
47	0.0043	0.0028	0.0015
48	0.0043	0.0028	0.0015
49	0.0044	0.0029	0.0015
50	0.0044	0.0029	0.0015
51	0.0044	0.0029	0.0015
52	0.0044	0.0029	0.0015
53	0.0044	0.0029	0.0015
54	0.0044	0.0029	0.0015
55	0.0045	0.0029	0.0015
56	0.0045	0.0029	0.0015
57	0.0045	0.0029	0.0016
58	0.0045	0.0030	0.0016
59	0.0045	0.0030	0.0016
60	0.0046	0.0030	0.0016
61	0.0046	0.0030	0.0016
62	0.0046	0.0030	0.0016

63	0.0046	0.0030	0.0016
64	0.0046	0.0030	0.0016
65	0.0047	0.0030	0.0016
66	0.0047	0.0031	0.0016
67	0.0047	0.0031	0.0016
68	0.0047	0.0031	0.0016
69	0.0047	0.0031	0.0016
70	0.0048	0.0031	0.0016
71	0.0048	0.0031	0.0017
72	0.0048	0.0031	0.0017
73	0.0048	0.0032	0.0017
74	0.0048	0.0032	0.0017
75	0.0049	0.0032	0.0017
76	0.0049	0.0032	0.0017
77	0.0049	0.0032	0.0017
78	0.0049	0.0032	0.0017
79	0.0050	0.0033	0.0017
80	0.0050	0.0033	0.0017
81	0.0050	0.0033	0.0017
82	0.0050	0.0033	0.0017
83	0.0051	0.0033	0.0018
84	0.0051	0.0033	0.0018
85	0.0051	0.0034	0.0018
86	0.0052	0.0034	0.0018
87	0.0052	0.0034	0.0018
88	0.0052	0.0034	0.0018
89	0.0052	0.0034	0.0018
90	0.0053	0.0034	0.0018
91	0.0053	0.0035	0.0018
92	0.0053	0.0035	0.0018
93	0.0054	0.0035	0.0019
94	0.0054	0.0035	0.0019
95	0.0054	0.0035	0.0019
96	0.0054	0.0036	0.0019
97	0.0055	0.0036	0.0019
98	0.0055	0.0036	0.0019
99	0.0056	0.0036	0.0019
100	0.0056	0.0036	0.0019
101	0.0056	0.0037	0.0019
102	0.0056	0.0037	0.0020
103	0.0057	0.0037	0.0020
104	0.0057	0.0037	0.0020
105	0.0058	0.0038	0.0020
106	0.0058	0.0038	0.0020
107	0.0058	0.0038	0.0020
108	0.0059	0.0038	0.0020
109	0.0059	0.0039	0.0020
110	0.0059	0.0039	0.0021
111	0.0060	0.0039	0.0021
112	0.0060	0.0039	0.0021
113	0.0061	0.0040	0.0021
114	0.0061	0.0040	0.0021
115	0.0062	0.0040	0.0021
116	0.0062	0.0041	0.0021
117	0.0063	0.0041	0.0022
118	0.0063	0.0041	0.0022
119	0.0064	0.0042	0.0022
120	0.0064	0.0042	0.0022
121	0.0065	0.0042	0.0022
122	0.0065	0.0043	0.0022
123	0.0066	0.0043	0.0023
124	0.0066	0.0043	0.0023
125	0.0067	0.0044	0.0023
126	0.0067	0.0044	0.0023
127	0.0068	0.0044	0.0024
128	0.0068	0.0045	0.0024
129	0.0069	0.0045	0.0024
130	0.0070	0.0045	0.0024
131	0.0070	0.0046	0.0024
132	0.0071	0.0046	0.0025
133	0.0072	0.0047	0.0025
134	0.0072	0.0047	0.0025
135	0.0073	0.0048	0.0025
136	0.0074	0.0048	0.0025
137	0.0075	0.0049	0.0026
138	0.0075	0.0049	0.0026
139	0.0076	0.0050	0.0026
140	0.0077	0.0050	0.0027
141	0.0078	0.0051	0.0027

142	0.0078	0.0051	0.0027
143	0.0080	0.0052	0.0028
144	0.0080	0.0052	0.0028
145	0.0077	0.0051	0.0027
146	0.0078	0.0051	0.0027
147	0.0079	0.0052	0.0027
148	0.0080	0.0052	0.0028
149	0.0082	0.0053	0.0028
150	0.0082	0.0054	0.0028
151	0.0084	0.0055	0.0029
152	0.0085	0.0055	0.0029
153	0.0086	0.0056	0.0030
154	0.0087	0.0057	0.0030
155	0.0089	0.0058	0.0031
156	0.0090	0.0059	0.0031
157	0.0092	0.0060	0.0032
158	0.0093	0.0061	0.0032
159	0.0095	0.0062	0.0033
160	0.0096	0.0063	0.0033
161	0.0099	0.0064	0.0034
162	0.0100	0.0065	0.0035
163	0.0102	0.0067	0.0035
164	0.0104	0.0068	0.0036
165	0.0107	0.0070	0.0037
166	0.0108	0.0071	0.0037
167	0.0112	0.0073	0.0039
168	0.0113	0.0074	0.0039
169	0.0117	0.0077	0.0041
170	0.0119	0.0078	0.0041
171	0.0123	0.0081	0.0043
172	0.0126	0.0082	0.0043
173	0.0131	0.0085	0.0045
174	0.0133	0.0087	0.0046
175	0.0139	0.0091	0.0048
176	0.0142	0.0093	0.0049
177	0.0149	0.0098	0.0052
178	0.0153	0.0100	0.0053
179	0.0162	0.0106	0.0056
180	0.0167	0.0109	0.0058
181	0.0178	0.0116	0.0061
182	0.0184	0.0120	0.0064
183	0.0198	0.0130	0.0069
184	0.0207	0.0135	0.0072
185	0.0166	0.0109	0.0058
186	0.0177	0.0116	0.0061
187	0.0206	0.0134	0.0071
188	0.0224	0.0147	0.0078
189	0.0279	0.0183	0.0097
190	0.0321	0.0210	0.0111
191	0.0488	0.0311	0.0177
192	0.0708	0.0311	0.0397
193	0.3063	0.0311	0.2752
194	0.0384	0.0251	0.0133
195	0.0248	0.0162	0.0086
196	0.0190	0.0124	0.0066
197	0.0216	0.0142	0.0075
198	0.0191	0.0125	0.0066
199	0.0172	0.0112	0.0059
200	0.0157	0.0103	0.0054
201	0.0146	0.0095	0.0050
202	0.0136	0.0089	0.0047
203	0.0128	0.0084	0.0044
204	0.0121	0.0079	0.0042
205	0.0115	0.0075	0.0040
206	0.0110	0.0072	0.0038
207	0.0105	0.0069	0.0036
208	0.0101	0.0066	0.0035
209	0.0097	0.0064	0.0034
210	0.0094	0.0061	0.0033
211	0.0091	0.0059	0.0031
212	0.0088	0.0058	0.0030
213	0.0085	0.0056	0.0030
214	0.0083	0.0054	0.0029
215	0.0081	0.0053	0.0028
216	0.0079	0.0052	0.0027
217	0.0081	0.0053	0.0028
218	0.0079	0.0052	0.0027
219	0.0077	0.0051	0.0027
220	0.0076	0.0049	0.0026

221	0.0074	0.0048	0.0026
222	0.0073	0.0048	0.0025
223	0.0071	0.0047	0.0025
224	0.0070	0.0046	0.0024
225	0.0069	0.0045	0.0024
226	0.0068	0.0044	0.0023
227	0.0066	0.0043	0.0023
228	0.0065	0.0043	0.0023
229	0.0064	0.0042	0.0022
230	0.0063	0.0041	0.0022
231	0.0062	0.0041	0.0022
232	0.0061	0.0040	0.0021
233	0.0061	0.0040	0.0021
234	0.0060	0.0039	0.0021
235	0.0059	0.0039	0.0020
236	0.0058	0.0038	0.0020
237	0.0057	0.0038	0.0020
238	0.0057	0.0037	0.0020
239	0.0056	0.0037	0.0019
240	0.0055	0.0036	0.0019
241	0.0055	0.0036	0.0019
242	0.0054	0.0035	0.0019
243	0.0053	0.0035	0.0018
244	0.0053	0.0035	0.0018
245	0.0052	0.0034	0.0018
246	0.0052	0.0034	0.0018
247	0.0051	0.0033	0.0018
248	0.0051	0.0033	0.0018
249	0.0050	0.0033	0.0017
250	0.0050	0.0032	0.0017
251	0.0049	0.0032	0.0017
252	0.0049	0.0032	0.0017
253	0.0048	0.0032	0.0017
254	0.0048	0.0031	0.0017
255	0.0047	0.0031	0.0016
256	0.0047	0.0031	0.0016
257	0.0046	0.0030	0.0016
258	0.0046	0.0030	0.0016
259	0.0046	0.0030	0.0016
260	0.0045	0.0030	0.0016
261	0.0045	0.0029	0.0016
262	0.0045	0.0029	0.0015
263	0.0044	0.0029	0.0015
264	0.0044	0.0029	0.0015
265	0.0043	0.0028	0.0015
266	0.0043	0.0028	0.0015
267	0.0043	0.0028	0.0015
268	0.0042	0.0028	0.0015
269	0.0042	0.0028	0.0015
270	0.0042	0.0027	0.0014
271	0.0042	0.0027	0.0014
272	0.0041	0.0027	0.0014
273	0.0041	0.0027	0.0014
274	0.0041	0.0027	0.0014
275	0.0040	0.0026	0.0014
276	0.0040	0.0026	0.0014
277	0.0040	0.0026	0.0014
278	0.0040	0.0026	0.0014
279	0.0039	0.0026	0.0014
280	0.0039	0.0026	0.0014
281	0.0039	0.0025	0.0013
282	0.0039	0.0025	0.0013
283	0.0038	0.0025	0.0013
284	0.0038	0.0025	0.0013
285	0.0038	0.0025	0.0013
286	0.0038	0.0025	0.0013
287	0.0037	0.0024	0.0013
288	0.0037	0.0024	0.0013

Total soil rain loss = 1.42(In)
Total effective rainfall = 1.04(In)
Peak flow rate in flood hydrograph = 32.05(CFS)

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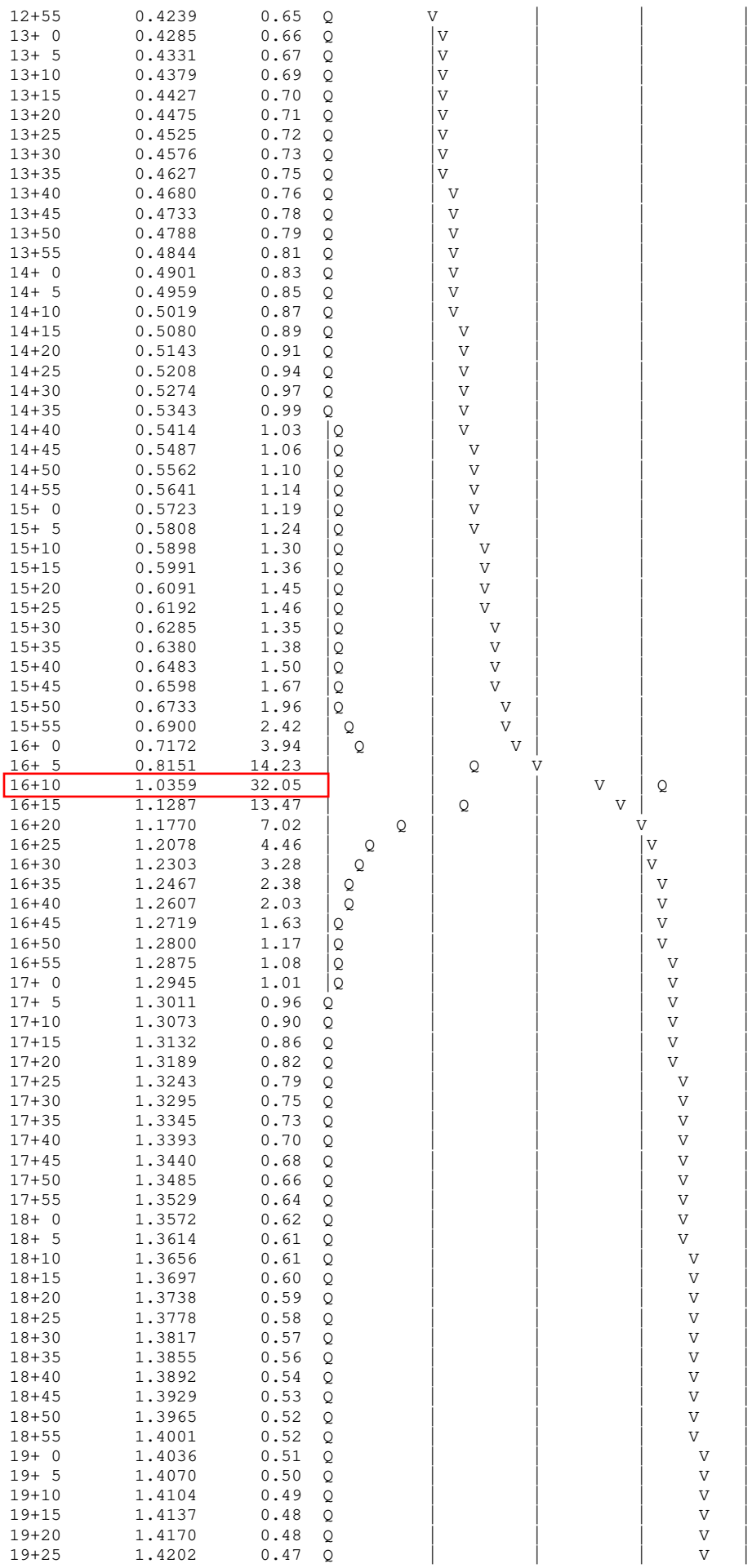
24 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	10.0	20.0	30.0	40.0
0+ 5	0.0003	0.04	Q				
0+10	0.0015	0.18	Q				
0+15	0.0031	0.23	Q				
0+20	0.0048	0.25	Q				
0+25	0.0067	0.27	Q				
0+30	0.0086	0.27	Q				
0+35	0.0105	0.28	Q				
0+40	0.0124	0.28	Q				
0+45	0.0144	0.28	Q				
0+50	0.0163	0.29	Q				
0+55	0.0183	0.29	Q				
1+ 0	0.0203	0.29	Q				
1+ 5	0.0223	0.29	Q				
1+10	0.0243	0.29	Q				
1+15	0.0263	0.29	Q				
1+20	0.0283	0.29	Q				
1+25	0.0303	0.29	Q				
1+30	0.0323	0.29	Q				
1+35	0.0343	0.29	Q				
1+40	0.0363	0.29	Q				
1+45	0.0384	0.30	Q				
1+50	0.0404	0.30	QV				
1+55	0.0425	0.30	QV				
2+ 0	0.0445	0.30	QV				
2+ 5	0.0466	0.30	QV				
2+10	0.0487	0.30	QV				
2+15	0.0507	0.30	QV				
2+20	0.0528	0.30	QV				
2+25	0.0549	0.30	QV				
2+30	0.0570	0.30	QV				
2+35	0.0591	0.31	QV				
2+40	0.0612	0.31	QV				
2+45	0.0634	0.31	QV				
2+50	0.0655	0.31	QV				
2+55	0.0676	0.31	QV				
3+ 0	0.0698	0.31	QV				
3+ 5	0.0719	0.31	QV				
3+10	0.0741	0.31	QV				
3+15	0.0762	0.31	QV				
3+20	0.0784	0.32	Q V				
3+25	0.0806	0.32	Q V				
3+30	0.0828	0.32	Q V				
3+35	0.0850	0.32	Q V				
3+40	0.0872	0.32	Q V				
3+45	0.0894	0.32	Q V				
3+50	0.0916	0.32	Q V				
3+55	0.0939	0.32	Q V				
4+ 0	0.0961	0.33	Q V				
4+ 5	0.0984	0.33	Q V				
4+10	0.1006	0.33	Q V				
4+15	0.1029	0.33	Q V				
4+20	0.1052	0.33	Q V				
4+25	0.1075	0.33	Q V				
4+30	0.1097	0.33	Q V				
4+35	0.1121	0.33	Q V				
4+40	0.1144	0.34	Q V				
4+45	0.1167	0.34	Q V				
4+50	0.1190	0.34	Q V				
4+55	0.1214	0.34	Q V				
5+ 0	0.1237	0.34	Q V				
5+ 5	0.1261	0.34	Q V				
5+10	0.1285	0.34	Q V				
5+15	0.1308	0.35	Q V				
5+20	0.1332	0.35	Q V				
5+25	0.1356	0.35	Q V				
5+30	0.1380	0.35	Q V				
5+35	0.1405	0.35	Q V				
5+40	0.1429	0.35	Q V				
5+45	0.1454	0.36	Q V				
5+50	0.1478	0.36	Q V				
5+55	0.1503	0.36	Q V				
6+ 0	0.1528	0.36	Q V				
6+ 5	0.1553	0.36	Q V				
6+10	0.1578	0.36	Q V				
6+15	0.1603	0.37	Q V				

6+20	0.1628	0.37	Q	V				
6+25	0.1653	0.37	Q	V				
6+30	0.1679	0.37	Q	V				
6+35	0.1705	0.37	Q	V				
6+40	0.1730	0.37	Q	V				
6+45	0.1756	0.38	Q	V				
6+50	0.1782	0.38	Q	V				
6+55	0.1808	0.38	Q	V				
7+ 0	0.1835	0.38	Q	V				
7+ 5	0.1861	0.38	Q	V				
7+10	0.1888	0.39	Q	V				
7+15	0.1915	0.39	Q	V				
7+20	0.1941	0.39	Q	V				
7+25	0.1968	0.39	Q	V				
7+30	0.1996	0.39	Q	V				
7+35	0.2023	0.40	Q	V				
7+40	0.2050	0.40	Q	V				
7+45	0.2078	0.40	Q	V				
7+50	0.2106	0.40	Q	V				
7+55	0.2134	0.41	Q	V				
8+ 0	0.2162	0.41	Q	V				
8+ 5	0.2190	0.41	Q	V				
8+10	0.2218	0.41	Q	V				
8+15	0.2247	0.41	Q	V				
8+20	0.2276	0.42	Q	V				
8+25	0.2305	0.42	Q	V				
8+30	0.2334	0.42	Q	V				
8+35	0.2363	0.43	Q	V				
8+40	0.2392	0.43	Q	V				
8+45	0.2422	0.43	Q	V				
8+50	0.2452	0.43	Q	V				
8+55	0.2482	0.44	Q	V				
9+ 0	0.2512	0.44	Q	V				
9+ 5	0.2543	0.44	Q	V				
9+10	0.2573	0.44	Q	V				
9+15	0.2604	0.45	Q	V				
9+20	0.2635	0.45	Q	V				
9+25	0.2666	0.45	Q	V				
9+30	0.2698	0.46	Q	V				
9+35	0.2730	0.46	Q	V				
9+40	0.2761	0.46	Q	V				
9+45	0.2794	0.47	Q	V				
9+50	0.2826	0.47	Q	V				
9+55	0.2859	0.47	Q	V				
10+ 0	0.2892	0.48	Q	V				
10+ 5	0.2925	0.48	Q	V				
10+10	0.2958	0.49	Q	V				
10+15	0.2992	0.49	Q	V				
10+20	0.3026	0.49	Q	V				
10+25	0.3060	0.50	Q	V				
10+30	0.3095	0.50	Q	V				
10+35	0.3129	0.51	Q	V				
10+40	0.3164	0.51	Q	V				
10+45	0.3200	0.51	Q	V				
10+50	0.3236	0.52	Q	V				
10+55	0.3272	0.52	Q	V				
11+ 0	0.3308	0.53	Q	V				
11+ 5	0.3345	0.53	Q	V				
11+10	0.3382	0.54	Q	V				
11+15	0.3419	0.54	Q	V				
11+20	0.3457	0.55	Q	V				
11+25	0.3495	0.55	Q	V				
11+30	0.3533	0.56	Q	V				
11+35	0.3572	0.56	Q	V				
11+40	0.3612	0.57	Q	V				
11+45	0.3651	0.58	Q	V				
11+50	0.3691	0.58	Q	V				
11+55	0.3732	0.59	Q	V				
12+ 0	0.3773	0.60	Q	V				
12+ 5	0.3814	0.60	Q	V				
12+10	0.3855	0.59	Q	V				
12+15	0.3896	0.59	Q	V				
12+20	0.3937	0.60	Q	V				
12+25	0.3978	0.60	Q	V				
12+30	0.4020	0.61	Q	V				
12+35	0.4063	0.62	Q	V				
12+40	0.4106	0.63	Q	V				
12+45	0.4150	0.63	Q	V				
12+50	0.4194	0.64	Q	V				



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  19+30       1.4234      0.46  Q          |          |          |      V   |
  19+35       1.4265      0.46  Q          |          |          |      V   |
  19+40       1.4296      0.45  Q          |          |          |      V   |
  19+45       1.4327      0.44  Q          |          |          |      V   |
  19+50       1.4357      0.44  Q          |          |          |      V   |
  19+55       1.4387      0.43  Q          |          |          |      V   |
  20+ 0       1.4416      0.43  Q          |          |          |       V  |
  20+ 5       1.4445      0.42  Q          |          |          |       V  |
  20+10       1.4474      0.42  Q          |          |          |       V  |
  20+15       1.4502      0.41  Q          |          |          |       V  |
  20+20       1.4530      0.41  Q          |          |          |       V  |
  20+25       1.4557      0.40  Q          |          |          |       V  |
  20+30       1.4585      0.40  Q          |          |          |       V  |
  20+35       1.4612      0.39  Q          |          |          |       V  |
  20+40       1.4639      0.39  Q          |          |          |       V  |
  20+45       1.4665      0.38  Q          |          |          |       V  |
  20+50       1.4691      0.38  Q          |          |          |       V  |
  20+55       1.4717      0.38  Q          |          |          |       V  |
  21+ 0       1.4743      0.37  Q          |          |          |       V  |
  21+ 5       1.4768      0.37  Q          |          |          |       V  |
  21+10       1.4794      0.37  Q          |          |          |        V |
  21+15       1.4819      0.36  Q          |          |          |        V |
  21+20       1.4843      0.36  Q          |          |          |        V |
  21+25       1.4868      0.36  Q          |          |          |        V |
  21+30       1.4892      0.35  Q          |          |          |        V |
  21+35       1.4916      0.35  Q          |          |          |        V |
  21+40       1.4940      0.35  Q          |          |          |        V |
  21+45       1.4964      0.34  Q          |          |          |        V |
  21+50       1.4987      0.34  Q          |          |          |        V |
  21+55       1.5010      0.34  Q          |          |          |        V |
  22+ 0       1.5034      0.34  Q          |          |          |        V |
  22+ 5       1.5056      0.33  Q          |          |          |        V |
  22+10       1.5079      0.33  Q          |          |          |        V |
  22+15       1.5102      0.33  Q          |          |          |        V |
  22+20       1.5124      0.32  Q          |          |          |        V |
  22+25       1.5146      0.32  Q          |          |          |        V |
  22+30       1.5168      0.32  Q          |          |          |        V |
  22+35       1.5190      0.32  Q          |          |          |         V|
  22+40       1.5212      0.31  Q          |          |          |         V|
  22+45       1.5233      0.31  Q          |          |          |         V|
  22+50       1.5255      0.31  Q          |          |          |         V|
  22+55       1.5276      0.31  Q          |          |          |         V|
  23+ 0       1.5297      0.31  Q          |          |          |         V|
  23+ 5       1.5318      0.30  Q          |          |          |         V|
  23+10       1.5339      0.30  Q          |          |          |         V|
  23+15       1.5359      0.30  Q          |          |          |         V|
  23+20       1.5380      0.30  Q          |          |          |         V|
  23+25       1.5400      0.30  Q          |          |          |         V|
  23+30       1.5421      0.29  Q          |          |          |         V|
  23+35       1.5441      0.29  Q          |          |          |         V|
  23+40       1.5461      0.29  Q          |          |          |         V|
  23+45       1.5481      0.29  Q          |          |          |         V|
  23+50       1.5500      0.29  Q          |          |          |         V|
  23+55       1.5520      0.28  Q          |          |          |         V|
  24+ 0       1.5539      0.28  Q          |          |          |         V|
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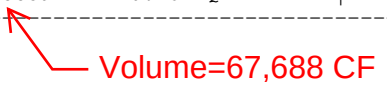
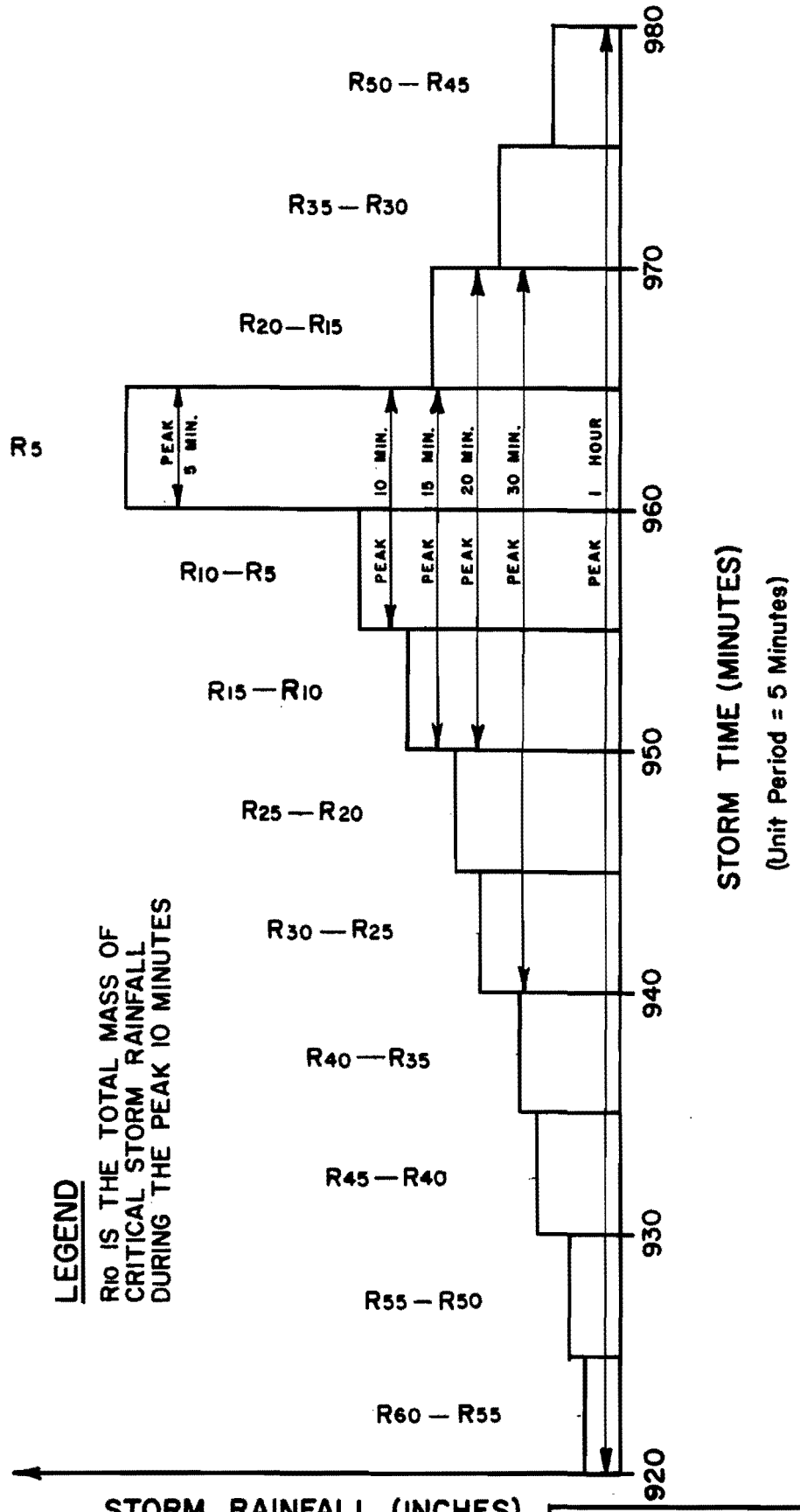


100-YEAR 1-HOUR



SAN BERNARDINO COUNTY

HYDROLOGY MANUAL

DESIGN CRITICAL STORM PEAK 1-HOUR PATTERN

PROJECT NAME: VICTORVILLE CONNECTION

PROJECT LOCATION: VICTORVILLE

DMA - 1

SHORTCUT SYNTHETIC UNIT HYDROGRAPH

Storm Period, Years:	100
Storm Period, Hrs:	1
Area, Acres:	8.68
Point Rainfall, Inches	1.12
Unit Time, Minutes:	5
Loss Rate, In/hr:	0.373
Land Use:	Existing - Vacant Lot

Effective Rainfall:	**0.75**	**Inches**
Storm Volume:	**0.54**	**Ac-Ft**
	2,712	**CF / Acre**

Unit Time Period	% Pattern	Storm Rainfall in/hr	Max. Loss Rate in/hr	Effective Rainfall in/hr	Flow Rate cfs	Flow Volume CF	Volume to Store CF	Total Storage Volume CF
1	3.0	0.403	0.373	0.030	0.26	79	79	79
2	3.0	0.403	0.373	0.030	0.26	79	79	159
3	3.1	0.417	0.373	0.044	0.38	115	115	273
4	3.2	0.430	0.373	0.057	0.50	150	150	423
5	3.5	0.470	0.373	0.097	0.85	256	256	679
6	4.0	0.538	0.373	0.165	1.44	432	432	1,111
7	5.2	0.699	0.373	0.326	2.85	856	856	1,967
8	16.0	2.150	0.373	1.777	15.56	4,667	4,667	6,634
9	35.0	4.704	0.373	4.331	37.91	11,372	11,372	18,005
10	13.0	1.747	0.373	1.374	12.03	3,608	3,608	21,614
11	8.0	1.075	0.373	0.702	6.15	1,844	1,844	23,457
12	3.0	0.403	0.373	0.030	0.26	79	79	23,537
	100.0			**9.0**				**23,537**

Notes: Refer to County of San Bernardino County Hydrology Manual Figure E-5a
DESIGN CRITICAL STORM PEAK 1-HOUR PATTERN

SCS curve No.(AMCII)	SCS curve NO.(AMC 1)	Area (Ac.)	Area Fraction	Fp(Fig C6) (In/Hr)	Ap (dec.)	Fm (In/Hr)
91.0	79.8	8.68	1.000	0.373	1.000	0.373

Area-averaged adjusted loss rate Fm (In/Hr) = 0.373

PROJECT NAME: VICTORVILLE CONNECTION

PROJECT LOCATION: VICTORVILLE

DMA - 2

SHORTCUT SYNTHETIC UNIT HYDROGRAPH

Storm Period, Years:	100
Storm Period, Hrs:	1
Area, Acres:	3.07
Point Rainfall, Inches	1.12
Unit Time, Minutes:	5
Loss Rate, In/hr:	0.373
Land Use:	Existing - Vacant Lot

Effective Rainfall:	**0.75**	**Inches**
Storm Volume:	**0.19**	**Ac-Ft**
	2,712	**CF / Acre**

Unit Time Period	% Pattern	Storm Rainfall in/hr	Max. Loss Rate in/hr	Effective Rainfall in/hr	Flow Rate cfs	Flow Volume CF	Volume to Store CF	Total Storage Volume CF
1	3.0	0.403	0.373	0.030	0.09	28	28	28
2	3.0	0.403	0.373	0.030	0.09	28	28	56
3	3.1	0.417	0.373	0.044	0.14	41	41	97
4	3.2	0.430	0.373	0.057	0.18	53	53	150
5	3.5	0.470	0.373	0.097	0.30	90	90	240
6	4.0	0.538	0.373	0.165	0.51	153	153	393
7	5.2	0.699	0.373	0.326	1.01	303	303	696
8	16.0	2.150	0.373	1.777	5.50	1,651	1,651	2,346
9	33.9	4.556	0.373	4.183	12.95	3,885	3,885	6,231
10	14.1	1.895	0.373	1.522	4.71	1,413	1,413	7,644
11	8.0	1.075	0.373	0.702	2.17	652	652	8,297
12	3.0	0.403	0.373	0.030	0.09	28	28	8,325
	100.0			**9.0**				**8,325**

Notes: Refer to County of San Bernardino County Hydrology Manual Figure E-5a
DESIGN CRITICAL STORM PEAK 1-HOUR PATTERN

SCS curve No.(AMCII)	SCS curve NO.(AMC 1)	Area (Ac.)	Area Fraction	Fp(Fig C6) (In/Hr)	Ap (dec.)	Fm (In/Hr)
91.0	79.8	8.68	1.000	0.373	1.000	0.373

Area-averaged adjusted loss rate Fm (In/Hr) = 0.373

PROJECT NAME: VICTORVILLE CONNECTION

PROJECT LOCATION: VICTORVILLE

DMA - 3

SHORTCUT SYNTHETIC UNIT HYDROGRAPH

Storm Period, Years:	100
Storm Period, Hrs:	1
Area, Acres:	3.4
Point Rainfall, Inches	1.12
Unit Time, Minutes:	5
Loss Rate, In/hr:	0.373
Land Use:	Existing - Vacant Lot

Effective Rainfall:	**0.75**	**Inches**
Storm Volume:	**0.21**	**Ac-Ft**
Yield:	**2,712**	**CF / Acre**

Unit Time Period	% Pattern	Storm Rainfall in/hr	Max. Loss Rate in/hr	Effective Rainfall in/hr	Flow Rate cfs	Flow Volume CF	Perc. Volume CF	Volume to Store CF	Total Storage Volume CF
1	3.0	0.403	0.373	0.030	0.10	31	-	31	31
2	3.0	0.403	0.373	0.030	0.10	31	-	31	62
3	3.1	0.417	0.373	0.044	0.15	45	-	45	107
4	3.2	0.430	0.373	0.057	0.20	59	-	59	166
5	3.5	0.470	0.373	0.097	0.33	100	-	100	266
6	4.0	0.538	0.373	0.165	0.56	169	-	169	435
7	5.2	0.699	0.373	0.326	1.12	335	-	335	770
8	16.0	2.150	0.373	1.777	6.09	1,828	-	1,828	2,598
9	35.0	4.704	0.373	4.331	14.85	4,454	-	4,454	7,053
10	13.0	1.747	0.373	1.374	4.71	1,413	-	1,413	8,466
11	8.0	1.075	0.373	0.702	2.41	722	-	722	9,188
12	3.0	0.403	0.373	0.030	0.10	31	-	31	9,219
	100.0			**9.0**					**9,219**

Notes: Refer to County of San Bernardino County Hydrology Manual Figure E-5a
DESIGN CRITICAL STORM PEAK 1-HOUR PATTERN

SCS curve No.(AMCII)	SCS curve NO.(AMC 1)	Area (Ac.)	Area Fraction	Fp(Fig C6) (In/Hr)	Ap (dec.)	Fm (In/Hr)
91.0	79.8	8.68	1.000	0.373	1.000	0.373

Area-averaged adjusted loss rate Fm (In/Hr) = 0.373

PROJECT NAME: VICTORVILLE CONNECTION

PROJECT LOCATION: VICTORVILLE

DMA - 4

SHORTCUT SYNTHETIC UNIT HYDROGRAPH

Storm Period, Years:	100
Storm Period, Hrs:	1
Area, Acres:	18.04
Point Rainfall, Inches	1.12
Unit Time, Minutes:	5
Loss Rate, In/hr:	0.373
Land Use:	Existing - Vacant Lot

Effective Rainfall:	**0.75**	**Inches**
Storm Volume:	**1.12**	**Ac-Ft**
	2,712	**CF / Acre**

Unit Time Period	% Pattern	Storm Rainfall in/hr	Max. Loss Rate in/hr	Effective Rainfall in/hr	Flow Rate cfs	Flow Volume CF	Volume to Store CF	Total Storage Volume CF
1	3.0	0.403	0.373	0.030	0.55	165	165	165
2	4.0	0.538	0.373	0.165	2.99	898	898	1,063
3	4.1	0.551	0.373	0.178	3.24	972	972	2,035
4	4.2	0.564	0.373	0.191	3.48	1,045	1,045	3,080
5	4.5	0.605	0.373	0.232	4.22	1,265	1,265	4,345
6	6.0	0.806	0.373	0.433	7.88	2,365	2,365	6,710
7	6.2	0.833	0.373	0.460	8.37	2,512	2,512	9,221
8	16.0	2.150	0.373	1.777	32.33	9,699	9,699	18,921
9	26.4	3.548	0.373	3.175	57.76	17,327	17,327	36,248
10	16.6	2.231	0.373	1.858	33.80	10,140	10,140	46,388
11	6.0	0.806	0.373	0.433	7.88	2,365	2,365	48,753
12	3.0	0.403	0.373	0.030	0.55	165	165	48,917
	100.0			**9.0**				**48,917**

Notes: Refer to County of San Bernardino County Hydrology Manual Figure E-5a
DESIGN CRITICAL STORM PEAK 1-HOUR PATTERN

SCS curve No.(AMCII)	SCS curve NO.(AMC 1)	Area (Ac.)	Area Fraction	Fp(Fig C6) (In/Hr)	Ap (dec.)	Fm (In/Hr)
91.0	79.8	8.68	1.000	0.373	1.000	0.373

Area-averaged adjusted loss rate Fm (In/Hr) = 0.373

PROPOSED CONDITION UNIT HYDROGRAPH CALCULATIONS

10-YEAR 24-HOUR

DMA -1

```
        U n i t   H y d r o g r a p h   A n a l y s i s

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                Study date  05/07/21

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San Bernardino County Synthetic Unit Hydrology Method
                Manual date - August 1986


Program License Serial Number 6310

------------------------------------------------------------------------
20-523 BEAR VALLEY CONNECTION PROJECT
DMA-1 PROPOSED CONDITION


------------------------------------------------------------------------

        Storm Event Year = 10

        Antecedent Moisture Condition = 1

 English (in-lb) Input Units Used

 English Rainfall Data (Inches) Input Values Used

 English Units used in output format



Area averaged rainfall intensity isohyetal data:
        Sub-Area        Duration        Isohyetal
        (Ac.)             (hours)         (In)
Rainfall data for year 10
             8.68            1           0.65
------------------------------------------------------------------------
Rainfall data for year 10
             8.68            6           1.35
------------------------------------------------------------------------
Rainfall data for year 10
             8.68           24           2.46
------------------------------------------------------------------------
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

******** Area-averaged max loss rate, Fm ********


SCS curve  SCS curve     Area     Area     Fp(Fig C6)    Ap       Fm
No.(AMCII) NO.(AMC 1)    (Ac.)    Fraction     (In/Hr)  (dec.)    (In/Hr)
 69.0       49.8          8.68      1.000     0.812    0.120     0.097

Area-averaged adjusted loss rate Fm (In/Hr) =  0.097

********* Area-Averaged low loss rate fraction, Yb **********

Area        Area          SCS CN    SCS CN      S     Pervious
 (Ac.)       Fract         (AMC2)    (AMC1)          Yield Fr
     1.04   0.120          69.0      49.8      10.08     0.008
     7.64   0.880          98.0      98.0       0.20     0.907

Area-averaged catchment yield fraction, Y =  0.799
Area-averaged low loss fraction, Yb =  0.201
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Watercourse length =     900.00(Ft.)
Length from concentration point to centroid =     500.00(Ft.)
Elevation difference along watercourse =      13.00(Ft.)
Mannings friction factor along watercourse =  0.015
Watershed area =       8.68(Ac.)
Catchment Lag time =   0.033 hours
Unit interval =   5.000 minutes
Unit interval percentage of lag time = 253.0119
Hydrograph baseflow =     0.00(CFS)
```

Lag=0.8 x Tc; Tc=2.48 Min.
Note: 5 minute minimum

Average maximum watershed loss rate(Fm) = 0.097(In/Hr)
Average low loss rate fraction (Yb) = 0.201 (decimal)
DESERT S-Graph Selected
Computed peak 5-minute rainfall = 0.307(In)
Computed peak 30-minute rainfall = 0.525(In)
Specified peak 1-hour rainfall = 0.646(In)
Computed peak 3-hour rainfall = 1.015(In)
Specified peak 6-hour rainfall = 1.350(In)
Specified peak 24-hour rainfall = 2.460(In)

Rainfall depth area reduction factors:
Using a total area of 8.68(Ac.) (Ref: fig. E-4)

5-minute factor = 1.000 Adjusted rainfall = 0.306(In)
30-minute factor = 1.000 Adjusted rainfall = 0.525(In)
1-hour factor = 1.000 Adjusted rainfall = 0.646(In)
3-hour factor = 1.000 Adjusted rainfall = 1.015(In)
6-hour factor = 1.000 Adjusted rainfall = 1.350(In)
24-hour factor = 1.000 Adjusted rainfall = 2.460(In)

U n i t H y d r o g r a p h

Interval Number	'S' Graph Mean values	Unit Hydrograph ((CFS))
	(K = 104.97 (CFS))	
1	50.462	52.972
2	92.317	43.936
3	98.655	6.654
4	100.000	1.412

Peak Unit Number	Adjusted mass rainfall (In)	Unit rainfall (In)
1	0.3064	0.3064
2	0.3772	0.0708
3	0.4260	0.0488
4	0.4644	0.0384
5	0.4966	0.0322
6	0.5245	0.0279
7	0.5493	0.0248
8	0.5718	0.0225
9	0.5923	0.0206
10	0.6114	0.0190
11	0.6291	0.0177
12	0.6457	0.0166
13	0.6674	0.0216
14	0.6880	0.0207
15	0.7079	0.0198
16	0.7269	0.0191
17	0.7453	0.0184
18	0.7630	0.0177
19	0.7802	0.0172
20	0.7969	0.0167
21	0.8130	0.0162
22	0.8288	0.0157
23	0.8441	0.0153
24	0.8590	0.0149
25	0.8735	0.0146
26	0.8878	0.0142
27	0.9017	0.0139
28	0.9153	0.0136
29	0.9286	0.0133
30	0.9416	0.0131
31	0.9544	0.0128
32	0.9670	0.0126
33	0.9793	0.0123
34	0.9914	0.0121
35	1.0033	0.0119
36	1.0150	0.0117
37	1.0265	0.0115
38	1.0379	0.0113
39	1.0490	0.0112
40	1.0600	0.0110
41	1.0708	0.0108
42	1.0815	0.0107
43	1.0920	0.0105

44	1.1024	0.0104
45	1.1126	0.0102
46	1.1227	0.0101
47	1.1327	0.0100
48	1.1426	0.0099
49	1.1523	0.0097
50	1.1619	0.0096
51	1.1714	0.0095
52	1.1808	0.0094
53	1.1901	0.0093
54	1.1993	0.0092
55	1.2084	0.0091
56	1.2174	0.0090
57	1.2263	0.0089
58	1.2351	0.0088
59	1.2438	0.0087
60	1.2524	0.0086
61	1.2610	0.0085
62	1.2694	0.0085
63	1.2778	0.0084
64	1.2861	0.0083
65	1.2943	0.0082
66	1.3025	0.0082
67	1.3106	0.0081
68	1.3186	0.0080
69	1.3265	0.0079
70	1.3344	0.0079
71	1.3422	0.0078
72	1.3500	0.0077
73	1.3580	0.0081
74	1.3661	0.0080
75	1.3740	0.0080
76	1.3819	0.0079
77	1.3898	0.0078
78	1.3976	0.0078
79	1.4053	0.0077
80	1.4130	0.0077
81	1.4206	0.0076
82	1.4281	0.0076
83	1.4357	0.0075
84	1.4431	0.0075
85	1.4505	0.0074
86	1.4579	0.0074
87	1.4652	0.0073
88	1.4725	0.0073
89	1.4797	0.0072
90	1.4869	0.0072
91	1.4940	0.0071
92	1.5011	0.0071
93	1.5081	0.0070
94	1.5151	0.0070
95	1.5221	0.0070
96	1.5290	0.0069
97	1.5359	0.0069
98	1.5427	0.0068
99	1.5495	0.0068
100	1.5562	0.0068
101	1.5630	0.0067
102	1.5696	0.0067
103	1.5763	0.0066
104	1.5829	0.0066
105	1.5895	0.0066
106	1.5960	0.0065
107	1.6025	0.0065
108	1.6090	0.0065
109	1.6154	0.0064
110	1.6218	0.0064
111	1.6282	0.0064
112	1.6345	0.0063
113	1.6408	0.0063
114	1.6471	0.0063
115	1.6533	0.0062
116	1.6595	0.0062
117	1.6657	0.0062
118	1.6718	0.0061
119	1.6779	0.0061
120	1.6840	0.0061
121	1.6901	0.0061
122	1.6961	0.0060

123	1.7021	0.0060
124	1.7081	0.0060
125	1.7141	0.0059
126	1.7200	0.0059
127	1.7259	0.0059
128	1.7317	0.0059
129	1.7376	0.0058
130	1.7434	0.0058
131	1.7492	0.0058
132	1.7550	0.0058
133	1.7607	0.0057
134	1.7664	0.0057
135	1.7721	0.0057
136	1.7778	0.0057
137	1.7834	0.0056
138	1.7891	0.0056
139	1.7947	0.0056
140	1.8002	0.0056
141	1.8058	0.0056
142	1.8113	0.0055
143	1.8168	0.0055
144	1.8223	0.0055
145	1.8278	0.0055
146	1.8332	0.0054
147	1.8387	0.0054
148	1.8441	0.0054
149	1.8495	0.0054
150	1.8548	0.0054
151	1.8602	0.0053
152	1.8655	0.0053
153	1.8708	0.0053
154	1.8761	0.0053
155	1.8813	0.0053
156	1.8866	0.0052
157	1.8918	0.0052
158	1.8970	0.0052
159	1.9022	0.0052
160	1.9074	0.0052
161	1.9125	0.0052
162	1.9176	0.0051
163	1.9228	0.0051
164	1.9279	0.0051
165	1.9329	0.0051
166	1.9380	0.0051
167	1.9430	0.0050
168	1.9481	0.0050
169	1.9531	0.0050
170	1.9581	0.0050
171	1.9631	0.0050
172	1.9680	0.0050
173	1.9730	0.0049
174	1.9779	0.0049
175	1.9828	0.0049
176	1.9877	0.0049
177	1.9926	0.0049
178	1.9974	0.0049
179	2.0023	0.0048
180	2.0071	0.0048
181	2.0119	0.0048
182	2.0167	0.0048
183	2.0215	0.0048
184	2.0263	0.0048
185	2.0311	0.0048
186	2.0358	0.0047
187	2.0405	0.0047
188	2.0453	0.0047
189	2.0500	0.0047
190	2.0547	0.0047
191	2.0593	0.0047
192	2.0640	0.0047
193	2.0686	0.0046
194	2.0733	0.0046
195	2.0779	0.0046
196	2.0825	0.0046
197	2.0871	0.0046
198	2.0917	0.0046
199	2.0962	0.0046
200	2.1008	0.0046
201	2.1053	0.0045

202	2.1099	0.0045
203	2.1144	0.0045
204	2.1189	0.0045
205	2.1234	0.0045
206	2.1278	0.0045
207	2.1323	0.0045
208	2.1368	0.0045
209	2.1412	0.0044
210	2.1456	0.0044
211	2.1500	0.0044
212	2.1544	0.0044
213	2.1588	0.0044
214	2.1632	0.0044
215	2.1676	0.0044
216	2.1719	0.0044
217	2.1763	0.0043
218	2.1806	0.0043
219	2.1850	0.0043
220	2.1893	0.0043
221	2.1936	0.0043
222	2.1979	0.0043
223	2.2021	0.0043
224	2.2064	0.0043
225	2.2107	0.0043
226	2.2149	0.0042
227	2.2192	0.0042
228	2.2234	0.0042
229	2.2276	0.0042
230	2.2318	0.0042
231	2.2360	0.0042
232	2.2402	0.0042
233	2.2444	0.0042
234	2.2485	0.0042
235	2.2527	0.0042
236	2.2568	0.0041
237	2.2610	0.0041
238	2.2651	0.0041
239	2.2692	0.0041
240	2.2733	0.0041
241	2.2774	0.0041
242	2.2815	0.0041
243	2.2856	0.0041
244	2.2896	0.0041
245	2.2937	0.0041
246	2.2977	0.0040
247	2.3018	0.0040
248	2.3058	0.0040
249	2.3098	0.0040
250	2.3138	0.0040
251	2.3178	0.0040
252	2.3218	0.0040
253	2.3258	0.0040
254	2.3298	0.0040
255	2.3337	0.0040
256	2.3377	0.0040
257	2.3416	0.0039
258	2.3456	0.0039
259	2.3495	0.0039
260	2.3534	0.0039
261	2.3574	0.0039
262	2.3613	0.0039
263	2.3652	0.0039
264	2.3690	0.0039
265	2.3729	0.0039
266	2.3768	0.0039
267	2.3807	0.0039
268	2.3845	0.0039
269	2.3884	0.0038
270	2.3922	0.0038
271	2.3960	0.0038
272	2.3999	0.0038
273	2.4037	0.0038
274	2.4075	0.0038
275	2.4113	0.0038
276	2.4151	0.0038
277	2.4189	0.0038
278	2.4226	0.0038
279	2.4264	0.0038
280	2.4302	0.0038

281	2.4339	0.0038
282	2.4377	0.0037
283	2.4414	0.0037
284	2.4451	0.0037
285	2.4488	0.0037
286	2.4526	0.0037
287	2.4563	0.0037
288	2.4600	0.0037

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0037	0.0007	0.0030
2	0.0037	0.0007	0.0030
3	0.0037	0.0007	0.0030
4	0.0037	0.0007	0.0030
5	0.0037	0.0008	0.0030
6	0.0038	0.0008	0.0030
7	0.0038	0.0008	0.0030
8	0.0038	0.0008	0.0030
9	0.0038	0.0008	0.0030
10	0.0038	0.0008	0.0030
11	0.0038	0.0008	0.0030
12	0.0038	0.0008	0.0031
13	0.0038	0.0008	0.0031
14	0.0038	0.0008	0.0031
15	0.0039	0.0008	0.0031
16	0.0039	0.0008	0.0031
17	0.0039	0.0008	0.0031
18	0.0039	0.0008	0.0031
19	0.0039	0.0008	0.0031
20	0.0039	0.0008	0.0031
21	0.0039	0.0008	0.0031
22	0.0039	0.0008	0.0032
23	0.0040	0.0008	0.0032
24	0.0040	0.0008	0.0032
25	0.0040	0.0008	0.0032
26	0.0040	0.0008	0.0032
27	0.0040	0.0008	0.0032
28	0.0040	0.0008	0.0032
29	0.0040	0.0008	0.0032
30	0.0041	0.0008	0.0032
31	0.0041	0.0008	0.0033
32	0.0041	0.0008	0.0033
33	0.0041	0.0008	0.0033
34	0.0041	0.0008	0.0033
35	0.0041	0.0008	0.0033
36	0.0041	0.0008	0.0033
37	0.0042	0.0008	0.0033
38	0.0042	0.0008	0.0033
39	0.0042	0.0008	0.0034
40	0.0042	0.0008	0.0034
41	0.0042	0.0008	0.0034
42	0.0042	0.0009	0.0034
43	0.0043	0.0009	0.0034
44	0.0043	0.0009	0.0034
45	0.0043	0.0009	0.0034
46	0.0043	0.0009	0.0034
47	0.0043	0.0009	0.0035
48	0.0043	0.0009	0.0035
49	0.0044	0.0009	0.0035
50	0.0044	0.0009	0.0035
51	0.0044	0.0009	0.0035
52	0.0044	0.0009	0.0035
53	0.0044	0.0009	0.0035
54	0.0044	0.0009	0.0035
55	0.0045	0.0009	0.0036
56	0.0045	0.0009	0.0036
57	0.0045	0.0009	0.0036
58	0.0045	0.0009	0.0036
59	0.0045	0.0009	0.0036
60	0.0046	0.0009	0.0036
61	0.0046	0.0009	0.0037
62	0.0046	0.0009	0.0037
63	0.0046	0.0009	0.0037
64	0.0046	0.0009	0.0037
65	0.0047	0.0009	0.0037
66	0.0047	0.0009	0.0037

67	0.0047	0.0009	0.0038
68	0.0047	0.0009	0.0038
69	0.0047	0.0010	0.0038
70	0.0048	0.0010	0.0038
71	0.0048	0.0010	0.0038
72	0.0048	0.0010	0.0038
73	0.0048	0.0010	0.0039
74	0.0048	0.0010	0.0039
75	0.0049	0.0010	0.0039
76	0.0049	0.0010	0.0039
77	0.0049	0.0010	0.0039
78	0.0049	0.0010	0.0040
79	0.0050	0.0010	0.0040
80	0.0050	0.0010	0.0040
81	0.0050	0.0010	0.0040
82	0.0050	0.0010	0.0040
83	0.0051	0.0010	0.0041
84	0.0051	0.0010	0.0041
85	0.0051	0.0010	0.0041
86	0.0052	0.0010	0.0041
87	0.0052	0.0010	0.0041
88	0.0052	0.0010	0.0042
89	0.0052	0.0011	0.0042
90	0.0053	0.0011	0.0042
91	0.0053	0.0011	0.0042
92	0.0053	0.0011	0.0043
93	0.0054	0.0011	0.0043
94	0.0054	0.0011	0.0043
95	0.0054	0.0011	0.0043
96	0.0054	0.0011	0.0044
97	0.0055	0.0011	0.0044
98	0.0055	0.0011	0.0044
99	0.0056	0.0011	0.0044
100	0.0056	0.0011	0.0045
101	0.0056	0.0011	0.0045
102	0.0056	0.0011	0.0045
103	0.0057	0.0011	0.0045
104	0.0057	0.0011	0.0046
105	0.0058	0.0012	0.0046
106	0.0058	0.0012	0.0046
107	0.0058	0.0012	0.0047
108	0.0059	0.0012	0.0047
109	0.0059	0.0012	0.0047
110	0.0059	0.0012	0.0048
111	0.0060	0.0012	0.0048
112	0.0060	0.0012	0.0048
113	0.0061	0.0012	0.0049
114	0.0061	0.0012	0.0049
115	0.0062	0.0012	0.0049
116	0.0062	0.0012	0.0050
117	0.0063	0.0013	0.0050
118	0.0063	0.0013	0.0050
119	0.0064	0.0013	0.0051
120	0.0064	0.0013	0.0051
121	0.0065	0.0013	0.0052
122	0.0065	0.0013	0.0052
123	0.0066	0.0013	0.0052
124	0.0066	0.0013	0.0053
125	0.0067	0.0013	0.0053
126	0.0067	0.0014	0.0054
127	0.0068	0.0014	0.0054
128	0.0068	0.0014	0.0055
129	0.0069	0.0014	0.0055
130	0.0070	0.0014	0.0056
131	0.0070	0.0014	0.0056
132	0.0071	0.0014	0.0057
133	0.0072	0.0014	0.0057
134	0.0072	0.0015	0.0058
135	0.0073	0.0015	0.0058
136	0.0074	0.0015	0.0059
137	0.0075	0.0015	0.0060
138	0.0075	0.0015	0.0060
139	0.0076	0.0015	0.0061
140	0.0077	0.0015	0.0061
141	0.0078	0.0016	0.0062
142	0.0078	0.0016	0.0063
143	0.0080	0.0016	0.0064
144	0.0080	0.0016	0.0064
145	0.0077	0.0016	0.0062

146	0.0078	0.0016	0.0062
147	0.0079	0.0016	0.0063
148	0.0080	0.0016	0.0064
149	0.0082	0.0016	0.0065
150	0.0082	0.0017	0.0066
151	0.0084	0.0017	0.0067
152	0.0085	0.0017	0.0068
153	0.0086	0.0017	0.0069
154	0.0087	0.0018	0.0070
155	0.0089	0.0018	0.0071
156	0.0090	0.0018	0.0072
157	0.0092	0.0018	0.0073
158	0.0093	0.0019	0.0074
159	0.0095	0.0019	0.0076
160	0.0096	0.0019	0.0077
161	0.0099	0.0020	0.0079
162	0.0100	0.0020	0.0080
163	0.0102	0.0021	0.0082
164	0.0104	0.0021	0.0083
165	0.0107	0.0021	0.0085
166	0.0108	0.0022	0.0086
167	0.0112	0.0022	0.0089
168	0.0113	0.0023	0.0090
169	0.0117	0.0024	0.0094
170	0.0119	0.0024	0.0095
171	0.0123	0.0025	0.0098
172	0.0126	0.0025	0.0100
173	0.0131	0.0026	0.0104
174	0.0133	0.0027	0.0106
175	0.0139	0.0028	0.0111
176	0.0142	0.0029	0.0114
177	0.0149	0.0030	0.0119
178	0.0153	0.0031	0.0122
179	0.0162	0.0032	0.0129
180	0.0167	0.0033	0.0133
181	0.0177	0.0036	0.0142
182	0.0184	0.0037	0.0147
183	0.0198	0.0040	0.0158
184	0.0207	0.0042	0.0165
185	0.0166	0.0033	0.0133
186	0.0177	0.0036	0.0142
187	0.0206	0.0041	0.0164
188	0.0225	0.0045	0.0179
189	0.0279	0.0056	0.0223
190	0.0322	0.0065	0.0257
191	0.0488	0.0081	0.0407
192	0.0708	0.0081	0.0627
193	0.3064	0.0081	0.2983
194	0.0384	0.0077	0.0307
195	0.0248	0.0050	0.0198
196	0.0190	0.0038	0.0152
197	0.0216	0.0043	0.0173
198	0.0191	0.0038	0.0152
199	0.0172	0.0035	0.0137
200	0.0157	0.0032	0.0126
201	0.0146	0.0029	0.0116
202	0.0136	0.0027	0.0109
203	0.0128	0.0026	0.0102
204	0.0121	0.0024	0.0097
205	0.0115	0.0023	0.0092
206	0.0110	0.0022	0.0088
207	0.0105	0.0021	0.0084
208	0.0101	0.0020	0.0081
209	0.0097	0.0020	0.0078
210	0.0094	0.0019	0.0075
211	0.0091	0.0018	0.0073
212	0.0088	0.0018	0.0070
213	0.0085	0.0017	0.0068
214	0.0083	0.0017	0.0066
215	0.0081	0.0016	0.0065
216	0.0079	0.0016	0.0063
217	0.0081	0.0016	0.0065
218	0.0079	0.0016	0.0063
219	0.0077	0.0016	0.0062
220	0.0076	0.0015	0.0060
221	0.0074	0.0015	0.0059
222	0.0073	0.0015	0.0058
223	0.0071	0.0014	0.0057
224	0.0070	0.0014	0.0056

225	0.0069	0.0014	0.0055
226	0.0068	0.0014	0.0054
227	0.0066	0.0013	0.0053
228	0.0065	0.0013	0.0052
229	0.0064	0.0013	0.0051
230	0.0063	0.0013	0.0051
231	0.0062	0.0013	0.0050
232	0.0061	0.0012	0.0049
233	0.0061	0.0012	0.0048
234	0.0060	0.0012	0.0048
235	0.0059	0.0012	0.0047
236	0.0058	0.0012	0.0046
237	0.0057	0.0012	0.0046
238	0.0057	0.0011	0.0045
239	0.0056	0.0011	0.0045
240	0.0055	0.0011	0.0044
241	0.0055	0.0011	0.0044
242	0.0054	0.0011	0.0043
243	0.0053	0.0011	0.0043
244	0.0053	0.0011	0.0042
245	0.0052	0.0011	0.0042
246	0.0052	0.0010	0.0041
247	0.0051	0.0010	0.0041
248	0.0051	0.0010	0.0040
249	0.0050	0.0010	0.0040
250	0.0050	0.0010	0.0040
251	0.0049	0.0010	0.0039
252	0.0049	0.0010	0.0039
253	0.0048	0.0010	0.0039
254	0.0048	0.0010	0.0038
255	0.0047	0.0010	0.0038
256	0.0047	0.0009	0.0037
257	0.0046	0.0009	0.0037
258	0.0046	0.0009	0.0037
259	0.0046	0.0009	0.0036
260	0.0045	0.0009	0.0036
261	0.0045	0.0009	0.0036
262	0.0045	0.0009	0.0036
263	0.0044	0.0009	0.0035
264	0.0044	0.0009	0.0035
265	0.0043	0.0009	0.0035
266	0.0043	0.0009	0.0034
267	0.0043	0.0009	0.0034
268	0.0042	0.0009	0.0034
269	0.0042	0.0008	0.0034
270	0.0042	0.0008	0.0033
271	0.0042	0.0008	0.0033
272	0.0041	0.0008	0.0033
273	0.0041	0.0008	0.0033
274	0.0041	0.0008	0.0032
275	0.0040	0.0008	0.0032
276	0.0040	0.0008	0.0032
277	0.0040	0.0008	0.0032
278	0.0040	0.0008	0.0032
279	0.0039	0.0008	0.0031
280	0.0039	0.0008	0.0031
281	0.0039	0.0008	0.0031
282	0.0039	0.0008	0.0031
283	0.0038	0.0008	0.0031
284	0.0038	0.0008	0.0030
285	0.0038	0.0008	0.0030
286	0.0038	0.0008	0.0030
287	0.0037	0.0008	0.0030
288	0.0037	0.0007	0.0030

Total soil rain loss = 0.43(In)
Total effective rainfall = 2.03(In)
Peak flow rate in flood hydrograph = 18.86(CFS)

++

24 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m) Volume Ac.Ft Q(CFS) 0 5.0 10.0 15.0 20.0

0+ 5	0.0011	0.16	Q				
0+10	0.0031	0.29	Q				
0+15	0.0052	0.31	Q				
0+20	0.0073	0.31	Q				
0+25	0.0095	0.31	Q				
0+30	0.0116	0.31	Q				
0+35	0.0138	0.32	Q				
0+40	0.0160	0.32	Q				
0+45	0.0182	0.32	Q				
0+50	0.0204	0.32	Q				
0+55	0.0226	0.32	Q				
1+ 0	0.0248	0.32	Q				
1+ 5	0.0270	0.32	Q				
1+10	0.0292	0.32	Q				
1+15	0.0314	0.32	Q				
1+20	0.0337	0.32	Q				
1+25	0.0359	0.33	Q				
1+30	0.0382	0.33	QV				
1+35	0.0404	0.33	QV				
1+40	0.0427	0.33	QV				
1+45	0.0449	0.33	QV				
1+50	0.0472	0.33	QV				
1+55	0.0495	0.33	QV				
2+ 0	0.0518	0.33	QV				
2+ 5	0.0541	0.33	QV				
2+10	0.0564	0.34	QV				
2+15	0.0587	0.34	QV				
2+20	0.0611	0.34	QV				
2+25	0.0634	0.34	QV				
2+30	0.0657	0.34	QV				
2+35	0.0681	0.34	QV				
2+40	0.0704	0.34	QV				
2+45	0.0728	0.34	QV				
2+50	0.0752	0.34	Q V				
2+55	0.0775	0.35	Q V				
3+ 0	0.0799	0.35	Q V				
3+ 5	0.0823	0.35	Q V				
3+10	0.0847	0.35	Q V				
3+15	0.0872	0.35	Q V				
3+20	0.0896	0.35	Q V				
3+25	0.0920	0.35	Q V				
3+30	0.0945	0.35	Q V				
3+35	0.0969	0.36	Q V				
3+40	0.0994	0.36	Q V				
3+45	0.1019	0.36	Q V				
3+50	0.1043	0.36	Q V				
3+55	0.1068	0.36	Q V				
4+ 0	0.1093	0.36	Q V				
4+ 5	0.1118	0.36	Q V				
4+10	0.1144	0.37	Q V				
4+15	0.1169	0.37	Q V				
4+20	0.1194	0.37	Q V				
4+25	0.1220	0.37	Q V				
4+30	0.1245	0.37	Q V				
4+35	0.1271	0.37	Q V				
4+40	0.1297	0.37	Q V				
4+45	0.1323	0.38	Q V				
4+50	0.1349	0.38	Q V				
4+55	0.1375	0.38	Q V				
5+ 0	0.1401	0.38	Q V				
5+ 5	0.1428	0.38	Q V				
5+10	0.1454	0.38	Q V				
5+15	0.1481	0.39	Q V				
5+20	0.1507	0.39	Q V				
5+25	0.1534	0.39	Q V				
5+30	0.1561	0.39	Q V				
5+35	0.1588	0.39	Q V				
5+40	0.1615	0.39	Q V				
5+45	0.1643	0.40	Q V				
5+50	0.1670	0.40	Q V				
5+55	0.1698	0.40	Q V				
6+ 0	0.1725	0.40	Q V				
6+ 5	0.1753	0.40	Q V				
6+10	0.1781	0.41	Q V				
6+15	0.1809	0.41	Q V				
6+20	0.1838	0.41	Q V				
6+25	0.1866	0.41	Q V				
6+30	0.1894	0.41	Q V				
6+35	0.1923	0.42	Q V				

6+40	0.1952	0.42	Q	V				
6+45	0.1981	0.42	Q	V				
6+50	0.2010	0.42	Q	V				
6+55	0.2039	0.42	Q	V				
7+ 0	0.2068	0.43	Q	V				
7+ 5	0.2098	0.43	Q	V				
7+10	0.2128	0.43	Q	V				
7+15	0.2158	0.43	Q	V				
7+20	0.2188	0.44	Q	V				
7+25	0.2218	0.44	Q	V				
7+30	0.2248	0.44	Q	V				
7+35	0.2279	0.44	Q	V				
7+40	0.2309	0.45	Q	V				
7+45	0.2340	0.45	Q	V				
7+50	0.2371	0.45	Q	V				
7+55	0.2402	0.45	Q	V				
8+ 0	0.2434	0.46	Q	V				
8+ 5	0.2465	0.46	Q	V				
8+10	0.2497	0.46	Q	V				
8+15	0.2529	0.46	Q	V				
8+20	0.2561	0.47	Q	V				
8+25	0.2593	0.47	Q	V				
8+30	0.2626	0.47	Q	V				
8+35	0.2659	0.48	Q	V				
8+40	0.2692	0.48	Q	V				
8+45	0.2725	0.48	Q	V				
8+50	0.2758	0.48	Q	V				
8+55	0.2792	0.49	Q	V				
9+ 0	0.2826	0.49	Q	V				
9+ 5	0.2860	0.49	Q	V				
9+10	0.2894	0.50	Q	V				
9+15	0.2928	0.50	Q	V				
9+20	0.2963	0.50	Q	V				
9+25	0.2998	0.51	Q	V				
9+30	0.3033	0.51	Q	V				
9+35	0.3069	0.52	Q	V				
9+40	0.3105	0.52	Q	V				
9+45	0.3141	0.52	Q	V				
9+50	0.3177	0.53	Q	V				
9+55	0.3213	0.53	Q	V				
10+ 0	0.3250	0.53	Q	V				
10+ 5	0.3287	0.54	Q	V				
10+10	0.3325	0.54	Q	V				
10+15	0.3363	0.55	Q	V				
10+20	0.3401	0.55	Q	V				
10+25	0.3439	0.56	Q	V				
10+30	0.3478	0.56	Q	V				
10+35	0.3517	0.57	Q	V				
10+40	0.3556	0.57	Q	V				
10+45	0.3596	0.58	Q	V				
10+50	0.3636	0.58	Q	V				
10+55	0.3676	0.59	Q	V				
11+ 0	0.3717	0.59	Q	V				
11+ 5	0.3758	0.60	Q	V				
11+10	0.3799	0.60	Q	V				
11+15	0.3841	0.61	Q	V				
11+20	0.3884	0.61	Q	V				
11+25	0.3927	0.62	Q	V				
11+30	0.3970	0.63	Q	V				
11+35	0.4013	0.63	Q	V				
11+40	0.4058	0.64	Q	V				
11+45	0.4102	0.65	Q	V				
11+50	0.4147	0.65	Q	V				
11+55	0.4193	0.66	Q	V				
12+ 0	0.4239	0.67	Q	V				
12+ 5	0.4284	0.66	Q	V				
12+10	0.4329	0.65	Q	V				
12+15	0.4375	0.66	Q	V				
12+20	0.4421	0.67	Q	V				
12+25	0.4468	0.68	Q	V				
12+30	0.4515	0.69	Q	V				
12+35	0.4563	0.70	Q	V				
12+40	0.4611	0.71	Q	V				
12+45	0.4661	0.72	Q	V				
12+50	0.4711	0.73	Q	V				
12+55	0.4762	0.74	Q	V				
13+ 0	0.4813	0.75	Q	V				
13+ 5	0.4866	0.76	Q	V				
13+10	0.4919	0.77	Q	V				

13+15	0.4973	0.79	Q	V			
13+20	0.5028	0.80	Q	V			
13+25	0.5084	0.82	Q	V			
13+30	0.5142	0.83	Q	V			
13+35	0.5200	0.85	Q	V			
13+40	0.5259	0.86	Q	V			
13+45	0.5320	0.88	Q	V			
13+50	0.5382	0.90	Q	V			
13+55	0.5445	0.92	Q	V			
14+ 0	0.5510	0.94	Q	V			
14+ 5	0.5577	0.96	Q	V			
14+10	0.5645	0.99	Q	V			
14+15	0.5714	1.01	Q	V			
14+20	0.5786	1.04	Q	V			
14+25	0.5860	1.07	Q	V			
14+30	0.5936	1.10	Q	V			
14+35	0.6014	1.14	Q	V			
14+40	0.6095	1.18	Q	V			
14+45	0.6179	1.22	Q	V			
14+50	0.6266	1.26	Q	V			
14+55	0.6357	1.32	Q	V			
15+ 0	0.6451	1.37	Q	V			
15+ 5	0.6550	1.44	Q	V			
15+10	0.6654	1.51	Q	V			
15+15	0.6764	1.60	Q	V			
15+20	0.6880	1.69	Q	V			
15+25	0.6988	1.56	Q	V			
15+30	0.7089	1.47	Q	V			
15+35	0.7199	1.60	Q	V			
15+40	0.7322	1.79	Q	V			
15+45	0.7467	2.10	Q	V			
15+50	0.7638	2.48	Q	V			
15+55	0.7876	3.46	Q	V			
16+ 0	0.8242	5.31	Q	V			
16+ 5	0.9541	18.86		V		Q	
16+10	1.0588	15.21		V Q			
16+15	1.0896	4.47	Q	V			
16+20	1.1054	2.30	Q	V			
16+25	1.1176	1.76	Q	V			
16+30	1.1292	1.70	Q	V			
16+35	1.1398	1.53	Q	V			
16+40	1.1494	1.39	Q	V			
16+45	1.1582	1.28	Q	V			
16+50	1.1664	1.19	Q	V			
16+55	1.1741	1.11	Q	V			
17+ 0	1.1813	1.05	Q	V			
17+ 5	1.1882	1.00	Q	V			
17+10	1.1947	0.95	Q	V			
17+15	1.2009	0.91	Q	V			
17+20	1.2069	0.87	Q	V			
17+25	1.2127	0.84	Q	V			
17+30	1.2182	0.80	Q	V			
17+35	1.2236	0.78	Q	V			
17+40	1.2287	0.75	Q	V			
17+45	1.2338	0.73	Q	V			
17+50	1.2386	0.71	Q	V			
17+55	1.2434	0.69	Q	V			
18+ 0	1.2480	0.67	Q	V			
18+ 5	1.2526	0.67	Q	V			
18+10	1.2572	0.67	Q	V			
18+15	1.2618	0.66	Q	V			
18+20	1.2662	0.64	Q	V			
18+25	1.2705	0.63	Q	V			
18+30	1.2748	0.62	Q	V			
18+35	1.2789	0.60	Q	V			
18+40	1.2830	0.59	Q	V			
18+45	1.2870	0.58	Q	V			
18+50	1.2910	0.57	Q	V			
18+55	1.2949	0.56	Q	V			
19+ 0	1.2987	0.55	Q	V			
19+ 5	1.3024	0.54	Q	V			
19+10	1.3061	0.54	Q	V			
19+15	1.3097	0.53	Q	V			
19+20	1.3133	0.52	Q	V			
19+25	1.3169	0.51	Q	V			
19+30	1.3203	0.51	Q	V			
19+35	1.3238	0.50	Q	V			
19+40	1.3272	0.49	Q	V			
19+45	1.3305	0.49	Q	V			

19+50	1.3338	0.48	Q				V
19+55	1.3371	0.47	Q				V
20+ 0	1.3403	0.47	Q				V
20+ 5	1.3435	0.46	Q				V
20+10	1.3466	0.46	Q				V
20+15	1.3497	0.45	Q				V
20+20	1.3528	0.45	Q				V
20+25	1.3558	0.44	Q				V
20+30	1.3588	0.44	Q				V
20+35	1.3618	0.43	Q				V
20+40	1.3647	0.43	Q				V
20+45	1.3676	0.42	Q				V
20+50	1.3705	0.42	Q				V
20+55	1.3734	0.41	Q				V
21+ 0	1.3762	0.41	Q				V
21+ 5	1.3790	0.41	Q				V
21+10	1.3818	0.40	Q				V
21+15	1.3845	0.40	Q				V
21+20	1.3873	0.40	Q				V
21+25	1.3900	0.39	Q				V
21+30	1.3926	0.39	Q				V
21+35	1.3953	0.38	Q				V
21+40	1.3979	0.38	Q				V
21+45	1.4005	0.38	Q				V
21+50	1.4031	0.38	Q				V
21+55	1.4057	0.37	Q				V
22+ 0	1.4082	0.37	Q				V
22+ 5	1.4107	0.37	Q				V
22+10	1.4132	0.36	Q				V
22+15	1.4157	0.36	Q				V
22+20	1.4182	0.36	Q				V
22+25	1.4206	0.36	Q				V
22+30	1.4230	0.35	Q				V
22+35	1.4255	0.35	Q				V
22+40	1.4279	0.35	Q				V
22+45	1.4302	0.34	Q				V
22+50	1.4326	0.34	Q				V
22+55	1.4349	0.34	Q				V
23+ 0	1.4373	0.34	Q				V
23+ 5	1.4396	0.34	Q				V
23+10	1.4419	0.33	Q				V
23+15	1.4441	0.33	Q				V
23+20	1.4464	0.33	Q				V
23+25	1.4487	0.33	Q				V
23+30	1.4509	0.32	Q				V
23+35	1.4531	0.32	Q				V
23+40	1.4553	0.32	Q				V
23+45	1.4575	0.32	Q				V
23+50	1.4597	0.32	Q				V
23+55	1.4619	0.31	Q				V
24+ 0	1.4640	0.31	Q				V

Volume=63,772 CF

DMA -2

U n i t H y d r o g r a p h A n a l y s i s

Study date 05/07/21

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San Bernardino County Synthetic Unit Hydrology Method
Manual date - August 1986

Program License Serial Number 6310

20-523 BEAR VALLEY CONNECTION PROJECT
PROPOSED CONDITION, DMA-2

Storm Event Year = 10

Antecedent Moisture Condition = 1

English (in-lb) Input Units Used

English Rainfall Data (Inches) Input Values Used

English Units used in output format

Area averaged rainfall intensity isohyetal data:

Sub-Area (Ac.)	Duration (hours)	Isohyetal (In)
Rainfall data for year 10		
3.07	1	0.65
Rainfall data for year 10		
3.07	6	1.35
Rainfall data for year 10		
3.07	24	2.46

++

******** Area-averaged max loss rate, Fm ********

SCS curve No.(AMCII)	SCS curve NO.(AMC 1)	Area (Ac.)	Area Fraction	Fp(Fig C6) (In/Hr)	Ap (dec.)	Fm (In/Hr)
69.0	49.8	3.07	1.000	0.812	0.120	0.097

Area-averaged adjusted loss rate Fm (In/Hr) = 0.097

********* Area-Averaged low loss rate fraction, Yb **********

Area (Ac.)	Area Fract	SCS CN (AMC2)	SCS CN (AMC1)	S	Pervious Yield Fr
0.37	0.120	69.0	49.8	10.08	0.008
2.70	0.880	98.0	98.0	0.20	0.907

Area-averaged catchment yield fraction, Y = 0.799
Area-averaged low loss fraction, Yb = 0.201
++
Watercourse length = 460.00(Ft.)
Length from concentration point to centroid = 250.00(Ft.)
Elevation difference along watercourse = 14.00(Ft.)
Mannings friction factor along watercourse = 0.015
Watershed area = 3.07(Ac.)
Catchment Lag time = 0.017 hours
Unit interval = 5.000 minutes
Unit interval percentage of lag time = 489.5461
Hydrograph baseflow = 0.00(CFS)

Lag=0.8 x Tc; Tc=1.28 Min.
Note: 5 minute minimum

Average maximum watershed loss rate(Fm) = 0.097(In/Hr)
Average low loss rate fraction (Yb) = 0.201 (decimal)
DESERT S-Graph Selected
Computed peak 5-minute rainfall = 0.307(In)
Computed peak 30-minute rainfall = 0.525(In)
Specified peak 1-hour rainfall = 0.646(In)
Computed peak 3-hour rainfall = 1.015(In)
Specified peak 6-hour rainfall = 1.350(In)
Specified peak 24-hour rainfall = 2.460(In)

Rainfall depth area reduction factors:
Using a total area of 3.07(Ac.) (Ref: fig. E-4)

5-minute factor = 1.000 Adjusted rainfall = 0.306(In)
30-minute factor = 1.000 Adjusted rainfall = 0.525(In)
1-hour factor = 1.000 Adjusted rainfall = 0.646(In)
3-hour factor = 1.000 Adjusted rainfall = 1.015(In)
6-hour factor = 1.000 Adjusted rainfall = 1.350(In)
24-hour factor = 1.000 Adjusted rainfall = 2.460(In)

U n i t H y d r o g r a p h

Interval Number	'S' Graph Mean values	Unit Hydrograph ((CFS))
(K = 37.13 (CFS))		
1	70.533	26.187
2	100.000	10.941

Peak Unit Number	Adjusted mass rainfall (In)	Unit rainfall (In)
1	0.3065	0.3065
2	0.3773	0.0708
3	0.4261	0.0488
4	0.4646	0.0384
5	0.4967	0.0322
6	0.5246	0.0279
7	0.5495	0.0248
8	0.5719	0.0225
9	0.5925	0.0206
10	0.6115	0.0190
11	0.6293	0.0177
12	0.6459	0.0166
13	0.6675	0.0216
14	0.6882	0.0207
15	0.7080	0.0198
16	0.7271	0.0191
17	0.7454	0.0184
18	0.7632	0.0177
19	0.7803	0.0172
20	0.7970	0.0166
21	0.8132	0.0162
22	0.8289	0.0157
23	0.8442	0.0153
24	0.8591	0.0149
25	0.8736	0.0146
26	0.8879	0.0142
27	0.9017	0.0139
28	0.9153	0.0136
29	0.9287	0.0133
30	0.9417	0.0130
31	0.9545	0.0128
32	0.9670	0.0126
33	0.9794	0.0123
34	0.9915	0.0121
35	1.0034	0.0119
36	1.0151	0.0117
37	1.0266	0.0115
38	1.0379	0.0113
39	1.0490	0.0112
40	1.0600	0.0110
41	1.0709	0.0108
42	1.0815	0.0107
43	1.0920	0.0105
44	1.1024	0.0104
45	1.1127	0.0102

46	1.1228	0.0101
47	1.1327	0.0100
48	1.1426	0.0099
49	1.1523	0.0097
50	1.1619	0.0096
51	1.1714	0.0095
52	1.1808	0.0094
53	1.1901	0.0093
54	1.1993	0.0092
55	1.2084	0.0091
56	1.2174	0.0090
57	1.2263	0.0089
58	1.2351	0.0088
59	1.2438	0.0087
60	1.2524	0.0086
61	1.2610	0.0085
62	1.2694	0.0085
63	1.2778	0.0084
64	1.2861	0.0083
65	1.2944	0.0082
66	1.3025	0.0082
67	1.3106	0.0081
68	1.3186	0.0080
69	1.3266	0.0079
70	1.3344	0.0079
71	1.3422	0.0078
72	1.3500	0.0077
73	1.3581	0.0081
74	1.3661	0.0080
75	1.3741	0.0080
76	1.3820	0.0079
77	1.3898	0.0078
78	1.3976	0.0078
79	1.4053	0.0077
80	1.4130	0.0077
81	1.4206	0.0076
82	1.4282	0.0076
83	1.4357	0.0075
84	1.4431	0.0075
85	1.4505	0.0074
86	1.4579	0.0074
87	1.4652	0.0073
88	1.4725	0.0073
89	1.4797	0.0072
90	1.4869	0.0072
91	1.4940	0.0071
92	1.5011	0.0071
93	1.5081	0.0070
94	1.5151	0.0070
95	1.5221	0.0070
96	1.5290	0.0069
97	1.5359	0.0069
98	1.5427	0.0068
99	1.5495	0.0068
100	1.5563	0.0068
101	1.5630	0.0067
102	1.5697	0.0067
103	1.5763	0.0066
104	1.5829	0.0066
105	1.5895	0.0066
106	1.5960	0.0065
107	1.6025	0.0065
108	1.6090	0.0065
109	1.6154	0.0064
110	1.6218	0.0064
111	1.6282	0.0064
112	1.6345	0.0063
113	1.6408	0.0063
114	1.6471	0.0063
115	1.6533	0.0062
116	1.6595	0.0062
117	1.6657	0.0062
118	1.6719	0.0061
119	1.6780	0.0061
120	1.6841	0.0061
121	1.6901	0.0061
122	1.6962	0.0060
123	1.7022	0.0060
124	1.7081	0.0060

125	1.7141	0.0059
126	1.7200	0.0059
127	1.7259	0.0059
128	1.7318	0.0059
129	1.7376	0.0058
130	1.7434	0.0058
131	1.7492	0.0058
132	1.7550	0.0058
133	1.7607	0.0057
134	1.7665	0.0057
135	1.7721	0.0057
136	1.7778	0.0057
137	1.7835	0.0056
138	1.7891	0.0056
139	1.7947	0.0056
140	1.8003	0.0056
141	1.8058	0.0056
142	1.8113	0.0055
143	1.8169	0.0055
144	1.8223	0.0055
145	1.8278	0.0055
146	1.8333	0.0054
147	1.8387	0.0054
148	1.8441	0.0054
149	1.8495	0.0054
150	1.8548	0.0054
151	1.8602	0.0053
152	1.8655	0.0053
153	1.8708	0.0053
154	1.8761	0.0053
155	1.8813	0.0053
156	1.8866	0.0052
157	1.8918	0.0052
158	1.8970	0.0052
159	1.9022	0.0052
160	1.9074	0.0052
161	1.9125	0.0052
162	1.9177	0.0051
163	1.9228	0.0051
164	1.9279	0.0051
165	1.9330	0.0051
166	1.9380	0.0051
167	1.9431	0.0050
168	1.9481	0.0050
169	1.9531	0.0050
170	1.9581	0.0050
171	1.9631	0.0050
172	1.9680	0.0050
173	1.9730	0.0049
174	1.9779	0.0049
175	1.9828	0.0049
176	1.9877	0.0049
177	1.9926	0.0049
178	1.9975	0.0049
179	2.0023	0.0048
180	2.0071	0.0048
181	2.0120	0.0048
182	2.0168	0.0048
183	2.0216	0.0048
184	2.0263	0.0048
185	2.0311	0.0048
186	2.0358	0.0047
187	2.0406	0.0047
188	2.0453	0.0047
189	2.0500	0.0047
190	2.0547	0.0047
191	2.0593	0.0047
192	2.0640	0.0047
193	2.0687	0.0046
194	2.0733	0.0046
195	2.0779	0.0046
196	2.0825	0.0046
197	2.0871	0.0046
198	2.0917	0.0046
199	2.0963	0.0046
200	2.1008	0.0046
201	2.1053	0.0045
202	2.1099	0.0045
203	2.1144	0.0045

204	2.1189	0.0045
205	2.1234	0.0045
206	2.1279	0.0045
207	2.1323	0.0045
208	2.1368	0.0045
209	2.1412	0.0044
210	2.1456	0.0044
211	2.1501	0.0044
212	2.1545	0.0044
213	2.1589	0.0044
214	2.1632	0.0044
215	2.1676	0.0044
216	2.1720	0.0044
217	2.1763	0.0043
218	2.1806	0.0043
219	2.1850	0.0043
220	2.1893	0.0043
221	2.1936	0.0043
222	2.1979	0.0043
223	2.2022	0.0043
224	2.2064	0.0043
225	2.2107	0.0043
226	2.2149	0.0042
227	2.2192	0.0042
228	2.2234	0.0042
229	2.2276	0.0042
230	2.2318	0.0042
231	2.2360	0.0042
232	2.2402	0.0042
233	2.2444	0.0042
234	2.2485	0.0042
235	2.2527	0.0042
236	2.2568	0.0041
237	2.2610	0.0041
238	2.2651	0.0041
239	2.2692	0.0041
240	2.2733	0.0041
241	2.2774	0.0041
242	2.2815	0.0041
243	2.2856	0.0041
244	2.2896	0.0041
245	2.2937	0.0041
246	2.2977	0.0040
247	2.3018	0.0040
248	2.3058	0.0040
249	2.3098	0.0040
250	2.3138	0.0040
251	2.3178	0.0040
252	2.3218	0.0040
253	2.3258	0.0040
254	2.3298	0.0040
255	2.3338	0.0040
256	2.3377	0.0040
257	2.3417	0.0039
258	2.3456	0.0039
259	2.3495	0.0039
260	2.3535	0.0039
261	2.3574	0.0039
262	2.3613	0.0039
263	2.3652	0.0039
264	2.3691	0.0039
265	2.3729	0.0039
266	2.3768	0.0039
267	2.3807	0.0039
268	2.3845	0.0039
269	2.3884	0.0038
270	2.3922	0.0038
271	2.3961	0.0038
272	2.3999	0.0038
273	2.4037	0.0038
274	2.4075	0.0038
275	2.4113	0.0038
276	2.4151	0.0038
277	2.4189	0.0038
278	2.4226	0.0038
279	2.4264	0.0038
280	2.4302	0.0038
281	2.4339	0.0038
282	2.4377	0.0037

283	2.4414	0.0037
284	2.4451	0.0037
285	2.4489	0.0037
286	2.4526	0.0037
287	2.4563	0.0037
288	2.4600	0.0037

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0037	0.0007	0.0030
2	0.0037	0.0007	0.0030
3	0.0037	0.0007	0.0030
4	0.0037	0.0007	0.0030
5	0.0037	0.0008	0.0030
6	0.0038	0.0008	0.0030
7	0.0038	0.0008	0.0030
8	0.0038	0.0008	0.0030
9	0.0038	0.0008	0.0030
10	0.0038	0.0008	0.0030
11	0.0038	0.0008	0.0030
12	0.0038	0.0008	0.0031
13	0.0038	0.0008	0.0031
14	0.0038	0.0008	0.0031
15	0.0039	0.0008	0.0031
16	0.0039	0.0008	0.0031
17	0.0039	0.0008	0.0031
18	0.0039	0.0008	0.0031
19	0.0039	0.0008	0.0031
20	0.0039	0.0008	0.0031
21	0.0039	0.0008	0.0031
22	0.0039	0.0008	0.0032
23	0.0040	0.0008	0.0032
24	0.0040	0.0008	0.0032
25	0.0040	0.0008	0.0032
26	0.0040	0.0008	0.0032
27	0.0040	0.0008	0.0032
28	0.0040	0.0008	0.0032
29	0.0040	0.0008	0.0032
30	0.0041	0.0008	0.0032
31	0.0041	0.0008	0.0033
32	0.0041	0.0008	0.0033
33	0.0041	0.0008	0.0033
34	0.0041	0.0008	0.0033
35	0.0041	0.0008	0.0033
36	0.0041	0.0008	0.0033
37	0.0042	0.0008	0.0033
38	0.0042	0.0008	0.0033
39	0.0042	0.0008	0.0034
40	0.0042	0.0008	0.0034
41	0.0042	0.0008	0.0034
42	0.0042	0.0009	0.0034
43	0.0043	0.0009	0.0034
44	0.0043	0.0009	0.0034
45	0.0043	0.0009	0.0034
46	0.0043	0.0009	0.0034
47	0.0043	0.0009	0.0035
48	0.0043	0.0009	0.0035
49	0.0044	0.0009	0.0035
50	0.0044	0.0009	0.0035
51	0.0044	0.0009	0.0035
52	0.0044	0.0009	0.0035
53	0.0044	0.0009	0.0035
54	0.0044	0.0009	0.0035
55	0.0045	0.0009	0.0036
56	0.0045	0.0009	0.0036
57	0.0045	0.0009	0.0036
58	0.0045	0.0009	0.0036
59	0.0045	0.0009	0.0036
60	0.0046	0.0009	0.0036
61	0.0046	0.0009	0.0037
62	0.0046	0.0009	0.0037
63	0.0046	0.0009	0.0037
64	0.0046	0.0009	0.0037
65	0.0047	0.0009	0.0037
66	0.0047	0.0009	0.0037
67	0.0047	0.0009	0.0038
68	0.0047	0.0009	0.0038

69	0.0047	0.0010	0.0038
70	0.0048	0.0010	0.0038
71	0.0048	0.0010	0.0038
72	0.0048	0.0010	0.0038
73	0.0048	0.0010	0.0039
74	0.0048	0.0010	0.0039
75	0.0049	0.0010	0.0039
76	0.0049	0.0010	0.0039
77	0.0049	0.0010	0.0039
78	0.0049	0.0010	0.0040
79	0.0050	0.0010	0.0040
80	0.0050	0.0010	0.0040
81	0.0050	0.0010	0.0040
82	0.0050	0.0010	0.0040
83	0.0051	0.0010	0.0041
84	0.0051	0.0010	0.0041
85	0.0051	0.0010	0.0041
86	0.0052	0.0010	0.0041
87	0.0052	0.0010	0.0041
88	0.0052	0.0010	0.0042
89	0.0052	0.0011	0.0042
90	0.0053	0.0011	0.0042
91	0.0053	0.0011	0.0042
92	0.0053	0.0011	0.0043
93	0.0054	0.0011	0.0043
94	0.0054	0.0011	0.0043
95	0.0054	0.0011	0.0043
96	0.0054	0.0011	0.0044
97	0.0055	0.0011	0.0044
98	0.0055	0.0011	0.0044
99	0.0056	0.0011	0.0044
100	0.0056	0.0011	0.0045
101	0.0056	0.0011	0.0045
102	0.0056	0.0011	0.0045
103	0.0057	0.0011	0.0045
104	0.0057	0.0011	0.0046
105	0.0058	0.0012	0.0046
106	0.0058	0.0012	0.0046
107	0.0058	0.0012	0.0047
108	0.0059	0.0012	0.0047
109	0.0059	0.0012	0.0047
110	0.0059	0.0012	0.0048
111	0.0060	0.0012	0.0048
112	0.0060	0.0012	0.0048
113	0.0061	0.0012	0.0049
114	0.0061	0.0012	0.0049
115	0.0062	0.0012	0.0049
116	0.0062	0.0012	0.0050
117	0.0063	0.0013	0.0050
118	0.0063	0.0013	0.0050
119	0.0064	0.0013	0.0051
120	0.0064	0.0013	0.0051
121	0.0065	0.0013	0.0052
122	0.0065	0.0013	0.0052
123	0.0066	0.0013	0.0052
124	0.0066	0.0013	0.0053
125	0.0067	0.0013	0.0053
126	0.0067	0.0014	0.0054
127	0.0068	0.0014	0.0054
128	0.0068	0.0014	0.0055
129	0.0069	0.0014	0.0055
130	0.0070	0.0014	0.0056
131	0.0070	0.0014	0.0056
132	0.0071	0.0014	0.0057
133	0.0072	0.0014	0.0057
134	0.0072	0.0015	0.0058
135	0.0073	0.0015	0.0058
136	0.0074	0.0015	0.0059
137	0.0075	0.0015	0.0060
138	0.0075	0.0015	0.0060
139	0.0076	0.0015	0.0061
140	0.0077	0.0015	0.0061
141	0.0078	0.0016	0.0062
142	0.0078	0.0016	0.0063
143	0.0080	0.0016	0.0064
144	0.0080	0.0016	0.0064
145	0.0077	0.0016	0.0062
146	0.0078	0.0016	0.0062
147	0.0079	0.0016	0.0063

148	0.0080	0.0016	0.0064
149	0.0082	0.0016	0.0065
150	0.0082	0.0017	0.0066
151	0.0084	0.0017	0.0067
152	0.0085	0.0017	0.0068
153	0.0086	0.0017	0.0069
154	0.0087	0.0018	0.0070
155	0.0089	0.0018	0.0071
156	0.0090	0.0018	0.0072
157	0.0092	0.0018	0.0073
158	0.0093	0.0019	0.0074
159	0.0095	0.0019	0.0076
160	0.0096	0.0019	0.0077
161	0.0099	0.0020	0.0079
162	0.0100	0.0020	0.0080
163	0.0102	0.0021	0.0082
164	0.0104	0.0021	0.0083
165	0.0107	0.0021	0.0085
166	0.0108	0.0022	0.0086
167	0.0112	0.0022	0.0089
168	0.0113	0.0023	0.0090
169	0.0117	0.0024	0.0093
170	0.0119	0.0024	0.0095
171	0.0123	0.0025	0.0098
172	0.0126	0.0025	0.0100
173	0.0130	0.0026	0.0104
174	0.0133	0.0027	0.0106
175	0.0139	0.0028	0.0111
176	0.0142	0.0029	0.0114
177	0.0149	0.0030	0.0119
178	0.0153	0.0031	0.0122
179	0.0162	0.0032	0.0129
180	0.0166	0.0033	0.0133
181	0.0177	0.0036	0.0142
182	0.0184	0.0037	0.0147
183	0.0198	0.0040	0.0158
184	0.0207	0.0042	0.0165
185	0.0166	0.0033	0.0133
186	0.0177	0.0036	0.0142
187	0.0206	0.0041	0.0164
188	0.0225	0.0045	0.0179
189	0.0279	0.0056	0.0223
190	0.0322	0.0065	0.0257
191	0.0488	0.0081	0.0407
192	0.0708	0.0081	0.0627
193	0.3065	0.0081	0.2984
194	0.0384	0.0077	0.0307
195	0.0248	0.0050	0.0198
196	0.0190	0.0038	0.0152
197	0.0216	0.0043	0.0173
198	0.0191	0.0038	0.0152
199	0.0172	0.0035	0.0137
200	0.0157	0.0032	0.0126
201	0.0146	0.0029	0.0116
202	0.0136	0.0027	0.0109
203	0.0128	0.0026	0.0102
204	0.0121	0.0024	0.0097
205	0.0115	0.0023	0.0092
206	0.0110	0.0022	0.0088
207	0.0105	0.0021	0.0084
208	0.0101	0.0020	0.0081
209	0.0097	0.0020	0.0078
210	0.0094	0.0019	0.0075
211	0.0091	0.0018	0.0073
212	0.0088	0.0018	0.0070
213	0.0085	0.0017	0.0068
214	0.0083	0.0017	0.0066
215	0.0081	0.0016	0.0065
216	0.0079	0.0016	0.0063
217	0.0081	0.0016	0.0065
218	0.0079	0.0016	0.0063
219	0.0077	0.0016	0.0062
220	0.0076	0.0015	0.0060
221	0.0074	0.0015	0.0059
222	0.0073	0.0015	0.0058
223	0.0071	0.0014	0.0057
224	0.0070	0.0014	0.0056
225	0.0069	0.0014	0.0055
226	0.0068	0.0014	0.0054

227	0.0066	0.0013	0.0053
228	0.0065	0.0013	0.0052
229	0.0064	0.0013	0.0051
230	0.0063	0.0013	0.0051
231	0.0062	0.0013	0.0050
232	0.0061	0.0012	0.0049
233	0.0061	0.0012	0.0048
234	0.0060	0.0012	0.0048
235	0.0059	0.0012	0.0047
236	0.0058	0.0012	0.0046
237	0.0057	0.0012	0.0046
238	0.0057	0.0011	0.0045
239	0.0056	0.0011	0.0045
240	0.0055	0.0011	0.0044
241	0.0055	0.0011	0.0044
242	0.0054	0.0011	0.0043
243	0.0053	0.0011	0.0043
244	0.0053	0.0011	0.0042
245	0.0052	0.0011	0.0042
246	0.0052	0.0010	0.0041
247	0.0051	0.0010	0.0041
248	0.0051	0.0010	0.0040
249	0.0050	0.0010	0.0040
250	0.0050	0.0010	0.0040
251	0.0049	0.0010	0.0039
252	0.0049	0.0010	0.0039
253	0.0048	0.0010	0.0039
254	0.0048	0.0010	0.0038
255	0.0047	0.0010	0.0038
256	0.0047	0.0009	0.0037
257	0.0046	0.0009	0.0037
258	0.0046	0.0009	0.0037
259	0.0046	0.0009	0.0036
260	0.0045	0.0009	0.0036
261	0.0045	0.0009	0.0036
262	0.0045	0.0009	0.0036
263	0.0044	0.0009	0.0035
264	0.0044	0.0009	0.0035
265	0.0043	0.0009	0.0035
266	0.0043	0.0009	0.0034
267	0.0043	0.0009	0.0034
268	0.0042	0.0009	0.0034
269	0.0042	0.0008	0.0034
270	0.0042	0.0008	0.0033
271	0.0042	0.0008	0.0033
272	0.0041	0.0008	0.0033
273	0.0041	0.0008	0.0033
274	0.0041	0.0008	0.0032
275	0.0040	0.0008	0.0032
276	0.0040	0.0008	0.0032
277	0.0040	0.0008	0.0032
278	0.0040	0.0008	0.0032
279	0.0039	0.0008	0.0031
280	0.0039	0.0008	0.0031
281	0.0039	0.0008	0.0031
282	0.0039	0.0008	0.0031
283	0.0038	0.0008	0.0031
284	0.0038	0.0008	0.0030
285	0.0038	0.0008	0.0030
286	0.0038	0.0008	0.0030
287	0.0037	0.0008	0.0030
288	0.0037	0.0007	0.0030

Total soil rain loss = 0.43(In)
Total effective rainfall = 2.03(In)
Peak flow rate in flood hydrograph = 8.50(CFS)

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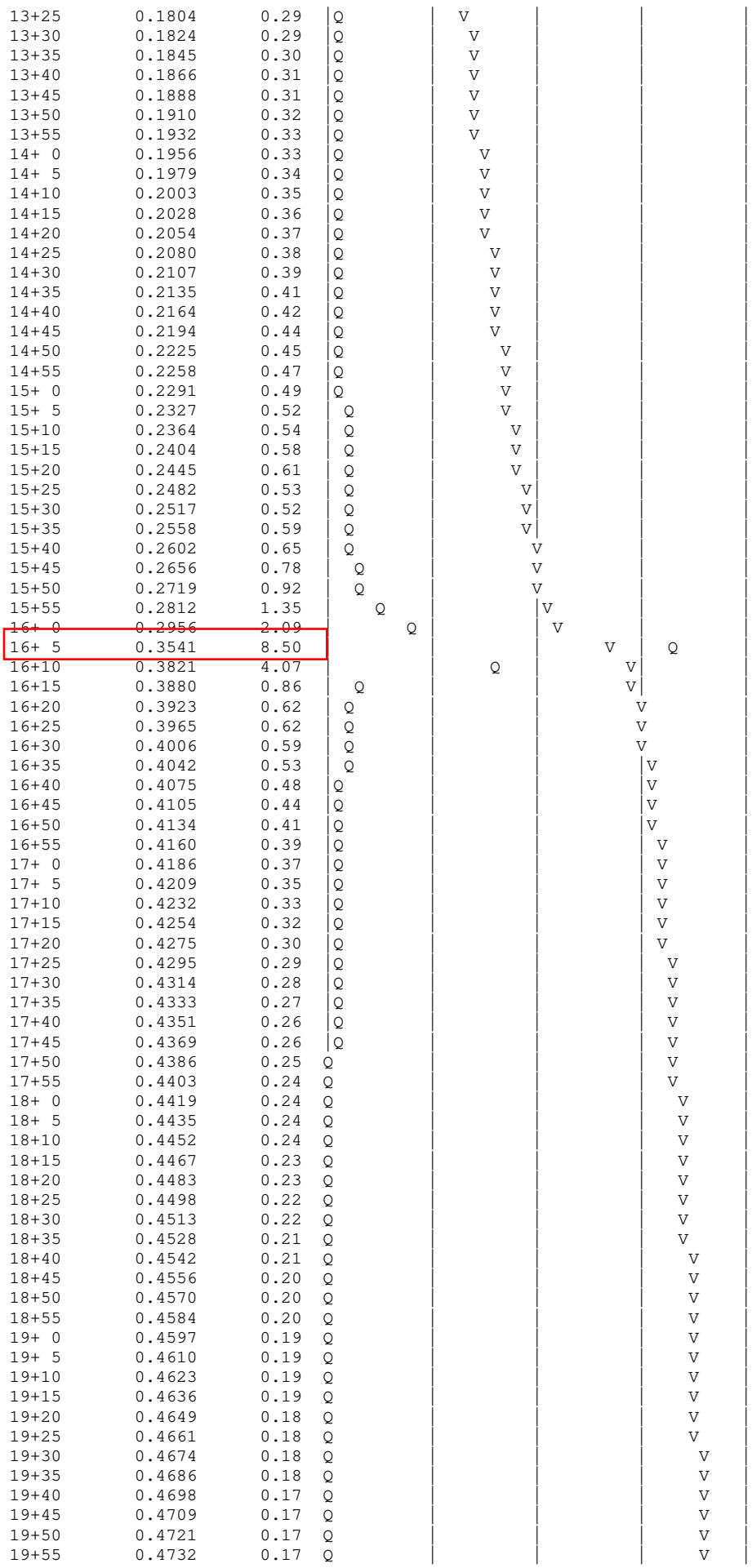
24 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	2.5	5.0	7.5	10.0
0+ 5	0.0005	0.08	Q				
0+10	0.0013	0.11	Q				

0+15	0.0021	0.11	Q				
0+20	0.0028	0.11	Q				
0+25	0.0036	0.11	Q				
0+30	0.0043	0.11	Q				
0+35	0.0051	0.11	Q				
0+40	0.0059	0.11	Q				
0+45	0.0067	0.11	Q				
0+50	0.0074	0.11	Q				
0+55	0.0082	0.11	Q				
1+ 0	0.0090	0.11	Q				
1+ 5	0.0098	0.11	Q				
1+10	0.0106	0.11	Q				
1+15	0.0113	0.11	Q				
1+20	0.0121	0.11	Q				
1+25	0.0129	0.12	Q				
1+30	0.0137	0.12	QV				
1+35	0.0145	0.12	QV				
1+40	0.0153	0.12	QV				
1+45	0.0161	0.12	QV				
1+50	0.0169	0.12	QV				
1+55	0.0177	0.12	QV				
2+ 0	0.0186	0.12	QV				
2+ 5	0.0194	0.12	QV				
2+10	0.0202	0.12	QV				
2+15	0.0210	0.12	QV				
2+20	0.0218	0.12	QV				
2+25	0.0227	0.12	QV				
2+30	0.0235	0.12	QV				
2+35	0.0243	0.12	QV				
2+40	0.0252	0.12	QV				
2+45	0.0260	0.12	Q V				
2+50	0.0268	0.12	Q V				
2+55	0.0277	0.12	Q V				
3+ 0	0.0285	0.12	Q V				
3+ 5	0.0294	0.12	Q V				
3+10	0.0302	0.12	Q V				
3+15	0.0311	0.12	Q V				
3+20	0.0319	0.12	Q V				
3+25	0.0328	0.13	Q V				
3+30	0.0337	0.13	Q V				
3+35	0.0345	0.13	Q V				
3+40	0.0354	0.13	Q V				
3+45	0.0363	0.13	Q V				
3+50	0.0372	0.13	Q V				
3+55	0.0380	0.13	Q V				
4+ 0	0.0389	0.13	Q V				
4+ 5	0.0398	0.13	Q V				
4+10	0.0407	0.13	Q V				
4+15	0.0416	0.13	Q V				
4+20	0.0425	0.13	Q V				
4+25	0.0434	0.13	Q V				
4+30	0.0443	0.13	Q V				
4+35	0.0452	0.13	Q V				
4+40	0.0461	0.13	Q V				
4+45	0.0471	0.13	Q V				
4+50	0.0480	0.13	Q V				
4+55	0.0489	0.13	Q V				
5+ 0	0.0498	0.13	Q V				
5+ 5	0.0508	0.14	Q V				
5+10	0.0517	0.14	Q V				
5+15	0.0526	0.14	Q V				
5+20	0.0536	0.14	Q V				
5+25	0.0545	0.14	Q V				
5+30	0.0555	0.14	Q V				
5+35	0.0565	0.14	Q V				
5+40	0.0574	0.14	Q V				
5+45	0.0584	0.14	Q V				
5+50	0.0594	0.14	Q V				
5+55	0.0603	0.14	Q V				
6+ 0	0.0613	0.14	Q V				
6+ 5	0.0623	0.14	Q V				
6+10	0.0633	0.14	Q V				
6+15	0.0643	0.14	Q V				
6+20	0.0653	0.15	Q V				
6+25	0.0663	0.15	Q V				
6+30	0.0673	0.15	Q V				
6+35	0.0683	0.15	Q V				
6+40	0.0693	0.15	Q V				
6+45	0.0704	0.15	Q V				

6+50	0.0714	0.15	Q	V				
6+55	0.0724	0.15	Q	V				
7+ 0	0.0735	0.15	Q	V				
7+ 5	0.0745	0.15	Q	V				
7+10	0.0756	0.15	Q	V				
7+15	0.0766	0.15	Q	V				
7+20	0.0777	0.15	Q	V				
7+25	0.0787	0.16	Q	V				
7+30	0.0798	0.16	Q	V				
7+35	0.0809	0.16	Q	V				
7+40	0.0820	0.16	Q	V				
7+45	0.0831	0.16	Q	V				
7+50	0.0842	0.16	Q	V				
7+55	0.0853	0.16	Q	V				
8+ 0	0.0864	0.16	Q	V				
8+ 5	0.0875	0.16	Q	V				
8+10	0.0886	0.16	Q	V				
8+15	0.0898	0.16	Q	V				
8+20	0.0909	0.17	Q	V				
8+25	0.0921	0.17	Q	V				
8+30	0.0932	0.17	Q	V				
8+35	0.0944	0.17	Q	V				
8+40	0.0955	0.17	Q	V				
8+45	0.0967	0.17	Q	V				
8+50	0.0979	0.17	Q	V				
8+55	0.0991	0.17	Q	V				
9+ 0	0.1003	0.17	Q	V				
9+ 5	0.1015	0.18	Q	V				
9+10	0.1027	0.18	Q	V				
9+15	0.1039	0.18	Q	V				
9+20	0.1052	0.18	Q	V				
9+25	0.1064	0.18	Q	V				
9+30	0.1076	0.18	Q	V				
9+35	0.1089	0.18	Q	V				
9+40	0.1102	0.18	Q	V				
9+45	0.1114	0.19	Q	V				
9+50	0.1127	0.19	Q	V				
9+55	0.1140	0.19	Q	V				
10+ 0	0.1153	0.19	Q	V				
10+ 5	0.1167	0.19	Q	V				
10+10	0.1180	0.19	Q	V				
10+15	0.1193	0.19	Q	V				
10+20	0.1207	0.20	Q	V				
10+25	0.1220	0.20	Q	V				
10+30	0.1234	0.20	Q	V				
10+35	0.1248	0.20	Q	V				
10+40	0.1262	0.20	Q	V				
10+45	0.1276	0.20	Q	V				
10+50	0.1290	0.21	Q	V				
10+55	0.1304	0.21	Q	V				
11+ 0	0.1319	0.21	Q	V				
11+ 5	0.1333	0.21	Q	V				
11+10	0.1348	0.21	Q	V				
11+15	0.1363	0.22	Q	V				
11+20	0.1378	0.22	Q	V				
11+25	0.1393	0.22	Q	V				
11+30	0.1408	0.22	Q	V				
11+35	0.1424	0.23	Q	V				
11+40	0.1440	0.23	Q	V				
11+45	0.1455	0.23	Q	V				
11+50	0.1471	0.23	Q	V				
11+55	0.1488	0.24	Q	V				
12+ 0	0.1504	0.24	Q	V				
12+ 5	0.1520	0.23	Q	V				
12+10	0.1536	0.23	Q	V				
12+15	0.1552	0.23	Q	V				
12+20	0.1568	0.24	Q	V				
12+25	0.1585	0.24	Q	V				
12+30	0.1602	0.24	Q	V				
12+35	0.1619	0.25	Q	V				
12+40	0.1636	0.25	Q	V				
12+45	0.1654	0.25	Q	V				
12+50	0.1671	0.26	Q	V				
12+55	0.1689	0.26	Q	V				
13+ 0	0.1708	0.27	Q	V				
13+ 5	0.1726	0.27	Q	V				
13+10	0.1745	0.27	Q	V				
13+15	0.1765	0.28	Q	V				
13+20	0.1784	0.28	Q	V				



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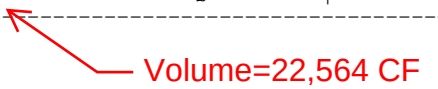
  20+ 0       0.4744      0.16  Q        |          |          |     V    |
  20+ 5       0.4755      0.16  Q        |          |          |     V    |
  20+10       0.4766      0.16  Q        |          |          |     V    |
  20+15       0.4777      0.16  Q        |          |          |     V    |
  20+20       0.4788      0.16  Q        |          |          |     V    |
  20+25       0.4799      0.16  Q        |          |          |      V   |
  20+30       0.4809      0.15  Q        |          |          |      V   |
  20+35       0.4820      0.15  Q        |          |          |      V   |
  20+40       0.4830      0.15  Q        |          |          |      V   |
  20+45       0.4840      0.15  Q        |          |          |      V   |
  20+50       0.4850      0.15  Q        |          |          |      V   |
  20+55       0.4861      0.15  Q        |          |          |      V   |
  21+ 0       0.4870      0.14  Q        |          |          |      V   |
  21+ 5       0.4880      0.14  Q        |          |          |      V   |
  21+10       0.4890      0.14  Q        |          |          |      V   |
  21+15       0.4900      0.14  Q        |          |          |      V   |
  21+20       0.4909      0.14  Q        |          |          |      V   |
  21+25       0.4919      0.14  Q        |          |          |      V   |
  21+30       0.4928      0.14  Q        |          |          |       V  |
  21+35       0.4938      0.14  Q        |          |          |       V  |
  21+40       0.4947      0.13  Q        |          |          |       V  |
  21+45       0.4956      0.13  Q        |          |          |       V  |
  21+50       0.4965      0.13  Q        |          |          |       V  |
  21+55       0.4974      0.13  Q        |          |          |       V  |
  22+ 0       0.4983      0.13  Q        |          |          |       V  |
  22+ 5       0.4992      0.13  Q        |          |          |       V  |
  22+10       0.5001      0.13  Q        |          |          |       V  |
  22+15       0.5010      0.13  Q        |          |          |       V  |
  22+20       0.5019      0.13  Q        |          |          |       V  |
  22+25       0.5027      0.13  Q        |          |          |       V  |
  22+30       0.5036      0.12  Q        |          |          |       V  |
  22+35       0.5044      0.12  Q        |          |          |       V  |
  22+40       0.5053      0.12  Q        |          |          |       V  |
  22+45       0.5061      0.12  Q        |          |          |        V |
  22+50       0.5069      0.12  Q        |          |          |        V |
  22+55       0.5078      0.12  Q        |          |          |        V |
  23+ 0       0.5086      0.12  Q        |          |          |        V |
  23+ 5       0.5094      0.12  Q        |          |          |        V |
  23+10       0.5102      0.12  Q        |          |          |        V |
  23+15       0.5110      0.12  Q        |          |          |        V |
  23+20       0.5118      0.12  Q        |          |          |        V |
  23+25       0.5126      0.12  Q        |          |          |        V |
  23+30       0.5134      0.11  Q        |          |          |        V |
  23+35       0.5142      0.11  Q        |          |          |        V |
  23+40       0.5150      0.11  Q        |          |          |        V |
  23+45       0.5157      0.11  Q        |          |          |        V |
  23+50       0.5165      0.11  Q        |          |          |        V |
  23+55       0.5173      0.11  Q        |          |          |        V |
  24+ 0       0.5180      0.11  Q        |          |          |        V |
-------------------------------------------------------------------------
```



DMA -3

U n i t H y d r o g r a p h A n a l y s i s

Study date 05/07/21

++

San Bernardino County Synthetic Unit Hydrology Method
Manual date - August 1986

Program License Serial Number 6310

20-523 BEAR VALLEY CONNECTION
PROPOSED CONDITION, DMA-3

Storm Event Year = 10

Antecedent Moisture Condition = 1

English (in-lb) Input Units Used

English Rainfall Data (Inches) Input Values Used

English Units used in output format

Area averaged rainfall intensity isohyetal data:

Sub-Area (Ac.)	Duration (hours)	Isohyetal (In)
Rainfall data for year 10		
3.40	1	0.65
Rainfall data for year 10		
3.40	6	1.35
Rainfall data for year 10		
3.40	24	2.43

++

******** Area-averaged max loss rate, Fm ********

SCS curve No.(AMCII)	SCS curve NO.(AMC 1)	Area (Ac.)	Area Fraction	Fp(Fig C6) (In/Hr)	Ap (dec.)	Fm (In/Hr)
69.0	49.8	3.40	1.000	0.812	0.120	0.097

Area-averaged adjusted loss rate Fm (In/Hr) = 0.097

********* Area-Averaged low loss rate fraction, Yb **********

Area (Ac.)	Area Fract	SCS CN (AMC2)	SCS CN (AMC1)	S	Pervious Yield Fr
0.41	0.120	69.0	49.8	10.08	0.007
2.99	0.880	98.0	98.0	0.20	0.906

Area-averaged catchment yield fraction, Y = 0.798
Area-averaged low loss fraction, Yb = 0.202
++
Watercourse length = 300.00(Ft.)
Length from concentration point to centroid = 200.00(Ft.)
Elevation difference along watercourse = 6.00(Ft.)
Mannings friction factor along watercourse = 0.015
Watershed area = 3.40(Ac.)
Catchment Lag time = 0.014 hours
Unit interval = 5.000 minutes
Unit interval percentage of lag time = 578.7842
Hydrograph baseflow = 0.00(CFS)

Lag=0.8 x Tc; Tc=1.05 Min.
Note: 5 minute minimum

Average maximum watershed loss rate(Fm) = 0.097(In/Hr)
Average low loss rate fraction (Yb) = 0.202 (decimal)
DESERT S-Graph Selected
Computed peak 5-minute rainfall = 0.307(In)
Computed peak 30-minute rainfall = 0.525(In)
Specified peak 1-hour rainfall = 0.646(In)
Computed peak 3-hour rainfall = 1.015(In)
Specified peak 6-hour rainfall = 1.350(In)
Specified peak 24-hour rainfall = 2.430(In)

Rainfall depth area reduction factors:
Using a total area of 3.40(Ac.) (Ref: fig. E-4)

5-minute factor = 1.000 Adjusted rainfall = 0.306(In)
30-minute factor = 1.000 Adjusted rainfall = 0.525(In)
1-hour factor = 1.000 Adjusted rainfall = 0.646(In)
3-hour factor = 1.000 Adjusted rainfall = 1.015(In)
6-hour factor = 1.000 Adjusted rainfall = 1.350(In)
24-hour factor = 1.000 Adjusted rainfall = 2.430(In)

U n i t H y d r o g r a p h

Interval Number	'S' Graph Mean values	Unit Hydrograph ((CFS))
(K = 41.12 (CFS))		
1	74.686	30.710
2	100.000	10.409

Peak Unit Number	Adjusted mass rainfall (In)	Unit rainfall (In)
1	0.3065	0.3065
2	0.3773	0.0708
3	0.4261	0.0488
4	0.4645	0.0384
5	0.4967	0.0322
6	0.5246	0.0279
7	0.5495	0.0248
8	0.5719	0.0225
9	0.5925	0.0206
10	0.6115	0.0190
11	0.6293	0.0177
12	0.6459	0.0166
13	0.6675	0.0216
14	0.6882	0.0207
15	0.7080	0.0198
16	0.7271	0.0191
17	0.7454	0.0184
18	0.7632	0.0177
19	0.7803	0.0172
20	0.7970	0.0166
21	0.8131	0.0162
22	0.8289	0.0157
23	0.8442	0.0153
24	0.8591	0.0149
25	0.8736	0.0146
26	0.8878	0.0142
27	0.9017	0.0139
28	0.9153	0.0136
29	0.9287	0.0133
30	0.9417	0.0130
31	0.9545	0.0128
32	0.9670	0.0126
33	0.9794	0.0123
34	0.9915	0.0121
35	1.0034	0.0119
36	1.0151	0.0117
37	1.0266	0.0115
38	1.0379	0.0113
39	1.0490	0.0112
40	1.0600	0.0110
41	1.0708	0.0108
42	1.0815	0.0107
43	1.0920	0.0105
44	1.1024	0.0104
45	1.1127	0.0102

46	1.1228	0.0101
47	1.1327	0.0100
48	1.1426	0.0099
49	1.1523	0.0097
50	1.1619	0.0096
51	1.1714	0.0095
52	1.1808	0.0094
53	1.1901	0.0093
54	1.1993	0.0092
55	1.2084	0.0091
56	1.2174	0.0090
57	1.2263	0.0089
58	1.2351	0.0088
59	1.2438	0.0087
60	1.2524	0.0086
61	1.2610	0.0085
62	1.2694	0.0085
63	1.2778	0.0084
64	1.2861	0.0083
65	1.2944	0.0082
66	1.3025	0.0082
67	1.3106	0.0081
68	1.3186	0.0080
69	1.3266	0.0079
70	1.3344	0.0079
71	1.3422	0.0078
72	1.3500	0.0077
73	1.3579	0.0079
74	1.3658	0.0079
75	1.3736	0.0078
76	1.3813	0.0077
77	1.3890	0.0077
78	1.3966	0.0076
79	1.4042	0.0076
80	1.4117	0.0075
81	1.4191	0.0075
82	1.4265	0.0074
83	1.4339	0.0074
84	1.4412	0.0073
85	1.4484	0.0072
86	1.4556	0.0072
87	1.4628	0.0072
88	1.4699	0.0071
89	1.4769	0.0071
90	1.4840	0.0070
91	1.4909	0.0070
92	1.4978	0.0069
93	1.5047	0.0069
94	1.5116	0.0068
95	1.5184	0.0068
96	1.5251	0.0068
97	1.5318	0.0067
98	1.5385	0.0067
99	1.5451	0.0066
100	1.5517	0.0066
101	1.5583	0.0066
102	1.5648	0.0065
103	1.5713	0.0065
104	1.5778	0.0065
105	1.5842	0.0064
106	1.5906	0.0064
107	1.5969	0.0063
108	1.6032	0.0063
109	1.6095	0.0063
110	1.6157	0.0062
111	1.6220	0.0062
112	1.6281	0.0062
113	1.6343	0.0061
114	1.6404	0.0061
115	1.6465	0.0061
116	1.6525	0.0061
117	1.6586	0.0060
118	1.6646	0.0060
119	1.6705	0.0060
120	1.6765	0.0059
121	1.6824	0.0059
122	1.6883	0.0059
123	1.6941	0.0059
124	1.6999	0.0058

125	1.7057	0.0058
126	1.7115	0.0058
127	1.7173	0.0057
128	1.7230	0.0057
129	1.7287	0.0057
130	1.7343	0.0057
131	1.7400	0.0056
132	1.7456	0.0056
133	1.7512	0.0056
134	1.7568	0.0056
135	1.7623	0.0055
136	1.7678	0.0055
137	1.7733	0.0055
138	1.7788	0.0055
139	1.7843	0.0055
140	1.7897	0.0054
141	1.7951	0.0054
142	1.8005	0.0054
143	1.8059	0.0054
144	1.8112	0.0053
145	1.8165	0.0053
146	1.8218	0.0053
147	1.8271	0.0053
148	1.8324	0.0053
149	1.8376	0.0052
150	1.8428	0.0052
151	1.8480	0.0052
152	1.8532	0.0052
153	1.8584	0.0052
154	1.8635	0.0051
155	1.8686	0.0051
156	1.8737	0.0051
157	1.8788	0.0051
158	1.8839	0.0051
159	1.8889	0.0050
160	1.8939	0.0050
161	1.8990	0.0050
162	1.9040	0.0050
163	1.9089	0.0050
164	1.9139	0.0050
165	1.9188	0.0049
166	1.9237	0.0049
167	1.9286	0.0049
168	1.9335	0.0049
169	1.9384	0.0049
170	1.9433	0.0049
171	1.9481	0.0048
172	1.9529	0.0048
173	1.9577	0.0048
174	1.9625	0.0048
175	1.9673	0.0048
176	1.9721	0.0048
177	1.9768	0.0047
178	1.9815	0.0047
179	1.9862	0.0047
180	1.9909	0.0047
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195	2.0597	0.0045
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209	2.1211	0.0043
210	2.1254	0.0043
211	2.1297	0.0043
212	2.1340	0.0043
213	2.1382	0.0043
214	2.1425	0.0043
215	2.1467	0.0042
216	2.1509	0.0042
217	2.1552	0.0042
218	2.1594	0.0042
219	2.1636	0.0042
220	2.1677	0.0042
221	2.1719	0.0042
222	2.1761	0.0042
223	2.1802	0.0042
224	2.1844	0.0041
225	2.1885	0.0041
226	2.1926	0.0041
227	2.1967	0.0041
228	2.2008	0.0041
229	2.2049	0.0041
230	2.2090	0.0041
231	2.2131	0.0041
232	2.2171	0.0041
233	2.2212	0.0040
234	2.2252	0.0040
235	2.2292	0.0040
236	2.2332	0.0040
237	2.2373	0.0040
238	2.2413	0.0040
239	2.2452	0.0040
240	2.2492	0.0040
241	2.2532	0.0040
242	2.2571	0.0040
243	2.2611	0.0039
244	2.2650	0.0039
245	2.2690	0.0039
246	2.2729	0.0039
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248	2.2807	0.0039
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261	2.3307	0.0038
262	2.3344	0.0038
263	2.3382	0.0038
264	2.3420	0.0038
265	2.3457	0.0038
266	2.3495	0.0037
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269	2.3607	0.0037
270	2.3644	0.0037
271	2.3681	0.0037
272	2.3718	0.0037
273	2.3755	0.0037
274	2.3792	0.0037
275	2.3829	0.0037
276	2.3865	0.0037
277	2.3902	0.0037
278	2.3939	0.0037
279	2.3975	0.0036
280	2.4011	0.0036
281	2.4048	0.0036
282	2.4084	0.0036

283	2.4120	0.0036
284	2.4156	0.0036
285	2.4192	0.0036
286	2.4228	0.0036
287	2.4264	0.0036
288	2.4300	0.0036

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0036	0.0007	0.0029
2	0.0036	0.0007	0.0029
3	0.0036	0.0007	0.0029
4	0.0036	0.0007	0.0029
5	0.0036	0.0007	0.0029
6	0.0036	0.0007	0.0029
7	0.0036	0.0007	0.0029
8	0.0037	0.0007	0.0029
9	0.0037	0.0007	0.0029
10	0.0037	0.0007	0.0029
11	0.0037	0.0007	0.0029
12	0.0037	0.0007	0.0030
13	0.0037	0.0008	0.0030
14	0.0037	0.0008	0.0030
15	0.0037	0.0008	0.0030
16	0.0037	0.0008	0.0030
17	0.0038	0.0008	0.0030
18	0.0038	0.0008	0.0030
19	0.0038	0.0008	0.0030
20	0.0038	0.0008	0.0030
21	0.0038	0.0008	0.0030
22	0.0038	0.0008	0.0031
23	0.0038	0.0008	0.0031
24	0.0039	0.0008	0.0031
25	0.0039	0.0008	0.0031
26	0.0039	0.0008	0.0031
27	0.0039	0.0008	0.0031
28	0.0039	0.0008	0.0031
29	0.0039	0.0008	0.0031
30	0.0039	0.0008	0.0031
31	0.0039	0.0008	0.0032
32	0.0040	0.0008	0.0032
33	0.0040	0.0008	0.0032
34	0.0040	0.0008	0.0032
35	0.0040	0.0008	0.0032
36	0.0040	0.0008	0.0032
37	0.0040	0.0008	0.0032
38	0.0040	0.0008	0.0032
39	0.0041	0.0008	0.0032
40	0.0041	0.0008	0.0033
41	0.0041	0.0008	0.0033
42	0.0041	0.0008	0.0033
43	0.0041	0.0008	0.0033
44	0.0041	0.0008	0.0033
45	0.0042	0.0008	0.0033
46	0.0042	0.0008	0.0033
47	0.0042	0.0008	0.0033
48	0.0042	0.0008	0.0034
49	0.0042	0.0009	0.0034
50	0.0042	0.0009	0.0034
51	0.0043	0.0009	0.0034
52	0.0043	0.0009	0.0034
53	0.0043	0.0009	0.0034
54	0.0043	0.0009	0.0034
55	0.0043	0.0009	0.0035
56	0.0043	0.0009	0.0035
57	0.0044	0.0009	0.0035
58	0.0044	0.0009	0.0035
59	0.0044	0.0009	0.0035
60	0.0044	0.0009	0.0035
61	0.0044	0.0009	0.0035
62	0.0045	0.0009	0.0036
63	0.0045	0.0009	0.0036
64	0.0045	0.0009	0.0036
65	0.0045	0.0009	0.0036
66	0.0045	0.0009	0.0036
67	0.0046	0.0009	0.0036
68	0.0046	0.0009	0.0037

69	0.0046	0.0009	0.0037
70	0.0046	0.0009	0.0037
71	0.0047	0.0009	0.0037
72	0.0047	0.0009	0.0037
73	0.0047	0.0009	0.0037
74	0.0047	0.0010	0.0038
75	0.0047	0.0010	0.0038
76	0.0048	0.0010	0.0038
77	0.0048	0.0010	0.0038
78	0.0048	0.0010	0.0038
79	0.0048	0.0010	0.0039
80	0.0049	0.0010	0.0039
81	0.0049	0.0010	0.0039
82	0.0049	0.0010	0.0039
83	0.0049	0.0010	0.0039
84	0.0050	0.0010	0.0040
85	0.0050	0.0010	0.0040
86	0.0050	0.0010	0.0040
87	0.0050	0.0010	0.0040
88	0.0051	0.0010	0.0040
89	0.0051	0.0010	0.0041
90	0.0051	0.0010	0.0041
91	0.0052	0.0010	0.0041
92	0.0052	0.0010	0.0041
93	0.0052	0.0011	0.0042
94	0.0052	0.0011	0.0042
95	0.0053	0.0011	0.0042
96	0.0053	0.0011	0.0042
97	0.0053	0.0011	0.0043
98	0.0054	0.0011	0.0043
99	0.0054	0.0011	0.0043
100	0.0054	0.0011	0.0043
101	0.0055	0.0011	0.0044
102	0.0055	0.0011	0.0044
103	0.0055	0.0011	0.0044
104	0.0056	0.0011	0.0044
105	0.0056	0.0011	0.0045
106	0.0056	0.0011	0.0045
107	0.0057	0.0012	0.0045
108	0.0057	0.0012	0.0046
109	0.0058	0.0012	0.0046
110	0.0058	0.0012	0.0046
111	0.0059	0.0012	0.0047
112	0.0059	0.0012	0.0047
113	0.0059	0.0012	0.0047
114	0.0060	0.0012	0.0048
115	0.0060	0.0012	0.0048
116	0.0061	0.0012	0.0048
117	0.0061	0.0012	0.0049
118	0.0061	0.0012	0.0049
119	0.0062	0.0013	0.0050
120	0.0062	0.0013	0.0050
121	0.0063	0.0013	0.0050
122	0.0063	0.0013	0.0051
123	0.0064	0.0013	0.0051
124	0.0065	0.0013	0.0051
125	0.0065	0.0013	0.0052
126	0.0066	0.0013	0.0052
127	0.0066	0.0013	0.0053
128	0.0067	0.0013	0.0053
129	0.0068	0.0014	0.0054
130	0.0068	0.0014	0.0054
131	0.0069	0.0014	0.0055
132	0.0069	0.0014	0.0055
133	0.0070	0.0014	0.0056
134	0.0071	0.0014	0.0056
135	0.0072	0.0014	0.0057
136	0.0072	0.0015	0.0057
137	0.0073	0.0015	0.0058
138	0.0074	0.0015	0.0059
139	0.0075	0.0015	0.0059
140	0.0075	0.0015	0.0060
141	0.0076	0.0015	0.0061
142	0.0077	0.0016	0.0061
143	0.0078	0.0016	0.0062
144	0.0079	0.0016	0.0063
145	0.0077	0.0016	0.0062
146	0.0078	0.0016	0.0062
147	0.0079	0.0016	0.0063

148	0.0080	0.0016	0.0064
149	0.0082	0.0016	0.0065
150	0.0082	0.0017	0.0066
151	0.0084	0.0017	0.0067
152	0.0085	0.0017	0.0068
153	0.0086	0.0017	0.0069
154	0.0087	0.0018	0.0070
155	0.0089	0.0018	0.0071
156	0.0090	0.0018	0.0072
157	0.0092	0.0019	0.0073
158	0.0093	0.0019	0.0074
159	0.0095	0.0019	0.0076
160	0.0096	0.0019	0.0077
161	0.0099	0.0020	0.0079
162	0.0100	0.0020	0.0080
163	0.0102	0.0021	0.0082
164	0.0104	0.0021	0.0083
165	0.0107	0.0022	0.0085
166	0.0108	0.0022	0.0086
167	0.0112	0.0023	0.0089
168	0.0113	0.0023	0.0090
169	0.0117	0.0024	0.0093
170	0.0119	0.0024	0.0095
171	0.0123	0.0025	0.0098
172	0.0126	0.0025	0.0100
173	0.0130	0.0026	0.0104
174	0.0133	0.0027	0.0106
175	0.0139	0.0028	0.0111
176	0.0142	0.0029	0.0113
177	0.0149	0.0030	0.0119
178	0.0153	0.0031	0.0122
179	0.0162	0.0033	0.0129
180	0.0166	0.0034	0.0133
181	0.0177	0.0036	0.0142
182	0.0184	0.0037	0.0147
183	0.0198	0.0040	0.0158
184	0.0207	0.0042	0.0165
185	0.0166	0.0034	0.0133
186	0.0177	0.0036	0.0142
187	0.0206	0.0042	0.0164
188	0.0225	0.0045	0.0179
189	0.0279	0.0056	0.0223
190	0.0322	0.0065	0.0257
191	0.0488	0.0081	0.0407
192	0.0708	0.0081	0.0627
193	0.3065	0.0081	0.2984
194	0.0384	0.0078	0.0306
195	0.0248	0.0050	0.0198
196	0.0190	0.0038	0.0152
197	0.0216	0.0044	0.0173
198	0.0191	0.0039	0.0152
199	0.0172	0.0035	0.0137
200	0.0157	0.0032	0.0125
201	0.0146	0.0029	0.0116
202	0.0136	0.0027	0.0108
203	0.0128	0.0026	0.0102
204	0.0121	0.0024	0.0097
205	0.0115	0.0023	0.0092
206	0.0110	0.0022	0.0088
207	0.0105	0.0021	0.0084
208	0.0101	0.0020	0.0081
209	0.0097	0.0020	0.0078
210	0.0094	0.0019	0.0075
211	0.0091	0.0018	0.0073
212	0.0088	0.0018	0.0070
213	0.0085	0.0017	0.0068
214	0.0083	0.0017	0.0066
215	0.0081	0.0016	0.0064
216	0.0079	0.0016	0.0063
217	0.0079	0.0016	0.0063
218	0.0077	0.0016	0.0062
219	0.0076	0.0015	0.0060
220	0.0074	0.0015	0.0059
221	0.0072	0.0015	0.0058
222	0.0071	0.0014	0.0057
223	0.0070	0.0014	0.0056
224	0.0068	0.0014	0.0055
225	0.0067	0.0014	0.0054
226	0.0066	0.0013	0.0053

227	0.0065	0.0013	0.0052
228	0.0064	0.0013	0.0051
229	0.0063	0.0013	0.0050
230	0.0062	0.0012	0.0049
231	0.0061	0.0012	0.0049
232	0.0060	0.0012	0.0048
233	0.0059	0.0012	0.0047
234	0.0058	0.0012	0.0046
235	0.0057	0.0012	0.0046
236	0.0057	0.0011	0.0045
237	0.0056	0.0011	0.0045
238	0.0055	0.0011	0.0044
239	0.0055	0.0011	0.0044
240	0.0054	0.0011	0.0043
241	0.0053	0.0011	0.0042
242	0.0053	0.0011	0.0042
243	0.0052	0.0011	0.0041
244	0.0051	0.0010	0.0041
245	0.0051	0.0010	0.0041
246	0.0050	0.0010	0.0040
247	0.0050	0.0010	0.0040
248	0.0049	0.0010	0.0039
249	0.0049	0.0010	0.0039
250	0.0048	0.0010	0.0038
251	0.0048	0.0010	0.0038
252	0.0047	0.0010	0.0038
253	0.0047	0.0009	0.0037
254	0.0046	0.0009	0.0037
255	0.0046	0.0009	0.0037
256	0.0046	0.0009	0.0036
257	0.0045	0.0009	0.0036
258	0.0045	0.0009	0.0036
259	0.0044	0.0009	0.0035
260	0.0044	0.0009	0.0035
261	0.0044	0.0009	0.0035
262	0.0043	0.0009	0.0034
263	0.0043	0.0009	0.0034
264	0.0043	0.0009	0.0034
265	0.0042	0.0009	0.0034
266	0.0042	0.0008	0.0033
267	0.0042	0.0008	0.0033
268	0.0041	0.0008	0.0033
269	0.0041	0.0008	0.0033
270	0.0041	0.0008	0.0032
271	0.0040	0.0008	0.0032
272	0.0040	0.0008	0.0032
273	0.0040	0.0008	0.0032
274	0.0039	0.0008	0.0031
275	0.0039	0.0008	0.0031
276	0.0039	0.0008	0.0031
277	0.0039	0.0008	0.0031
278	0.0038	0.0008	0.0031
279	0.0038	0.0008	0.0030
280	0.0038	0.0008	0.0030
281	0.0038	0.0008	0.0030
282	0.0037	0.0008	0.0030
283	0.0037	0.0007	0.0030
284	0.0037	0.0007	0.0029
285	0.0037	0.0007	0.0029
286	0.0036	0.0007	0.0029
287	0.0036	0.0007	0.0029
288	0.0036	0.0007	0.0029

Total soil rain loss = 0.43(In)
Total effective rainfall = 2.00(In)
Peak flow rate in flood hydrograph = 9.82(CFS)

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24 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	2.5	5.0	7.5	10.0
0+ 5	0.0006	0.09	Q				
0+10	0.0014	0.12	Q				

0+15	0.0022	0.12	Q	|	|	|	|
0+20	0.0030	0.12	Q	|	|	|	|
0+25	0.0039	0.12	Q	|	|	|	|
0+30	0.0047	0.12	Q	|	|	|	|
0+35	0.0055	0.12	Q	|	|	|	|
0+40	0.0063	0.12	Q	|	|	|	|
0+45	0.0072	0.12	Q	|	|	|	|
0+50	0.0080	0.12	Q	|	|	|	|
0+55	0.0088	0.12	Q	|	|	|	|
1+ 0	0.0097	0.12	Q	|	|	|	|
1+ 5	0.0105	0.12	Q	|	|	|	|
1+10	0.0113	0.12	Q	|	|	|	|
1+15	0.0122	0.12	Q	|	|	|	|
1+20	0.0130	0.12	Q	|	|	|	|
1+25	0.0139	0.12	Q	|	|	|	|
1+30	0.0147	0.12	QV	|	|	|	|
1+35	0.0156	0.12	QV	|	|	|	|
1+40	0.0164	0.12	QV	|	|	|	|
1+45	0.0173	0.13	QV	|	|	|	|
1+50	0.0182	0.13	QV	|	|	|	|
1+55	0.0190	0.13	QV	|	|	|	|
2+ 0	0.0199	0.13	QV	|	|	|	|
2+ 5	0.0208	0.13	QV	|	|	|	|
2+10	0.0217	0.13	QV	|	|	|	|
2+15	0.0225	0.13	QV	|	|	|	|
2+20	0.0234	0.13	QV	|	|	|	|
2+25	0.0243	0.13	QV	|	|	|	|
2+30	0.0252	0.13	QV	|	|	|	|
2+35	0.0261	0.13	QV	|	|	|	|
2+40	0.0270	0.13	QV	|	|	|	|
2+45	0.0279	0.13	QV	|	|	|	|
2+50	0.0288	0.13	Q V	|	|	|	|
2+55	0.0297	0.13	Q V	|	|	|	|
3+ 0	0.0306	0.13	Q V	|	|	|	|
3+ 5	0.0315	0.13	Q V	|	|	|	|
3+10	0.0324	0.13	Q V	|	|	|	|
3+15	0.0333	0.13	Q V	|	|	|	|
3+20	0.0342	0.13	Q V	|	|	|	|
3+25	0.0352	0.13	Q V	|	|	|	|
3+30	0.0361	0.13	Q V	|	|	|	|
3+35	0.0370	0.14	Q V	|	|	|	|
3+40	0.0380	0.14	Q V	|	|	|	|
3+45	0.0389	0.14	Q V	|	|	|	|
3+50	0.0399	0.14	Q V	|	|	|	|
3+55	0.0408	0.14	Q V	|	|	|	|
4+ 0	0.0417	0.14	Q V	|	|	|	|
4+ 5	0.0427	0.14	Q V	|	|	|	|
4+10	0.0437	0.14	Q V	|	|	|	|
4+15	0.0446	0.14	Q V	|	|	|	|
4+20	0.0456	0.14	Q V	|	|	|	|
4+25	0.0466	0.14	Q V	|	|	|	|
4+30	0.0475	0.14	Q V	|	|	|	|
4+35	0.0485	0.14	Q V	|	|	|	|
4+40	0.0495	0.14	Q V	|	|	|	|
4+45	0.0505	0.14	Q V	|	|	|	|
4+50	0.0515	0.14	Q V	|	|	|	|
4+55	0.0525	0.14	Q V	|	|	|	|
5+ 0	0.0535	0.14	Q V	|	|	|	|
5+ 5	0.0545	0.15	Q V	|	|	|	|
5+10	0.0555	0.15	Q V	|	|	|	|
5+15	0.0565	0.15	Q V	|	|	|	|
5+20	0.0575	0.15	Q V	|	|	|	|
5+25	0.0585	0.15	Q V	|	|	|	|
5+30	0.0595	0.15	Q V	|	|	|	|
5+35	0.0606	0.15	Q V	|	|	|	|
5+40	0.0616	0.15	Q V	|	|	|	|
5+45	0.0626	0.15	Q V	|	|	|	|
5+50	0.0637	0.15	Q V	|	|	|	|
5+55	0.0647	0.15	Q V	|	|	|	|
6+ 0	0.0658	0.15	Q V	|	|	|	|
6+ 5	0.0668	0.15	Q V	|	|	|	|
6+10	0.0679	0.15	Q V	|	|	|	|
6+15	0.0690	0.16	Q V	|	|	|	|
6+20	0.0701	0.16	Q V	|	|	|	|
6+25	0.0711	0.16	Q V	|	|	|	|
6+30	0.0722	0.16	Q V	|	|	|	|
6+35	0.0733	0.16	Q V	|	|	|	|
6+40	0.0744	0.16	Q V	|	|	|	|
6+45	0.0755	0.16	Q V	|	|	|	|

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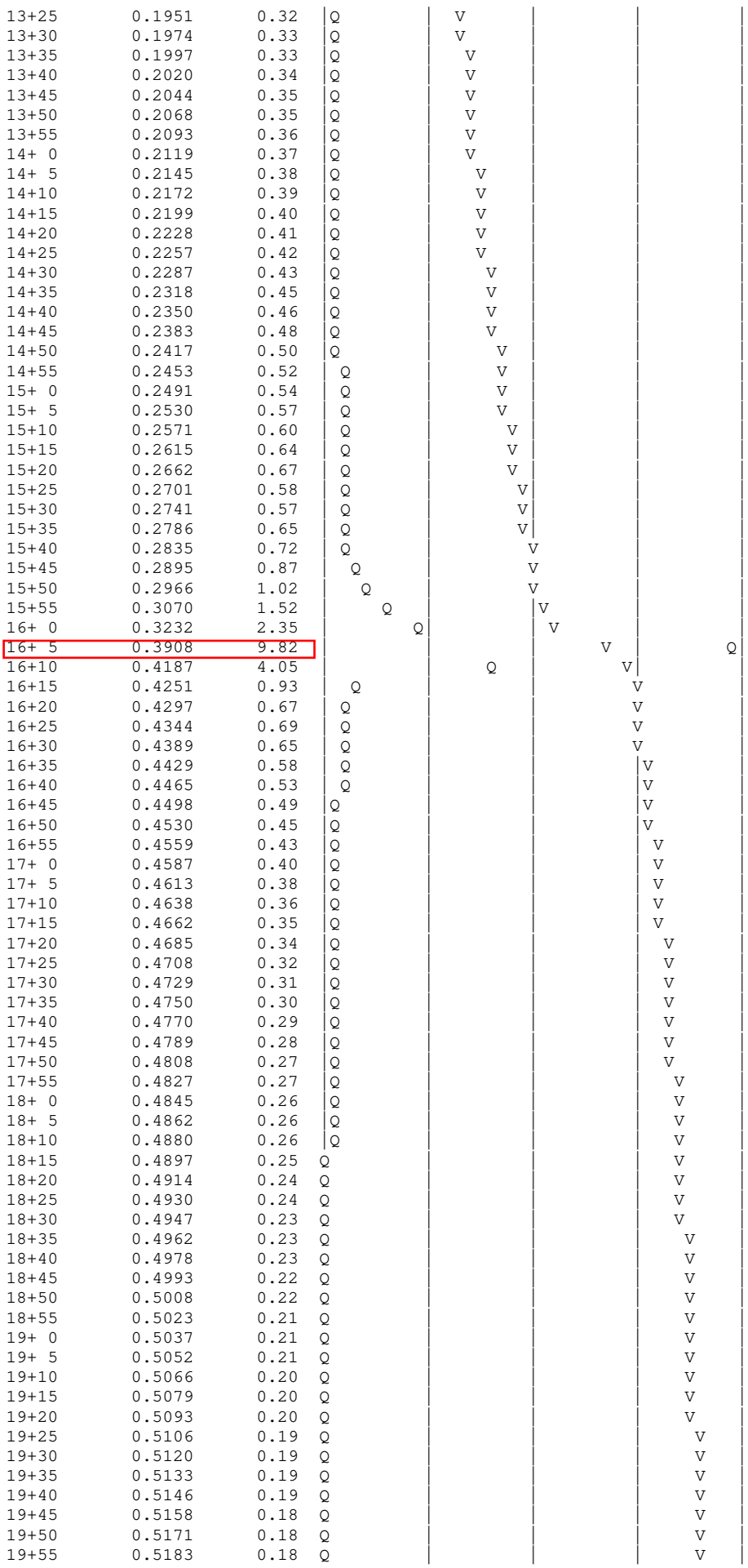
 6+50       0.0766      0.16  Q    V    |          |          |          |
 6+55       0.0777      0.16  Q    V    |          |          |          |
 7+ 0       0.0789      0.16  Q    V    |          |          |          |
 7+ 5       0.0800      0.16  Q    V    |          |          |          |
 7+10       0.0811      0.16  Q    V    |          |          |          |
 7+15       0.0823      0.17  Q    V    |          |          |          |
 7+20       0.0834      0.17  Q    V    |          |          |          |
 7+25       0.0845      0.17  Q    V    |          |          |          |
 7+30       0.0857      0.17  Q     V   |          |          |          |
 7+35       0.0869      0.17  Q     V   |          |          |          |
 7+40       0.0880      0.17  Q     V   |          |          |          |
 7+45       0.0892      0.17  Q     V   |          |          |          |
 7+50       0.0904      0.17  Q     V   |          |          |          |
 7+55       0.0916      0.17  Q     V   |          |          |          |
 8+ 0       0.0928      0.17  Q     V   |          |          |          |
 8+ 5       0.0940      0.17  Q     V   |          |          |          |
 8+10       0.0952      0.18  Q     V   |          |          |          |
 8+15       0.0964      0.18  Q     V   |          |          |          |
 8+20       0.0976      0.18  Q     V   |          |          |          |
 8+25       0.0989      0.18  Q     V   |          |          |          |
 8+30       0.1001      0.18  Q      V  |          |          |          |
 8+35       0.1014      0.18  Q      V  |          |          |          |
 8+40       0.1026      0.18  Q      V  |          |          |          |
 8+45       0.1039      0.18  Q      V  |          |          |          |
 8+50       0.1052      0.18  Q      V  |          |          |          |
 8+55       0.1065      0.19  Q      V  |          |          |          |
 9+ 0       0.1077      0.19  Q      V  |          |          |          |
 9+ 5       0.1090      0.19  Q      V  |          |          |          |
 9+10       0.1104      0.19  Q      V  |          |          |          |
 9+15       0.1117      0.19  Q      V  |          |          |          |
 9+20       0.1130      0.19  Q      V  |          |          |          |
 9+25       0.1143      0.19  Q       V |          |          |          |
 9+30       0.1157      0.20  Q       V |          |          |          |
 9+35       0.1170      0.20  Q       V |          |          |          |
 9+40       0.1184      0.20  Q       V |          |          |          |
 9+45       0.1198      0.20  Q       V |          |          |          |
 9+50       0.1212      0.20  Q       V |          |          |          |
 9+55       0.1226      0.20  Q       V |          |          |          |
10+ 0       0.1240      0.20  Q       V |          |          |          |
10+ 5       0.1254      0.21  Q       V |          |          |          |
10+10       0.1268      0.21  Q       V |          |          |          |
10+15       0.1283      0.21  Q        V|          |          |          |
10+20       0.1297      0.21  Q        V|          |          |          |
10+25       0.1312      0.21  Q        V|          |          |          |
10+30       0.1327      0.21  Q        V|          |          |          |
10+35       0.1342      0.22  Q        V|          |          |          |
10+40       0.1357      0.22  Q        V|          |          |          |
10+45       0.1372      0.22  Q        V|          |          |          |
10+50       0.1387      0.22  Q        V|          |          |          |
10+55       0.1403      0.23  Q        V|          |          |          |
11+ 0       0.1419      0.23  Q         V          |          |          |
11+ 5       0.1434      0.23  Q         V          |          |          |
11+10       0.1450      0.23  Q         V          |          |          |
11+15       0.1466      0.23  Q         V          |          |          |
11+20       0.1483      0.24  Q         V          |          |          |
11+25       0.1499      0.24  Q         V          |          |          |
11+30       0.1516      0.24  Q         V          |          |          |
11+35       0.1532      0.24  Q         V          |          |          |
11+40       0.1549      0.25  Q         V          |          |          |
11+45       0.1567      0.25  Q         |V         |          |          |
11+50       0.1584      0.25  |Q        |V         |          |          |
11+55       0.1601      0.25  |Q        |V         |          |          |
12+ 0       0.1619      0.26  |Q        |V         |          |          |
12+ 5       0.1637      0.26  |Q        |V         |          |          |
12+10       0.1654      0.26  |Q        |V         |          |          |
12+15       0.1672      0.26  |Q        |V         |          |          |
12+20       0.1690      0.26  |Q        |V         |          |          |
12+25       0.1709      0.27  |Q        | V        |          |          |
12+30       0.1727      0.27  |Q        | V        |          |          |
12+35       0.1746      0.27  |Q        | V        |          |          |
12+40       0.1765      0.28  |Q        | V        |          |          |
12+45       0.1785      0.28  |Q        | V        |          |          |
12+50       0.1804      0.29  |Q        | V        |          |          |
12+55       0.1824      0.29  |Q        | V        |          |          |
13+ 0       0.1844      0.29  |Q        |  V       |          |          |
13+ 5       0.1865      0.30  |Q        |  V       |          |          |
13+10       0.1886      0.30  |Q        |  V       |          |          |
13+15       0.1907      0.31  |Q        |  V       |          |          |
13+20       0.1929      0.31  |Q        |  V       |          |          |
```



```
  20+ 0       0.5195      0.18  Q        |          |          |     V    |
  20+ 5       0.5207      0.18  Q        |          |          |     V    |
  20+10       0.5219      0.17  Q        |          |          |     V    |
  20+15       0.5231      0.17  Q        |          |          |     V    |
  20+20       0.5243      0.17  Q        |          |          |      V   |
  20+25       0.5254      0.17  Q        |          |          |      V   |
  20+30       0.5266      0.17  Q        |          |          |      V   |
  20+35       0.5277      0.16  Q        |          |          |      V   |
  20+40       0.5288      0.16  Q        |          |          |      V   |
  20+45       0.5299      0.16  Q        |          |          |      V   |
  20+50       0.5310      0.16  Q        |          |          |      V   |
  20+55       0.5321      0.16  Q        |          |          |      V   |
  21+ 0       0.5332      0.16  Q        |          |          |      V   |
  21+ 5       0.5342      0.15  Q        |          |          |      V   |
  21+10       0.5353      0.15  Q        |          |          |      V   |
  21+15       0.5363      0.15  Q        |          |          |      V   |
  21+20       0.5373      0.15  Q        |          |          |      V   |
  21+25       0.5384      0.15  Q        |          |          |       V  |
  21+30       0.5394      0.15  Q        |          |          |       V  |
  21+35       0.5404      0.15  Q        |          |          |       V  |
  21+40       0.5414      0.14  Q        |          |          |       V  |
  21+45       0.5424      0.14  Q        |          |          |       V  |
  21+50       0.5433      0.14  Q        |          |          |       V  |
  21+55       0.5443      0.14  Q        |          |          |       V  |
  22+ 0       0.5453      0.14  Q        |          |          |       V  |
  22+ 5       0.5462      0.14  Q        |          |          |       V  |
  22+10       0.5472      0.14  Q        |          |          |       V  |
  22+15       0.5481      0.14  Q        |          |          |       V  |
  22+20       0.5490      0.14  Q        |          |          |       V  |
  22+25       0.5500      0.13  Q        |          |          |       V  |
  22+30       0.5509      0.13  Q        |          |          |       V  |
  22+35       0.5518      0.13  Q        |          |          |       V  |
  22+40       0.5527      0.13  Q        |          |          |        V |
  22+45       0.5536      0.13  Q        |          |          |        V |
  22+50       0.5545      0.13  Q        |          |          |        V |
  22+55       0.5554      0.13  Q        |          |          |        V |
  23+ 0       0.5563      0.13  Q        |          |          |        V |
  23+ 5       0.5571      0.13  Q        |          |          |        V |
  23+10       0.5580      0.13  Q        |          |          |        V |
  23+15       0.5589      0.13  Q        |          |          |        V |
  23+20       0.5597      0.12  Q        |          |          |        V |
  23+25       0.5606      0.12  Q        |          |          |        V |
  23+30       0.5614      0.12  Q        |          |          |        V |
  23+35       0.5623      0.12  Q        |          |          |        V |
  23+40       0.5631      0.12  Q        |          |          |        V |
  23+45       0.5639      0.12  Q        |          |          |        V |
  23+50       0.5647      0.12  Q        |          |          |        V |
  23+55       0.5656      0.12  Q        |          |          |        V |
  24+ 0       0.5664      0.12  Q        |          |          |        V |
-------------------------------------------------------------------------
```

Volume=24,672 CF

DMA -4

```
       U n i t   H y d r o g r a p h   A n a l y s i s

       Copyright (c) CIVILCADD/CIVILDESIGN, 1989 - 2012, Version 7.1

              Study date  05/07/21

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
------------------------------------------------------------------------------

San Bernardino County Synthetic Unit Hydrology Method
              Manual date - August 1986


Program License Serial Number 6310

------------------------------------------------------------------------
20-523 BEAR VALLEY CONNECTION PROJECT
DMA-D PROPOSED CONDITION


------------------------------------------------------------------------

       Storm Event Year = 10

       Antecedent Moisture Condition = 1

 English (in-lb) Input Units Used

 English Rainfall Data (Inches) Input Values Used

 English Units used in output format



Area averaged rainfall intensity isohyetal data:
       Sub-Area        Duration        Isohyetal
       (Ac.)            (hours)         (In)
Rainfall data for year 10
           18.04            1           0.65
------------------------------------------------------------------------
Rainfall data for year 10
           18.04            6           1.35
------------------------------------------------------------------------
Rainfall data for year 10
           18.04           24           2.43
------------------------------------------------------------------------
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

******** Area-averaged max loss rate, Fm ********


SCS curve  SCS curve     Area     Area     Fp(Fig C6)    Ap      Fm
No.(AMCII) NO.(AMC 1)    (Ac.)    Fraction     (In/Hr)  (dec.)   (In/Hr)
 69.0       49.8         18.04      1.000     0.812    0.200    0.162

Area-averaged adjusted loss rate Fm (In/Hr) =  0.162

********* Area-Averaged low loss rate fraction, Yb **********

Area        Area          SCS CN    SCS CN      S     Pervious
 (Ac.)       Fract         (AMC2)    (AMC1)          Yield Fr
     3.61    0.200         69.0      49.8      10.08     0.007
    14.43    0.800         98.0      98.0       0.20     0.906

Area-averaged catchment yield fraction, Y =  0.726
Area-averaged low loss fraction, Yb =  0.274
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Watercourse length =    2050.00(Ft.)
Length from concentration point to centroid =    1400.00(Ft.)
Elevation difference along watercourse =      19.00(Ft.)
Mannings friction factor along watercourse =  0.015
Watershed area =      18.04(Ac.)
Catchment Lag time =   0.072 hours
Unit interval =   5.000 minutes
Unit interval percentage of lag time = 115.0147
Hydrograph baseflow =     0.00(CFS)
```

Lag=0.8 x Tc; Tc=5.40 Min.

Average maximum watershed loss rate(Fm) = 0.162(In/Hr)
Average low loss rate fraction (Yb) = 0.274 (decimal)
DESERT S-Graph Selected
Computed peak 5-minute rainfall = 0.307(In)
Computed peak 30-minute rainfall = 0.525(In)
Specified peak 1-hour rainfall = 0.646(In)
Computed peak 3-hour rainfall = 1.015(In)
Specified peak 6-hour rainfall = 1.350(In)
Specified peak 24-hour rainfall = 2.430(In)

Rainfall depth area reduction factors:
Using a total area of 18.04(Ac.) (Ref: fig. E-4)

5-minute factor = 0.999 Adjusted rainfall = 0.306(In)
30-minute factor = 0.999 Adjusted rainfall = 0.524(In)
1-hour factor = 0.999 Adjusted rainfall = 0.645(In)
3-hour factor = 1.000 Adjusted rainfall = 1.015(In)
6-hour factor = 1.000 Adjusted rainfall = 1.350(In)
24-hour factor = 1.000 Adjusted rainfall = 2.430(In)

U n i t H y d r o g r a p h

Interval Number	'S' Graph Mean values	Unit Hydrograph ((CFS))
	(K = 218.17 (CFS))	
1	22.020	48.042
2	72.325	109.751
3	87.358	32.797
4	93.835	14.132
5	97.139	7.207
6	98.696	3.398
7	100.000	2.844

Peak Unit Number	Adjusted mass rainfall (In)	Unit rainfall (In)
1	0.3063	0.3063
2	0.3771	0.0708
3	0.4258	0.0488
4	0.4642	0.0384
5	0.4964	0.0321
6	0.5243	0.0279
7	0.5491	0.0248
8	0.5715	0.0224
9	0.5921	0.0206
10	0.6111	0.0190
11	0.6288	0.0177
12	0.6455	0.0166
13	0.6671	0.0216
14	0.6878	0.0207
15	0.7076	0.0198
16	0.7267	0.0191
17	0.7451	0.0184
18	0.7628	0.0178
19	0.7800	0.0172
20	0.7967	0.0167
21	0.8128	0.0162
22	0.8286	0.0157
23	0.8439	0.0153
24	0.8588	0.0149
25	0.8734	0.0146
26	0.8876	0.0142
27	0.9015	0.0139
28	0.9151	0.0136
29	0.9285	0.0133
30	0.9415	0.0131
31	0.9543	0.0128
32	0.9669	0.0126
33	0.9792	0.0123
34	0.9914	0.0121
35	1.0033	0.0119
36	1.0150	0.0117
37	1.0265	0.0115
38	1.0378	0.0113
39	1.0490	0.0112
40	1.0599	0.0110

41	1.0708	0.0108
42	1.0814	0.0107
43	1.0920	0.0105
44	1.1023	0.0104
45	1.1126	0.0102
46	1.1227	0.0101
47	1.1327	0.0100
48	1.1425	0.0099
49	1.1522	0.0097
50	1.1619	0.0096
51	1.1714	0.0095
52	1.1808	0.0094
53	1.1900	0.0093
54	1.1992	0.0092
55	1.2083	0.0091
56	1.2173	0.0090
57	1.2262	0.0089
58	1.2350	0.0088
59	1.2437	0.0087
60	1.2524	0.0086
61	1.2609	0.0085
62	1.2694	0.0085
63	1.2778	0.0084
64	1.2861	0.0083
65	1.2943	0.0082
66	1.3025	0.0082
67	1.3105	0.0081
68	1.3185	0.0080
69	1.3265	0.0079
70	1.3344	0.0079
71	1.3422	0.0078
72	1.3499	0.0077
73	1.3578	0.0079
74	1.3657	0.0079
75	1.3735	0.0078
76	1.3812	0.0077
77	1.3889	0.0077
78	1.3965	0.0076
79	1.4041	0.0076
80	1.4116	0.0075
81	1.4191	0.0075
82	1.4265	0.0074
83	1.4338	0.0074
84	1.4411	0.0073
85	1.4484	0.0072
86	1.4556	0.0072
87	1.4627	0.0072
88	1.4698	0.0071
89	1.4769	0.0071
90	1.4839	0.0070
91	1.4909	0.0070
92	1.4978	0.0069
93	1.5047	0.0069
94	1.5115	0.0068
95	1.5183	0.0068
96	1.5251	0.0068
97	1.5318	0.0067
98	1.5384	0.0067
99	1.5451	0.0066
100	1.5517	0.0066
101	1.5582	0.0066
102	1.5648	0.0065
103	1.5713	0.0065
104	1.5777	0.0065
105	1.5841	0.0064
106	1.5905	0.0064
107	1.5968	0.0063
108	1.6032	0.0063
109	1.6094	0.0063
110	1.6157	0.0062
111	1.6219	0.0062
112	1.6281	0.0062
113	1.6342	0.0061
114	1.6403	0.0061
115	1.6464	0.0061
116	1.6525	0.0061
117	1.6585	0.0060
118	1.6645	0.0060
119	1.6705	0.0060

120	1.6764	0.0059
121	1.6823	0.0059
122	1.6882	0.0059
123	1.6940	0.0059
124	1.6999	0.0058
125	1.7057	0.0058
126	1.7114	0.0058
127	1.7172	0.0057
128	1.7229	0.0057
129	1.7286	0.0057
130	1.7343	0.0057
131	1.7399	0.0056
132	1.7455	0.0056
133	1.7511	0.0056
134	1.7567	0.0056
135	1.7623	0.0055
136	1.7678	0.0055
137	1.7733	0.0055
138	1.7788	0.0055
139	1.7842	0.0055
140	1.7896	0.0054
141	1.7950	0.0054
142	1.8004	0.0054
143	1.8058	0.0054
144	1.8111	0.0053
145	1.8165	0.0053
146	1.8218	0.0053
147	1.8270	0.0053
148	1.8323	0.0053
149	1.8375	0.0052
150	1.8428	0.0052
151	1.8480	0.0052
152	1.8531	0.0052
153	1.8583	0.0052
154	1.8634	0.0051
155	1.8686	0.0051
156	1.8737	0.0051
157	1.8788	0.0051
158	1.8838	0.0051
159	1.8889	0.0050
160	1.8939	0.0050
161	1.8989	0.0050
162	1.9039	0.0050
163	1.9089	0.0050
164	1.9138	0.0050
165	1.9188	0.0049
166	1.9237	0.0049
167	1.9286	0.0049
168	1.9335	0.0049
169	1.9384	0.0049
170	1.9432	0.0049
171	1.9480	0.0048
172	1.9529	0.0048
173	1.9577	0.0048
174	1.9625	0.0048
175	1.9672	0.0048
176	1.9720	0.0048
177	1.9767	0.0047
178	1.9815	0.0047
179	1.9862	0.0047
180	1.9909	0.0047
181	1.9956	0.0047
182	2.0002	0.0047
183	2.0049	0.0047
184	2.0095	0.0046
185	2.0141	0.0046
186	2.0188	0.0046
187	2.0233	0.0046
188	2.0279	0.0046
189	2.0325	0.0046
190	2.0370	0.0046
191	2.0416	0.0045
192	2.0461	0.0045
193	2.0506	0.0045
194	2.0551	0.0045
195	2.0596	0.0045
196	2.0641	0.0045
197	2.0685	0.0045
198	2.0730	0.0044

199	2.0774	0.0044
200	2.0818	0.0044
201	2.0862	0.0044
202	2.0906	0.0044
203	2.0950	0.0044
204	2.0994	0.0044
205	2.1038	0.0044
206	2.1081	0.0043
207	2.1124	0.0043
208	2.1168	0.0043
209	2.1211	0.0043
210	2.1254	0.0043
211	2.1296	0.0043
212	2.1339	0.0043
213	2.1382	0.0043
214	2.1424	0.0043
215	2.1467	0.0042
216	2.1509	0.0042
217	2.1551	0.0042
218	2.1593	0.0042
219	2.1635	0.0042
220	2.1677	0.0042
221	2.1719	0.0042
222	2.1760	0.0042
223	2.1802	0.0042
224	2.1843	0.0041
225	2.1885	0.0041
226	2.1926	0.0041
227	2.1967	0.0041
228	2.2008	0.0041
229	2.2049	0.0041
230	2.2089	0.0041
231	2.2130	0.0041
232	2.2171	0.0041
233	2.2211	0.0040
234	2.2252	0.0040
235	2.2292	0.0040
236	2.2332	0.0040
237	2.2372	0.0040
238	2.2412	0.0040
239	2.2452	0.0040
240	2.2492	0.0040
241	2.2531	0.0040
242	2.2571	0.0040
243	2.2610	0.0040
244	2.2650	0.0039
245	2.2689	0.0039
246	2.2728	0.0039
247	2.2768	0.0039
248	2.2807	0.0039
249	2.2846	0.0039
250	2.2884	0.0039
251	2.2923	0.0039
252	2.2962	0.0039
253	2.3000	0.0039
254	2.3039	0.0039
255	2.3077	0.0038
256	2.3116	0.0038
257	2.3154	0.0038
258	2.3192	0.0038
259	2.3230	0.0038
260	2.3268	0.0038
261	2.3306	0.0038
262	2.3344	0.0038
263	2.3382	0.0038
264	2.3419	0.0038
265	2.3457	0.0038
266	2.3494	0.0037
267	2.3532	0.0037
268	2.3569	0.0037
269	2.3606	0.0037
270	2.3643	0.0037
271	2.3681	0.0037
272	2.3718	0.0037
273	2.3755	0.0037
274	2.3791	0.0037
275	2.3828	0.0037
276	2.3865	0.0037
277	2.3901	0.0037

278	2.3938	0.0037
279	2.3975	0.0036
280	2.4011	0.0036
281	2.4047	0.0036
282	2.4083	0.0036
283	2.4120	0.0036
284	2.4156	0.0036
285	2.4192	0.0036
286	2.4228	0.0036
287	2.4264	0.0036
288	2.4299	0.0036

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0036	0.0010	0.0026
2	0.0036	0.0010	0.0026
3	0.0036	0.0010	0.0026
4	0.0036	0.0010	0.0026
5	0.0036	0.0010	0.0026
6	0.0036	0.0010	0.0026
7	0.0036	0.0010	0.0026
8	0.0037	0.0010	0.0027
9	0.0037	0.0010	0.0027
10	0.0037	0.0010	0.0027
11	0.0037	0.0010	0.0027
12	0.0037	0.0010	0.0027
13	0.0037	0.0010	0.0027
14	0.0037	0.0010	0.0027
15	0.0037	0.0010	0.0027
16	0.0037	0.0010	0.0027
17	0.0038	0.0010	0.0027
18	0.0038	0.0010	0.0027
19	0.0038	0.0010	0.0028
20	0.0038	0.0010	0.0028
21	0.0038	0.0010	0.0028
22	0.0038	0.0010	0.0028
23	0.0038	0.0011	0.0028
24	0.0039	0.0011	0.0028
25	0.0039	0.0011	0.0028
26	0.0039	0.0011	0.0028
27	0.0039	0.0011	0.0028
28	0.0039	0.0011	0.0028
29	0.0039	0.0011	0.0028
30	0.0039	0.0011	0.0029
31	0.0040	0.0011	0.0029
32	0.0040	0.0011	0.0029
33	0.0040	0.0011	0.0029
34	0.0040	0.0011	0.0029
35	0.0040	0.0011	0.0029
36	0.0040	0.0011	0.0029
37	0.0040	0.0011	0.0029
38	0.0040	0.0011	0.0029
39	0.0041	0.0011	0.0030
40	0.0041	0.0011	0.0030
41	0.0041	0.0011	0.0030
42	0.0041	0.0011	0.0030
43	0.0041	0.0011	0.0030
44	0.0041	0.0011	0.0030
45	0.0042	0.0011	0.0030
46	0.0042	0.0011	0.0030
47	0.0042	0.0011	0.0030
48	0.0042	0.0012	0.0031
49	0.0042	0.0012	0.0031
50	0.0042	0.0012	0.0031
51	0.0043	0.0012	0.0031
52	0.0043	0.0012	0.0031
53	0.0043	0.0012	0.0031
54	0.0043	0.0012	0.0031
55	0.0043	0.0012	0.0031
56	0.0043	0.0012	0.0032
57	0.0044	0.0012	0.0032
58	0.0044	0.0012	0.0032
59	0.0044	0.0012	0.0032
60	0.0044	0.0012	0.0032
61	0.0044	0.0012	0.0032
62	0.0045	0.0012	0.0032
63	0.0045	0.0012	0.0033

64	0.0045	0.0012	0.0033
65	0.0045	0.0012	0.0033
66	0.0045	0.0012	0.0033
67	0.0046	0.0013	0.0033
68	0.0046	0.0013	0.0033
69	0.0046	0.0013	0.0033
70	0.0046	0.0013	0.0034
71	0.0047	0.0013	0.0034
72	0.0047	0.0013	0.0034
73	0.0047	0.0013	0.0034
74	0.0047	0.0013	0.0034
75	0.0047	0.0013	0.0034
76	0.0048	0.0013	0.0035
77	0.0048	0.0013	0.0035
78	0.0048	0.0013	0.0035
79	0.0048	0.0013	0.0035
80	0.0049	0.0013	0.0035
81	0.0049	0.0013	0.0035
82	0.0049	0.0013	0.0036
83	0.0049	0.0014	0.0036
84	0.0050	0.0014	0.0036
85	0.0050	0.0014	0.0036
86	0.0050	0.0014	0.0036
87	0.0050	0.0014	0.0037
88	0.0051	0.0014	0.0037
89	0.0051	0.0014	0.0037
90	0.0051	0.0014	0.0037
91	0.0052	0.0014	0.0037
92	0.0052	0.0014	0.0038
93	0.0052	0.0014	0.0038
94	0.0052	0.0014	0.0038
95	0.0053	0.0014	0.0038
96	0.0053	0.0015	0.0038
97	0.0053	0.0015	0.0039
98	0.0054	0.0015	0.0039
99	0.0054	0.0015	0.0039
100	0.0054	0.0015	0.0039
101	0.0055	0.0015	0.0040
102	0.0055	0.0015	0.0040
103	0.0055	0.0015	0.0040
104	0.0056	0.0015	0.0040
105	0.0056	0.0015	0.0041
106	0.0056	0.0015	0.0041
107	0.0057	0.0016	0.0041
108	0.0057	0.0016	0.0042
109	0.0058	0.0016	0.0042
110	0.0058	0.0016	0.0042
111	0.0059	0.0016	0.0042
112	0.0059	0.0016	0.0043
113	0.0059	0.0016	0.0043
114	0.0060	0.0016	0.0043
115	0.0060	0.0017	0.0044
116	0.0061	0.0017	0.0044
117	0.0061	0.0017	0.0044
118	0.0061	0.0017	0.0045
119	0.0062	0.0017	0.0045
120	0.0062	0.0017	0.0045
121	0.0063	0.0017	0.0046
122	0.0063	0.0017	0.0046
123	0.0064	0.0018	0.0047
124	0.0065	0.0018	0.0047
125	0.0065	0.0018	0.0047
126	0.0066	0.0018	0.0048
127	0.0066	0.0018	0.0048
128	0.0067	0.0018	0.0048
129	0.0068	0.0019	0.0049
130	0.0068	0.0019	0.0049
131	0.0069	0.0019	0.0050
132	0.0069	0.0019	0.0050
133	0.0070	0.0019	0.0051
134	0.0071	0.0019	0.0051
135	0.0072	0.0020	0.0052
136	0.0072	0.0020	0.0052
137	0.0073	0.0020	0.0053
138	0.0074	0.0020	0.0053
139	0.0075	0.0020	0.0054
140	0.0075	0.0021	0.0055
141	0.0076	0.0021	0.0055
142	0.0077	0.0021	0.0056

143	0.0078	0.0021	0.0057
144	0.0079	0.0022	0.0057
145	0.0077	0.0021	0.0056
146	0.0078	0.0021	0.0057
147	0.0079	0.0022	0.0058
148	0.0080	0.0022	0.0058
149	0.0082	0.0022	0.0059
150	0.0082	0.0023	0.0060
151	0.0084	0.0023	0.0061
152	0.0085	0.0023	0.0061
153	0.0086	0.0024	0.0063
154	0.0087	0.0024	0.0063
155	0.0089	0.0024	0.0065
156	0.0090	0.0025	0.0065
157	0.0092	0.0025	0.0067
158	0.0093	0.0025	0.0067
159	0.0095	0.0026	0.0069
160	0.0096	0.0026	0.0070
161	0.0099	0.0027	0.0072
162	0.0100	0.0027	0.0072
163	0.0102	0.0028	0.0074
164	0.0104	0.0028	0.0075
165	0.0107	0.0029	0.0077
166	0.0108	0.0030	0.0079
167	0.0112	0.0031	0.0081
168	0.0113	0.0031	0.0082
169	0.0117	0.0032	0.0085
170	0.0119	0.0033	0.0086
171	0.0123	0.0034	0.0090
172	0.0126	0.0034	0.0091
173	0.0131	0.0036	0.0095
174	0.0133	0.0037	0.0097
175	0.0139	0.0038	0.0101
176	0.0142	0.0039	0.0103
177	0.0149	0.0041	0.0108
178	0.0153	0.0042	0.0111
179	0.0162	0.0044	0.0117
180	0.0167	0.0046	0.0121
181	0.0178	0.0049	0.0129
182	0.0184	0.0050	0.0133
183	0.0198	0.0054	0.0144
184	0.0207	0.0057	0.0150
185	0.0166	0.0046	0.0121
186	0.0177	0.0049	0.0129
187	0.0206	0.0056	0.0149
188	0.0224	0.0061	0.0163
189	0.0279	0.0076	0.0203
190	0.0321	0.0088	0.0233
191	0.0488	0.0134	0.0354
192	0.0708	0.0135	0.0573
193	0.3063	0.0135	0.2927
194	0.0384	0.0105	0.0279
195	0.0248	0.0068	0.0180
196	0.0190	0.0052	0.0138
197	0.0216	0.0059	0.0157
198	0.0191	0.0052	0.0138
199	0.0172	0.0047	0.0125
200	0.0157	0.0043	0.0114
201	0.0146	0.0040	0.0106
202	0.0136	0.0037	0.0099
203	0.0128	0.0035	0.0093
204	0.0121	0.0033	0.0088
205	0.0115	0.0032	0.0084
206	0.0110	0.0030	0.0080
207	0.0105	0.0029	0.0076
208	0.0101	0.0028	0.0073
209	0.0097	0.0027	0.0071
210	0.0094	0.0026	0.0068
211	0.0091	0.0025	0.0066
212	0.0088	0.0024	0.0064
213	0.0085	0.0023	0.0062
214	0.0083	0.0023	0.0060
215	0.0081	0.0022	0.0059
216	0.0079	0.0022	0.0057
217	0.0079	0.0022	0.0057
218	0.0077	0.0021	0.0056
219	0.0076	0.0021	0.0055
220	0.0074	0.0020	0.0054
221	0.0072	0.0020	0.0053

222	0.0071	0.0019	0.0052
223	0.0070	0.0019	0.0051
224	0.0068	0.0019	0.0050
225	0.0067	0.0018	0.0049
226	0.0066	0.0018	0.0048
227	0.0065	0.0018	0.0047
228	0.0064	0.0017	0.0046
229	0.0063	0.0017	0.0046
230	0.0062	0.0017	0.0045
231	0.0061	0.0017	0.0044
232	0.0060	0.0016	0.0044
233	0.0059	0.0016	0.0043
234	0.0058	0.0016	0.0042
235	0.0057	0.0016	0.0042
236	0.0057	0.0016	0.0041
237	0.0056	0.0015	0.0041
238	0.0055	0.0015	0.0040
239	0.0055	0.0015	0.0040
240	0.0054	0.0015	0.0039
241	0.0053	0.0015	0.0039
242	0.0053	0.0014	0.0038
243	0.0052	0.0014	0.0038
244	0.0051	0.0014	0.0037
245	0.0051	0.0014	0.0037
246	0.0050	0.0014	0.0037
247	0.0050	0.0014	0.0036
248	0.0049	0.0013	0.0036
249	0.0049	0.0013	0.0035
250	0.0048	0.0013	0.0035
251	0.0048	0.0013	0.0035
252	0.0047	0.0013	0.0034
253	0.0047	0.0013	0.0034
254	0.0046	0.0013	0.0034
255	0.0046	0.0013	0.0033
256	0.0046	0.0012	0.0033
257	0.0045	0.0012	0.0033
258	0.0045	0.0012	0.0032
259	0.0044	0.0012	0.0032
260	0.0044	0.0012	0.0032
261	0.0044	0.0012	0.0032
262	0.0043	0.0012	0.0031
263	0.0043	0.0012	0.0031
264	0.0043	0.0012	0.0031
265	0.0042	0.0012	0.0031
266	0.0042	0.0011	0.0030
267	0.0042	0.0011	0.0030
268	0.0041	0.0011	0.0030
269	0.0041	0.0011	0.0030
270	0.0041	0.0011	0.0029
271	0.0040	0.0011	0.0029
272	0.0040	0.0011	0.0029
273	0.0040	0.0011	0.0029
274	0.0039	0.0011	0.0029
275	0.0039	0.0011	0.0028
276	0.0039	0.0011	0.0028
277	0.0039	0.0011	0.0028
278	0.0038	0.0011	0.0028
279	0.0038	0.0010	0.0028
280	0.0038	0.0010	0.0027
281	0.0038	0.0010	0.0027
282	0.0037	0.0010	0.0027
283	0.0037	0.0010	0.0027
284	0.0037	0.0010	0.0027
285	0.0037	0.0010	0.0027
286	0.0036	0.0010	0.0026
287	0.0036	0.0010	0.0026
288	0.0036	0.0010	0.0026

Total soil rain loss = 0.59(In)
Total effective rainfall = 1.84(In)
Peak flow rate in flood hydrograph = 36.13(CFS)

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24 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	10.0	20.0	30.0	40.0
0+ 5	0.0009	0.12	Q				
0+10	0.0037	0.41	Q				
0+15	0.0071	0.50	Q				
0+20	0.0108	0.54	Q				
0+25	0.0146	0.56	Q				
0+30	0.0185	0.57	Q				
0+35	0.0225	0.58	Q				
0+40	0.0265	0.58	Q				
0+45	0.0304	0.58	Q				
0+50	0.0344	0.58	Q				
0+55	0.0384	0.58	Q				
1+ 0	0.0425	0.58	Q				
1+ 5	0.0465	0.59	Q				
1+10	0.0506	0.59	Q				
1+15	0.0546	0.59	Q				
1+20	0.0587	0.59	Q				
1+25	0.0628	0.59	Q				
1+30	0.0669	0.60	Q				
1+35	0.0710	0.60	QV				
1+40	0.0751	0.60	QV				
1+45	0.0793	0.60	QV				
1+50	0.0834	0.60	QV				
1+55	0.0876	0.61	QV				
2+ 0	0.0918	0.61	QV				
2+ 5	0.0960	0.61	QV				
2+10	0.1002	0.61	QV				
2+15	0.1044	0.61	QV				
2+20	0.1087	0.62	QV				
2+25	0.1129	0.62	QV				
2+30	0.1172	0.62	QV				
2+35	0.1215	0.62	QV				
2+40	0.1258	0.62	QV				
2+45	0.1301	0.63	QV				
2+50	0.1344	0.63	QV				
2+55	0.1388	0.63	Q V				
3+ 0	0.1431	0.63	Q V				
3+ 5	0.1475	0.64	Q V				
3+10	0.1519	0.64	Q V				
3+15	0.1563	0.64	Q V				
3+20	0.1608	0.64	Q V				
3+25	0.1652	0.65	Q V				
3+30	0.1697	0.65	Q V				
3+35	0.1742	0.65	Q V				
3+40	0.1787	0.65	Q V				
3+45	0.1832	0.66	Q V				
3+50	0.1877	0.66	Q V				
3+55	0.1922	0.66	Q V				
4+ 0	0.1968	0.66	Q V				
4+ 5	0.2014	0.67	Q V				
4+10	0.2060	0.67	Q V				
4+15	0.2106	0.67	Q V				
4+20	0.2153	0.67	Q V				
4+25	0.2199	0.68	Q V				
4+30	0.2246	0.68	Q V				
4+35	0.2293	0.68	Q V				
4+40	0.2340	0.69	Q V				
4+45	0.2388	0.69	Q V				
4+50	0.2435	0.69	Q V				
4+55	0.2483	0.69	Q V				
5+ 0	0.2531	0.70	Q V				
5+ 5	0.2579	0.70	Q V				
5+10	0.2628	0.70	Q V				
5+15	0.2676	0.71	Q V				
5+20	0.2725	0.71	Q V				
5+25	0.2774	0.71	Q V				
5+30	0.2823	0.72	Q V				
5+35	0.2873	0.72	Q V				
5+40	0.2923	0.72	Q V				
5+45	0.2972	0.73	Q V				
5+50	0.3023	0.73	Q V				
5+55	0.3073	0.73	Q V				
6+ 0	0.3124	0.74	Q V				
6+ 5	0.3175	0.74	Q V				
6+10	0.3226	0.74	Q V				
6+15	0.3277	0.75	Q V				
6+20	0.3329	0.75	Q V				

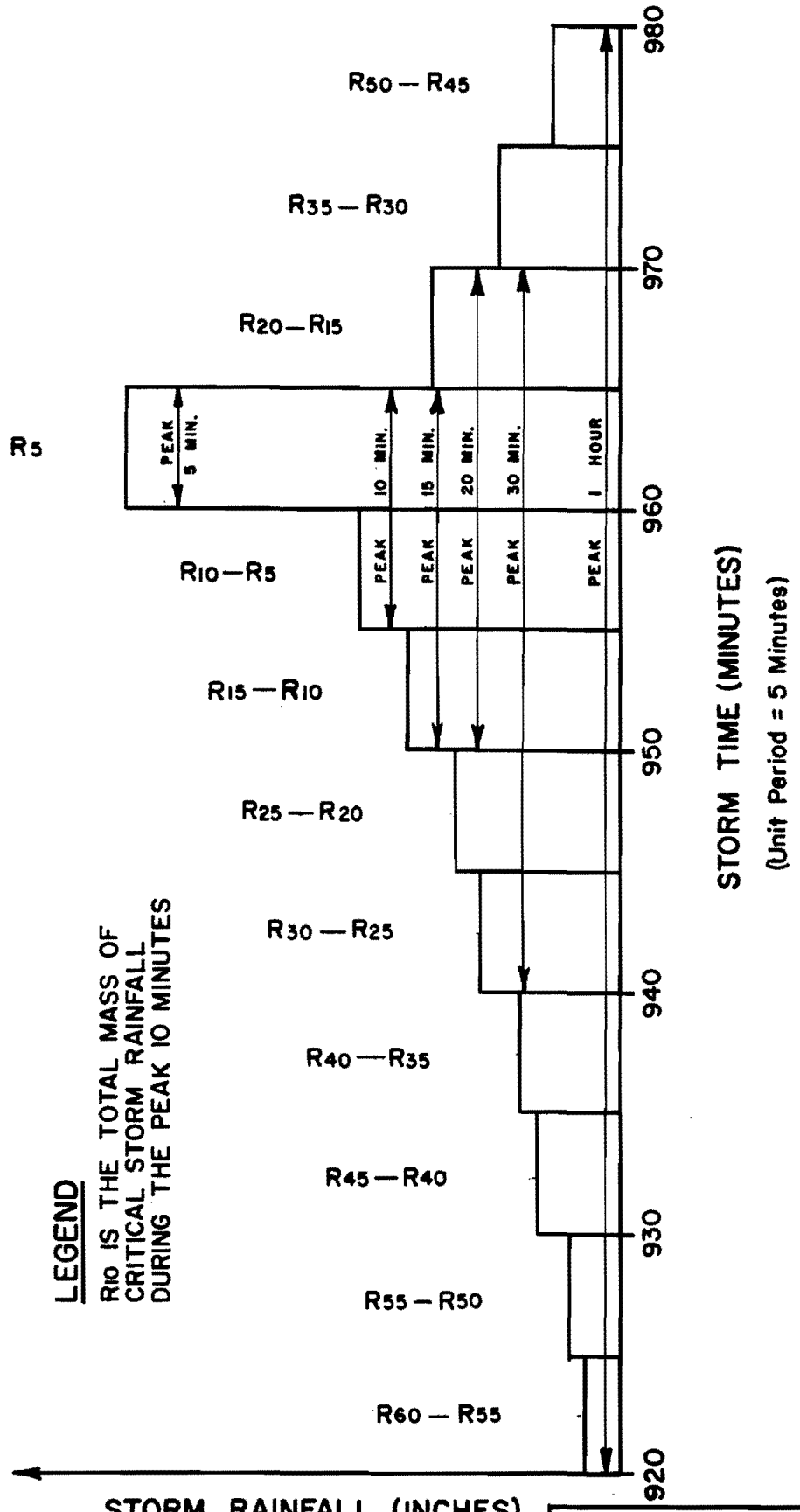
6+25	0.3381	0.75	Q	V			
6+30	0.3433	0.76	Q	V			
6+35	0.3485	0.76	Q	V			
6+40	0.3538	0.76	Q	V			
6+45	0.3591	0.77	Q	V			
6+50	0.3644	0.77	Q	V			
6+55	0.3697	0.78	Q	V			
7+ 0	0.3751	0.78	Q	V			
7+ 5	0.3805	0.78	Q	V			
7+10	0.3860	0.79	Q	V			
7+15	0.3914	0.79	Q	V			
7+20	0.3969	0.80	Q	V			
7+25	0.4024	0.80	Q	V			
7+30	0.4080	0.81	Q	V			
7+35	0.4136	0.81	Q	V			
7+40	0.4192	0.82	Q	V			
7+45	0.4248	0.82	Q	V			
7+50	0.4305	0.82	Q	V			
7+55	0.4362	0.83	Q	V			
8+ 0	0.4420	0.83	Q	V			
8+ 5	0.4477	0.84	Q	V			
8+10	0.4536	0.84	Q	V			
8+15	0.4594	0.85	Q	V			
8+20	0.4653	0.85	Q	V			
8+25	0.4712	0.86	Q	V			
8+30	0.4772	0.87	Q	V			
8+35	0.4832	0.87	Q	V			
8+40	0.4892	0.88	Q	V			
8+45	0.4953	0.88	Q	V			
8+50	0.5014	0.89	Q	V			
8+55	0.5075	0.89	Q	V			
9+ 0	0.5137	0.90	Q	V			
9+ 5	0.5200	0.91	Q	V			
9+10	0.5262	0.91	Q	V			
9+15	0.5326	0.92	Q	V			
9+20	0.5389	0.92	Q	V			
9+25	0.5453	0.93	Q	V			
9+30	0.5518	0.94	Q	V			
9+35	0.5583	0.94	Q	V			
9+40	0.5649	0.95	Q	V			
9+45	0.5715	0.96	Q	V			
9+50	0.5781	0.97	Q	V			
9+55	0.5848	0.97	Q	V			
10+ 0	0.5916	0.98	Q	V			
10+ 5	0.5984	0.99	Q	V			
10+10	0.6052	1.00	Q	V			
10+15	0.6121	1.00	Q	V			
10+20	0.6191	1.01	Q	V			
10+25	0.6262	1.02	Q	V			
10+30	0.6332	1.03	Q	V			
10+35	0.6404	1.04	Q	V			
10+40	0.6476	1.05	Q	V			
10+45	0.6549	1.06	Q	V			
10+50	0.6622	1.07	Q	V			
10+55	0.6696	1.08	Q	V			
11+ 0	0.6771	1.09	Q	V			
11+ 5	0.6847	1.10	Q	V			
11+10	0.6923	1.11	Q	V			
11+15	0.7000	1.12	Q	V			
11+20	0.7077	1.13	Q	V			
11+25	0.7156	1.14	Q	V			
11+30	0.7235	1.15	Q	V			
11+35	0.7315	1.16	Q	V			
11+40	0.7396	1.18	Q	V			
11+45	0.7478	1.19	Q	V			
11+50	0.7561	1.20	Q	V			
11+55	0.7644	1.21	Q	V			
12+ 0	0.7729	1.23	Q	V			
12+ 5	0.7814	1.23	Q	V			
12+10	0.7899	1.23	Q	V			
12+15	0.7984	1.24	Q	V			
12+20	0.8071	1.25	Q	V			
12+25	0.8158	1.27	Q	V			
12+30	0.8246	1.29	Q	V			
12+35	0.8336	1.30	Q	V			
12+40	0.8427	1.32	Q	V			
12+45	0.8519	1.34	Q	V			
12+50	0.8613	1.36	Q	V			
12+55	0.8708	1.38	Q	V			

13+ 0	0.8804	1.40	Q	V			
13+ 5	0.8902	1.42	Q	V			
13+10	0.9002	1.45	Q	V			
13+15	0.9103	1.47	Q	V			
13+20	0.9206	1.50	Q	V			
13+25	0.9310	1.52	Q	V			
13+30	0.9417	1.55	Q	V			
13+35	0.9526	1.58	Q	V			
13+40	0.9637	1.61	Q	V			
13+45	0.9750	1.64	Q	V			
13+50	0.9865	1.68	Q	V			
13+55	0.9983	1.71	Q	V			
14+ 0	1.0103	1.75	Q	V			
14+ 5	1.0227	1.79	Q	V			
14+10	1.0353	1.84	Q	V			
14+15	1.0483	1.88	Q	V			
14+20	1.0616	1.93	Q	V			
14+25	1.0753	1.99	Q	V			
14+30	1.0894	2.05	Q	V			
14+35	1.1039	2.11	Q	V			
14+40	1.1188	2.18	Q	V			
14+45	1.1343	2.25	Q	V			
14+50	1.1504	2.33	Q	V			
14+55	1.1671	2.42	Q	V			
15+ 0	1.1844	2.52	Q	V			
15+ 5	1.2026	2.63	Q	V			
15+10	1.2216	2.76	Q	V			
15+15	1.2416	2.90	Q	V			
15+20	1.2628	3.08	Q	V			
15+25	1.2839	3.06	Q	V			
15+30	1.3032	2.81	Q	V			
15+35	1.3234	2.92	Q	V			
15+40	1.3455	3.21	Q	V			
15+45	1.3703	3.61	Q	V			
15+50	1.3997	4.27	Q	V			
15+55	1.4365	5.34	Q	V			
16+ 0	1.4909	7.89	Q	V			
16+ 5	1.6430	22.08	Q	V			
16+10	1.8918	36.13	Q	V			
16+15	1.9932	14.73	Q	V			
16+20	2.0503	8.29	Q	V			
16+25	2.0893	5.66	Q	V			
16+30	2.1200	4.46	Q	V			
16+35	2.1467	3.89	Q	V			
16+40	2.1663	2.83	Q	V			
16+45	2.1840	2.58	Q	V			
16+50	2.2004	2.38	Q	V			
16+55	2.2157	2.22	Q	V			
17+ 0	2.2300	2.08	Q	V			
17+ 5	2.2435	1.96	Q	V			
17+10	2.2563	1.86	Q	V			
17+15	2.2685	1.77	Q	V			
17+20	2.2802	1.69	Q	V			
17+25	2.2914	1.62	Q	V			
17+30	2.3022	1.56	Q	V			
17+35	2.3125	1.51	Q	V			
17+40	2.3226	1.46	Q	V			
17+45	2.3323	1.41	Q	V			
17+50	2.3417	1.37	Q	V			
17+55	2.3508	1.33	Q	V			
18+ 0	2.3597	1.29	Q	V			
18+ 5	2.3685	1.27	Q	V			
18+10	2.3771	1.25	Q	V			
18+15	2.3856	1.23	Q	V			
18+20	2.3939	1.20	Q	V			
18+25	2.4020	1.18	Q	V			
18+30	2.4099	1.16	Q	V			
18+35	2.4177	1.13	Q	V			
18+40	2.4254	1.11	Q	V			
18+45	2.4329	1.09	Q	V			
18+50	2.4403	1.07	Q	V			
18+55	2.4475	1.05	Q	V			
19+ 0	2.4546	1.03	Q	V			
19+ 5	2.4616	1.02	Q	V			
19+10	2.4685	1.00	Q	V			
19+15	2.4753	0.98	Q	V			
19+20	2.4820	0.97	Q	V			
19+25	2.4885	0.95	Q	V			
19+30	2.4950	0.94	Q	V			

19+35	2.5014	0.93	Q				V
19+40	2.5077	0.91	Q				V
19+45	2.5139	0.90	Q				V
19+50	2.5200	0.89	Q				V
19+55	2.5261	0.88	Q				V
20+ 0	2.5320	0.87	Q				V
20+ 5	2.5379	0.86	Q				V
20+10	2.5438	0.85	Q				V
20+15	2.5495	0.84	Q				V
20+20	2.5552	0.83	Q				V
20+25	2.5608	0.82	Q				V
20+30	2.5664	0.81	Q				V
20+35	2.5719	0.80	Q				V
20+40	2.5774	0.79	Q				V
20+45	2.5827	0.78	Q				V
20+50	2.5881	0.77	Q				V
20+55	2.5934	0.77	Q				V
21+ 0	2.5986	0.76	Q				V
21+ 5	2.6037	0.75	Q				V
21+10	2.6089	0.74	Q				V
21+15	2.6139	0.74	Q				V
21+20	2.6190	0.73	Q				V
21+25	2.6240	0.72	Q				V
21+30	2.6289	0.72	Q				V
21+35	2.6338	0.71	Q				V
21+40	2.6386	0.70	Q				V
21+45	2.6434	0.70	Q				V
21+50	2.6482	0.69	Q				V
21+55	2.6529	0.69	Q				V
22+ 0	2.6576	0.68	Q				V
22+ 5	2.6623	0.67	Q				V
22+10	2.6669	0.67	Q				V
22+15	2.6714	0.66	Q				V
22+20	2.6760	0.66	Q				V
22+25	2.6805	0.65	Q				V
22+30	2.6850	0.65	Q				V
22+35	2.6894	0.64	Q				V
22+40	2.6938	0.64	Q				V
22+45	2.6982	0.63	Q				V
22+50	2.7025	0.63	Q				V
22+55	2.7068	0.63	Q				V
23+ 0	2.7111	0.62	Q				V
23+ 5	2.7153	0.62	Q				V
23+10	2.7196	0.61	Q				V
23+15	2.7237	0.61	Q				V
23+20	2.7279	0.60	Q				V
23+25	2.7320	0.60	Q				V
23+30	2.7362	0.60	Q				V
23+35	2.7402	0.59	Q				V
23+40	2.7443	0.59	Q				V
23+45	2.7483	0.58	Q				V
23+50	2.7523	0.58	Q				V
23+55	2.7563	0.58	Q				V
24+ 0	2.7602	0.57	Q				V

Volume=120,234 CF

100-YEAR 1-HOUR



SAN BERNARDINO COUNTY

HYDROLOGY MANUAL

DESIGN CRITICAL STORM PEAK 1-HOUR PATTERN

PROJECT NAME: VICTORVILLE CONNECTION

PROJECT LOCATION: VICTORVILLE

DMA - 1

SHORTCUT SYNTHETIC UNIT HYDROGRAPH

Storm Period, Years:	100
Storm Period, Hrs:	1
Area, Acres:	8.68
Point Rainfall, Inches	1.12
Unit Time, Minutes:	5
Loss Rate, In/hr:	0.097
Land Use:	Commerial

Effective R	**1.02**	**Inches**
Storm Volu	**0.74**	**Ac-Ft**
	3,713	**CF / Acre**

Unit Time Period	% Pattern	Storm Rainfall in/hr	Max. Loss Rate in/hr	Effective Rainfall in/hr	Flow Rate cfs	Flow Volume CF	Volume to Store CF	Total Storage Volume CF
1	2.0	0.269	0.097	0.172	1.50	451	451	451
2	3.0	0.403	0.097	0.306	2.68	804	804	1,255
3	3.1	0.417	0.097	0.320	2.80	839	839	2,094
4	3.2	0.430	0.097	0.333	2.92	875	875	2,969
5	3.5	0.470	0.097	0.373	3.27	980	980	3,949
6	5.0	0.672	0.097	0.575	5.03	1,510	1,510	5,459
7	5.2	0.699	0.097	0.602	5.27	1,580	1,580	7,040
8	16.0	2.150	0.097	2.053	17.97	5,392	5,392	12,431
9	35.0	4.704	0.097	4.607	40.32	12,097	12,097	24,528
10	13.0	1.747	0.097	1.650	14.44	4,333	4,333	28,861
11	8.0	1.075	0.097	0.978	8.56	2,568	2,568	31,429
12	3.0	0.403	0.097	0.306	2.68	804	804	32,233
	100.0			**12.3**				**32,233**

28,150 CF Basin Volume

Qpeak (cfs) max. = **21.91**

Notes: Refer to County of San Bernardino County Hydrology Manual Figure E-5a
DESIGN CRITICAL STORM PEAK 1-HOUR PATTERN

```
SCS curve  SCS curve     Area      Area      Fp(Fig C6)     Ap       Fm
No.(AMCII) NO.(AMC 1)    (Ac.)     Fraction     (In/Hr)   (dec.)    (In/Hr)
 69.0       49.8         8.68       1.000      0.812     0.120     0.097

Area-averaged adjusted loss rate Fm (In/Hr) =  0.097
```

PROJECT NAME: VICTORVILLE CONNECTION

PROJECT LOCATION: VICTORVILLE

DMA - 2

SHORTCUT SYNTHETIC UNIT HYDROGRAPH

Storm Period, Years:	100
Storm Period, Hrs:	1
Area, Acres:	3.07
Point Rainfall, Inches	1.12
Unit Time, Minutes:	5
Loss Rate, In/hr:	0.097
Land Use:	Commerial

Effective R	**1.02**	**Inches**
Storm Volu	**0.26**	**Ac-Ft**
	3,713	**CF / Acre**

Unit Time Period	% Pattern	Storm Rainfall in/hr	Max. Loss Rate in/hr	Effective Rainfall in/hr	Flow Rate cfs	Flow Volume CF	Volume to Store CF	Total Storage Volume CF
1	2.0	0.269	0.097	0.172	0.53	160	160	160
2	3.0	0.403	0.097	0.306	0.95	284	284	444
3	3.1	0.417	0.097	0.320	0.99	297	297	741
4	3.2	0.430	0.097	0.333	1.03	309	309	1,050
5	3.5	0.470	0.097	0.373	1.16	347	347	1,397
6	5.0	0.672	0.097	0.575	1.78	534	534	1,931
7	5.2	0.699	0.097	0.602	1.86	559	559	2,490
8	16.0	2.150	0.097	2.053	6.36	1,907	1,907	4,397
9	33.9	4.556	0.097	4.459	13.80	4,141	4,141	8,538
10	14.1	1.895	0.097	1.798	5.57	1,670	1,670	10,208
11	8.0	1.075	0.097	0.978	3.03	908	908	11,116
12	3.0	0.403	0.097	0.306	0.95	284	284	11,400
	100.0			**12.3**				**11,400**

10,450 CF Basin Volume

Qpeak (cfs) max. = **5.57**

Notes: Refer to County of San Bernardino County Hydrology Manual Figure E-5a
DESIGN CRITICAL STORM PEAK 1-HOUR PATTERN

SCS curve No.(AMCII)	SCS curve NO.(AMC 1)	Area (Ac.)	Area Fraction	Fp(Fig C6) (In/Hr)	Ap (dec.)	Fm (In/Hr)
69.0	49.8	8.68	1.000	0.812	0.120	0.097

Area-averaged adjusted loss rate Fm (In/Hr) = 0.097

PROJECT NAME: VICTORVILLE CONNECTION

PROJECT LOCATION: VICTORVILLE

DMA - 3

SHORTCUT SYNTHETIC UNIT HYDROGRAPH

Storm Period, Years:	100
Storm Period, Hrs:	1
Area, Acres:	3.4
Point Rainfall, Inches	1.12
Unit Time, Minutes:	5
Loss Rate, In/hr:	0.097
Land Use:	Commerial

Effective R	**1.02**	**Inches**
Storm Volu	**0.29**	**Ac-Ft**
	3,713	**CF / Acre**

Unit Time Period	% Pattern	Storm Rainfall in/hr	Max. Loss Rate in/hr	Effective Rainfall in/hr	Flow Rate cfs	Flow Volume CF	Volume to Store CF	Total Storage Volume CF
1	2.0	0.269	0.097	0.172	0.59	177	177	177
2	3.0	0.403	0.097	0.306	1.05	315	315	492
3	3.1	0.417	0.097	0.320	1.10	329	329	820
4	3.2	0.430	0.097	0.333	1.14	343	343	1,163
5	3.5	0.470	0.097	0.373	1.28	384	384	1,547
6	5.0	0.672	0.097	0.575	1.97	591	591	2,138
7	5.2	0.699	0.097	0.602	2.06	619	619	2,757
8	16.0	2.150	0.097	2.053	7.04	2,112	2,112	4,869
9	35.0	4.704	0.097	4.607	15.79	4,738	4,738	9,608
10	13.0	1.747	0.097	1.650	5.66	1,697	1,697	11,305
11	8.0	1.075	0.097	0.978	3.35	1,006	1,006	12,311
12	3.0	0.403	0.097	0.306	1.05	315	315	12,626
	100.0			**12.3**				**12,626**

10,779 CF Basin Volume

Qpeak (cfs) max. = **7.51**

Notes: Refer to County of San Bernardino County Hydrology Manual Figure E-5a
DESIGN CRITICAL STORM PEAK 1-HOUR PATTERN

```
SCS curve  SCS curve     Area     Area     Fp(Fig C6)     Ap       Fm
No.(AMCII) NO.(AMC 1)    (Ac.)    Fraction     (In/Hr)   (dec.)    (In/Hr)
 69.0       49.8         8.68      1.000      0.812     0.120     0.097

Area-averaged adjusted loss rate Fm (In/Hr) =  0.097
```

PROJECT NAME: VICTORVILLE CONNECTION

PROJECT LOCATION: VICTORVILLE

DMA - 4

SHORTCUT SYNTHETIC UNIT HYDROGRAPH

Storm Period, Years:	100
Storm Period, Hrs:	1
Area, Acres:	18.04
Point Rainfall, Inches	1.12
Unit Time, Minutes:	5
Loss Rate, In/hr:	0.162
Land Use:	High Density Residential

Effective Rainfall:	**0.96**	**Inches**
Storm Volume:	**1.44**	**Ac-Ft**
	3,478	**CF / Acre**

Unit Time Period	% Pattern	Storm Rainfall in/hr	Max. Loss Rate in/hr	Effective Rainfall in/hr	Flow Rate cfs	Flow Volume CF	Volume to Store CF	Total Storage Volume CF
1	3.0	0.403	0.162	0.241	4.39	1,316	1,316	1,316
2	4.0	0.538	0.162	0.376	6.83	2,050	2,050	3,366
3	4.1	0.551	0.162	0.389	7.08	2,123	2,123	5,489
4	4.2	0.564	0.162	0.402	7.32	2,196	2,196	7,685
5	4.5	0.605	0.162	0.443	8.05	2,416	2,416	10,102
6	6.0	0.806	0.162	0.644	11.72	3,517	3,517	13,618
7	6.2	0.833	0.162	0.671	12.21	3,663	3,663	17,282
8	15.0	2.016	0.162	1.854	33.72	10,117	10,117	27,399
9	26.2	3.521	0.162	3.359	61.11	18,332	18,332	45,731
10	17.8	2.392	0.162	2.230	40.57	12,171	12,171	57,902
11	6.0	0.806	0.162	0.644	11.72	3,517	3,517	61,419
12	3.0	0.403	0.162	0.241	4.39	1,316	1,316	62,735
	100.0			**11.5**				**62,735**

46,845 CF Basin Volume

Qpeak (cfs) max. = **56.94**

Notes: Refer to County of San Bernardino County Hydrology Manual Figure E-5a
DESIGN CRITICAL STORM PEAK 1-HOUR PATTERN

SCS curve No.(AMCII)	SCS curve NO.(AMC 1)	Area (Ac.)	Area Fraction	Fp(Fig C6) (In/Hr)	Ap (dec.)	Fm (In/Hr)
69.0	49.8	18.04	1.000	0.812	0.200	0.162

Area-averaged adjusted loss rate Fm (In/Hr) = 0.162

Appendix C
Percolation Test

Bear Valley Plaza - 76 Gas Station
Bear Valley Road, between 2nd and 3rd Avenues
Victorville, CA

Results of Two Percolation Tests and Calculated Infiltration Rates

For: Bear Valley Road and 2nd Avenue, LLC
Prepared By: Merrell Johnson Companies

May 15, 2020

Sheryl Hernandez
Bear Valley Road and 2nd Avenue, LLC
c/o Michael Asheghian
12300 Wilshire Blvd. #410
Los Angeles, CA 90025

Subject: Results of Two Percolation Tests and Calculated Infiltration Rates | Proposed 76 Gas Station | NE Corner of Bear Valley Road and 3rd Avenue, Victorville, CA | M.J. Project No. 3526.001.500

Ms. Hernandez:

Construction of a 76 Gas Station is proposed at the southwest corner of the 36-acre Bear Valley Plaza site, which is located on the north side of Bear Valley Road between 2nd and 3rd Avenues. The Gas Station will incorporate a convenience store, pump islands, and car wash.

Storm and nuisance water from the site will be directed to two infiltration basins, designated Basins A and B. Basin A will be a 5-foot-deep basin excavated to the east of the convenience store. Basin B will be a 7.5-foot-deep underground basin that will be located north of the car wash. A temporary graded basin, designated Basin C, will be excavated outside the northeast corner of the site. The configurations of the proposed Gas Station and associated basins are shown on the attached Conceptual Grading Plan, Exhibit "A" Infiltration Test Locations, prepared by DRC Engineering, Inc., revised April 28, 2020.

TEST BORINGS

On May 11, 2020 we excavated two test borings within the boundaries of the proposed basins. The borings within Basins A and B were drilled to depths of 5.0 and 7.5 feet, respectively. The soil percolation rate was measured in both

borings. The Porchet Method equation was then used to covert the percolation rate to the approximate infiltration rate. The Porchet Method procedures used for this report were outlined in the Riverside County Low Impact Development BMP Handbook, rev. 9/2011. A corresponding Technical Guidance Document Errata Sheet #2 was prepared by Orange County Public Works on February 5, 2013, which correcting some equation errors listed in Riverside County's Handbook.

The approximate locations of the test borings are shown on the attached Conceptual Grading Plan.

SOIL CONDITIONS

The soil conditions encountered in the test borings are tabulated below:

Boring No.	Depth (feet)	Soil Description	Lab Test
P-1	0-1.0	Brown silty sand with gravel (SM), dense (compacted), dry	
	1.0-2.5	Brown sand with silt & gravel (SP-SM) medium dense, moist	
	2.5-5.0	Light brown well graded sand with gravel (SP), medium dense, moist	4.7% Passing #200
P-2	0-1.0	Brown silty sand with gravel (SM), dense (compacted), dry	
	1.0-2.5	Brown sand with silt & gravel (SP-SM) medium dense, moist	
	2.5-7.5	Light brown well graded sand with gravel (SP), medium dense, moist	

GROUNDWATER

Water well data published by the California Department of Water Resources lists a well located about 0.8 miles northeast of the site near the southeast corner of 1st Avenue and Jasmine Street. Their data indicates the groundwater table is

about 250 feet below the ground surface at this location. The following is a link to their website: http://wdl.water.ca.gov/waterdatalibrary/

PERCOLATION TESTS

Test Preparation

Percolation Test Borings P-1 and P-2 were excavated to depths of 5.0 and 7.5 feet, respectively. The bottoms of the holes correspond to the designed depths of the respective basins. The bottoms of the test holes were covered with 2 inches of 3/8-inch pea gravel. To minimize caving, a 4-inch diameter perforated PVC pipe was inserted into each hole.

Pre-soaking

The holes were pre-soaked by filling each hole with about 15 gallons of water. This provided sufficient water to fill the holes to a level at least 5 times the holes' radiuses (4-inch radius). The water levels in both borings dropped rapidly after the filling stopped, percolating away completely in approximately 3 minutes.

Test Procedure

Following the pre-soak described above, the holes were refilled twice. The two consecutive measurements showed that at least 6 inches of water seeped away in less than 25 minutes, therefore; the sandy soil criteria for testing was used as is described below:

- The holes were filled with potable water to a depth of at least 5 times the holes' radiuses.
- The drop in the water level was measured every 10 minutes or until all the water had percolated away.
- The holes were refilled between measurements.
- Measurements were taken from a fixed reference point at a precision of 0.1 inch using an electronic measuring meter (tape) that audibly signaled contact with the water level.

- The measurements were recorded on the attached Percolation Test Data Sheets.

PERCOLATION TEST RESULTS

The results of the percolation test are listed below.

- P-1 = 0.34 minutes/inch
- P-2 = 0.36 minutes/inch

INFILTRATION RATE CALCULATIONS

The observed infiltration rate (I_t) was converted from the data collected at the final percolation test interval using the Porchet Method equation presented below:

$$I_t = \frac{\Delta H \Pi r^2 60}{\Delta t (\Pi r^2 + 2\Pi r H_{avg})} = \frac{\Delta H 60 r}{\Delta t (r + 2 H_{avg})}$$

Where:

I_t = observed infiltration rate, inches per hour
ΔH = change in head over the time interval, inches
Δt = time interval, minutes
r = effective radius of the test hole
H_{avg}

P-1 - The observed infiltration rate for Boring P-1 was calculated as follows:

- Time interval, Δt = 7.8 minutes
- Final depth to water, D_f = 60.0 inches
- Test hole radius, r = 4 inches
- Initial depth to water, D_0 = 37.0 inches
- Total depth of test hole, D_t = 60.0 inches

The conversion equation is used:

$$I_t = \frac{\Delta H 60 r}{\Delta t (r + 2 H_{avg})}$$

$H_0 = D_{t.} - D_0 = 60$ inches – 37 inches = 23 inches
$H_f = D_t - D_f = 60$ inches – 60 inches = 0 inches
$\Delta H = \Delta D = H_0 - H_f = 23$ inches – 0 inches = 23 inches
$H_{avg} = (H_0 + H_f) / 2 = (23 + 0) / 2 = 11.5$ inches

$$P\text{-}1\ I_t = \frac{\Delta H\ 60\ r}{\Delta t\ (r+2H_{avg})} = \frac{(23\text{ in})(60\text{ min/hr})(4\text{ in})}{7.8\text{ min }((4\text{ in} + 2\ (11.5\text{ in}))} = \mathbf{26.2\ in/hr}$$

P-2 - The observed infiltration rate for Boring P-1 was calculated as follows:

- Time interval, $\Delta t = 8.0$ minutes
- Final depth to water, $D_f = 90.0$ inches
- Test hole radius, r = 4 inches
- Initial depth to water, $D_0 = 68.0$ inches
- Total depth of test hole, $D_t = 90.0$ inches

The conversion equation is used:

$$I_t = \frac{\Delta H\ 60\ r}{\Delta t\ (r+2H_{avg})}$$

$H_0 = D_{t.} - D_0 = 90$ inches – 68 inches = 22 inches
$H_f = D_{t.} - D_f = 90$ inches – 90 inches = 0 inches
$\Delta H = \Delta D = H_0 - H_f = 22$ inches – 0 inches = 22 inches
$H_{avg} = (H_0 + H_f) / 2 = (22 + 0) / 2 = 11.0$ inches

$$P\text{-}1\ I_{t.} = \frac{\Delta H\ 60\ r}{\Delta t\ (r+2H_{avg})} = \frac{(22\text{ in})(60\text{ min/hr})(4\text{ in})}{8.0\text{ min }((4\text{ in} + 2\ (11.0\text{ in}))} = \mathbf{25.4\ in/hr}$$

Summary of Results				
Test Boring	Boring Depth (inches)	Soil Type	Measured Percolation Rate (min/in)	Observed Infiltration Rate (in/hr)
P-1	60	SP	0.34	26.2
P-2	90	SP	0.36	25.4

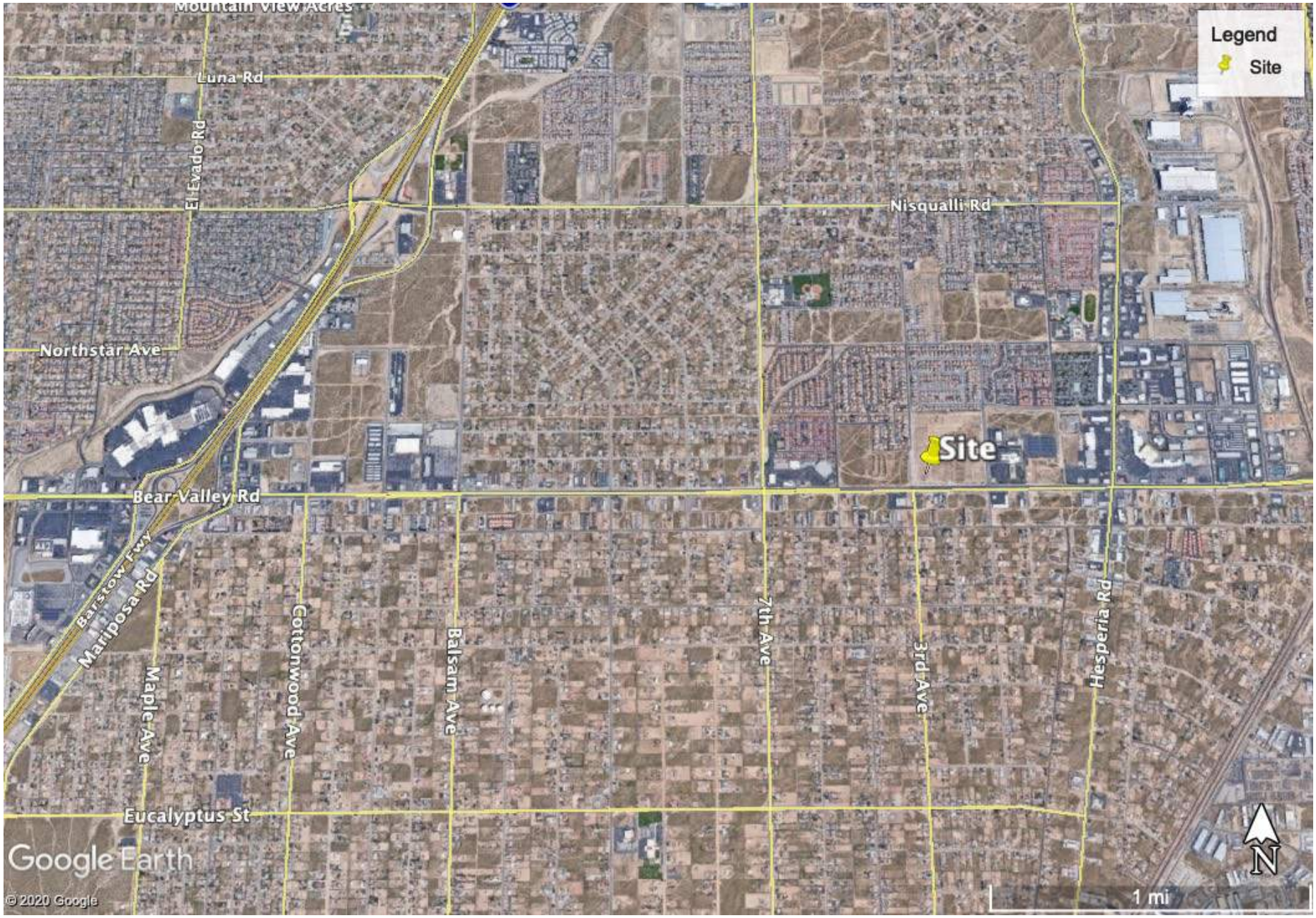
We appreciate this opportunity to be of service. Should you have questions, please contact our office.

Sincerely,
Merrell Engineering Company, Inc.

Brad S. Merrell, P.E.
President
R.C.E. 49423 Exp. 09/30/20

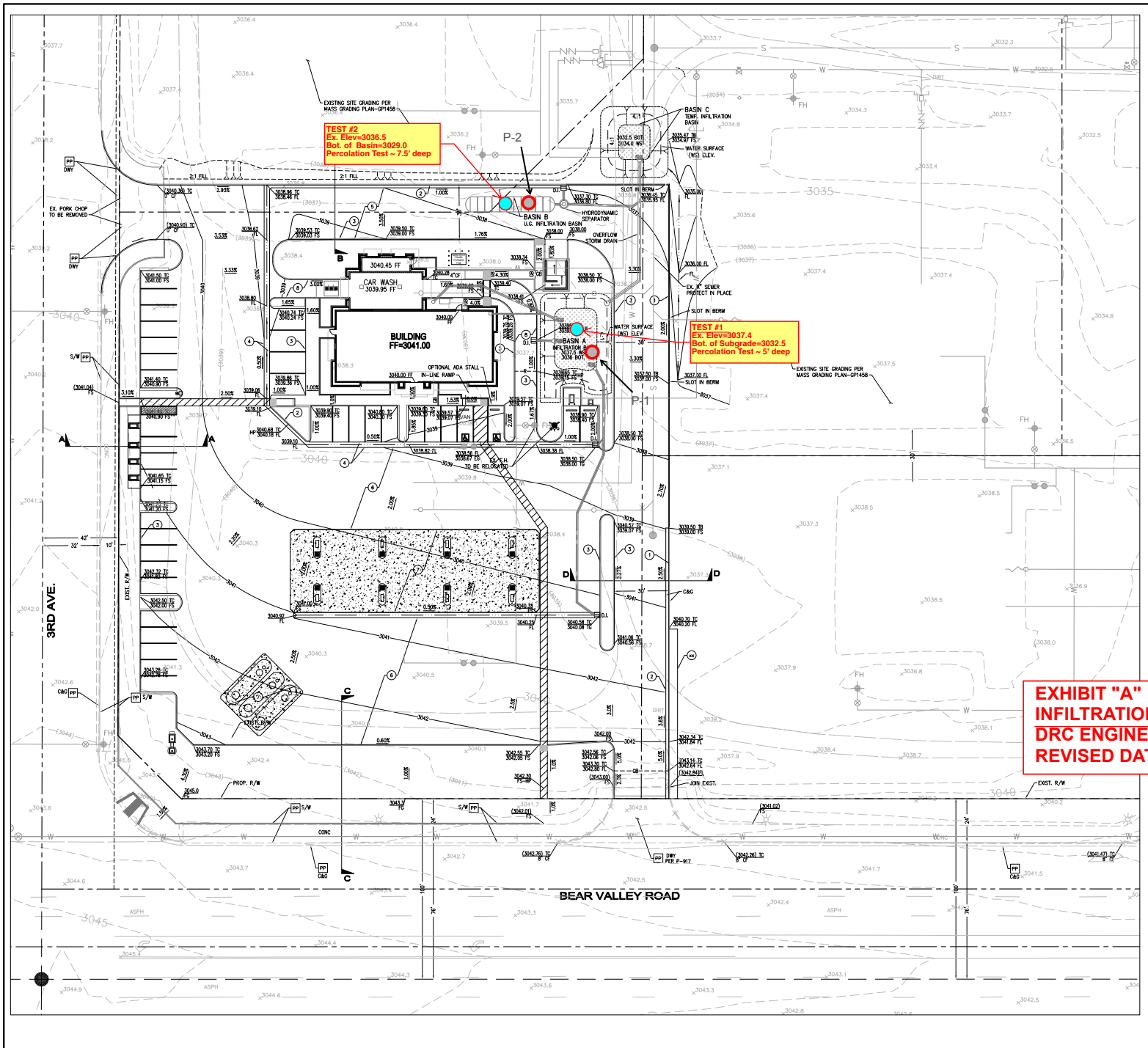
Appendix A
Figures

May 15, 2020
Observed Infiltration Rates Derived Using the Porchet Method
Proposed 76 Gas Station Infiltration Basins, Bear Valley Road and 3rd Avenue, Victorville, CA
MJ Project No. 3526.001.500



May 15, 2020
Observed Infiltration Rates Derived Using the Porchet Method
Proposed 76 Gas Station Infiltration Basins, Bear Valley Road and 3rd Avenue, Victorville, CA
MJ Project No. 3526.001.500
Figure 1 | Site Vicinity

Merrell Johnson



GRADING CONSTRUCTION NOTES

1. CONSTRUCT 6" AC CURB PER SPPWC STANDARD PLAN 120-2, D1-6
2. CONSTRUCT 6" CURB & GUTTER PER CITY OF VICTORVILLE STD DWG S-01
3. CONSTRUCT 6" CURB PER CITY OF VICTORVILLE STD DWG S-09
4. CONSTRUCT 3' WIDE CONCRETE RIBBON GUTTER PER DETAIL X ON SHEET X
5. CONSTRUCT 4" A.C. OVER 8" CLASS II A.B. OVER COMPACTED NATIVE SOILS PER SOILS REPORT AND CITY REQUIREMENT (SEE GENERAL NOTE 12)
6. CONSTRUCT 3" A.C. OVER 5" CLASS II A.B. OVER COMPACTED NATIVE SOILS PER SOILS REPORT AND CITY REQUIREMENT (SEE GENERAL NOTE 12)
7. CONSTRUCT 6" CONCRETE PAVEMENT OVER 4" A.B.
8. CONSTRUCT 6" CONCRETE PAVEMENT OVER 6" A.B. OR CMB OVER 12" COMPACTED SUBGRADE

Legend

P-1, Percolation Test Boring

EXHIBIT "A"
INFILTRATION TEST LOCATIONS
DRC ENGINEERING, INC.
REVISED DATE: 4-28-20

20' 0' 20' 40' 60'
GRAPHIC SCALE: 1"=20'

NOT FOR CONSTRUCTION

160 S. Old Springs Road
Suite 210
Anaheim Hills, CA 92808
714-685-6860
DRC Engineering, Inc.
Civil Engineering/Land Surveying/Land Planning

NO: REVISION: DATE:

PROJECT: VICTORVILLE CONNECTION
BEAR VALLEY ROAD & 3RD AVE.
VICTORVILLE, CA

DRAWING NAME: CONCEPTUAL GRADING PLAN

ISSUE:	CONCEPTUAL
DATE:	04/13/20
CHECKED: RS	DRAWN: BJ
DRAWING FILE: 20523CG	
PROJECT NO.: 20-523	
SHEET NUMBER:	1
OF 1	SHEETS
SCALE: PER PLAN	

FILENAME: M:\2020\20-523 Intersmile Bear Vly Apt\CONCEPTUAL\20523 cg Intersmile Bear Vly Apt.dwg Date: Wednesday, April 15, 2020 11:40am PLOTTED BY: BOB, ON: Apr 15 2020 2:34pm, XR

Appendix B
Laboratory Testing

May 15, 2020
Observed Infiltration Rates Derived Using the Porchet Method
Proposed 76 Gas Station Infiltration Basins, Bear Valley Road and 3rd Avenue, Victorville, CA
MJ Project No. 3526.001.500

Particle-Size Analysis of Soil

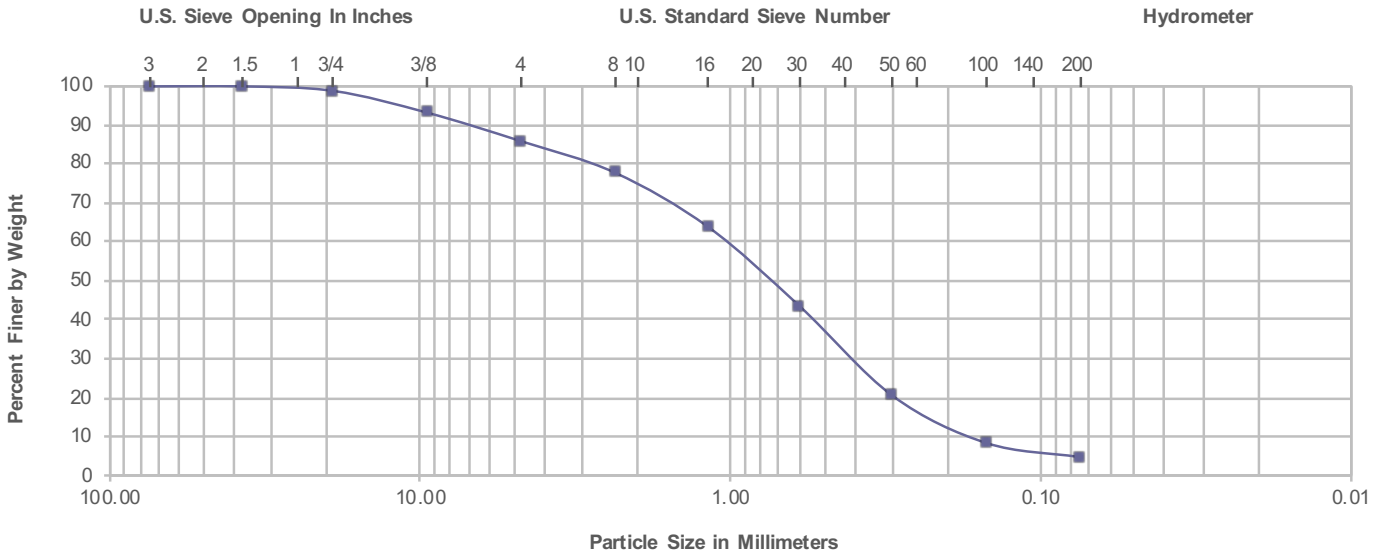
D422, D1140, D2487

Report Date:	05/14/20
Sheet:	1 of 1
Attachments:	DR01, SS01
Permit No:	
Client Project No:	
Other:	
DSA File No:	
DSA Application No:	
DSA LEA No:	

Project Number:	3526.001.500
Project Title:	Gas Station, Bear Valley Plaza
Project Location:	NE Cor. Of Bear Valley Rd. & Thrid Ave.,Victorville, CA
Client:	Bear Valley Road & Second Avenue, LLC

Sample ID: CDL05112001 **Gravel (%):** 14.1% **Sand (%):** 81.2% **Fines (%):** 4.7%

Classification, ASTM D2487:	Well graded sand
Sample Origin:	P-1, 3' to 5'
Laboratory Remarks:	



C_u	C_c	Moisture	D_{100}	D_{60}	D_{30}	D_{10}	LL	PL	PI	SG	FM	Other
6	1	3.3%	37.500	1.050	0.405	0.185	ND	ND	ND	ND	ND	-

Method / Procudure Used:	D422, D1140
Size of Initial Dry Mass (g):	998.4
Determination of Dry Mass:	D2216
Particles; Shape, Hardness:	ND
Dispersion Device/Period:	Manual/12 hr
Type & Amount of Agent:	Defloc. & 1.0
Laboratory Comments:	

The Material ☐ Was ☐ Was Not Sampled & tested in accordance with the reqs. of the DSA approved documents.
The Material Tested ☐ Met ☐ Did Not Meet The requirements of the DSA approved documents.

cc: Project Architect, Structural Engineer, Project Inspector, DSA Regional Office, School District

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Appendix C
Percolation Test Results

May 15, 2020
Observed Infiltration Rates Derived Using the Porchet Method
Proposed 76 Gas Station Infiltration Basins, Bear Valley Road and 3rd Avenue, Victorville, CA
MJ Project No. 3526.001.500

Percolation Test Data Sheet

Project:	Bear Valley Plaza	Project No:	3526.001.500	Date:	05/11/20
Test Hole No:	P-1	Tested By:	CDL		
Depth of Test Hole, D_T:	60"	USCS Soil Classification:	SP		

Test Hole Dimensions (inches)			Length	Width	
Diameter (if round)=	8"	Sides (if rectangular)=			

Sandy Soil Criteria Test*

Trial No.	Start Time	Stop Time	Time Interval, (min.)	Initial Depth to Water (in.)	Final Depth to Water (in.)	Change in Water Level (in.)	Greater than or Equal to 6"? (y/n)
1	0805	0830	25	29.0	dry	31+	y
2	0842	0907	25	28.0	dry	32+	y

*If two consecutive measurements show that six inches of water seeps away in less than 25 minutes, the test shall be run for an additional hour with measurements taken every 10 minutes. Other wise, pre-soak (fill) overnight. Obtain at least twelve measurements per hole over at least six hours (approximately 30 minute intervals) with a precision of at least 0.25".

Trial No.	Start Time	Stop Time	Δt Time Interval (min.)	D_o Initial Depth to Water (in.)	D_f Final Depth to Water (in.)	ΔD Change in Water Level (in.)	Percolation Rate (min./in.)
1	0910	0913.5	3.5	40.0	dry	20.0	0.18
2	0920	0924.8	4.8	39.0	dry	21.0	0.23
3	0930	0936.7	6.7	39.0	dry	21.0	0.32
4	0940	0947.5	7.5	37.0	dry	23.0	0.33
5	0950	0957.7	7.7	36.0	dry	24.0	0.32
6	1000	1008.1	8.1	36.0	dry	24.0	0.34
7	1010	1017.8	7.8	37.0	dry	23.0	0.34
8							
9							
10							
11							
12							
13							
14							
15							

COMMENTS:

Percolation Test Data Sheet

Project:	Bear Valley Plaza	Project No:	3526.001.500	Date:	5/11/20
Test Hole No:	P-2	Tested By:	CDL		
Depth of Test Hole, D_T:	90"	USCS Soil Classification:	SP		

Test Hole Dimensions (inches)			Length	Width	
Diameter (if round)=	8"	Sides (if rectangular)=			

Sandy Soil Criteria Test*

Trial No.	Start Time	Stop Time	Time Interval, (min.)	Initial Depth to Water (in.)	Final Depth to Water (in.)	Change in Water Level (in.)	Greater than or Equal to 6"? (y/n)
1	0900	0925	25	62.0	dry	28+	y
2	0931	0956	25	63.0	dry	29+	y

*If two consecutive measurements show that six inches of water seeps away in less than 25 minutes, the test shall be run for an additional hour with measurements taken every 10 minutes. Other wise, pre-soak (fill) overnight. Obtain at least twelve measurements per hole over at least six hours (approximately 30 minute intervals) with a precision of at least 0.25".

Trial No.	Start Time	Stop Time	Δt Time Interval (min.)	D_o Initial Depth to Water (in.)	D_f Final Depth to Water (in.)	ΔD Change in Water Level (in.)	Percolation Rate (min./in.)
1	1005	1009.0	3.3	68.0	dry	22.0	0.15
2	1015	1019.9	4.9	68.0	dry	22.0	0.23
3	1025	1031.3	6.3	67.0	dry	23.0	0.27
4	1035	1042.1	7.1	68.0	dry	22.0	0.32
5	1045	1054.9	7.9	68.0	dry	22.0	0.36
6	1100	1107.7	7.7	68.0	dry	22.0	0.35
7	1110	1118.0	8.0	68.0	dry	22.0	0.36
8							
9							
10							
11							
12							
13							
14							
15							

COMMENTS:

Appendix D
Infiltration Basin Sizing

LID BMP Performance Criteria for Design Capture Volume

1-hour rainfall depth (in) for a 2-year return period from *http://hdsc.nws.noaa.gov/hdsc/pfds/pfds_map_cont.html?bkmrk=ca* = 0.375

DA#	Area		Pervious Area			Impervious Area			Runoff Coefficient (Rc)	Mean 6-hr Precipitation P_6 (in)	Drawdown Rate	Design Capture Vol. DCV (ft^3)	Required Storage Volume ** Volume (CF)	Basin Volume Provided (CF)
	s.f.	acres	s.f.	acres	%	s.f.	acres	%						
DMA-1	378,100	8.68	45,372	1.04	12.00%	332,728	7.64	88.00%	0.702	0.46	48-hrs	20,137	28,000	28,150
DMA-2	133,730	3.07	16,048	0.37	12.00%	117,682	2.70	88.00%	0.702	0.46	48-hrs	7,122	9,900	10,450
DMA-3	148,105	3.40	17,773	0.41	12.00%	130,332	2.99	88.00%	0.702	0.46	48-hrs	7,888	10,666	10,779
DMA-4	785,825	18.04	157,165	3.61	20.00%	628,660	14.43	80.00%	0.599	0.46	48-hrs	35,739	46,534	46,845
Total	**659,935**		**45,372**			**332,728**						**70,886**		

Required Volume Based on Hydromodificaton

Note:
See Form 4.2-1 LID BMP Performance Criteria for Design Capture Volume for more information.

BMP Sizing Calculation

Basin A:

Total Volome Provided 20,169 CF Volume Provided > Design Capture DCV? **Yes**
Refer to attached calculations

Basin B:

Total Volome Provided 7,146 CF Volume Provided > Design Capture DCV? **Yes**
Refer to attached calculations

Basin C:

Total Volome Provided 7,972 CF Volume Provided > Design Capture DCV? **Yes**
Refer to attached calculations

Basin D:

Total Volome Provided 36,215 CF Volume Provided > Design Capture DCV? **Yes**
Refer to attached calculations

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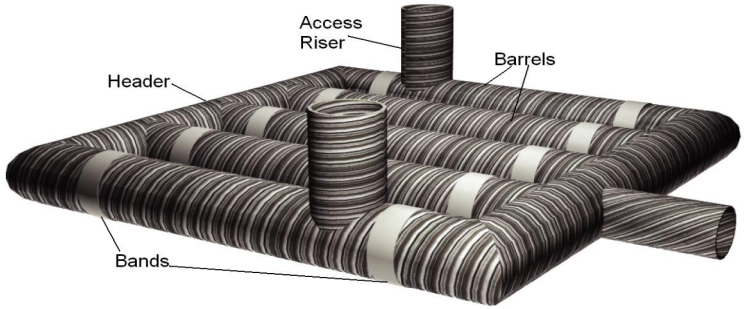


Project Summary

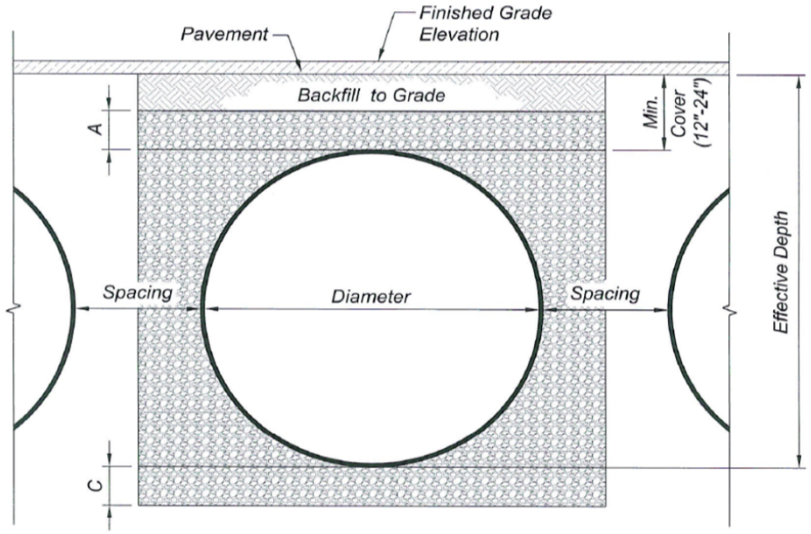
Date:	5/5/2021
Project Name:	VICTORVILLE CONNECTION
City / County:	VICTORVILLE
State:	CA
Designed By:	YH
Company:	DRC ENGINEERING INC.
Telephone:	714-685-6860

Enter Information in Blue Cells

Corrugated Metal Pipe Calculator

Storage Volume Required (cf):	28,000
Limiting Width (ft):	50.00
Invert Depth Below Asphalt (ft):	10.00
Solid or Perforated Pipe:	Perforated
Shape Or Diameter (in):	96
Number Of Headers:	2
Spacing between Barrels (ft):	3.00
Stone Width Around Perimeter of System (ft):	0.5
Depth A: Porous Stone Above Pipe (in):	0
Depth C: Porous Stone Below Pipe (in):	12
Stone Porosity (0 to 40%):	40

50.27 ft^2 Pipe Area



System Sizing

Pipe Storage:	21,212	cf	
Porous Stone Storage:	6,938	cf	
Total Storage Provided:	28,150	cf	100.5% Of Required Storage
Number of Barrels:	4	barrels	
Length per Barrel:	85.0	ft	
Length Per Header:	41.0	ft	
Rectangular Footprint (W x L):	42. ft x 102. ft		

CONTECH Materials

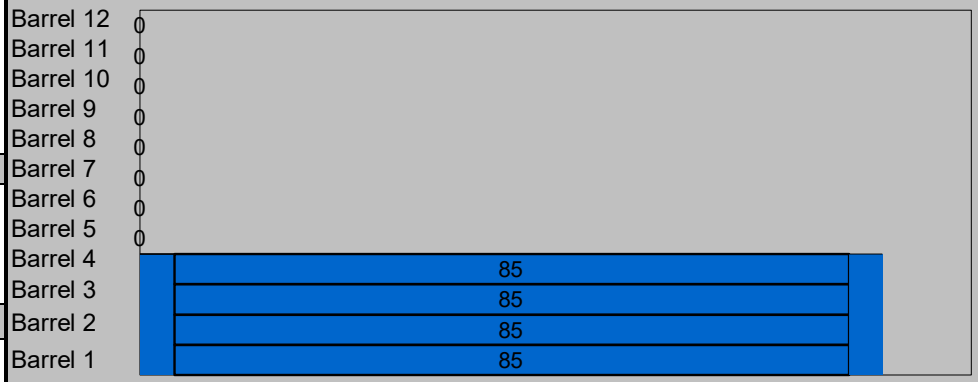
Total CMP Footage:	422	ft
Approximate Total Pieces:	20	pcs
Approximate Coupling Bands:	16	bands
Approximate Truckloads:	8	trucks

Construction Quantities**

Total Excavation:	1587	cy
Porous Stone Backfill For Storage:	642	cy stone
Backfill to Grade Excluding Stone:	159	cy fill

***Construction quantities are approximate and should be verified upon final design*

System Layout



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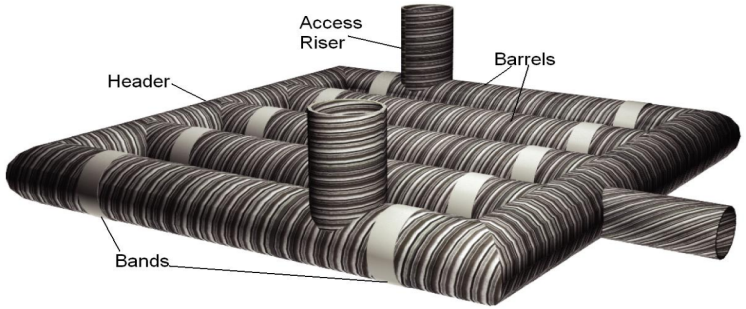

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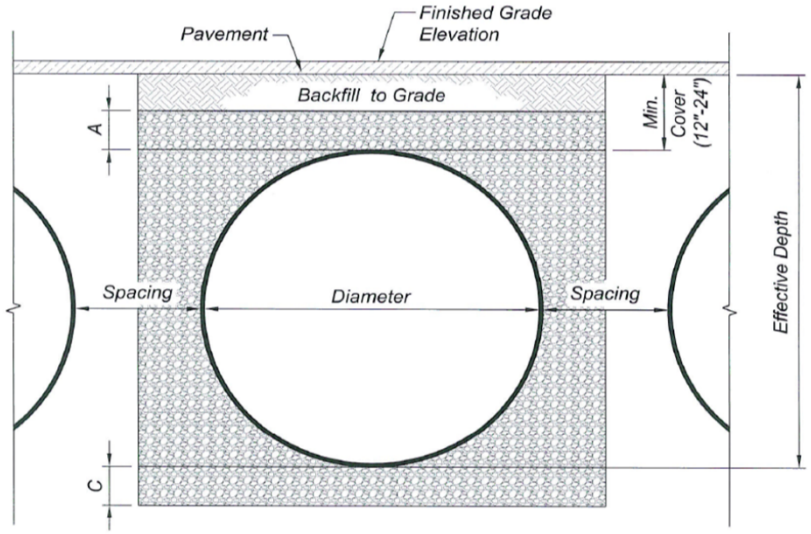
Telephone:	714-685-6860

Enter Information in Blue Cells

Corrugated Metal Pipe Calculator

Storage Volume Required (cf):	9,900
Limiting Width (ft):	20.00
Invert Depth Below Asphalt (ft):	10.00
Solid or Perforated Pipe:	Perforated
Shape Or Diameter (in):	96
Number Of Headers:	2
Spacing between Barrels (ft):	3.00
Stone Width Around Perimeter of System (ft):	0.5
Depth A: Porous Stone Above Pipe (in):	0
Depth C: Porous Stone Below Pipe (in):	12
Stone Porosity (0 to 40%):	40

50.27 ft^2 Pipe Area



System Sizing

Pipe Storage:	7,741	cf	
Porous Stone Storage:	2,304	cf	
Total Storage Provided:	10,045	cf	101.5% Of Required Storage
Number of Barrels:	2	barrels	
Length per Barrel:	58.0	ft	
Length Per Header:	19.0	ft	
Rectangular Footprint (W x L):	20. ft x 75. ft		

CONTECH Materials

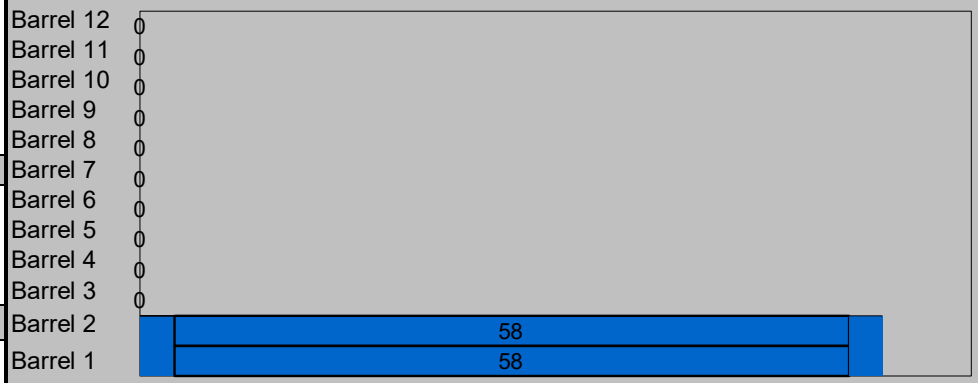
Total CMP Footage:	154	ft
Approximate Total Pieces:	8	pcs
Approximate Coupling Bands:	6	bands
Approximate Truckloads:	3	trucks

Construction Quantities**

Total Excavation:	556	cy
Porous Stone Backfill For Storage:	213	cy stone
Backfill to Grade Excluding Stone:	56	cy fill

***Construction quantities are approximate and should be verified upon final design*

System Layout



Barrel Footage (w/o headers)

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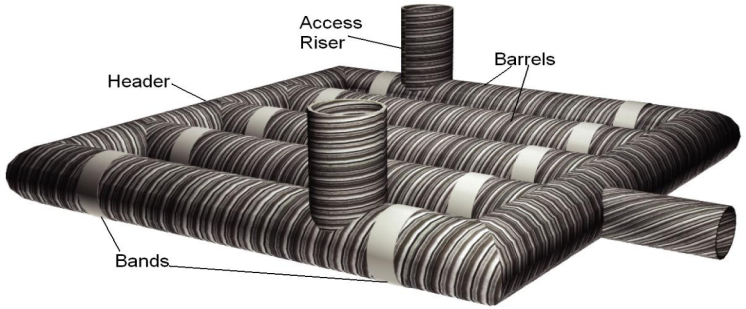

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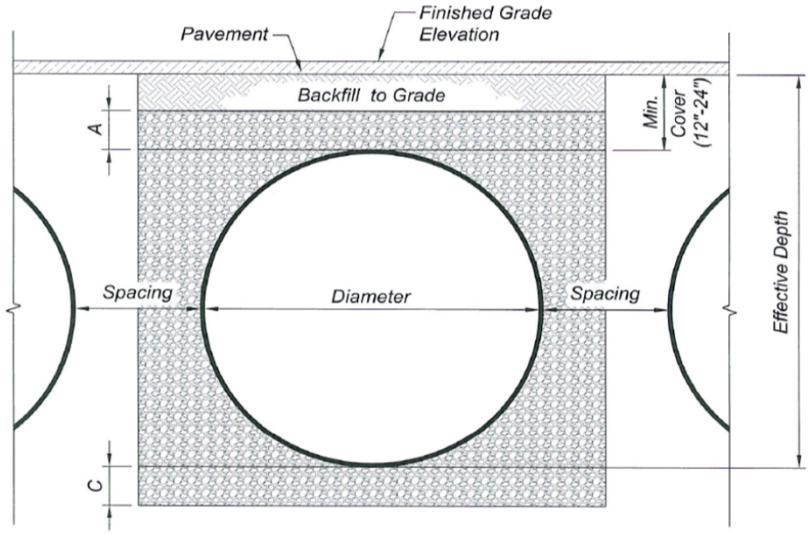
State:	CA
Designed By:	YH
Company:	DRC ENGINEERING INC.
Telephone:	714-685-6860

Enter Information in Blue Cells

Corrugated Metal Pipe Calculator

Storage Volume Required (cf):	10,666
Limiting Width (ft):	34.00
Invert Depth Below Asphalt (ft):	10.00
Solid or Perforated Pipe:	Perforated
Shape Or Diameter (in):	96
Number Of Headers:	2
Spacing between Barrels (ft):	3.00
Stone Width Around Perimeter of System (ft):	0.5
Depth A: Porous Stone Above Pipe (in):	0
Depth C: Porous Stone Below Pipe (in):	12
Stone Porosity (0 to 40%):	40

50.27 ft^2 Pipe Area



System Sizing

Pipe Storage:	8,294	cf	
Porous Stone Storage:	2,486	cf	
Total Storage Provided:	10,779	cf	101.1% Of Required Storage
Number of Barrels:	3	barrels	
Length per Barrel:	35.0	ft	
Length Per Header:	30.0	ft	
Rectangular Footprint (W x L):	31. ft x 52. ft		

CONTECH Materials

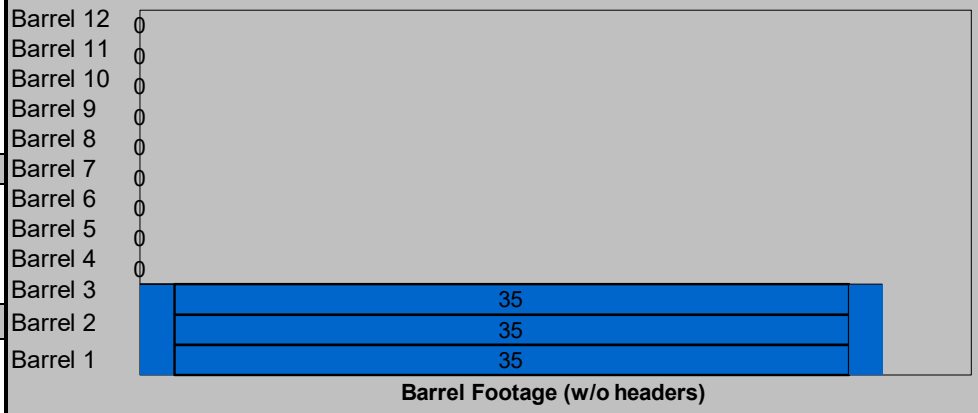
Total CMP Footage:	165	ft
Approximate Total Pieces:	9	pcs
Approximate Coupling Bands:	6	bands
Approximate Truckloads:	3	trucks

Construction Quantities**

Total Excavation:	598	cy
Porous Stone Backfill For Storage:	230	cy stone
Backfill to Grade Excluding Stone:	61	cy fill

***Construction quantities are approximate and should be verified upon final design*

System Layout



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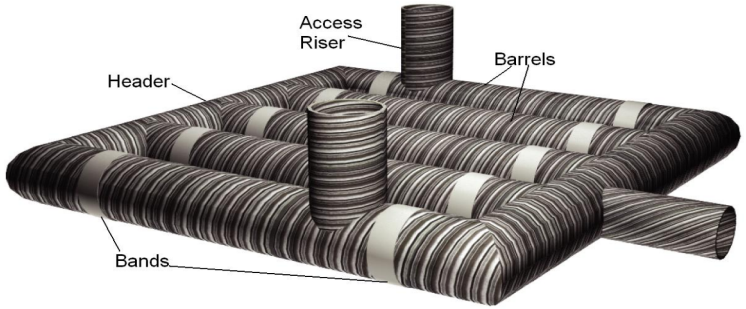

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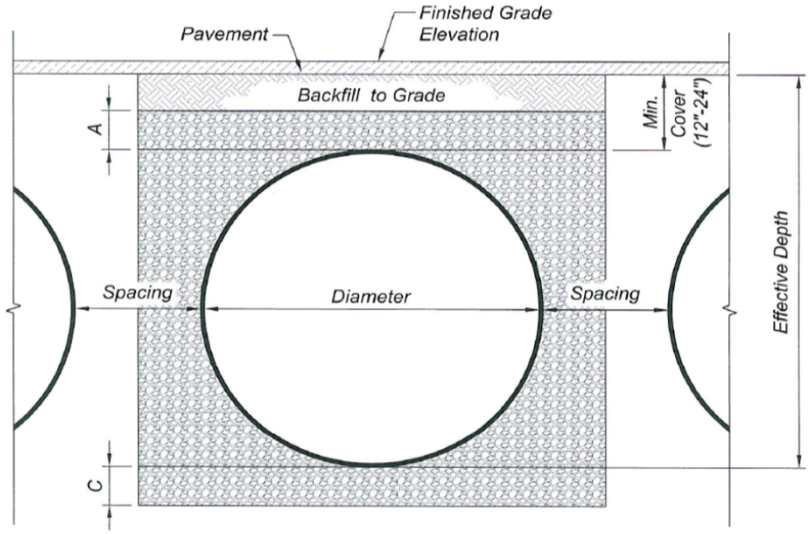
Enter Information in Blue Cells

Corrugated Metal Pipe Calculator

Storage Volume Required (cf):	26,534
Limiting Width (ft):	32.00
Invert Depth Below Asphalt (ft):	10.00
Solid or Perforated Pipe:	Perforated
Shape Or Diameter (in):	96
Number Of Headers:	2
Spacing between Barrels (ft):	3.00
Stone Width Around Perimeter of System (ft):	0.5
Depth A: Porous Stone Above Pipe (in):	0
Depth C: Porous Stone Below Pipe (in):	12
Stone Porosity (0 to 40%):	40

50.27 ft^2 Pipe Area



System Sizing

Pipe Storage:	20,207	cf	
Porous Stone Storage:	6,537	cf	
Total Storage Provided:	26,744	cf	100.8% Of Required Storage
Number of Barrels:	3	barrels	
Length per Barrel:	114.0	ft	
Length Per Header:	30.0	ft	
Rectangular Footprint (W x L):	31. ft x 131. ft		

CONTECH Materials

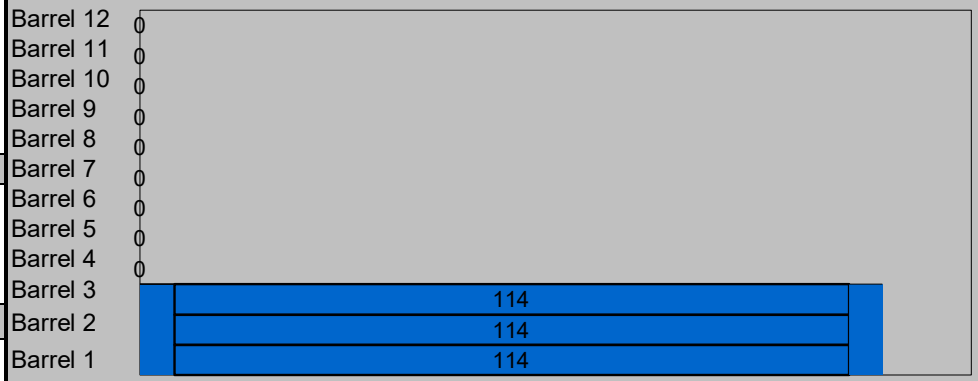
Total CMP Footage:	402	ft
Approximate Total Pieces:	19	pcs
Approximate Coupling Bands:	16	bands
Approximate Truckloads:	8	trucks

Construction Quantities**

Total Excavation:	1505	cy
Porous Stone Backfill For Storage:	605	cy stone
Backfill to Grade Excluding Stone:	151	cy fill

***Construction quantities are approximate and should be verified upon final design*

System Layout



Barrel Footage (w/o headers)

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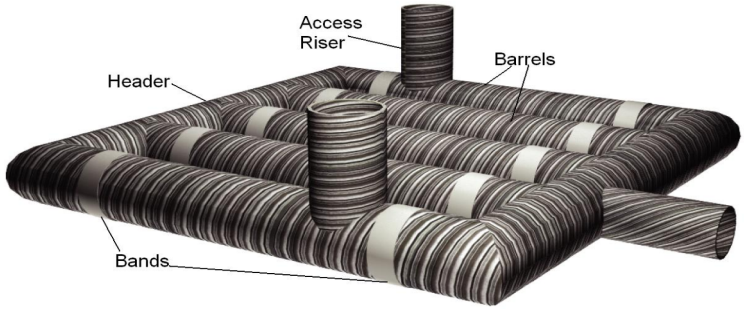

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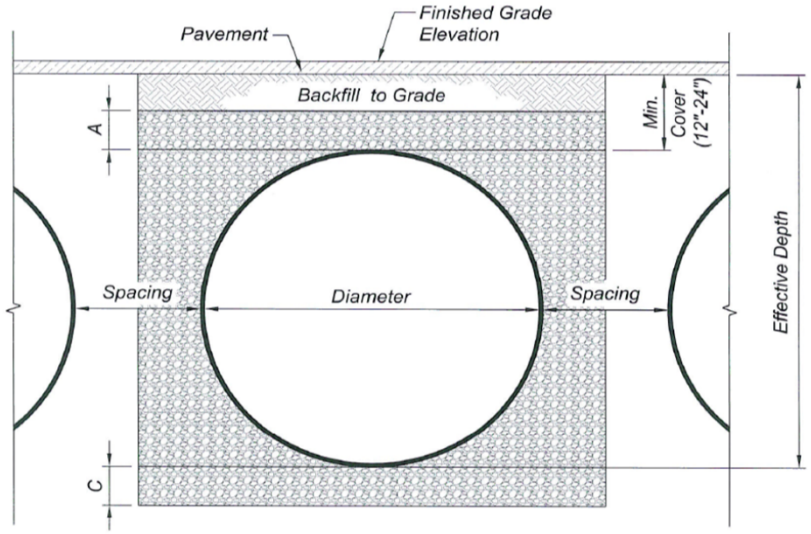
Enter Information in Blue Cells

Corrugated Metal Pipe Calculator

Storage Volume Required (cf):	20,000
Limiting Width (ft):	20.00
Invert Depth Below Asphalt (ft):	10.00
Solid or Perforated Pipe:	Perforated
Shape Or Diameter (in):	96
Number Of Headers:	2
Spacing between Barrels (ft):	3.00
Stone Width Around Perimeter of System (ft):	0.5
Depth A: Porous Stone Above Pipe (in):	0
Depth C: Porous Stone Below Pipe (in):	12
Stone Porosity (0 to 40%):	40

50.27 ft^2 Pipe Area



System Sizing

Pipe Storage:	15,381	cf	
Porous Stone Storage:	4,720	cf	
Total Storage Provided:	20,101	cf	100.5% Of Required Storage
Number of Barrels:	2	barrels	
Length per Barrel:	134.0	ft	
Length Per Header:	19.0	ft	
Rectangular Footprint (W x L):	20. ft x 151. ft		

CONTECH Materials

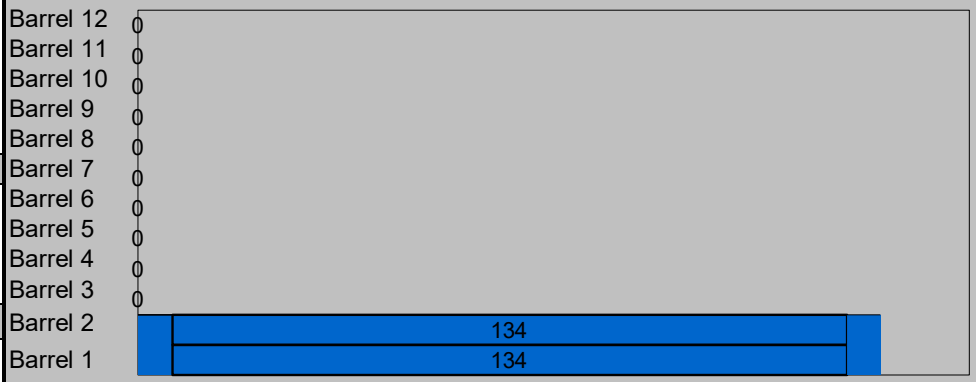
Total CMP Footage:	306	ft
Approximate Total Pieces:	15	pcs
Approximate Coupling Bands:	13	bands
Approximate Truckloads:	7	trucks

Construction Quantities**

Total Excavation:	1119	cy
Porous Stone Backfill For Storage:	437	cy stone
Backfill to Grade Excluding Stone:	112	cy fill

***Construction quantities are approximate and should be verified upon final design*

System Layout



Barrel Footage (w/o headers)

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Corrugated Metal Pipe Detention Design Guide

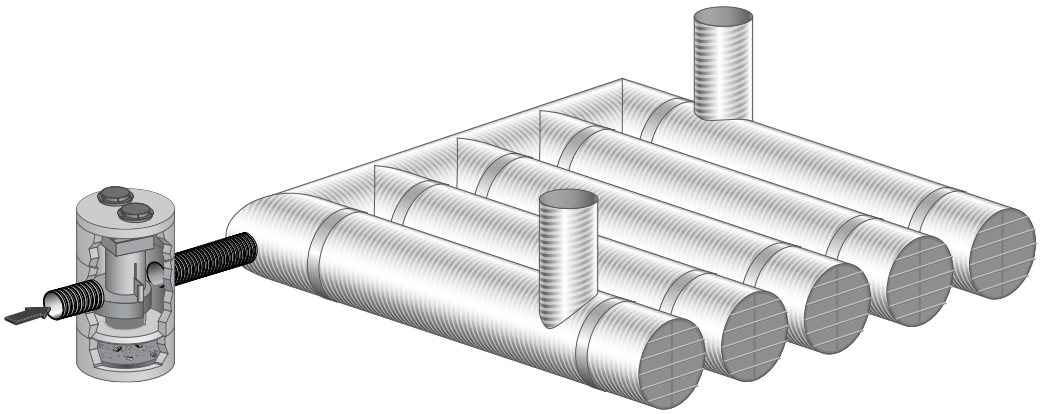
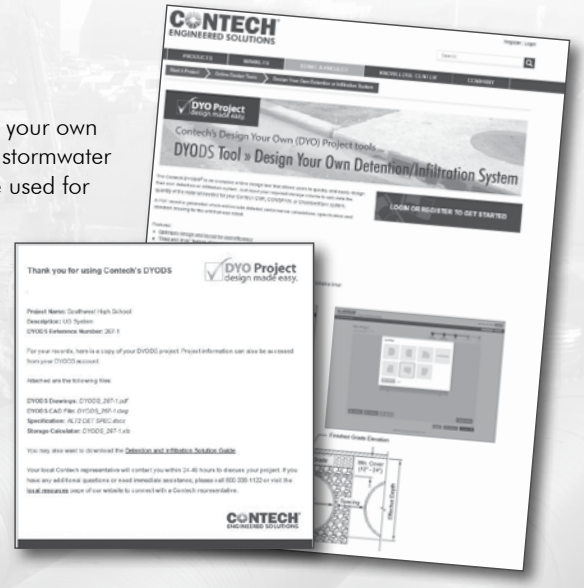


Table of Contents

CMP Detention System Design Tools



Design Your Own Detention System (DYODS®)

Contech's DYODS is an exclusive, online design tool that allows you to design your own detention or infiltration system. DYODS fully automates the layout process for stormwater detention and infiltration systems and produces CAD and PDF files that can be used for creating plans and specs, and for estimating total installed costs.
Features of the new tool include:

- Optimizes design and layout for cost efficiency
- "Drag and drop" feature allow users to customize layout
- Design multiple systems per project and save for future use
- Provides instant access to customized, project specific drawings
- CAD/PDF files provided for use in creating plans and specs
- Guides the selection of CMP material and coatings

The DYODS tool is available at www.conteches.com/DYO.

Online Product Design Worksheet (PDW)

Our in-house team of engineers can support you through the entire permitting process. Just enter your information into the online form, and one of our in-house engineers will contact you with specific recommendations for your project.

The Detention Product Design Worksheet
is available at www.conteches.com/detentionpdw

Engineering Services & Support

Contech has regional engineering offices and local stormwater consultants trained to provide regulatory guidance and permitting assistance, preliminary standard details and/or site specific final drawings and specifications, Low Impact Development design assistance, engineering calculations for hydraulics/hydrology, buoyancy, and stage-storage, installation support, maintenance support and more.

Guidelines for Designing CMP Detention Systems

Please follows these guidelines when designing a custom fabricated CMP detention system.

- No riser or stubs on a weld.
- Minimum distance from riser or stub to a weld joint is 12".
- Riser minimum distance to end of pipe is 24".
- Stub minimum distance to end of pipe is 12".
- Spacing between pipe runs up to /incl 24"diameter pipe is 12", 24" to 72" diameter pipe is equal to half the diameter of pipe, =>72" Diameter pipe is 3 ft standard spacing.
- Minimum depth of earth cover is 1' above crown of pipe up 96" diameter pipe, 102" diameter pipe and over is 18" min. earth cover.
- Standardized length of pipe is 24' but can vary from one region to another. Speak to your local Contech representative for additional information.
- Minimum length of pipe needs to be 4 feet greater than the diameter of the pipe.
- Any system should be outside the building's foundation zone of influence and any system beneath a structure should be evaluated on an individual basis.

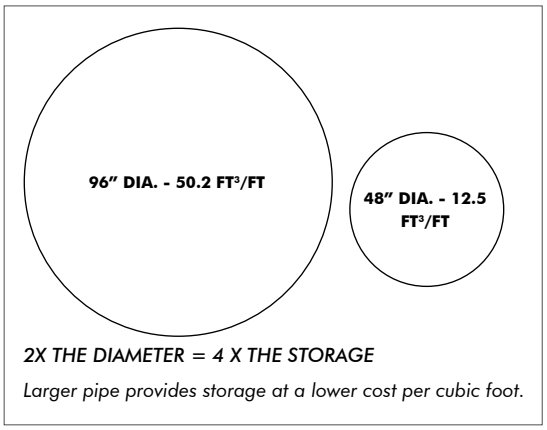
Cost-Effective Design and Layout

The three most important goals should be to shrink the footprint of the system by maximizing the storage volume within a given area, eliminate unnecessary welding and fabrication, and eliminate unnecessary structures.

Shrinking the Footprint

The goal of any CMP detention system should be to maximize the vertical space available to minimize the overall footprint, to reduce material, excavation, and backfill costs. To do this we recommend using the largest diameter pipe possible.

Increasing the depth of a CMP detention system allows for a smaller footprint while storing the same amount of water. For example, doubling the diameter of pipe yields four times as much storage volume per foot in the pipe. This provides significant cost savings per cubic foot of storage. Also, more vertical storage space means a smaller footprint equating to less excavation, less backfill and lower project costs.

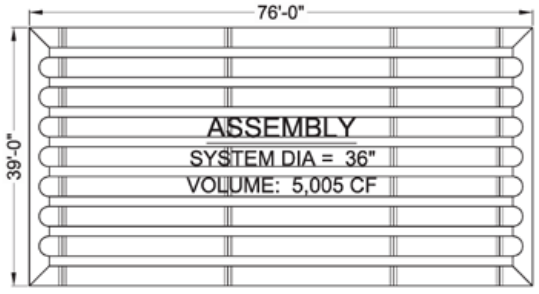


2X THE DIAMETER = 4 X THE STORAGE

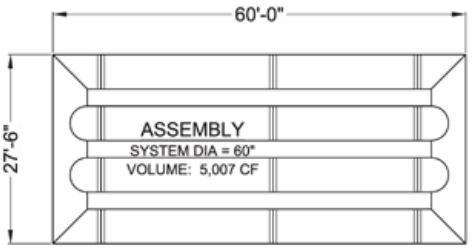
Larger pipe provides storage at a lower cost per cubic foot.

Consider the following example:

System 1 is made from 36" diameter pipe that provides 5,005 cubic feet of storage. System 2 is made from 60" diameter pipe that provides the same 5,005 cubic feet of storage. Both systems provide the same amount of storage, but System 2 is the most economical design as it reduces material costs, fabrication costs, excavation, and backfill costs. Having fewer runs of pipe will cut down on the number of welds and special fabrication requirements. Having fewer welds will also cut down on lead times. Lastly, System 2 has a footprint that is 1,300 square feet smaller than System 1, reducing excavation and backfill costs. The only instance, where System 2 may not be feasible, is when you do not have the available depth for the larger diameter pipe.



System 1

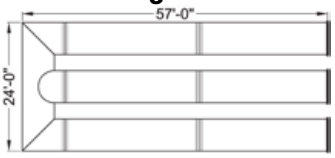


System 2

Eliminating Unnecessary Welds

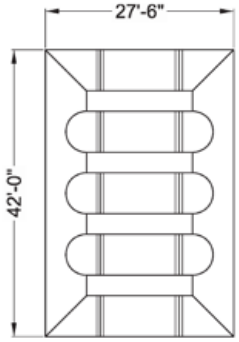
The rule of thumb is to use as much straight pipe as possible to reduce the number of tees and elbows in your design. Doing so will result in a more cost effective and efficient design, and will also reduce lead times. In the example below, both systems are designed with 72" diameter pipe and roughly the same storage volume. System 1 uses only two elbows and one tee and will be much more cost effective than System Two that uses four elbows and six tees.

Efficient Design



System 1

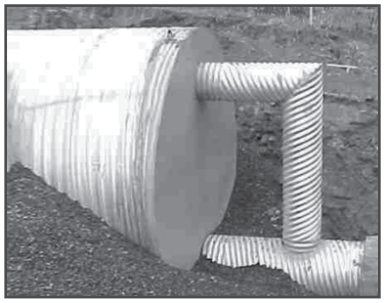
Inefficient Design



System 2

Eliminating Unnecessary Structures

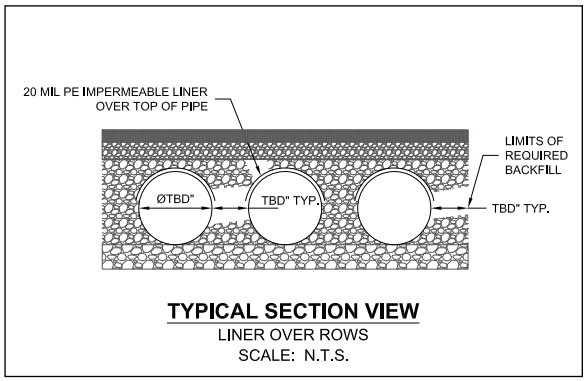
Costs can also be reduced by eliminating concrete structures such as catch basins and outlet control structures by incorporating them into the CMP system. For example, a riser can be added to a system in the low point of a parking lot with a grated inlet to eliminate a concrete catch basin. Internal weir plates and multiple external outlet stubs can often be used to eliminate a separate concrete outlet control structure downstream. Such designs may seem a bit unusual for an engineer that is used to designing with concrete structures. Contech's team of stormwater design engineers have experience in this and can assist with the routing designs of CMP detention systems.



CMP Detention Systems in Corrosive Environments

A site's resistivity may change over time when various types of salting agents are used, such as road salts for deicing purposes. If salting agents are used on or near the project site, a geomembrane barrier must be used with the system. The geomembrane liner is intended to help protect the system from the potential adverse effects that may result from the use of such salting agents including premature corrosion and reduced actual service life.

The project's Engineer of Record is to evaluate whether salting agents will be used on or near the project site, and use his/her best judgement to determine if any additional protective measures are required. Below is a typical detail showing the placement of a geomembrane barrier for projects where salting agents are used on or near the project site.



Standard Liner Over Rows

Detention Pipe Selection

Durability Design Guide for CMP Detention Products

Proper design of detention systems requires structural, hydraulic and durability considerations. While most designers are comfortable with structural and hydraulic design, the mechanics of evaluating abrasion, corrosion and water chemistry to perform a durability design are not found in most civil engineering handbooks.

The durability and service life of a CMP detention installation is directly related to the environmental conditions encountered at the site and the type of materials and coatings from which the system is fabricated. Two principle causes of early failure for CMP are corrosion and abrasion.

Service life can be affected by the corrosive action of the backfill in contact with the outside of a CMP detention or occasionally by the corrosive and abrasive action of the flow in the invert of the CMP detention. The design life analysis should include a check for both the water side and soil side environments to determine which is more critical— or which governs service life.

Metal loss in the invert of a CMP detention due to abrasive flows is not typical as the hydraulic dynamics are different as compared to a culvert application. An estimate for potential abrasion is required at each pipe location in order to determine the appropriate material and gage. Typical Detention applications are considered to have an Abrasion Level 1, or non-abrasive.

This manual is intended to guide specifiers through the mechanics of selecting appropriate materials to meet service life requirements. The information contained in the following pages is a composite of several national guidelines.

Procedure for Selection of the Appropriate System

The choice of material, gage and product type can be extremely important to service life. The following steps describe the procedure for selecting the appropriate CMP detention material and gage to meet a specific service life requirement.

Design Sequence:

1. Select pipe or structure based on hydraulic and clearance requirements.

2. Use Height of Cover tables for the chosen pipe or structure to determine the material gage required for the specific loading condition.

3. Use Table 2 to select the appropriate material for the site-specific environmental conditions. There may be some instances where more than one material is appropriate for the project environmental conditions. Generally speaking, the metal material types increase in price as you move from top down on Table 2. Please contact your local Contech Representative for pricing.

4. Use Table 3 to determine which abrasion level most accurately describes site conditions. The expected stream velocity and associated abrasion conditions should be based on a typical flow and not a 10 or 50-year design flood. Abrasion Level 1 is typically an accepted value for detention and infiltration applications.

5. Use Table 4 to determine whether the structural gage for the selected material is sufficient for the design service life. If the structural gage is greater than or equal to the gage required for a particular abrasion condition and service life, use the structural gage. Conversely, if the structural gage is less than the gage required for a particular abrasion condition and service life, use the gage required by Table 4.

Note: *Corrosive environments, such as seawater and road/de-icing salt infiltration, and other environments with pH and resistivity outside of the recommended range may cause premature corrosion and reduce actual service life. See page 19 for additional information.*

Table 1 - AASHTO Reference Specifications

	Material Type	Material	Pipe	Design*	Installation*
Pipe & Pipe Arch	**CMP (1/2" or 1" deep corrugations)**				
	Galvanized (2 oz.)	M218	M36	Section 12	Section 26
	Asphalt Coated	M190	M36	Section 12	Section 26
	Asphalt Coated and Paved Invert	M190	M36	Section 12	Section 26
	Aluminized Type 2	M274	M36	Section 12	Section 26
	Polymer Coated	M246	M36 & M245	Section 12	Section 26
	Aluminum Alloy	M197	M196	Section 12	Section 26
	ULTRA FLO® (3/4" x 3/4" x 7-1/2" corrugation)				
	Galvanized (2 oz.)	M218	M36	Section 12	Section 26
	Aluminized Type 2	M274	M36	Section 12	Section 26
	Polymer Coated	M246	M36 & M245	Section 12	Section 26
	Aluminum Alloy	M197	M196	Section 12	Section 26
	Smooth Cor™				
	Polymer Coated	M246	M36 & M245	Section 12	Section 26

* *AASHTO LRFD Bridge Design Specification and AASHTO Standard Specification for Highway Bridges*

Table 2 — Recommended Environments

Material Type	Soil* and Water pH										Resistivity (ohm-cm)	
	3	4	5	6	7	8	9	10	11	12	Minimum	Maximum
Galvanized Steel*											2,000	10,000
Aluminized Steel Type 2											1,500	N/A
Polymer Coated											250	N/A
Aluminum Alloy											500	N/A

**Appropriate pH range for Galvanized Steel is 6.0 to 10*

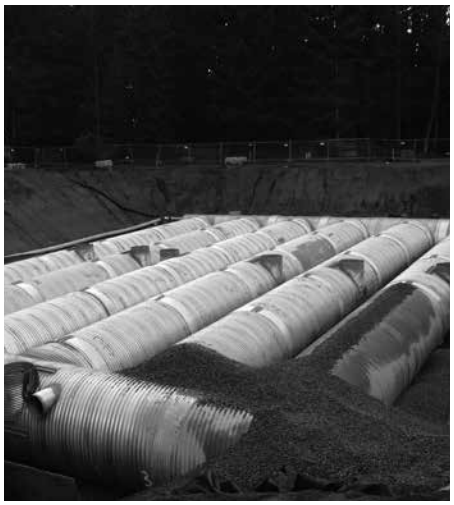


Table 3 — FHWA Abrasion Guidelines

Abrasion Level	Abrasion Condition	Bed Load	Flow Velocity (fps)
1*	Non-Abrasive	None	Minimal
2	Low Abrasion	Minor	< 5
3	Moderate Abrasion	Moderate	5 - 15
4	Severe Abrasion	Heavy	> 15

"Interim Direct Guidelines on CMP Drainage Alternative Selection." FHWA, 2005.

** Typical abrasion level for Detention and Infiltration applications is level 1.*

Table 4 – CMP Detention & Infiltration Typical Gage Recommendations

Design Service Life[1] Estimates Abrasion Level 1 & 2	25 Years	50 Years	75 Years	100 Years
Galvanized (2 oz.)[2]	16	12	10	8[5]
Aluminized Type 2[3]	16	16	16	14[6]
Polymer Coated[4]	16	16	16[7]	16[8]
Aluminum Alloy	16	16	16	16

"Interim Direct Guidelines on CMP Drainage Alternative Selection." FHWA, 2005.

1. All service life guidance is based on use in certain recommended environments only.
2. The National Corrugated Steel Pipe Association (NCSPA) provides service life guidance for galvanized materials, with service life guidance up to 97 years for 8 GA galvanized.
3. Aluminized Type 2 is the typical coating for most detention and infiltration applications. The NCSPA service life guidance of 75+ years for ALT2 in recommended environments, for pH 5-9 and resistivity > 1,500 ohm-cm.
4. The NCSPA provides service life guidance for polymer coated materials. Service life guidance of up to 75 years for polymer coated materials is based on a pH range of 4-9 and resistivity greater than 750 ohm-cm and of up to 100 years for polymer coated is based on a pH range of 5-9 and resistivity greater than 1,500 ohm-cm.
5. Design service life for 8 GA galvanized is 97 years.
6. NCSPA states that 14 GA ALT2 can achieve a 100 year service life when the environmental conditions have a pH of 5 to 9 and a resistivity greater than 1,500 ohm-cm.
7. 75 year service life for polymer-coated is based on a pH range of 4-9 and resistivity greater than 750 ohm-cm.
8. 100 year service life for polymer-coated is based on a pH range of 5-9 and resistivity greater than 1,500 ohm-cm.

CMP for Subsurface Infilitration

- CMP infiltration systems can be designed to meet HS 20 or greater load requirements with proper depths of cover.
- Protective pipe coatings such as Aluminized Type 2 (ALT2), Galvanized, and Polymer-Coated are matched to the pH and resistivity of the surrounding soil. See table 3 for additional information.
- CMP infiltration systems need to be surrounded by clean crushed stone to provide increased capacity utilizing storage in the void space. The system is then wrapped with fabric on the sides and top. The fabric is primarily used to keep native soils from filling stone voids and reducing long term storage capacity.

Storage Volumes for Corrugated Steel Pipe

Round Pipe - Hydraulic Storage per Linear Foot	
Diameter (Inches)	Hydraulic Storage (CF per FT)
12	0.8
15	1.2
18	1.8
21	2.4
24	3.1
30	4.9
36	7.1
42	9.6
48	12.6
54	15.9
60	19.6
66	23.8
72	28.3
78	33.2
84	38.5
90	44.2
96	50.3
102	56.7
108	63.6
114	70.9
120	78.5
126	86.6
132	95.0
138	103.9
144	113.1

Pipe Arch - Hydraulic Storage per Linear Foot		
2 2/3" x 1/2" Corrugated Steel Pipe		
Diameter (Inches)	Pipe Arch Equivalent Size (Inches)	Hydraulic Storage (CF per FT)
15	17 x 13	1.1
18	21 x 15	1.6
21	24 x 18	2.2
24	28 x 20	2.4
30	35 x 24	4.5
36	42 x 29	6.5
42	49 x 33	8.9
48	57 x 38	11.6
54	64 x 43	14.7
60	71 x 47	18.1
66	77 x 52	21.9
72	83 x 57	26.0

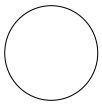
Pipe Arch - Hydraulic Storage per Linear Foot		
3" x 1" or 5" x 1" Corrugated Steel Pipe		
Diameter (Inches)	Pipe Arch Equivalent Size (Inches)	Hydraulic Storage (CF per FT)
54	60 x 46	15.6
60	66 x 51	19.3
66	73 x 55	23.2
72	81 x 59	27.4
78	87 x 63	32.1
84	95 x 67	37.0
90	103 x 71	42.4
96	112 x 75	48.0
102	117 x 79	54.2
108	128 x 83	60.5
114	137 x 87	67.4
120	142 x 91	74.5

Height of Cover and Weights Tables for HEL-COR® Corrugated Steel Pipe (CSP)

Heights of Cover Notes:

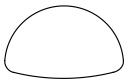
1. *These tables are for lock-seam or welded-seam construction. They are not for riveted construction. Consult your Contech Stormwater Consultant for Height of Cover tables on riveted pipe.*
2. *These values, where applicable, were calculated using a load factor of K=0.86 as adopted in the NCSPA CSP Design Manual, 2008.*
3. *The span and rise shown in these tables are nominal. Typically the actual rise that forms is greater than the specified nominal. This actual rise is within the tolerances as allowed by the AASHTO & ASTM specifications. The minimum covers shown are more conservative than required by the AASHTO and ASTM specifications to account for this anticipated increase in rise. Less cover height may be tolerated depending upon actual rise of supplied pipe arch.*
4. *H 20 and H 25 minimum cover is measured from top of pipe to bottom of flexible pavement or top of rigid pavement.*
5. *The H 20 and H 25 pipe-arch tables are based on 2 tons per square foot corner bearing pressures.*
6. *0.052" is 18 gage.*
   0.064" is 16 gage.
   0.079" is 14 gage.
   0.109" is 12 gage.
   0.138" is 10 gage.
   0.168" is 8 gage.
7. *For construction and firetruck loads, see Page 18.*
8. *1-1/2" x 1/4" corrugation. H 20, H 25 and E 80 loading.*
9. *Sewer gage (trench conditions) tables for corrugated steel pipe can be found in the AISI book "Modern Sewer Design," 4th Edition, 1999. These tables may reduce the minimum gage due to a higher flexibility factor allowed for a trench condition.*
10. *The haunch areas of a pipe-arch are the most critical zone for backfilling. Extra care should be taken to provide good material and compaction to a point above the spring line.*

Heights of Cover Limits – 2 2/3" x ½" HEL-COR CSP



H 20 and H 25 Live Loads

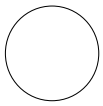
Diameter or Span, Inches	Minimum Cover, Inches	Maximum Cover, Feet					
		Specified Thickness, Inches					
		0.052	0.064	0.079	0.109	0.138	0.168
6[8]	12	388	486				
8[8]	12	291	365				
10[8]	12	233	392				
12	12	197	248	310			
15	12	158	198	248			
18	12	131	165	206			
21	12	113	141	177	248		
24	12	98	124	155	217		
30	12		99	124	173		
36	12		83	103	145	186	
42	12		71	88	124	159	195
48	12		62	77	108	139	171
54	12			67	94	122	150
60	12				80	104	128
66	12				68	88	109
72	12					75	93
78	12						79
84	12						66



H 20 and H 25 Live Loads, Pipe-Arch

Size		Minimum Structural Thickness, Inches	Minimum Cover, Inches	Maximum Cover, Feet
Round Equivalent, Inches	Span x Rise, Inches			2 Tons/Ft.² Corner Bearing Pressure
15	17 x 13	0.064	12	16
18	21 x 15	0.064	12	15
21	24 x 18	0.064	12	15
24	28 x 20	0.064	12	15
30	35 x 24	0.064	12	15
36	42 x 29	0.064	12	15
42	49 x 33	0.064*	12	15
48	57 x 38	0.064*	12	15
54	64 x 43	0.079*	12	15
60	71 x 47	0.109*	12	15
66	77 x 52	0.109*	12	15
72	83 x 57	0.138*	12	15

Heights of Cover Limits – 5" x 1" or 3" x 1" HEL-COR CSP



H 20 and H 25 Live Loads

Diameter or Span, Inches	Minimum Cover, Inches	Maximum Cover, Feet				
		Specified Thickness, Inches				
		0.064	0.079	0.109	0.138	0.168
54	12	56	70	98	127	155
60	12	50	63	88	114	139
66	12	46	57	80	103	127
72	12	42	52	74	95	116
78	12	39	48	68	87	107
84	12	36	45	63	81	99
90	12	33	42	59	76	93
96	12	31	39	55	71	87
102	18	29	37	52	67	82
108	18		35	49	63	77
114	18		32	45	58	72
120	18		30	42	54	66
126	18			39	50	61
132	18			36	46	58
138	18			33	43	53
144	18				39	49

Maximum cover heights shown are for 5" x 1".
To obtain maximum cover for 3" x 1", increase these values by 12%.

H 20 and H 25 Live Loads, Pipe-Arch

Size		Minimum Structural Thickness, Inches	Minimum Cover, Inches	Maximum Cover, Feet
Round Equivalent, Inches	Span x Rise, Inches			2 Tons/Ft.² Corner Bearing Pressure
72	81 x 59	0.109	18	21
78	87 x 63	0.109	18	20
84	95 x 67	0.109	18	20
90	103 x 71	0.109	18	20
96	112 x 75	0.109	21	20
102	117 x 79	0.109	21	19
108	128 x 83	0.109	24	19
114	137 x 87	0.109	24	19
120	142 x 91	0.138	24	19

Larger sizes are available in some areas of the United States. Check with your local Contech representative . Some minimum heights of cover for pipe-arches have been increased to take into account allowable "plus" tolerances on the manufactured rise.

Approximate Weight – Pounds/Foot
HEL-COR® CSP

(Estimated Average Weights—Not for Specification Use)

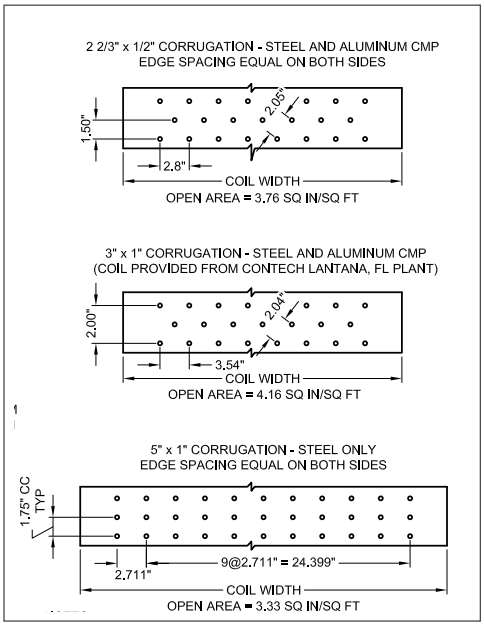
2 ²/₃" x ¹/₂" HEL-COR® CSP						
Inside Diameter, Inches	Weight (Pounds/Feet) Specified Thickness (Gage)					
	0.052 18	0.064 16	0.079 14	0.109 12	0.138 10	0.168 8
12	8	10	12			
15	10	12	15			
18	12	15	18			
21	14	17	21	29		
24	15	19	24	33		
30		24	30	41		
36		29	36	49	62	
42		34	42	57	72	88
48		38	48	65	82	100
54			54	73	92	112
60				81	103	124
66				89	113	137
72					123	149
78						161
84						173

3" x 1" HEL-COR® CSP						
Inside Diameter, Inches	Weight (Pounds/Feet) Specified Thickness (Gage)					
	0.052 18	0.064 16	0.079 14	0.109 12	0.138 10	0.168 8
54		50	61	83	106	129
60		55	67	92	118	143
66		60	74	101	129	157
72		66	81	110	140	171
78		71	87	119	152	185
84		77	94	128	164	199
90		82	100	137	175	213
96		87	107	147	188	228
102		93	114	155	198	241
108			120	165	211	256
114			127	174	222	271
120			134	183	234	284
126				195	247	299
132				204	259	259
138				213	270	328
144					282	344

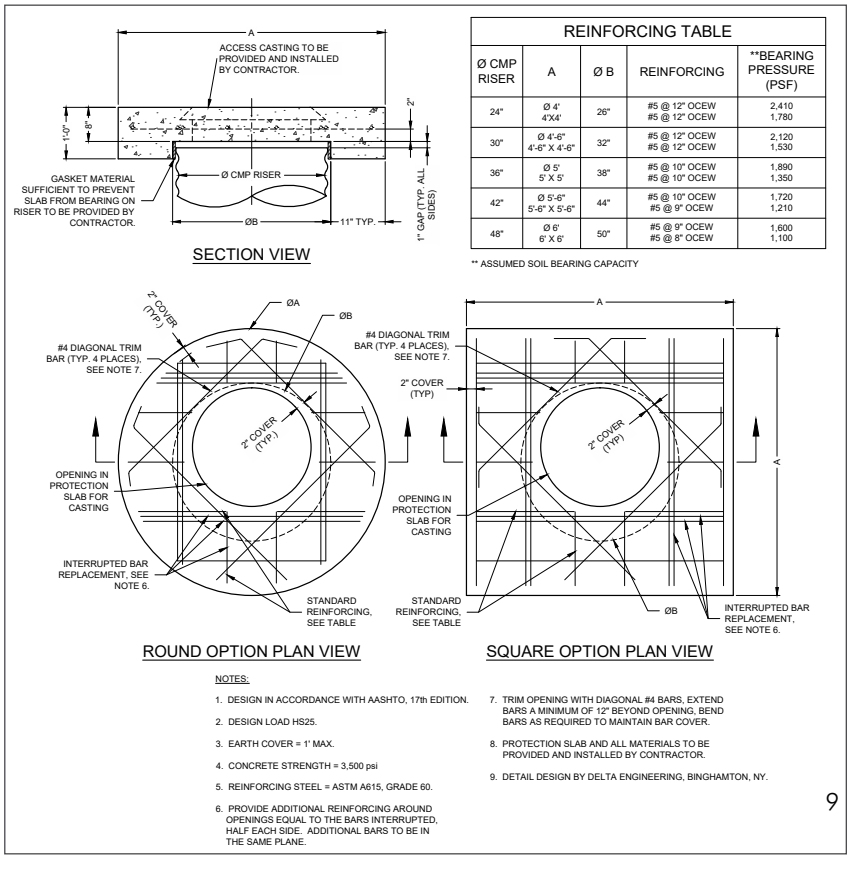
Notes::

1. *Weights shown apply to galvanized and aluminized type 2 (ALT2) CSP only. Weights for polymer coated CSP are 1% to 4% higher, varying by gage.*
2. *Please contact your Contech Stormwater Consultant.*
3. *Weights listed in the 3" x 1" or 5" x 1" table are for 3" x 1" pipe. Weights for 5" x 1" are approximately 12% less than those used in this table, for metallic coated pipe.*

CMP Perforation Details

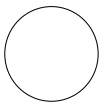


Manhole Cap Detail



Height of Cover and Weights Tables - CORLIX® Corrugated Aluminum Pipe (CAP)

Heights of Cover Limits – 2 ²/₃" x ½" CORLIX CAP



HL 93 Live Load

Diameter or Span, Inches	Minimum Cover, Inches	Maximum Cover, Feet[2] Specified Thickness (Gage) 18	16	14	12	10	8[5]
6[4]	12	197	247				
8[4]	12	147	185				
10[4]	12	119	148				
12	12		125	157			
15	12		100	125			
18	12		83	104			
21	12		71	89			
24	12		62	78	109		
27	12			69	97		
30	12			62	87		
36	12			51	73	94	
42	12				62	80	
48	12				54	70	85
54	15				48	62	76
60	15					52	64
66	18						52
72	18						43

HL 93 Live Load, Pipe-Arch

Round Pipe Dia. (Inches)	Size, Inches Span x Rise	Minimum Gage	Minimum[3] Cover (Inches)	Maximum Cover, (Ft.) Aluminum Pipe-Arch[2] 2 Tons/Ft.² for Corner Bearing Pressures
15	17 x 13	16	12	13
18	21 x 15	16	12	12
21	24 x 18	16	12	12
24	28 x 20	14	12	12
30	35 x 24	14	12	12
36	42 x 29	12	12	12
42	49 x 33	12	15	12
48	57 x 38	10	15	12
54	64 x 43	10	18	12
60	71 x 47	8[5]	18	12

Notes:

1. Height of cover is measured to top of rigid pavement or to bottom of flexible pavement.
2. Maximum cover meets AASHTO LRFD design criteria.
3. Minimum cover meets AASHTO and ASTM B 790 design criteria.
4. 1 1/2" x 1/4" corrugation.
5. 8-gage pipe has limited availability.
6. For construction loads, see page 18.

Approximate Weight – Pounds/Foot

CORLIX® CAP

(Estimated Average Weights—Not for Specification Use)

2 ²/₃" x ¹/₂" CORLIX® CAP

Diameter or Span, Inches	Weight (Pounds/Feet) Specified Thickness (Gage) 0.048 18	0.060 16	0.075 14	0.105 12	0.135 10	0.164 8[3]
6[4]	1.3	1.6				
8[4]	1.7	2.1				
10[4]	2.1	2.6				
12		3.2	4			
15		4	4.9			
18		4.8	5.9			
21		5.6	6.9			
24		6.3	7.9	10.8		
27			8.8	12.2		
30			9.8	13.5		
36			11.8	16.3	20.7	
42				19	24.2	
48				21.7	27.6	33.5
54				24.4	31.1	37.7
60					34.6	41.9
66						46
72						50.1

3" x 1" CORLIX® CAP

Diameter or Span, Inches	Weight (Pounds/Feet) Specified Thickness (Gage) 0.060 16	0.075 14	0.105 12	0.135 10	0.164 8[3]
30	9.3	11.5	15.8	20.2	
36	11.1	13.7	18.9	24.1	
42	12.9	16	22	28	
48	14.7	18.2	25.1	32	38.8
54	16.5	20.5	28.2	35.9	43.6
60	18.3	22.7	31.3	40	48.3
66	20.2	24.9	34.3	43.7	53
72	22	27.1	37.4	47.6	57.8
78		29.3	40.4	51.5	62.5
84			43.5	55.4	67.2
90			46.6	59.3	71.9
96			49.6	63.2	76.7
102				66.6	80.8
108				71	86.1
114					90.9
120					95.6

Notes:

1. Helical lockseam pipe only. Annular riveted pipe weights will be higher.
2. 1 ½" x ¼" Corrugation.
3. 8-gage pipe has limited availability.

Pretreatment Options

Regardless of infiltration material type and configuration, one of the most important components to consider is pretreatment. A pretreatment device prolongs the life of the infiltration system by removing debris and sediment that can collect on the invert and within the stone backfill voids. Pretreatment will maintain the efficiency of an infiltration system as well as extend the life cycle, therefore preventing a premature replacement. Pretreatment also offers these additional benefits:

- Pretreatment creates a single collection point which is easier to clean and maintain compared to the infiltration system alone.
- Cost savings due to the extended service life of the system.
- Removing trash and debris protects downstream outlet control structures from clogging.

Contech offers a number of pretreatment options, all of which will extend the life of subsurface infiltration systems and improve water quality. The type of system chosen will depend on a number of factors including footprint, soil conditions, local regulations, and the desired level of pretreatment.

Hydrodynamic Separation

Hydrodynamic Separation (HDS) provides a basic level of pretreatment by capturing and retaining trash and debris, sediment, and oil from stormwater runoff.

Cascade Separator™
The Cascade Separator™ is the latest innovation in hydrodynamic separation from Contech. The Cascade uses advanced sediment capture technology to provide the highest sediment removal efficiency of any Contech HDS product. Cascade also captures trash and hydrocarbons.

CDS®
The CDS® uses both swirl concentration and a nonblocking screen to capture and retain 100% of floatables and neutrally buoyant debris 4.7mm or larger.

Vortechs®
Vortechs combines swirl concentration and flow controls into a shallow treatment unit that traps and retains trash, debris, sediment, and hydrocarbons from stormwater runoff. Vortechs removes sediment down to 50 microns and is the ideal solution for projects that require a shallow treatment device due to groundwater, utility, or bedrock constraints.

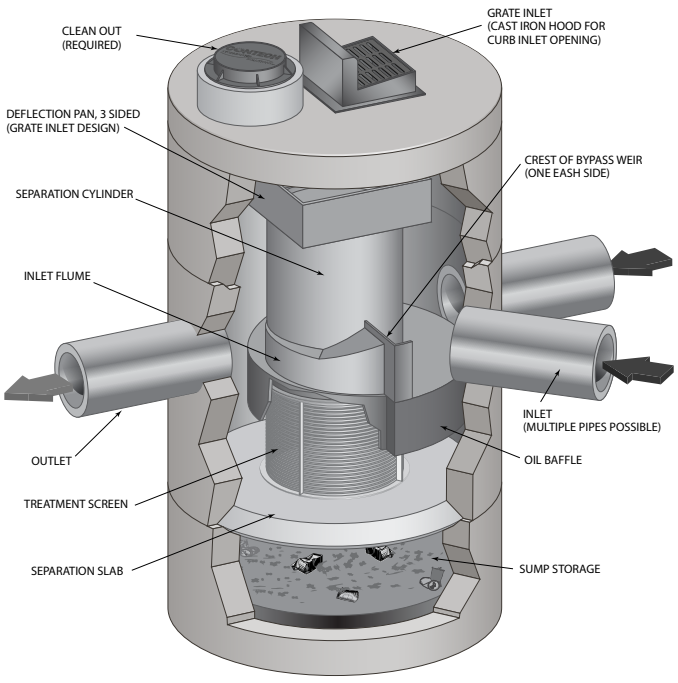
Filtration

Filtration provides a higher level of pretreatment and improved water quality by removing trash and debris, oil, fine solids, and dissolved pollutants such as metals, hydrocarbons, and nutrients.

Filterra® Bioretention System
Filterra is an engineered bioretention system that has been optimized for high volume/flow treatment and high pollutant removal.

The Stormwater Management StormFilter®
The StormFilter system is comprised of a structure that houses rechargeable, media-filled cartridges. The media can be customized to target site-specific pollutants.

Jellyfish® Filter
The Jellyfish filter uses membrane filtration in a compact footprint to remove a high level and a wide variety of stormwater pollutants such as fine particulates, oil, trash and debris, metals, and nutrients.



CDS® Hydrodynamic Separator

Custom Fabrication and Fittings

One of the benefits of CMP detention systems is its flexibility. With the addition of elbows, tees, stubs, and other components, CMP detention systems can be configured to meet sight specific constraints.

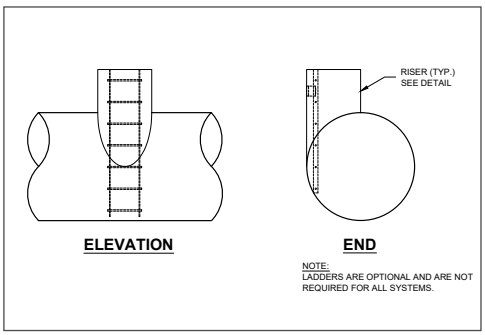
Benefits of Custom Fabrication

- More efficiently match site constraints
- System components are easy to install
- Provide maintenance ready structures - easily accessible
- Easily control influent and effluent
- Eliminate concrete structures such as junction boxes

CMP is also versatile enough for use for the entire stormwater system, including:

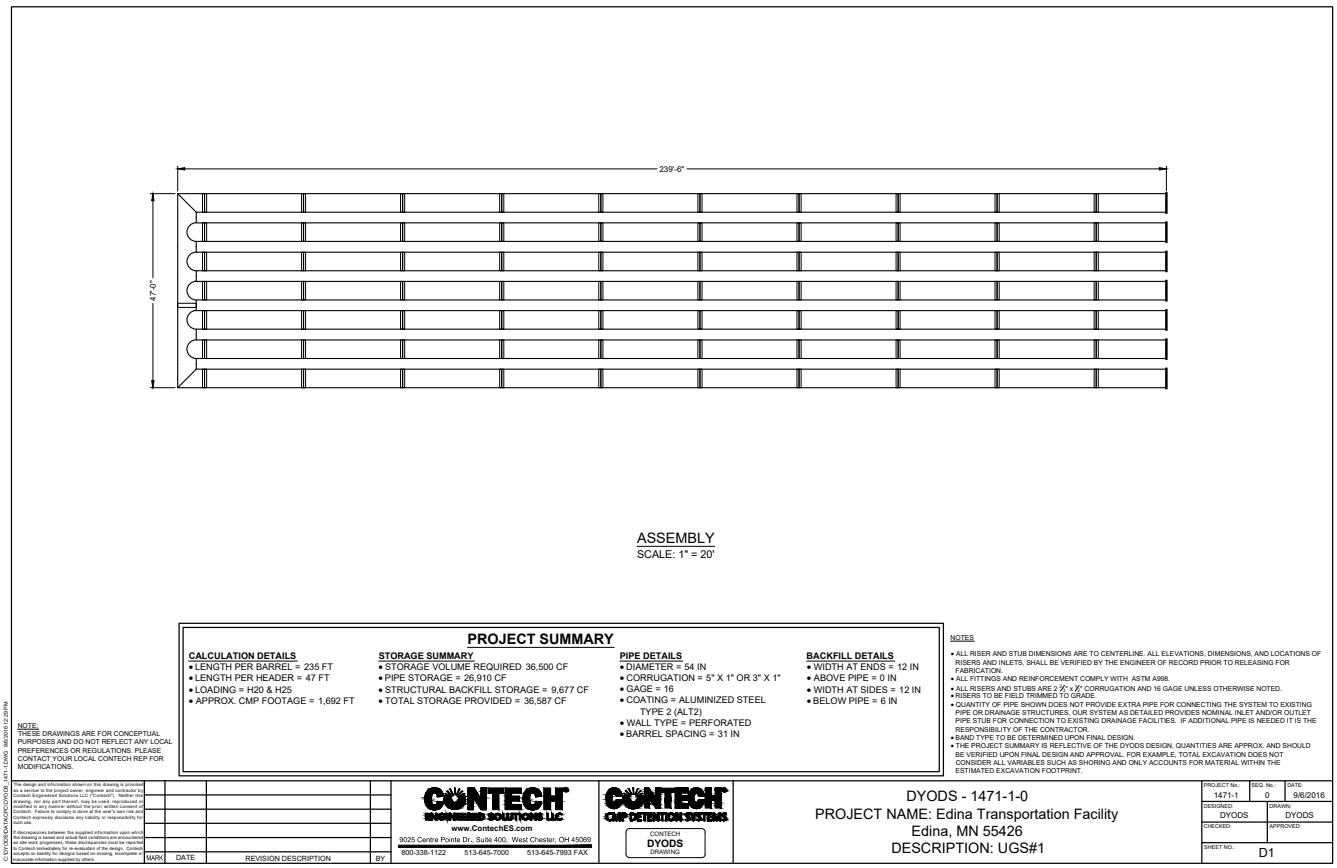
- Slotted drain pipe
- Storm sewer pipe
- Manholes / Inlet structures

Typical Riser Detail



One benefit to CMP detention systems is that we can integrate the manhole risers so you don't have to have an additional concrete junction box which can add cost to the project. Vertical risers can be used as manholes or inlets…or both, and ladders can be added so the opening can be used for access. We typically locate the manhole on the side of the pipe so that the ladder can be extend down the wall of the pipe to the invert.

Sample Proposal Drawing



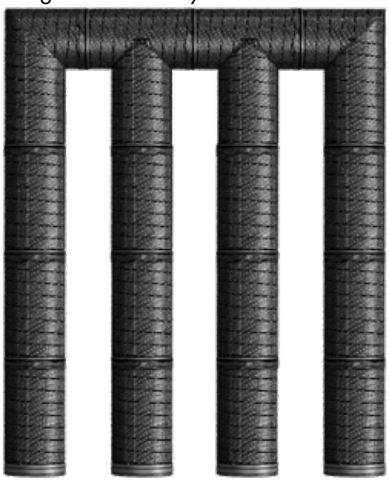
Note: Fittings will need to be structurally checked for reinforcements.

CMP Detention System Bedding and Backfill

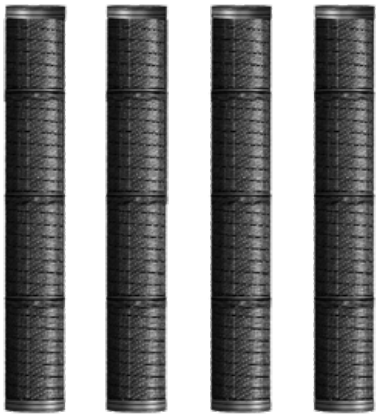
Please follow the guidelines below regarding pipe bedding and backfill.

1. Minimum trench width must allow room for proper compaction of haunch materials under pipe. min. width = (1.5 x diameter) + 12" (follow AASHTO Section 12 & 26).
    a. The minimum embankment width is 3 pipe diameters.
2. The foundation shall be well consolidated & stable.
3. The bedding material shall be a relatively loose material that is roughly shaped to fit the bottom of the pipe, 4" to 6" in depth.
4. Bedding material shall be a relatively loose material that is roughly shaped to fit the bottom of the pipe, and a minimum of twice the corrugation depth in thickness, with the maximum particle size of one-half of the corrugation depth (AASHTO Section 26.3.8.1, 26.5.3).
    a. Haunch zone material shall be hand shoveled or shovel sliced into place to allow for proper compaction.
5. H 20 and H 25 minimum cover is measured from top of pipe to bottom of flexible pavement or top of rigid pavement. Minimum cover is 12 inches for diameters up to and including 96", 18 inches for diameters ranging from 102" and greater.
6. Final backfill material selection and compaction requirements per the project plans, specifications, or engineer of record.
7. Geotextile shall be used as required to prevent soil migration.
8. Final backfill material selection and compaction requirements shall follow the project plans and specifications per the engineer of record (26.5.4.1).

Single Manifold System



No Manifold System



CMP Detention System Installation

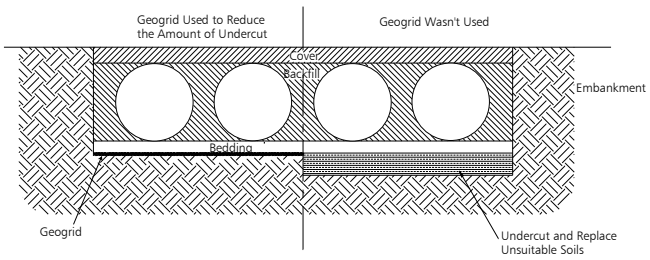
Overview

Proper installation of a flexible underground detention system will ensure long-term performance. The configuration of these systems often requires special construction practices that differ from conventional flexible pipe construction. Contech Engineered Solutions strongly suggests scheduling a pre-construction meeting with your local Sales Engineer to determine if additional measures, not covered in this guide, are appropriate for your site.

Foundation

Construct a foundation that can support the design loading applied by the pipe and adjacent backfill weight as well as maintain its integrity during construction.

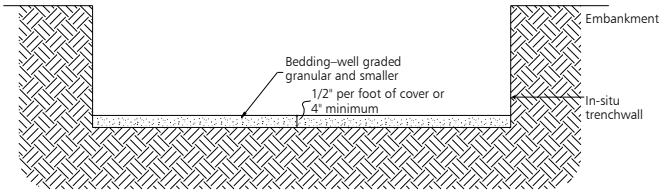
If soft or unsuitable soils are encountered, remove the poor soils down to a suitable depth and then build up to the appropriate elevation with a competent backfill material. The structural fill material gradation should not allow the migration of fines, which can cause settlement of the detention system or pavement above. If the structural fill material is not compatible with the underlying soils an engineering fabric should be used as a separator. In some cases, using a stiff reinforcing geogrid reduces over excavation and replacement fill quantities.



Grade the foundation subgrade to a uniform or slightly sloping grade. If the subgrade is clay or relatively non-porous and the construction sequence will last for an extended period of time, it is best to slope the grade to one end of the system. This will allow excess water to drain quickly, preventing saturation of the subgrade.

Bedding

A 4 to 6-inch thick, well-graded, granular material is the preferred pipe bedding. If construction equipment will operate for an extended period of time on the bedding, use either an engineering fabric or a stiff geogrid to ensure the base material maintains its integrity.

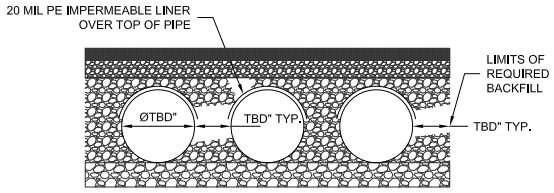


Using a relatively loose material, grade the base to a smooth, uniform grade to allow for the proper placement of the pipe. Using an open-graded bedding material is acceptable; however, an engineering fabric separator is required between the base and the subgrade.

Geomembrane Barrier

A site's resistivity may change over time when various types of salting agents are used, such as road salts for deicing purposes. If salting agents are used on or near the project site, a geomembrane barrier must be used with the system. The geomembrane liner is intended to help protect the system from the potential adverse effects that may result from the use of such salting agents including premature corrosion and reduced actual service life.

The project's Engineer of Record is to evaluate whether salting agents will be used on or near the project site, and use his/her best judgement to determine if any additional protective measures are required. Below is a typical detail showing the placement of a geomembrane barrier for projects where salting agents are used on or near the project site.



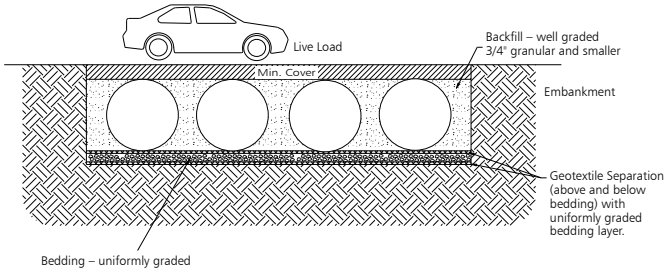
Standard Liner Over Rows

In-Situ Trench Wall

If excavation is required, the trench wall needs to be capable of supporting the load that the pipe sheds as the system is loaded. If soils are not capable of supporting these loads, the pipe can deflect. Perform a simple soil pressure check using the applied loads to determine the limits of excavation beyond the spring line of the outer most pipes. In most cases the requirements for a safe work environment and proper backfill placement and compaction take care of this concern.

Backfill Material

Typically, the best backfill material is an angular, well-graded, granular fill meeting the requirements of AASHTO A-1, A-2 or A-3. In some cases, it may be desirable to use a uniformly graded material for the first 18- to 24-inches. This type of material is easier to place under the haunches of the pipe and requires little compactive effort. Depending on the bedding material, a separation geotextile might be required above and below these initial lifts.

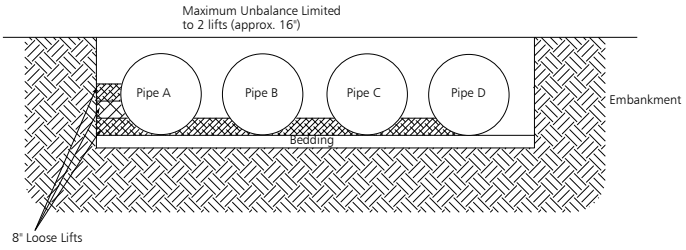


Open-graded fill is typically not used beyond the initial 18- to 24-inches because this type of fill often does not provide adequate confining restraint to the pipes. If a uniformly graded material (particles all one size) is used, install a geotextile separation fabric to prevent the migration of fines into the backfill.

Backfill using controlled low-strength material (CLSM or "flowable fill") when the spacing between the pipes will not allow for placement and adequate compaction of the backfill. Work closely with the local Contech Stormwater Consultant regarding the special installation techniques required when using CLSM.

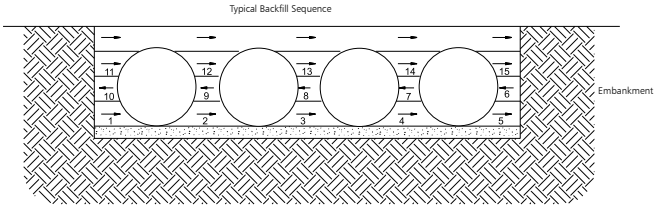
Backfill Placement

Place backfill in 8-inch loose lifts and compact to 90% AASHTO T99 standard proctor density. Material shall be worked into the pipe haunches by means of shovel-slicing, rodding, air tamper, vibratory rod, or other effective methods. If AASHTO T99 procedures are determined infeasible by the geotechnical engineer of record, compaction is considered adequate when no further yielding of the material is observed under the compactor, or under foot, and the geotechnical engineer of record (or representative thereof) is satisfied with the level of compaction.

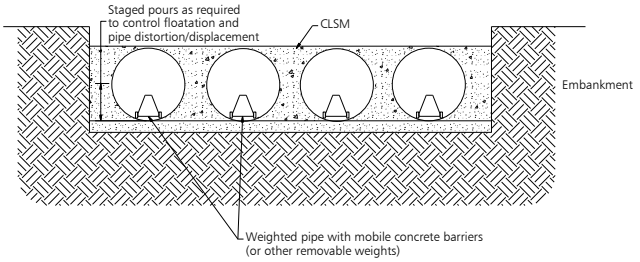


For large systems, conveyor systems, backhoes with long reaches or draglines with stone buckets may be used to place backfill.

Once minimum cover for construction loading across the entire width of the system is reached, advance the equipment to the end of the recently placed fill, and begin the sequence again until the system is completely backfilled. This type of construction sequence provides room for stockpiled backfill directly behind the backhoe, as well as the movement of construction traffic. Material stockpiles on top of the backfilled detention system should be limited to 8- to 10-feet high and must provide balanced loading across all barrels. To determine the proper cover over the pipes to allow the movement of construction equipment see Table 1, or contact your local Contech Stormwater Consultant.



When flowable fill is used, you must prevent pipe floatation. Typically, small lifts are placed between the pipes and then allowed to set-up prior to the placement of the next lift. The allowable thickness of the CLSM lift is a function of a proper balance between the uplift force of the CLSM, the opposing weight of the pipe, and the effect of other restraining measures. The pipe can carry limited fluid pressure without pipe distortion or displacement, which also affects the CLSM lift thickness. Your local Contech Stormwater Consultant can help determine the proper lift thickness.

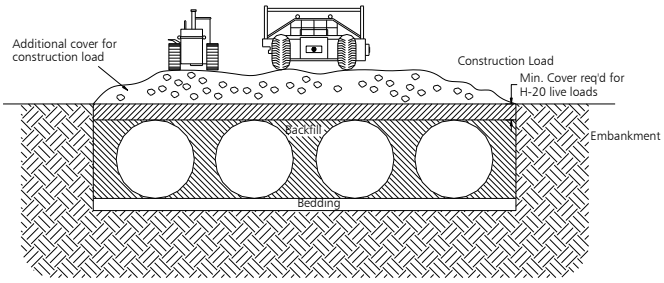


Construction Loading

Typically, the minimum cover specified for a project assumes H-20 live load. Because construction loads often exceed design live loads, increased temporary minimum cover requirements are necessary. Since construction equipment varies from job to job, it is best to address equipment specific minimum cover requirements with your local Contech Stormwater Consultant during your pre-construction meeting.

HEL-COR® CSP Minimum Height of Cover Requirements for Heavy Off-Road Construction Equipment

Pipe Span, Inches	Minimum Cover, Inches for Indicated Axle Loads (kips)			
	18-50	50-75	75-110	110-150
12 - 42	24	30	36	36
48-72	36	36	42	48
78-120	36	42	48	48
126 - 144	42	48	54	54



Firetruck Loading

Please use the table below for general guidance.

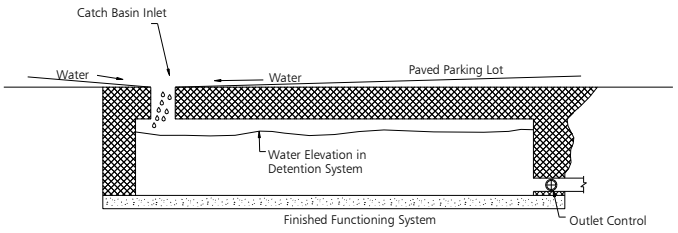
HEL-COR® CSP Minimum Height of Cover Requirements for Firetruck Loading[1]

Pipe Span, Inches	Corrugation Profile, Inches	Minimum Cover, Inches for Firetruck Outrigger Load (64 kips)[2,3]			
		16 GA	14 GA	12 GA	10 GA
		0.064	0.079	0.109	0.138
12 - 36	2 2/3 x ½	12	12	12	12
42 - 48	2 2/3 x ½	18	18	18	18
54 - 60	3 x 1 or 5 x 1	24	18		
72	3 x 1 or 5 x 1	30	24		
78 - 120	3 x 1 or 5 x 1		36	30	
126 - 144	3 x 1 or 5 x 1			42	36

1. *Minimum cover may vary depending on local conditions. The contractor must provide additional cover required to avoid damage to the pipe.* ***Minimum cover is measured from the top of the pipe to the top of the maintained construction roadway surface****.*
2. *Table is based on a typical 85,000 lb GVW firetruck with an outrigger load of 64,000 lbs. The 64,000 lb outrigger force is applied over a surface area of about 850.6 in2. The dimensions of the outrigger square pad are 25-7/8" x 32-7/8".*
3. *The outrigger load will be the heaviest load applied from the firetruck.*

Additional Considerations

Because most systems are constructed below-grade, rainfall can rapidly fill the excavation; potentially causing floatation and movement of the previously placed pipes. To help mitigate potential problems, it is best to start the installation at the downstream end with the outlet already constructed to allow a route for the water to escape. Temporary diversion measures may be required for high flows due to the restricted nature of the outlet pipe.



Contech Engineered Solutions LLC is a leading provider of site solution products and services for the civil engineering industry. Contech's product portfolio includes bridges, drainage, retaining walls, sanitary sewer, stormwater, erosion control, soil stabilization and wastewater products.

For more information, call one of Contech's Regional Offices located in the following cities:

Ohio (Corporate Office) 513-645-7000
California (Roseville) 800-548-4667
Colorado (Denver) 720-587-2700
Florida (Orlando) 321-348-3520
Maine (Scarborough) 207-885-9830
Maryland (Baltimore) 410-740-8490
Oregon (Portland) 503-258-3180
Texas (Dallas) 972-590-2000

www.ContechES.com
800-338-1122

CONTECH®
ENGINEERED SOLUTIONS

BRO-CMP-DETENTION DESIGN 8/19 MC

Appendix E
BMP Educational Materials

Stormwater Pollution Prevention

Best Management Practices for Homeowner's Associations, Property Managers and Property Owners

Your Guide To Maintaining Water Friendly Standards In Your Community

sbcountystormwater.org

Big Bear · Chino · Chino Hills · Colton · Fontana · Grand Terrace · Highland · Loma Linda · Montclair · Ontario · Rancho Cucamonga
Redlands · Rialto · San Bernardino · San Bernardino County · San Bernardino County Flood Control District · Upland · Yucaipa

Table of Contents

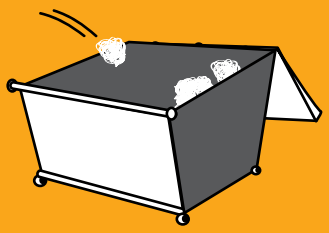
COMMERCIAL TRASH ENCLOSURES

FOLLOW THESE **REQUIREMENTS** TO **KEEP OUR WATERWAYS CLEAN**

Trash enclosures, such as those found in commercial and apartment complexes, typically contain materials that are intended to find their way to a landfill or a recycling facility. **These materials are NOT meant to go into our local lakes and rivers.**

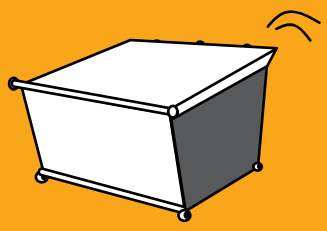
PROTECT WATER QUALITY BY FOLLOWING THESE SIMPLE STEPS

PUT TRASH INSIDE



Place trash inside the bin (preferably in sealed bags)

CLOSE THE LID



Prevent rain from entering the bin in order to avoid leakage of polluted water runoff

KEEP TOXICS OUT

- Paint
- Grease, fats and used oils
- Batteries, electronics and fluorescent lights

SOME ADDITIONAL GUIDELINES, INCLUDE

✓ SWEEP FREQUENTLY
Sweep trash enclosure areas frequently, instead of hosing them down, to prevent polluted water from flowing into the streets and storm drains.

✓ FIX LEAKS
Address trash bin leaks immediately by using dry clean up methods and report to your waste hauler to receive a replacement.

✓ CONSTRUCT ROOF
Construct a solid cover roof over the existing trash enclosure structure to prevent rainwater from coming into contact with trash and garbage. Check with your local City/County for Building Codes.

In San Bernardino County, stormwater pollution is caused by food waste, landscape waste, chemicals and other debris that are washed into storm drains and end up in our waterways - untreated! You can be part of the solution by maintaining a water-friendly trash enclosure.

THANK YOU FOR HELPING TO KEEP SAN BERNARDINO COUNTY CLEAN AND HEALTHY!

San Bernardino County STORMWATER PROGRAM

In the event of a spill or discharge to a storm drain or waterway, contact San Bernadino County Stormwater immediately: (877) WASTE18 | sbcountystormwater.org/report

sbcountystormwater.org

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Redlands • Rialto • San Bernadino • San Bernadino County • San Bernadino County Flood Control District • Upland • Yucaipa

CESQG PROGRAM

Conditionally Exempt Small Quantity Generator

WHAT IS A CESQG?

Businesses that generate 27 gallons or 220 lbs. of hazardous waste, or 2.2 lbs. of extremely hazardous waste per month are called "Conditionally Exempt Small Quantity Generators," or CESQGs. San Bernardino County Household Hazardous Program provides waste management services to CESQG businesses. The most common CESQGs in San Bernardino County are painters, print shops, auto shops, builders, agricultural operators and property managers, but there are many others. When you call, be ready to describe the types and amounts of waste your business generates in a typical month. If you generate hazardous waste on a regular basis, you must:

- Register with San Bernardino County Fire Department (909) 386-8401 as a hazardous waste generator.
- To obtain an EPA ID# and application form from the State visit www.dtsc.ca.gov.
- Manage hazardous waste in accordance with all applicable local, state and federal laws and regulations.

HOW DO I GET SERVICE?

To arrange an appointment for the CESQG Program, call 1-800-OILY CAT or 909-382-5401. Be ready to describe the type and amount of hazardous waste your business is ready to dispose of, and the types and size(s) of containers that the waste is in.

Waste Type and Cost

There is a small handling fee involved in the collection of hazardous waste from your business. Disposal costs depend on the type of waste.

Aerosols	$1.29/lb.
Automobile motor oil	$.73/gal.
Anti-freeze	$1.57/gal.
Contaminated oil	$4.48/gal.
Car batteries	$.62/ea.
Corrosive liquids, solids	$2.80/lb.
Flammable solids, liquids	$1.57/lb.
Latex Paint	$.73/lb.
Mercury	$10.08/lb.
NiCad/Alkaline Batteries	$2.13/lb.
Oil Base Paints	$1.00/lb.
Oil Filters	$.56/ea.
Oxidizers	$9.63/lb.
PCB Ballasts	$5.94/lb.
Pesticides (most)	$2.91/lb.
Photofixer, developer	$4.31/gal.
Television & Monitors	$11.20/ea.
Additional Handling	$138.00/hr.

Rates subject to change without notice

WE CANNOT ACCEPT

- Radioactives
- Water reactives
- Explosives
- Compressed gas cylinders
- Medical or biohazardous waste
- Asbestos
- Remediation wastes

HAZARDOUS WASTE

WHY IS THE FIRE DEPARTMENT COLLECTING HAZARDOUS WASTE?

Small Quantity Generators often have difficulty disposing of small quantities of hazardous waste. Hazardous waste companies usually have a minimum amount of waste that they will pick up, or charge a minimum fee for service. Typically, the minimum fee exceeds the cost of disposal for the hazardous waste. This leaves the small quantity generator in a difficult situation. Some respond by storing hazardous waste until it becomes economical for the hazardous waste transporter to pick it up, putting the business out of compliance by exceeding regulatory accumulation time limits. Other businesses simply store their hazardous wastes indefinitely, creating an unsafe work environment and exceeding accumulation time limits. Yet other businesses attempt to illegally dispose of their waste at household hazardous waste collection facilities. These facilities are not legally permitted to accept commercial wastes, nor are prepared to provide legal documentation for commercial hazardous waste disposal. In answer to the problems identified above, the San Bernardino County Fire Department Household Hazardous Program instituted the Conditionally Exempt Small Quantity Generator Program.

PAYMENT FOR SERVICES

The CESQG Program will prepare an invoice for your business at the time of service. You can pay at the time of service with cash or a check, or you can mail your payment to the Fire Department within 30 days. Please note that we do not accept credit card payments. The preferred method of payment is to handle payment at time of service. Additional charges may apply for accounts not paid within 30 days.

ARE THERE ANY OTHER WAYS THAT I CAN SAVE MONEY ON HAZARDOUS WASTE DISPOSAL?

Yes! First, start by reducing the amount of waste that you produce by changing processes or process chemicals, at your business. Next, examine if there is a way that you can recycle your waste back into your processes. Network with similar businesses or trade associations for waste minimization and pollution prevention solutions.

WHAT IF YOUR BUSINESS DOES NOT QUALIFY?

Call the San Bernardino County Fire Department Field Services Division for assistance with hazardous waste management at 909-386-8401. If you reduce the amount of waste you generate each month to 27 gallons or less, you may qualify in the future.

WHAT HAPPENS TO YOUR HAZARDOUS WASTE?

Hazardous waste collected by the CESQG Program is transported to a state permitted processing facility in San Bernardino. The waste is further processed at this point and packaged for off-site recycling (oil filters, oil, latex paint, antifreeze, and batteries) or destructive incineration (pesticides, corrosives, flammables, oil based paint).

San Bernardino County Fire Department
CESQG Program
2824 East "W" Street
San Bernardino, CA 92415-0799
Phone: 909-382-5401
Fax: 909-382-5413
www.sbcfire.org/hazmat/hhw.asp
Email: jschwab@sbcfire.org

WHEN WORKING OUTDOORS USE THE 3Cs

CUANDO TRABAJE AL AIRE LIBRE UTILICE LAS 3Cs

CONTROL | CONTROL

Locate the nearest storm drain and ensure nothing can enter or be discharged into it.
Ubique el desagüe de aguas pluviales más cercano y asegúrese de que nada pueda ingresar a éste ni descargarse en él.

CONTAIN | CONTENER

Isolate your area to prevent material from potentially flowing or being blown away.
Aísle su área para evitar que el material pueda discurrirse o ser llevado por el viento.

CAPTURE | CAPTURAR

Sweep up debris and place it in the trash. Clean up spills with an absorbent material (e.g. kitty litter) or vacuum with a Wet-Vac and dispose of properly.
Recoja los restos y colóquelos en la basura. Limpie los derrames con un material absorbente (como la arena para gatos) o aspírelos con una Wet-Vac (aspiradora de humedad) y deséchelos correctamente.

COMMERCIAL LANDSCAPE

DISCHARGE TO THE STORM DRAIN, **ACCIDENTAL OR NOT**, COULD LEAD TO ENFORCEMENT ACTIONS, WHICH COULD INCLUDE FINES.

Follow the best practices below to **prevent water pollution from landscaping activities.**

RECYCLE YARD WASTE

- Recycle leaves, grass clippings and other yard waste.
- Do not blow, sweep, rake or hose yard waste into the street or catch basin.
- **Try grasscycling:** the natural recycling of grass by leaving clippings on the lawn when mowing.

  For more information, please visit: **www.calrecycle.ca.gov/organics/grasscycling**

USE FERTILIZERS, HERBICIDES AND PESTICIDES SAFELY

- Fertilizers, herbicides and pesticides are often carried into the storm drain system by sprinkler runoff. Use natural and non-toxic alternatives as often as possible.
- If you must use chemical fertilizers, herbicides or pesticides:
  - Spot apply, rather than blanketing entire areas.
  - Avoid applying near curbs and driveways, and **never** before a rain.
  - Apply fertilizers as needed: when plants could best use it and when the potential runoff would be low.
  - Follow the manufacturer's instructions carefully—this will not only give the best results, but will save money.

USE WATER WISELY

- Control the amount of water and direction of sprinklers. Sprinklers should only be on long enough to allow water to soak into the ground, but not so long as to cause runoff.
- Periodically inspect, fix leaks and realign sprinkler heads.
- Plant native vegetation to reduce the need of water, fertilizers, herbicides and pesticides.

HOMEOWNERS

KEEP THESE TIPS IN MIND WHEN HIRING PROFESSIONAL LANDSCAPERS AND REMIND AS NECESSARY.

Leftover pesticides, fertilizers, and herbicides contaminate landfills and should be disposed of through a Hazardous Waste Facility.

For more information on proper disposal call,

(909) 382-5401 or 1-800-OILY CAT.

*FREE for San Bernardino County residents only. Businesses can call for cost inquiries and to schedule an appointment.

In the event of a spill or discharge to a storm drain or waterway, contact San Bernadino County Stormwater immediately: (877) WASTE18 | sbcountystormwater.org/report

sbcountystormwater.org

Big Bear • Chino • Chino Hills • Colton • Fontana • Grand Terrace • Highland • Loma Linda • Montclair • Ontario • Rancho Cucamonga
Redlands • Rialto • San Bernadino • San Bernadino County • San Bernadino County Flood Control District • Upland • Yucaipa

SIDEWALK, PLAZA, ENTRY MONUMENT & FOUNTAIN MAINTENANCE

Pollutants on sidewalks and other pedestrian traffic areas and plazas are typically due to littering and vehicle use. Fountain water containing chlorine and copperbased algaecides is toxic to aquatic life. Proper inspection, cleaning, and repair of pedestrian areas and HOA owned surfaces and structures can reduce pollutant runoff from these areas. Maintaining these areas may involve one or more of the following activities:

1. **Surface Cleaning**
2. **Graffiti Cleaning**
3. **Sidewalk Repair**
4. **Controlling Litter**
5. **Fountain Maintenance**

POLLUTION PREVENTION:

Pollution prevention measures have been considered and incorporated in the model procedures. Implementation of these measures may be more effective and reduce or eliminate the need to implement other more complicated or costly procedures. Possible pollution prevention measures for sidewalk, plaza, and fountain maintenance and cleaning include:

- Use dry cleaning methods whenever practical for surface cleaning activities.
- Use the least toxic materials available (e.g. water based paints, gels or sprays for graffiti removal).
- Once per year, educate HOA staff and tenants on pollution prevention measures.

MODEL PROCEDURES:

1. Surface Cleaning

Discharges of wash water to the storm water drainage system from cleaning or hosing of impervious surfaces is prohibited.

Sidewalks, Plazas

✓ Use dry methods (e.g. sweeping, backpack blowers, vacuuming) whenever practical to clean sidewalks and plazas rather than hosing, pressure washing, or steam cleaning. DO NOT sweep or blow material into curb; use devices that contain the materials.

✓ If water must be used, block storm drain inlets and contain runoff. Discharge wash water to landscaping or contain and dispose of properly.

SIDEWALK, PLAZA, ENTRY MONUMENT & FOUNTAIN MAINTENANCE

Parking Areas, Driveways, Drive-thru

✓ Parking facilities should be swept/vacuumed on a regular basis. Establish frequency of public parking lot sweeping based on usage and field observations of waste accumulation.

✓ If water must be used, block storm drain inlets and contain runoff. Discharge wash water to landscaping or contain and dispose of properly.

✓ Sweep all parking lots at least once before the onset of the wet season.

✓ Use absorbents to pick up oil; then dry sweep.

✓ Appropriately dispose of spilled materials and absorbents.

OPTIONAL:

- Consider increasing sweeping frequency based on factors such as traffic volume, land use, field observations of sediment and trash accumulation, proximity to water courses, etc.

Building Surfaces, Decks, etc., without loose paint

✓ Use high-pressure water, no soap.

✓ If water must be used, block storm drain inlets and contain runoff. Discharge wash water to landscaping or contain and dispose of properly.

Unpainted Building Surfaces, Wood Decks, etc.

✓ If water must be used, block storm drain inlets and contain runoff. Discharge wash water to landscaping or contain and dispose of properly.

✓ Use biodegradable cleaning agents to remove deposits.

✓ Make sure pH is between 6.5 and 8.5 THEN discharge to landscaping (if cold water without a cleaning agent) otherwise dispose of properly.

2. Graffiti Cleaning

Graffiti Removal

✓ Avoid graffiti abatement activities during rain events.

✓ When graffiti is removed by painting over, implement the procedures under Painting and Paint Removal in the Roads, Streets, and Highway Operation and Maintenance procedure sheet.

✓ Protect nearby storm drain inlets prior to removing graffiti from walls, signs, sidewalks, or other structures needing graffiti abatement. Clean up afterwards by sweeping or vacuuming thoroughly, and/or by using absorbent and properly disposing of the absorbent.

SIDEWALK, PLAZA, ENTRY MONUMENT & FOUNTAIN MAINTENANCE

✓ Note that care should be taken when disposing of waste since it may need to be disposed of as hazardous waste.

OPTIONAL:

• Consider using a waterless and non-toxic chemical cleaning method for graffiti removal (e.g. gels or spray compounds).

3. Sidewalk Repair

Surface Removal and Repair

✓ Schedule surface removal activities for dry weather if possible.

✓ Avoid creating excess dust when breaking asphalt or concrete.

✓ Take measures to protect nearby storm drain inlets prior to breaking up asphalt or concrete (e.g. place hay bales or sand bags around inlets). Clean afterwards by sweeping up material.

✓ Designate an area for clean up and proper disposal of excess materials.

✓ Remove and recycle as much of the broken pavement as possible.

✓ When making saw cuts in pavement, use as little water as possible. Cover each storm drain inlet with filter fabric during the sawing operation and contain the slurry by placing straw bales, sandbags, or gravel dams around the inlets. After the liquid drains shovel or vacuum the slurry, remove from site and dispose of properly.

✓ Always dry sweep first to clean up tracked dirt. Use a street sweeper or vacuum truck. Do not dump vacuumed liquid in storm drains. Once dry sweeping is complete, the area may be hosed down if needed. Discharge wash water to landscaping, pump to the sanitary sewer if permitted to do so or contain and dispose of properly.

Concrete Installation and Repair

✓ Avoid mixing excess amounts of fresh concrete or cement mortar on-site. Only mix what is needed for the job.

✓ Wash concrete trucks off-site or in designated areas on-site, such that there is no discharge of concrete wash water into storm drain inlets, open ditches, streets, or other storm water conveyance structures. (See Concrete Waste Management BMP WM – 8)

SIDEWALK, PLAZA, ENTRY MONUMENT & FOUNTAIN MAINTENANCE

✓ Store dry and wet concrete materials under cover, protected from rainfall and runoff and away from drainage areas. After job is complete remove temporary stockpiles (asphalt materials, sand, etc.) and other materials as soon as possible.

✓ Return leftover materials to the transit mixer. Dispose of small amounts of excess concrete, grout, and mortar in the trash.

✓ When washing concrete to remove fine particles and expose the aggregate, contain the wash water for proper disposal.

✓ Do not wash sweepings from exposed aggregate concrete into the street or storm drain. Collect and return sweepings to aggregate base stock pile, or dispose in the trash.

✓ Protect applications of fresh concrete from rainfall and runoff until the material has hardened.

4. Litter Control

✓ Enforce anti-litter laws.

✓ Provide litter receptacles in busy, high pedestrian traffic areas of the community, at recreational facilities, and at community events.

✓ Cover litter receptacles and clean out frequently to prevent leaking/spillage or overflow.

OPTIONAL:

• Post "No Littering" signs.

5. Fountain Maintenance

✓ Do not use copper-based algaecides. Control algae with chlorine or other alternatives, such as sodium bromide.

✓ Allow chlorine to dissipate for a few days and then recycle/reuse water by draining it gradually onto a landscaped area. Water must be tested prior to discharge to ensure that chlorine is not present (concentration must be less than 0.1 ppm).

✓ Contact local agency for approval to drain into sewer or storm drain.

✓ Avoid mixing excess amounts of fresh concrete or cement mortar on-site. Only mix what is needed for the job.

EQUIPMENT MAINTENANCE & REPAIR

Vehicle or equipment maintenance has the potential to be a significant source of stormwater pollution. Engine repair and service (parts cleaning, spilled fuel, oil, etc.), replacement of fluids, and outdoor equipment storage and parking (dripping engines) can all contaminate stormwater. Conducting the following activities in a controlled manner will reduce the potential for stormwater contamination:

1. **General Maintenance and Repair**
2. **Vehicle and Machine Repair**
3. **Waste Handling/Disposal**

Related vehicle maintenance activities are covered under the following program headings in this manual: "Vehicle and Equipment Cleaning", "Vehicle and Equipment Storage", and "Vehicle Fueling".

POLLUTION PREVENTION:

Pollution prevention measures have been considered and incorporated in the model procedures. Implementation of these measures may be more effective and reduce or eliminate the need to implement other more complicated or costly procedures. Possible pollution prevention measures for equipment maintenance and repair include:

- Review maintenance activities to verify that they minimize the amount of pollutants discharged to receiving waters. Keep accurate maintenance logs to evaluate materials removed and improvements made.
- Switch to non-toxic chemicals for maintenance when possible.
- Choose cleaning agents that can be recycled.
- Minimize use of solvents. Clean parts without using solvents whenever possible. Recycle used motor oil, diesel oil, and other vehicle fluids and parts whenever possible.
- Once per year, educate HOA staff and tenants on pollution prevention measures.

EQUIPMENT MAINTENANCE & REPAIR

MODEL PROCEDURES:

1. General Maintenance and Repair

General Guidelines

➔ *Note: Permission must be obtained for any discharge of wash water to the sanitary sewer from the local sewering agency.*

- ✓ Review maintenance activities to verify that they minimize the amount of pollutants discharged to receiving waters. Keep accurate maintenance logs to evaluate materials removed and improvements made.
- ✓ Regularly inspect vehicles and equipment for leaks.
- ✓ Move activity indoors or cover repair area with a permanent roof if feasible.
- ✓ Minimize contact of stormwater with outside operations through berming the local sewering and drainage routing.
- ✓ Place curbs around the immediate boundaries of the process equipment.
- ✓ Clean yard storm drain inlets regularly and stencil them.

Good Housekeeping

- ✓ Avoid hosing down work areas. If work areas are washed and if discharge to the sanitary sewer is allowed, treat water with an appropriate treatment device (e.g. clarifier) before discharging. If discharge to the sanitary sewer is not permitted, pump water to a tank and dispose of properly.
- ✓ Collect leaking or dripping fluids in drip pans or container. Fluids are easier to recycle or dispose of properly if kept separate.
- ✓ Keep a drip pan under the vehicle while you unclip hoses, unscrew filters, any discharge of or remove other parts. Place a drip pan under any vehicle that might leak while you work on it to keep splatters or drips off the shop floor.
- ✓ Educate employees on proper handling and disposal of engine fluids.
- ✓ Promptly transfer used fluids to the proper waste or recycling drums. Don't leave full drip pans or other open containers lying around.
- ✓ Do not pour liquid waste to floor drains, sinks, outdoor storm drain inlets, or other storm drains or sewer connections.
- ✓ Post signs at sinks and stencil outdoor storm drain inlets.

2. Vehicle Repair

General Guidelines

- ✓ Perform vehicle fluid removal or changing inside of a building or in a contained covered area, where feasible, to prevent the run-on of stormwater and the runoff of spills.
- ✓ Regularly inspect vehicles and equipment for leaks, and repair as needed.

EQUIPMENT MAINTENANCE & REPAIR

- ✓ Use secondary containment, such as a drain pan or drop cloth, to catch spills or leaks when removing or changing fluids.
- ✓ Immediately drain all fluids from wrecked vehicles. Ensure that the drain pan or drip pan is large enough to contain drained fluids (e.g. larger pans are needed to contain antifreeze, which may gush from some vehicles).
- ✓ Promptly transfer used fluids to the proper waste or recycling drums. Don't leave full drip pans or other open containers lying around.
- ✓ Recycle used motor oil, diesel oil, and other vehicle fluids and parts whenever possible.
- ✓ Oil filters disposed of in trash cans or dumpsters can leak oil. Place the oil filter in a funnel over a waste oil recycling drum to drain excess oil before disposal. Oil filters can also be recycled. Ask your oil supplier or recycler about recycling oil filters.
- ✓ Store cracked batteries in a non-leaking secondary container and dispose of properly at recycling facilities or at County hazardous waste disposal site.

Vehicle Leak and Spill Control

- ✓ Use absorbent materials on small spills. Remove the absorbent materials promptly and dispose of properly.
- ✓ Place a stockpile of spill cleanup materials where it will be readily accessible.
- ✓ Sweep floor using dry absorbent material.

3. Machine Repair

- ✓ Keep equipment clean; don't allow excessive build-up of oil or grease.
- ✓ Minimize use of solvents.
- ✓ Use secondary containment, such as a drain pan or drop cloth, to catch spills or leaks when removing or changing fluids.
- ✓ Perform major equipment repairs at the corporation yard, when practical.
- ✓ Following good housekeeping measures in Vehicle Repair section.

4. Waste Handling/Disposal

Waste Reduction

- ✓ Prevent spills and drips of solvents and cleansers to the shop floor.
- ✓ Do liquid cleaning at a centralized station so the solvents and residues stay in one area. Recycle liquid cleaners when feasible.

✓ Locate drip pans, drain boards, and drying racks to direct drips back into a solvent sink or fluid holding tank for reuse.

OPTIONAL:

- If possible, eliminate or reduce the amount of hazardous materials and waste by substituting non-hazardous or less hazardous material:

  -Use non-caustic detergents instead of caustic cleaning for parts cleaning.

  -Use a water-based cleaning service and have tank cleaned. Use detergent-based or water-based cleaning systems in place of organic solvent degreasers.

  -Replace chlorinated organic solvents with non-chlorinated solvents. Non-chlorinated solvents like kerosene or mineral spirits are less toxic and less expensive to dispose of properly. Check list of active ingredients to see whether it contains chlorinated solvents.

  -Choose cleaning agents that can be recycled.

Recycling

OPTIONAL:

- Separate wastes for easier recycling. Keep hazardous and non-hazardous wastes separate, do not mix used oil and solvents, and keep chlorinated solvents separate from non-chlorinated solvents.

- Label and track the recycling of waste material (e.g. used oil, spent solvents, batteries).

- Purchase recycled products to support the market for recycled materials.

LIMITATIONS:

Space and time limitations may preclude all work being conducted indoors. It may not be possible to contain and clean up spills from vehicles/equipment brought on-site after working hours. Dry floor cleaning methods may not be sufficient for some spills – see spill prevention and control procedures sheet. Identification of engine leaks may require some use of solvents.

POOL MAINTENANCE

Pool chemicals and filter solids, when discharged to the City streets, gutters or storm drans, DO NOT GET TREATED before reaching the Santa Ana River. Chlorine, acid cleaning chemicals and metal-based algaecides used in pools can kill beneficial organisms in the food chain and pollute our drinking water.

When emptying your swimming pool, spa or fountain, please use one of the following best management practices to prevent water pollution:

- Reuse the water as landscape irrigation
- Empty the water into the sewer between midnight and 6:00 am
- Remove solids and floating debris and dispose of in the trash, de-chlorinate the water to a chlorine residual = 0, wait 24 hours, then discharge the water to the street or storm drain
- Try not to use metal-based algaecides (i.e. copper sulfate) in your pool or spa. If you have, empty your pool or spa into the sewer. *Prior to discharging pool water into the sanitary sewer system, contact your local agency.*
- If the pool contains algae and mosquito larvae, discharge the water to the sewer

When acid cleaning or other chemical cleaning:

- Neutralize the pool water to pH of 6.5 to 8.5, then discharge to the sewer

For swimming pool and spa filter backwash:

- Dispose of solids into trash bag, then wash filter into a landscape area
- Settle, dispose of solids in trash and discharge water to the sewer, never to the storm drain

» For Residents

The following is a preview of the information we have available to residents. For more fact sheets, visit ***sbcountystormwater.org***

Household Hazardous Waste Center Locations

TOO TOXIC TO TRASH

Dispose of your **HOUSEHOLD HAZARDOUS WASTE** (HHW) at a **FREE** HHW Center near you. Examples of items collected: pesticides, fertilizers, paints, cleaners, antifreeze, batteries, motor oil, oil filters, and electronic waste.

SERVICE AREA	LOCATION	DAYS OPEN	HOURS
Big Bear Lake (does not accept E-waste)	42040 Garstin Dr. (cross: Big Bear Blvd.)	Saturdays	9 a.m. - 2 p.m.
Chino	5050 Schaefer Ave. (cross: 4th St.)	2nd & 4th Sat.	8 a.m. - 1 p.m.
Fontana (Fontana residents only)	16454 Orange Way (cross: Cypress Ave.) Note: Provide a trash bill and a driver's license as proof of residency.	Saturdays	8 a.m. - 12 p.m.
Ontario	1430 S. Cucamonga Ave. (cross: Belmont St.)	Fri. & Sat.	9 a.m. - 2 p.m.
Rancho Cucamonga	8794 Lion Street. (Off 9th St, between Vineyard and Hellman)	Saturdays	8 a.m. - 12 p.m.
Redlands	500 Kansas St. (cross: Park Ave.)	Saturdays	9:30 a.m. - 12:30 p.m.
Rialto (does not accept E-waste)	246 Willow Ave. (cross: Rialto Ave.)	2nd & 4th Fri. & Sat.	8 a.m. - 12 p.m.
San Bernardino	2824 East 'W' St., 302 (cross: Victoria Ave.)	Mon. – Fri.	9 a.m. - 4 p.m.
Upland	1370 N. Benson Ave. (cross: 14th St.)	Saturdays	9 a.m. - 2 p.m.

San Bernardino County STORMWATER PROGRAM

To report illegal dumping, call (877) WASTE18
or visit sbcountystormwater.org

Artwork Courtesy of the City of Los Angeles Stormwater Program. Printed on recycled paper.

TAKE ONE

WE DID IT OURSELVES AND WE DID IT RIGHT

When painting your home, protect your family and community.

- **PAINTS** that are water-based are less toxic and should be used whenever possible.
- **BRUSHES** with water-based paint should be washed in the sink. Those with oil-based paint should be cleaned with paint thinner.
- **SAFELY** dispose of unwanted paint and paint thinner. The County of San Bernardino offers 9 HHW Centers that accept paint and other household hazardous waste from residents FREE of charge. For a list of acceptable materials, location information, and hours of operation call 1-800-OILY CAT.

VEHICLE MAINTENANCE

Oil, grease, anti-freeze and other toxic automotive fluids often make their way into the San Bernardino County storm drain system, and do not get treated before reaching the Santa Ana River. This pollutes our drinking water and contaminates waterways, making them unsafe for people and wildlife. Follow these best management practices to prevent pollution and protect public health.

Cleaning Auto Parts
Scrape parts with a wire brush or use a bake oven rather than liquid cleaners. Arrange drip pans, drying racks and drain boards so that fluids are directed back into the parts washer or the fluid holding tank. Do not wash parts or equipment in a sink, parking lot, driveway or street.

Storing Hazardous Waste
Keep your liquid waste segregated. Many fluids can be recycled via hazardous waste disposal companies if they are not mixed. Store all materials under cover with spill containment or inside to prevent contamination of rainwater runoff.

Preventing Leaks and Spills
Conduct all vehicle maintenance inside of a garage. Place drip pans underneath vehicle to capture fluids. Use absorbent materials instead of water to clean work areas.

Cleaning Spills
Use dry methods for spill cleanup (sweeping, absorbent materials). To report accidental spills into the street or storm drain call (877) WASTE18 or 911.

Proper Disposal of Hazardous Waste
Dispose of household hazardous waste by taking it to your nearest household hazardous waste center. For more information, call 1-800-OILY CAT or check out sbcountystormwater.org/Disposal.html

PET WASTE DISPOSAL

FREE

DOGGIE WASTE BAGS

Remember to pick up after your pet every time to keep San Bernardino County clean and healthy!

San Bernardino County STORMWATER PROGRAM

In the event of a spill or discharge to a storm drain or waterway, contact San Bernadino County Stormwater immediately: (877) WASTE18 | sbcountystormwater.org/report

sbcountystormwater.org

Big Bear • Chino • Chino Hills • Colton • Fontana • Grand Terrace • Highland • Loma Linda • Montclair • Ontario • Rancho Cucamonga
Redlands • Rialto • San Bernadino • San Bernadino County • San Bernadino County Flood Control District • Upland • Yucaipa

» Get In Touch With Us Online!

» Website
sbcountystormwater.org

» eUpdates
sbcountystormwater.org/newsletter

» Facebook
facebook.com/sbcountystormwater

» YouTube
youtube.com/sbcountystormwater

» Report Pollution Violations
sbcountystormwater.org/report

» Email
info@sbcountystormwater.org

Appendix F
O&M Plans and Maintenance

Underground Infiltration Chamber System

INSPECTION AND MAINTENANCE:

See attached manufacturer's O&M Specifications

MAINTENANCE LOG:

Keep a log of all inspection and maintenance performed on the infiltration retention basins. Keep this log on-site.

Contech® CMP Detention Inspection and Maintenance Guide

Underground stormwater detention and infiltration systems must be inspected and maintained at regular intervals for purposes of performance and longevity.

Inspection

Inspection is the key to effective maintenance of CMP detention systems and is easily performed. Contech recommends ongoing, annual inspections. Sites with high trash load or small outlet control orifices may need more frequent inspections. The rate at which the system collects pollutants will depend more on-site specific activities rather than the size or configuration of the system.

Inspections should be performed more often in equipment washdown areas, in climates where sanding and/or salting operations take place, and in other various instances in which one would expect higher accumulations of sediment or abrasive/corrosive conditions. A record of each inspection is to be maintained for the life of the system.

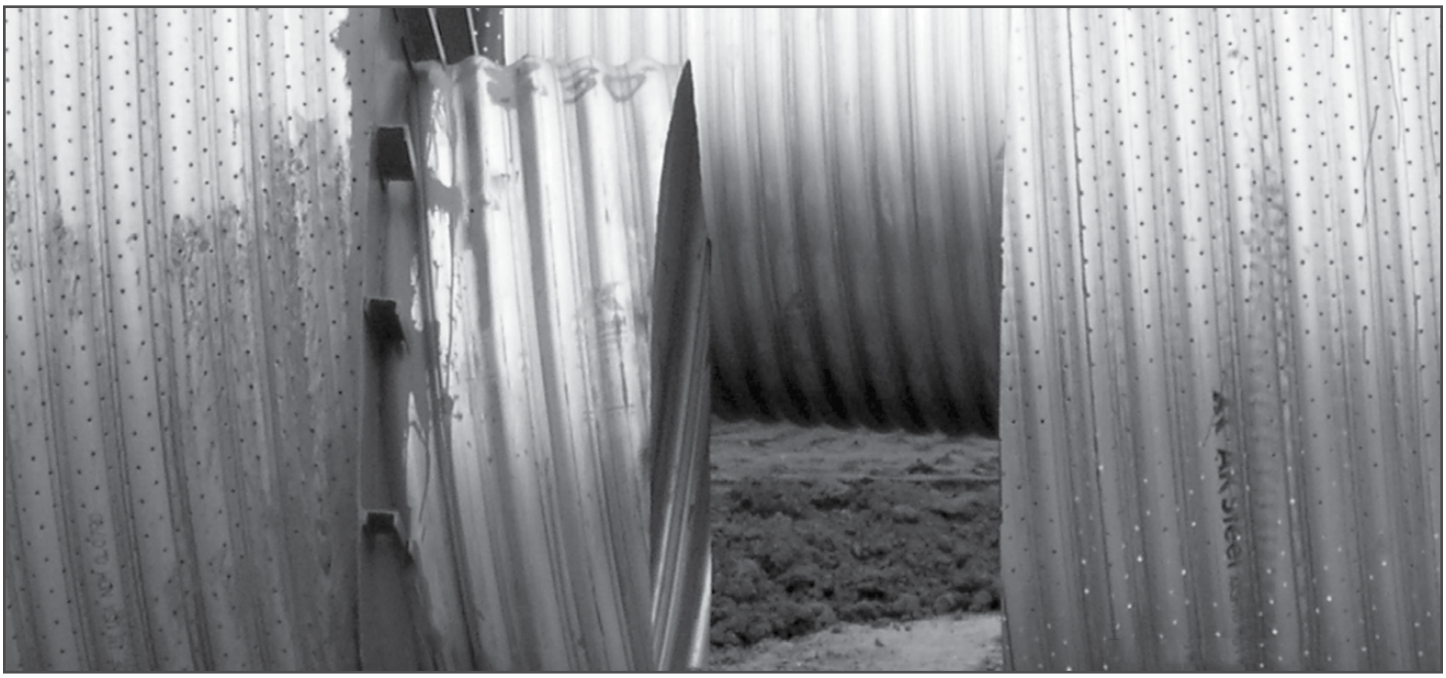
Maintenance

CMP detention systems should be cleaned when an inspection reveals accumulated sediment or trash is clogging the discharge orifice. Accumulated sediment and trash can typically be evacuated through the manhole over the outlet orifice. If maintenance is not performed as recommended, sediment and trash may accumulate in front of the outlet orifice. Manhole covers should be securely seated following cleaning activities. Contech suggests that all systems be designed with an access/inspection manhole situated at or near the inlet and the outlet orifice. Should it be necessary to get inside the system to perform maintenance activities, all appropriate precautions regarding confined space entry and OSHA regulations should be followed.

Annual inspections are best practice for all underground systems. During this inspection if evidence of salting/de-icing agents is observed within the system, it is best practice for the system to be rinsed, including above the spring line soon after the spring thaw as part of the maintenance program for the system.

Maintaining an underground detention or infiltration system is easiest when there is no flow entering the system. For this reason, it is a good idea to schedule the cleanout during dry weather.

The foregoing inspection and maintenance efforts help ensure underground pipe systems used for stormwater storage continue to function as intended by identifying recommended regular inspection and maintenance practices. Inspection and maintenance related to the structural integrity of the pipe or the soundness of pipe joint connections is beyond the scope of this guide.



CONTECH®
CMP DETENTION SYSTEMS

CONTECH®
ENGINEERED SOLUTIONS

Stormwater BMP Inspection and Maintenance Log

Facility Name	
Address	
Begin Date	End Date

Date	BMP ID#	BMP Description	Inspected by:	Cause for Inspection	Exceptions Noted	Comments and Actions Taken

Instructions: Record all inspections and maintenance for all treatment BMPs on this form. Use additional log sheets and/or attach extended comments or documentation as necessary. Submit a copy of the completed log with the annual independent inspectors' report to the municipality, and start a new log at that time.

BMP ID# — Always use ID# from the Operation and Maintenance Manual.
Inspected by — Note all inspections and maintenance on this form, including the required independent annual inspection.
Cause for inspection — Note if the inspection is routine, pre-rainy-season, post-storm, annual, or in response to a noted problem or complaint.
Exceptions noted — Note any condition that requires correction or indicates a need for maintenance.
Comments and actions taken — Describe any maintenance done and need for follow-up.

Stormwater BMP Inspection and Maintenance Log

Facility Name	
Address	
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Date	BMP ID#	BMP Description	Inspected by:	Cause for Inspection	Exceptions Noted	Comments and Actions Taken

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