Water Quality Management Plan

For:

Summerland Senior Living

APN 102-301-151

Prepared for:

Summerland Senior Living

1439 W Chapman Ave, Suite 15

Orange, CA 92868

(843) 425-7951

Prepared by:

United Engineering Group - California

8885 Haven Avenue, Suite 195

Rancho Cucamonga, CA 91730

(909) 466-9240

Submittal Date: 2-20-17

Revision Date: _____

Approval Date:_____

Project Owner's Certification

This Water Quality Management Plan (WQMP) has been prepared for Summerland Senior Living by United Engineering Group - California. The WQMP is intended to comply with the requirements of the City of Chino and the NPDES Areawide Stormwater Program requiring the preparation of a WQMP. 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 San Bernardino County's Municipal Storm Water Management Program and the intent of the NPDES Permit for San Bernardino County and the incorporated cities of San Bernardino County within the Santa Ana Region. Once the undersigned transfers its interest in the property, its successors in interest and the city/county 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."

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Project Data			
Permit/Application Number(s):		Grading Permit Number(s):	
Tract/Parcel Map Number(s):		Building Permit Number(s):	
CUP, SUP, and/or APN (Specify Lot Numbers if Portions of Tract):			APN 102-301-151

Owner's Signature			
Owner Name:			
Title			
Company	Summerland Senior Living		
Address	1439 W Chapman Ave, Suite 15		
Email			
Telephone #	(843) 425-7951		
Signature		Date	

Preparer's Certification

Project Data			
Permit/Application Number(s):		Grading Permit Number(s):	
Tract/Parcel Map Number(s):		Building Permit Number(s):	
CUP, SUP, and/or APN (Specify Lot Numbers if Portions of Tract):			APN 102-301-151

"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 Regional Water Quality Control Board Order No. R8-2010-0036."

Engineer: Christopher F Lenz	
Title	Principal
Company	United Engineering Group - California
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Email	clenz@unitedeng.com
Telephone #	480-705-5372 x 103
Signature	
Date	2-27-17

PE Stamp Below

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Forms

Section 1 Discretionary Permit(s)

Form 1-1 Project Information

Project Name	Summerland Senior Living				
Project Owner Contact Name:	Steve Stewart				
Mailing Address:	1439 W Chapman Ave, Suite 15	E-mail Address:		Telephone:	(843) 425-7951
Permit/Application Number(s):		Tract/Parcel Map Number(s):	APN 102-301-151		
Additional Information/ Comments:					
Description of Project:	The Summerland Senior Living Project is proposing to subdivide 3.16 ¬acres into a residential care facility for the elderly. The property is located east of Serenity Trail just northeast of the intersection of Chino Avenue and Serenity Trail in an unincorporated part of San Bernardino County between the City of Chino and the City of Chino Hills in California (Township 2 south, Range 8 West, Section 8). The property is triangular in shape and is bordered by the paved Serenity Trail to the west and south, and existing large lot existing residential on the North and East. The current property is vacant, but has been heavily disturbed, covered in primarily low growing native grass, with varying slope of an average 5 percent. The topography indicates that the runoff drains primarily from north to south. The project will propose treatment of water quality flows using a Filterra proprietary system located and maintained on-site. The Filterra system uses catch basins and planted filter systems at the abck of curb to accept and filter storm runoff form the paved and impervious areas on-site. Other areas of the project have been designed where possible to incorporated LID principles, including draining roof drainage to adjacent landscaping where possible and minimizing impervious areas through use of minimum sizes for hardscape (sidewalks and drive aisles). HCOC mitigation is provided by a single detention basin at the southeast corner of the project. The basin will overflow via a weir to a riprap spillway /spreader basin. At time of final design it will also have a bleed-off or underdrain that will connect to the existing storm drain in Serenity Trail to de-water the basin. It is assumed that the underground parking and internal courtyard areas will connect to the sanitary sewer and will not contribute to the project runoff.				
Provide summary of Conceptual WQMP conditions (if previously submitted and approved). Attach complete copy.					

Section 2 Project Description

2.1 Project Information

This section of the WQMP should provide the information listed below. The information provided for Conceptual/ Preliminary WQMP should give sufficient detail to identify the major proposed site design and LID BMPs and other anticipated water quality features that impact site planning. Final Project WQMP must specifically identify all BMP incorporated into the final site design and provide other detailed information as described herein.

The purpose of this information is to help determine the applicable development category, pollutants of concern, watershed description, and long term maintenance responsibilities for the project, and any applicable water quality credits. This information will be used in conjunction with the information in Section 3, Site Description, to establish the performance criteria and to select the LID BMP or other BMP for the project or other alternative programs that the project will participate in, which are described in Section 4.

Form 2.1-1 Description of Proposed Project

1 Development Category (Select all that apply):

☐ Significant re-development involving the addition or replacement of 5,000 ft^2 or more of impervious surface on an already developed site	☒ New development involving the creation of 10,000 ft^2 or more of impervious surface collectively over entire site	☐ Automotive repair shops with standard industrial classification (SIC) codes 5013, 5014, 5541, 7532- 7534, 7536-7539	☐ Restaurants (with SIC code 5812) where the land area of development is 5,000 ft^2 or more
☐ Hillside developments of 5,000 ft^2 or more which are located on areas with known erosive soil conditions or where the natural slope is 25 percent or more	☐ Developments of 2,500 ft^2 of impervious surface or more adjacent to (within 200 ft) or discharging directly into environmentally sensitive areas or waterbodies listed on the CWA Section 303(d) list of impaired waters.	☐ Parking lots of 5,000 ft^2 or more exposed to storm water	☐ Retail gasoline outlets that are either 5,000 ft^2 or more, or have a projected average daily traffic of 100 or more vehicles per day

☐ Non-Priority / Non-Category Project *May require source control LID BMPs and other LIP requirements. Please consult with local jurisdiction on specific requirements*.

2 Project Area (ft2):	137,650	**3** Number of Dwelling Units:	110	**4** SIC Code:	623312

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.*

6 Does Project include roads? Yes ☐ No ☒ *If yes, ensure that applicable requirements for transportation projects are addressed (see Appendix A of TGD for WQMP)*

2.2 Property Ownership/Management

Describe the ownership/management of all portions of the project and site. State whether any infrastructure will transfer to public agencies (City, County, Caltrans, etc.) after project completion. State if a homeowners or property owners association will be formed and be responsible for the long-term maintenance of project stormwater facilities. Describe any lot-level stormwater features that will be the responsibility of individual property owners.

Form 2.2-1 Property Ownership/Management

Describe property ownership/management responsible for long-term maintenance of WQMP stormwater facilities:
The project will be a managed assisted livning facility. Details to be provided at final design.

2.3 Potential Stormwater Pollutants

Determine and describe expected stormwater pollutants of concern based on land uses and site activities (refer to Table 3-3 in the TGD for WQMP).

Form 2.3-1 Pollutants of Concern			
Pollutant	Please check: E=Expected, N=Not Expected		Additional Information and Comments
Pathogens (Bacterial / Virus)	E ☒	N ☐	
Nutrients - Phosphorous	E ☐	N ☒	
Nutrients - Nitrogen	E ☒	N ☐	
Noxious Aquatic Plants	E ☒	N ☐	
Sediment	E ☒	N ☐	
Metals	E ☐	N ☒	
Oil and Grease	E ☒	N ☐	Expected only for uncovered parking area in NE
Trash/Debris	E ☒	N ☐	
Pesticides / Herbicides	E ☒	N ☐	
Organic Compounds	E ☒	N ☐	
Other:	E ☐	N ☐	
Other:	E ☐	N ☐	
Other:	E ☐	N ☐	
Other:	E ☐	N ☐	
Other:	E ☐	N ☐	

2.4 Water Quality Credits

A water quality credit program is applicable for certain types of development projects if it is not feasible to meet the requirements for on-site LID. Proponents for eligible projects, as described below, can apply for water quality credits that would reduce project obligations for selecting and sizing other treatment BMP or participating in other alternative compliance programs. Refer to Section 6.2 in the TGD for WQMP to determine if water quality credits are applicable for the project.

Form 2.4-1 Water Quality Credits

1 Project Types that Qualify for Water Quality Credits: *Select all that apply*			
☐ Redevelopment projects that reduce the overall impervious footprint of the project site. [Credit = % impervious reduced]	Higher density development projects ☒ Vertical density [20%] ☒ 7 units/ acre [5%]	☐ Mixed use development, (combination of residential, commercial, industrial, office, institutional, or other land uses which incorporate design principles that demonstrate environmental benefits not realized through single use projects) [20%]	☐ Brownfield redevelopment (redevelop real property complicated by presence or potential of hazardous contaminants) [25%]
☐ Redevelopment projects in established historic district, historic preservation area, or similar significant core city center areas [10%]	☐ Transit-oriented developments (mixed use residential or commercial area designed to maximize access to public transportation) [20%]	☒ In-fill projects (conversion of empty lots & other underused spaces < 5 acres, substantially surrounded by urban land uses, into more beneficially used spaces, such as residential or commercial areas) [10%]	☐ Live-Work developments (variety of developments designed to support residential and vocational needs) [20%]
2 Total Credit % 35 *(Total all credit percentages up to a maximum allowable credit of 50 percent)*			
Description of Water Quality Credit Eligibility (if applicable)			

Section 3 Site and Watershed Description

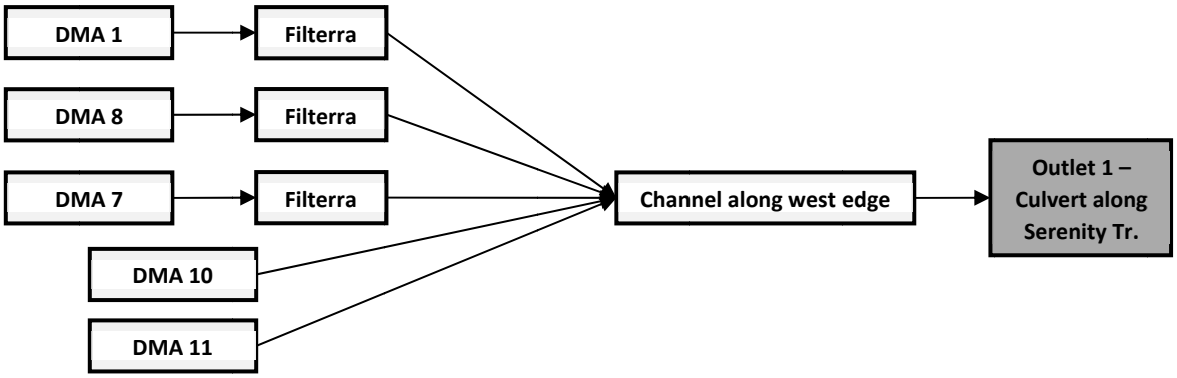
Describe the project site conditions that will facilitate the selection of BMP through an analysis of the physical conditions and limitations of the site and its receiving waters. Identify distinct drainage areas (DA) that collect flow from a portion of the site and describe how runoff from each DA (and sub-watershed DMAs) is conveyed to the site outlet(s). Refer to Section 3.2 in the TGD for WQMP. The form below is provided as an example. Then complete Forms 3.2 and 3.3 for each DA on the project site. ***If the project has more than one drainage area for stormwater management, then complete additional versions of these forms for each DA / outlet.***

Form 3-1 Site Location and Hydrologic Features

Site coordinates *take GPS measurement at approximate center of site*	Latitude 34d00'45"	Longitude 117d44'12"	Thomas Bros Map page

1 San Bernardino County climatic region: ☒ Valley ☐ Mountain

2 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). An example is provided below that can be modified for proposed project or a drawing clearly showing DMA and flow routing may be attached*



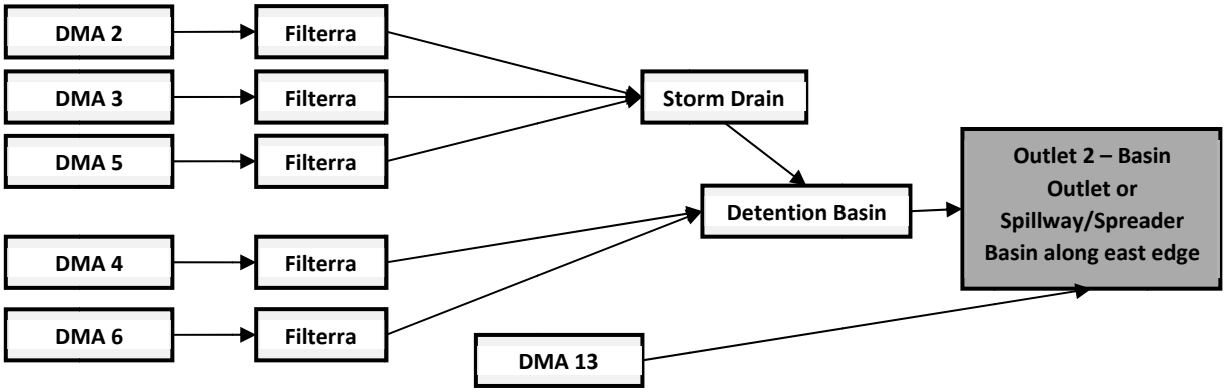
Conveyance	There is an existing Channel along the western edge of the subject site that drains to the southeast.
DMA1, 7, & 8 to Channel	Surface flow is routed to catch basins and Filterra Systems, and then routed via storm drain to the channel.
DMA 10 and 11	DMA 10 and 11 cover the downslope for the areas along the western edge of the project to meet exisitng grades, no wtaer quality features to be provided. Area to be landscaped to protect slopes.

Form 3-1 Site Location and Hydrologic Features

Site coordinates *take GPS measurement at approximate center of site*	Latitude 34d00'45"	Longitude 117d44'12"	Thomas Bros Map page

1 San Bernardino County climatic region: ☒ Valley ☐ Mountain

2 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). An example is provided below that can be modified for proposed project or a drawing clearly showing DMA and flow routing may be attached*



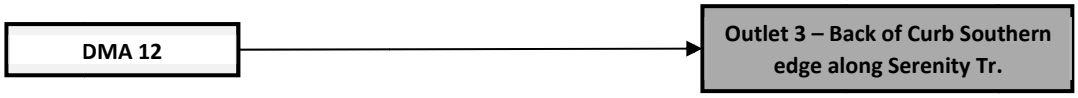
Conveyance	There is an existing Channel along the western edge of the subject site that drains to the southeast.
DMA2, 3, & 5 to Basin	Surface flow is routed to catch basins and Filterra Systems, and then routed via storm drain to the Basin.
DMA 4 and 6 to Basin	Surface flow is routed to catch basins and Filterra Systems, and then routed to the Basin.
DMA 13	DMA 13 is the downslope for the areas along the eastern edge of the project to meet exisitng grades, no water quality features to be provided. Area to be landscaped to protect slopes.

Form 3-1 Site Location and Hydrologic Features

Site coordinates *take GPS measurement at approximate center of site*	Latitude 34d00'45"	Longitude 117d44'12"	Thomas Bros Map page

1 San Bernardino County climatic region: ☒ Valley ☐ Mountain

2 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). An example is provided below that can be modified for proposed project or a drawing clearly showing DMA and flow routing may be attached*



Conveyance	There is an existing Channel along the western edge of the subject site that drains to the southeast.
DMA 12	DMA 13 is the downslope for the area along the southwestern edge of the project to meet exisitng grades, no water quality features to be provided. Area to be landscaped to protect slopes.

Form 3-2 Existing Hydrologic Characteristics for Drainage Area 1

For Drainage Area 1's sub-watershed DMA, provide the following characteristics	DMA 1	DMA 2	DMA 3	DMA 4
1 DMA drainage area (ft^2)	9583	10020	5663	33541
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*	2	2	2	2
4 Hydrologic soil group *Refer to Watershed Mapping Tool –* *http://permitrack.sbcounty.gov/wap/*	C	C	C	C
5 Longest flowpath length (ft)	173	120	413	513
6 Longest flowpath slope (ft/ft)	0.047	0.013	0.005	0.026
7 Current land cover type(s) *Select from Fig C-3 of Hydrology Manual*	Natural - Grass	Natural - Grass	Natural - Grass	Natural - Grass
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*	100	100	100	100

Form 3-2 Existing Hydrologic Characteristics for Drainage Area 1 (use only as needed for additional DMA w/in DA 1)

For Drainage Area 1's sub-watershed DMA, provide the following characteristics	DMA 5	DMA 6	DMA 7	DMA 8
1 DMA drainage area (ft^2)	4792	19166	8712	12197
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*	2	2	2	2
4 Hydrologic soil group *Refer to Watershed Mapping Tool –* *http://permitrack.sbcounty.gov/wap/*	C	C	C	C
5 Longest flowpath length (ft)	98	175	99	133
6 Longest flowpath slope (ft/ft)	0.010	0.021	0.010	0.010
7 Current land cover type(s) *Select from Fig C-3 of Hydrology Manual*	Natural - Grass	Natural - Grass	Natural - Grass	Natural - Grass
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*	100	100	100	100

Form 3-2 Existing Hydrologic Characteristics for Drainage Area 1 (use only as needed for additional DMA w/in DA 1)				
For Drainage Area 1's sub-watershed DMA, provide the following characteristics	DMA 9	DMA 10	DMA 11	DMA 12
1 DMA drainage area (ft^2)	10890	6534	308	405
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*	2	2	2	2
4 Hydrologic soil group *Refer to Watershed Mapping Tool – http://permitrack.sbcounty.gov/wap/*	C	C	C	C
5 Longest flowpath length (ft)	70	23	12	17
6 Longest flowpath slope (ft/ft)	0.005	0.50	0.50	0.50
7 Current land cover type(s) *Select from Fig C-3 of Hydrology Manual*	Natural - Grass	Natural - Grass	Natural - Grass	Natural - Grass
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*	100	100	100	100

Form 3-2 Existing Hydrologic Characteristics for Drainage Area 1 (use only as needed for additional DMA w/in DA 1)				
For Drainage Area 1's sub-watershed DMA, provide the following characteristics	DMA 13			
1 DMA drainage area (ft^2)	14375			
2 Existing site impervious area (ft^2)	0			
3 Antecedent moisture condition *For desert areas, use* *http://www.sbcounty.gov/dpw/floodcontrol/pdf/20100412_map.pdf*	2			
4 Hydrologic soil group *Refer to Watershed Mapping Tool –* *http://permitrack.sbcounty.gov/wap/*	C			
5 Longest flowpath length (ft)	260			
6 Longest flowpath slope (ft/ft)	0.054			
7 Current land cover type(s) *Select from Fig C-3 of Hydrology Manual*	Natural - Grass			
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*	100			

Form 3-3 Watershed Description for Drainage Area

Receiving waters *Refer to Watershed Mapping Tool - http://permitrack.sbcounty.gov/wap/ See 'Drainage Facilities" link at this website*	Chino Creek and Prado Park Lake
Applicable TMDLs *Refer to Local Implementation Plan*	Pathogens and Nutrients
303(d) listed impairments *Refer to Local Implementation Plan and Watershed Mapping Tool – http://permitrack.sbcounty.gov/wap/ and State Water Resources Control Board website – http://www.waterboards.ca.gov/santaana/water_issues/programs/tmdl/index.shtml*	Chemical Oxygen Demand; Nutrients; Pathogens
Environmentally Sensitive Areas (ESA) *Refer to Watershed Mapping Tool – http://permitrack.sbcounty.gov/wap/*	
Unlined Downstream Water Bodies *Refer to Watershed Mapping Tool – http://permitrack.sbcounty.gov/wap/*	
Hydrologic Conditions of Concern	☒ Yes *Complete Hydrologic Conditions of Concern (HCOC) Assessment. Include Forms 4.2-2 through Form 4.2-5 and Hydromodification BMP Form 4.3-10 in submittal* ☐ No
Watershed–based BMP included in a RWQCB approved WAP	☐ Yes *Attach verification of regional BMP evaluation criteria in WAP* • *More Effective than On-site LID* • *Remaining Capacity for Project DCV* • *Upstream of any Water of the US* • *Operational at Project Completion* • *Long-Term Maintenance Plan* ☒ No

Section 4 Best Management Practices (BMP)

4.1 Source Control BMP

4.1.1 Pollution Prevention

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.

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 POA will periodically provide environmental awareness education materials. The site will be assisted living so potential for prohibited activities area minimal.
N2	Activity Restrictions	☒	☐	CC&R's will establish and enforce the restrictions. The site will be assisted living so potential for prohibited activities area minimal.
N3	Landscape Management BMPs	☒	☐	Landscape maintenance to use minimal if any fertilizer or pesticide. Planting and Maintenance of slopes to ensure stability and prevent erosion.
N4	BMP Maintenance	☒	☐	BMP Maintenance to be provided by the POA.
N5	Title 22 CCR Compliance (How development will comply)	☒	☐	POA will ensure facility is in compliance with Adult Residential Facilities Title 22, Division 6, Chapter 6
N6	Local Water Quality Ordinances	☒	☐	The project will comply with local water quality ordinances. Easement will be given to the City to inspect and access water quality and flood facilities.
N7	Spill Contingency Plan	☒	☐	A spill contingency plan will be provided at final WQMP
N8	Underground Storage Tank Compliance	☐	☒	
N9	Hazardous Materials Disclosure Compliance	☒	☐	POA will work cooperatively to comply with local ordinance and the local agencies.

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	
N10	Uniform Fire Code Implementation	☒	☐	Building will be built per fire code
N11	Litter/Debris Control Program	☒	☐	POA will likely contract cleanup as part of, or in conjunction with, regularly scheduled landscaping and maintenance work.
N12	Employee Training	☒	☐	Employee training to include training on the BMP's.
N13	Housekeeping of Loading Docks	☐	☒	
N14	Catch Basin Inspection Program	☒	☐	POA will likely contract regular inspections and cleaning for the Filterra Systems. Contractor to be familiar with the system.
N15	Vacuum Sweeping of Private Streets and Parking Lots	☒	☐	POA will likely contract drive-aisle cleaning
N16	Other Non-structural Measures for Public Agency Projects	☐	☐	
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)	☒	☐	Project to stencil inlets to read "No Dumping – Flows to Creek"
S2	Design and construct outdoor material storage areas to reduce pollution introduction (CASQA New Development BMP Handbook SD-34)	☐	☒	
S3	Design and construct trash and waste storage areas to reduce pollution introduction (CASQA New Development BMP Handbook SD-32)	☒	☐	Trash enclosure placed and graded to contain leaks and not drain directly to the street or storm drain
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)	☒	☐	The project will install new irrigation systems in compliance with the new Model Water Efficient Landscape Ordinance
S5	Finish grade of landscaped areas at a minimum of 1-2 inches below top of curb, sidewalk, or pavement	☒	☐	
S6	Protect slopes and channels and provide energy dissipation (CASQA New Development BMP Handbook SD-10)	☒	☐	Project to install permanent stabilization BMP's on all slopes as quickly as possible during construction. Regular landscape maintenance to ensure continued stability. Proposed open channel conveyance on-site to be protected with rip rap or concrete to prevent erosion
S7	Covered dock areas (CASQA New Development BMP Handbook SD-31)	☐	☒	
S8	Covered maintenance bays with spill containment plans (CASQA New Development BMP Handbook SD-31)	☐	☒	
S9	Vehicle wash areas with spill containment plans (CASQA New Development BMP Handbook SD-33)	☐	☒	

S10	Covered outdoor processing areas (CASQA New Development BMP Handbook SD-36)	☐	☒	

Form 4.1-2 Structural Source Control BMPs

Identifier	Name	Check One		Describe BMP Implementation OR, If not applicable, state reason
		Included	Not Applicable	
S11	Equipment wash areas with spill containment plans (CASQA New Development BMP Handbook SD-33)	☐	☒	
S12	Fueling areas (CASQA New Development BMP Handbook SD-30)	☐	☒	
S13	Hillside landscaping (CASQA New Development BMP Handbook SD-10)	☒	☐	Landscape plans to include deep rooted, drought tolerant plant species selected for erosion control
S14	Wash water control for food preparation areas	☒	☐	Food Prep and wash areas to have floor drains connected to the sanitary sewer.
S15	Community car wash racks (CASQA New Development BMP Handbook SD-33)	☐	☒	

4.1.2 Preventative LID Site Design Practices

Site design practices associated with new LID requirements in the MS4 Permit should be considered in the earliest phases of a project. Preventative site design practices can result in smaller DCV for LID BMP and hydromodification control BMP by reducing runoff generation. Describe site design and drainage plan including:

- A narrative of site design practices utilized or rationale for not using practices
- A narrative of how site plan incorporates preventive site design practices
- Include an attached Site Plan layout which shows how preventative site design practices are included in WQMP

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

Form 4.1-3 Preventative LID 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: Use of minimum width drive aisles, and only internal sidewalk, maximizes the remaining areas left impervious.
Maximize natural infiltration capacity: Yes ☒ No ☐ Explanation: Grading of the site has "flattened" the average land slope increasing the potential for infiltration. Also areas will be set 1-2 inches below adjacent curb to allow for retention and infiltration/evapotranspiration.
Preserve existing drainage patterns and time of concentration: Yes ☒ No ☐ Explanation: Existing outlet points, peak flows, and time of concentration were all analyzed and designed to reduce or match developed conditions compared to existing conditions.
Disconnect impervious areas: Yes ☒ No ☐ Explanation: Where possible roof drains were routed to open space areas. The large impervious area (roof and drive aisle) is routed to the basin.
Protect existing vegetation and sensitive areas: Yes ☒ No ☐ Explanation: No sensitive areas were identified as the site has been disturbed in the past. Project proposes to leave undisturbed perimeter areas of the property that are not proposed for developed or needed for slopes.
Re-vegetate disturbed areas: Yes ☒ No ☐ Explanation: The project is proposed to have a full landscape design.
Minimize unnecessary compaction in stormwater retention/infiltration basin/trench areas: Yes ☒ No ☐ Explanation: During construction care will need to be given to not impact the southeast corner of the site. This should be achievable with the bulk of the proposed activity being around the building.
Utilize vegetated drainage swales in place of underground piping or imperviously lined swales: Yes ☐ No ☒ Explanation: Project slopes did not permit use of vegetated swales. Velocities were too high.
Stake off areas that will be used for landscaping to minimize compaction during construction : Yes ☒ No ☐ Explanation: The southeast corner of the site will be staked to protect.

4.2 Project Performance Criteria

The purpose of this section of the Project WQMP is to establish targets for post-development hydrology based on performance criteria specified in the 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 of any downstream waterbody segments with a HCOC. ***If the project has more than one outlet for stormwater runoff, then complete additional versions of these forms for each DA / outlet.***

Methods applied in the following forms include:

- For LID BMP Design Capture Volume (DCV), the San Bernardino County Stormwater Program requires use of the P_6 method (MS4 Permit Section XI.D.6a.ii) – Form 4.2-1
- For HCOC pre- and post-development hydrologic calculation, the San Bernardino County Stormwater Program 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 HCOC performance criteria.

Refer to Section 4 in the TGD for WQMP for detailed guidance and instructions.

Form 4.2-1 LID BMP Performance Criteria for Design Capture Volume (Overall Site)

1 Project area DA 1 (ft^2): 137,650	**2** Imperviousness after applying preventative site design practices (Imp%): 85%	**3** Runoff Coefficient (Rc): _0.66 *$R_c = 0.858(Imp\%)^{\wedge 3} - 0.78(Imp\%)^{\wedge 2} + 0.774(Imp\%) + 0.04$*
4 Determine 1-hour rainfall depth for a 2-year return period $P_{2yr\text{-}1hr}$ (in): 0.6 http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html		
5 Compute P_6, Mean 6-hr Precipitation (inches): 1.145 *P_6 = Item 4 *C_1, where C_1 is a function of site climatic region specified in Form 3-1 Item 1 (Valley = 1.4807; Mountain = 1.909; 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): 16,990 *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 HCOC Assessment (A1 pt 101-103)

Does project have the potential to cause or contribute to an HCOC in a downstream channel: Yes ☒ No ☐

Go to: *http://permitrack.sbcounty.gov/wap/*

If "Yes", then complete HCOC assessment of site hydrology for 2yr 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)

If "No," then proceed to Section 4.3 Project Conformance Analysis

Condition	Runoff Volume (ft^3)	Time of Concentration (min)	Peak Runoff (cfs)
Pre-developed	**1** 8,263 *Form 4.2-3 Item 12*	**2** 8.3 *Form 4.2-4 Item 13*	**3** 2.8 *Form 4.2-5 Item 10*
Post-developed	**4** 10,528 *Form 4.2-3 Item 13*	**5** 8.3 *Form 4.2-4 Item 14*	**6** 2.8 *Form 4.2-5 Item 14*
Difference	**7** *2,265* *Item 4 – Item 1*	**8** *0* *Item 2 – Item 5*	**9** *0* *Item 6 – Item 3*
Difference (as % of pre-developed)	**10** *27%* *Item 7 / Item 1*	**11** *0%* *Item 8 / Item 2*	**12** *0%* *Item 9 / Item 3*

Note: A1 impervious percentage calculated 20% for 2.6 acres (Existing Condition) = 0.52 ac + 21,564 sf of new impervious (measured) = 1.015 acres of impervious. 1.015/2.48 = 41% impervious used for HCOC calculation.

Refer to Appendix A for detailed software analysis.

Form 4.2-2 Summary of HCOC Assessment (A2 pt 201-203)

Does project have the potential to cause or contribute to an HCOC in a downstream channel: Yes ☒ No ☐

Go to: *http://permitrack.sbcounty.gov/wap/*

If "Yes", then complete HCOC assessment of site hydrology for 2yr 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)

If "No," then proceed to Section 4.3 Project Conformance Analysis

Condition	Runoff Volume (ft^3)	Time of Concentration (min)	Peak Runoff (cfs)
Pre-developed	**1** 10,136 *Form 4.2-3 Item 12*	**2** 9.5 *Form 4.2-4 Item 13*	**3** 3.7 *Form 4.2-5 Item 10*
Post-developed	**4** 26,136 *Form 4.2-3 Item 13*	**5** 8.1* *Form 4.2-4 Item 14*	**6** 5.8* *Form 4.2-5 Item 14*
Difference	**7** *16,000* *Item 4 – Item 1*	**8** *1.4* *Item 2 – Item 5*	**9** *1.9* *Item 6 – Item 3*
Difference (as % of pre-developed)	**10** *157%* *Item 7 / Item 1*	**11** *14.7%* *Item 8 / Item 2*	**12** *51%* *Item 9 / Item 3*

*Note: Post Development time of concentration is for offsite flow through concrete ditch. Similarly Post Development Peak Runoff is not analyzed as routed through the basin for peak mitigation. Onsite flows will pass through the detention basin further increasing the time of concentration and reducing the post development runoff. Final design calculations will be provided with the final WQMP and will consider bleed off flows from the orifice and pipe. Final design will ensure peak runoff is mitigated to less than 3.7 cfs.

Note: A2 actual impervious percentage calculated as 25% for 1.9 acres (offsite) and 85% for 2.55 acres or 59.4%. 60% used for HCOC calculation.

Refer to Appendix A for detailed software analysis.

Form 4.2-2 Summary of HCOC Assessment (A3 pt 301-302)

Does project have the potential to cause or contribute to an HCOC in a downstream channel: Yes ☒ No ☐

Go to: *http://permitrack.sbcounty.gov/wap/*

If "Yes", then complete HCOC assessment of site hydrology for 2yr 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)

If "No," then proceed to Section 4.3 Project Conformance Analysis

Condition	Runoff Volume (ft^3)	Time of Concentration (min)	Peak Runoff (cfs)
Pre-developed	**1** 3,816 *Form 4.2-3 Item 12*	**2** 14.5 *Form 4.2-4 Item 13*	**3** 0.52 *Form 4.2-5 Item 10*
Post-developed	**4** 2,653 *Form 4.2-3 Item 13*	**5** 14.5 *Form 4.2-4 Item 14*	**6** 0.37 *Form 4.2-5 Item 14*
Difference	**7** *(1,163)* *Item 4 – Item 1*	**8** *0* *Item 2 – Item 5*	**9** *(0.15)* *Item 6 – Item 3*
Difference (as % of pre-developed)	**10** *(30)%* *Item 7 / Item 1*	**11** *0* *Item 8 / Item 2*	**12** *(29)%* *Item 9 / Item 3*

Refer to Appendix A for detailed software analysis.

Form 4.2-3 HCOC Assessment for Runoff Volume (DA 1)

Weighted Curve Number Determination for: Pre-developed DA	DMA A	DMA B	DMA C	DMA D	DMA E	DMA F	DMA G	DMA H
1a Land Cover type								
2a Hydrologic Soil Group (HSG)								
3a DMA Area, ft^2 *sum of areas of DMA should equal area of DA*								
4a Curve Number (CN) *use Items 1 and 2 to select the appropriate CN from Appendix C-2 of the TGD for WQMP*								
Weighted Curve Number Determination for: Post-developed DA	DMA A	DMA B	DMA C	DMA D	DMA E	DMA F	DMA G	DMA H
1b Land Cover type								
2b Hydrologic Soil Group (HSG)								
3b DMA Area, ft^2 *sum of areas of DMA should equal area of DA*								
4b Curve Number (CN) *use Items 5 and 6 to select the appropriate CN from Appendix C-2 of the TGD for WQMP*								

5 Pre-Developed area-weighted CN:	**7** Pre-developed soil storage capacity, S (in): *S = (1000 / Item 5) - 10*	**9** Initial abstraction, I_a (in): *I_a = 0.2 * Item 7*
6 Post-Developed area-weighted CN:	**8** Post-developed soil storage capacity, S (in): *S = (1000 / Item 6) - 10*	**10** Initial abstraction, I_a (in): *I_a = 0.2 * Item 8*

11 Precipitation for 2 yr, 24 hr storm (in):
Go to: http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html

12 Pre-developed Volume (ft^3):
*V_{pre} =(1 / 12) * (Item sum of Item 3) * [(Item 11 – Item 9)^2 / ((Item 11 – Item 9 + Item 7)*

13 Post-developed Volume (ft^3):
*V_{pre} =(1 / 12) * (Item sum of Item 3) * [(Item 11 – Item 10)^2 / ((Item 11 – Item 10 + Item 8)*

14 Volume Reduction needed to meet HCOC Requirement, (ft^3):
*V_{HCOC} = (Item 13 * 0.95) – Item 12*

Form 4.2-4 HCOC Assessment for Time of Concentration (DA 1)

Compute time of concentration for pre and post developed conditions for each DA *(For projects using the Hydrology Manual complete the form below)*

Variables	Pre-developed DA1 *Use additional forms if there are more than 4 DMA*				Post-developed DA1 *Use additional forms if there are more than 4 DMA*			
	DMA A	DMA B	DMA C	DMA D	DMA A	DMA B	DMA C	DMA D
1 Length of flowpath (ft) *Use Form 3-2 Item 5 for pre-developed condition*								
2 Change in elevation (ft)								
3 Slope (ft/ft), S_o *= Item 2 / Item 1*								
4 Land cover								
5 Initial DMA Time of Concentration (min) *Appendix C-1 of the TGD for WQMP*								
6 Length of conveyance from DMA outlet to project site outlet (ft) *May be zero if DMA outlet is at project site outlet*								
7 Cross-sectional area of channel (ft^2)								
8 Wetted perimeter of channel (ft)								
9 Manning's roughness of channel (n)								
10 Channel flow velocity (ft/sec) V_{fps} *= (1.49 / Item 9) * (Item 7/Item 8)^0.67 * (Item 3)^0.5*								
11 Travel time to outlet (min) T_t *= Item 6 / (Item 10 * 60)*								
12 Total time of concentration (min) T_c *= Item 5 + Item 11*								
13 Pre-developed time of concentration (min): *Minimum of Item 12 pre-developed DMA*								
14 Post-developed time of concentration (min): *Minimum of Item 12 post-developed DMA*								
15 Additional time of concentration needed to meet HCOC requirement (min): $T_{C\text{-}HCOC}$ *= (Item 13 * 0.95) – Item 14*								

Form 4.2-5 HCOC Assessment for Peak Runoff (DA 1)

Compute peak runoff for pre- and post-developed conditions

Variables		Pre-developed DA to Project Outlet (*Use additional forms if more than 3 DMA)*			Post-developed DA to Project Outlet (*Use additional forms if more than 3 DMA)*		
		DMA A	DMA B	DMA C	DMA A	DMA B	DMA C
1 Rainfall Intensity for storm duration equal to time of concentration *I_{peak} = 10^(LOG Form 4.2-1 Item 4 - 0.6 LOG Form 4.2-4 Item 5 /60)*							
2 Drainage Area of each DMA (Acres) *For DMA with outlet at project site outlet, include upstream DMA (Using example schematic in Form 3-1, DMA A will include drainage from DMA C)*							
3 Ratio of pervious area to total area *For DMA with outlet at project site outlet, include upstream DMA (Using example schematic in Form 3-1, DMA A will include drainage from DMA C)*							
4 Pervious area infiltration rate (in/hr) *Use pervious area CN and antecedent moisture condition with Appendix C-3 of the TGD for WQMP*							
5 Maximum loss rate (in/hr) *F_m = Item 3 * Item 4* *Use area-weighted F_m from DMA with outlet at project site outlet, include upstream DMA (Using example schematic in Form 3-1, DMA A will include drainage from DMA C)*							
6 Peak Flow from DMA (cfs) *Q_p =Item 2 * 0.9 * (Item 1 - Item 5)*							
7 Time of concentration adjustment factor for other DMA to site discharge point *Form 4.2-4 Item 12 DMA / Other DMA upstream of site discharge point (If ratio is greater than 1.0, then use maximum value of 1.0)*	DMA A	*n/a*			*n/a*		
	DMA B		*n/a*			*n/a*	
	DMA C			*n/a*			*n/a*

8 Pre-developed Q_p at T_c for DMA A: *Q_p = Item 6_{DMAA} + [Item 6_{DMAB} * (Item 1_{DMAA} - Item 5_{DMAB})/(Item 1_{DMAB} - Item 5_{DMAB})* Item $7_{DMAA/2}$] + [Item 6_{DMAC} * (Item 1_{DMAA} - Item 5_{DMAC})/(Item 1_{DMAC} - Item 5_{DMAC})* Item $7_{DMAA/3}$]*	**9** Pre-developed Q_p at T_c for DMA B: *Q_p = Item 6_{DMAB} + [Item 6_{DMAA} * (Item 1_{DMAB} - Item 5_{DMAA})/(Item 1_{DMAA} - Item 5_{DMAA})* Item $7_{DMAB/1}$] + [Item 6_{DMAC} * (Item 1_{DMAB} - Item 5_{DMAC})/(Item 1_{DMAC} - Item 5_{DMAC})* Item $7_{DMAB/3}$]*	**10** Pre-developed Q_p at T_c for DMA C: *Q_p = Item 6_{DMAC} + [Item 6_{DMAA} * (Item 1_{DMAC} - Item 5_{DMAA})/(Item 1_{DMAA} - Item 5_{DMAA})* Item $7_{DMAC/1}$] + [Item 6_{DMAB} * (Item 1_{DMAC} - Item 5_{DMAB})/(Item 1_{DMAB} - Item 5_{DMAB})* Item $7_{DMAC/2}$]*

10 Peak runoff from pre-developed condition confluence analysis (cfs): *Maximum of Item 8, 9, and 10 (including additional forms as needed)*

11 Post-developed Q_p at T_c for DMA A: *Same as Item 8 for post-developed values*	**12** Post-developed Q_p at T_c for DMA B: *Same as Item 9 for post-developed values*	**13** Post-developed Q_p at T_c for DMA C: *Same as Item 10 for post-developed values*

14 Peak runoff from post-developed condition confluence analysis (cfs): *Maximum of Item 11, 12, and 13 (including additional forms as needed)*

15 Peak runoff reduction needed to meet HCOC Requirement (cfs): $Q_{p\text{-}HCOC}$ = *(Item 14 * 0.95) – Item 10*

4.3 Project Conformance Analysis

Complete the following forms for each project site DA to document that the proposed LID BMPs conform to the project DCV developed to meet performance criteria specified in the MS4 Permit (WQMP Template Section 4.2). For the LID DCV, the forms are ordered according to hierarchy of BMP selection as required by the MS4 Permit (see Section 5.3.1 in the TGD for WQMP). The forms compute the following for on-site LID BMP:

- Site Design and Hydrologic Source Controls (Form 4.3-2)
- Retention and Infiltration (Form 4.3-3)
- Harvested and Use (Form 4.3-4) or
- Biotreatment (Form 4.3-5).

At the end of each form, additional fields facilitate the determination of the extent of mitigation provided by the specific BMP category, allowing for use of the next category of BMP in the hierarchy, if necessary.

The first step in the analysis, using Section 5.3.2.1 of the TGD for WQMP, is to complete Forms 4.3-1 and 4.3-3) to determine if retention and infiltration BMPs are infeasible for the project. For each feasibility criterion in Form 4.3-1, if the answer is "Yes," provide all study findings that includes relevant calculations, maps, data sources, etc. used to make the determination of infeasibility.

Next, complete Forms 4.3-2 and 4.3-4 to determine the feasibility of applicable HSC and harvest and use BMPs, and, if their implementation is feasible, the extent of mitigation of the DCV.

If no site constraints exist that would limit the type of BMP to be implemented in a DA, evaluate the use of combinations of LID BMPs, including all applicable HSC BMPs to maximize on-site retention of the DCV. If no combination of BMP can mitigate the entire DCV, implement the single BMP type, or combination of BMP types, that maximizes on-site retention of the DCV within the minimum effective area.

If the combination of LID HSC, retention and infiltration, and harvest and use BMPs are unable to mitigate the entire DCV, then biotreatment BMPs may be implemented by the project proponent. If biotreatment BMPs are used, then they must be sized to provide sufficient capacity for effective treatment of the remainder of the volume-based performance criteria that cannot be achieved with LID BMPs (TGD for WQMP Section 5.4.4.2). **Under no circumstances shall any portion of the DCV be released from the site without effective mitigation and/or treatment**.

Form 4.3-1 Infiltration BMP Feasibility (DA 1)

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: (attach)

[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 eight 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: (attach)

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

If Yes, Provide basis: (attach)

[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: **The geotechnical report indicated *"The test results revealed impermeable soil conditions making infiltration unfeasible for this project."* – Page 23 Conclusions and Recommendations 8.10. Geotech Report is attached.**

[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: (attach)

[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: (attach)

[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, Harvest and Use 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, Hydrologic Source Control 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, Hydrologic Source Control BMP.

4.3.1 Site Design Hydrologic Source Control BMP

Section XI.E. of the Permit emphasizes the use of LID preventative measures; and the use of LID HSC BMPs reduces the portion of the DCV that must be addressed in downstream BMPs. Therefore, all applicable HSC 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 HSC, if a project cannot feasibly meet BMP sizing requirements or cannot fully address HCOCs, feasibility of all applicable HSC 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 HSC BMP. Refer to Section 5.4.1 in the TGD for more detailed guidance.

Form 4.3-2 Site Design Hydrologic Source Control BMPs (All Areas)

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)			
9 Surface area of amended soil/gravel (ft^2)			
10 Average depth of amended soil/gravel (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 Hydrologic Source Control BMPs (DA 1)

14 Implementation of evapotranspiration BMP (green, brown, or blue roofs): Yes ☐ No ☒ *If yes, complete Items 15-20. If no, proceed to Item 21*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
15 Rooftop area planned for ET BMP (ft^2)			
16 Average wet season ET demand (in/day) *Use local values, typical ~ 0.1*			
17 Daily ET demand (ft^3/day) *Item 15 * (Item 16 / 12)*			
18 Drawdown time (hrs) *Copy Item 6 in Form 4.2-1*			
19 Retention Volume (ft^3) $V_{retention}$ *= Item 17 * (Item 18 / 24)*			
20 Runoff volume retention from evapotranspiration BMPs (ft^3):	$V_{retention}$ *=Sum of Item 19 for all BMPs*		
21 Implementation of Street Trees: Yes ☐ No ☒ *If yes, complete Items 22-25. If no, proceed to Item 26*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
22 Number of Street Trees			
23 Average canopy cover over impervious area (ft^2)			
24 Runoff volume retention from street trees (ft^3) $V_{retention}$ *= Item 22 * Item 23 * (0.05/12) assume runoff retention of 0.05 inches*			
25 Runoff volume retention from street tree BMPs (ft^3):	$V_{retention}$ *= Sum of Item 24 for all BMPs*		
26 Implementation of residential rain barrel/cisterns: Yes☐ No ☒ *If yes, complete Items 27-29; If no, proceed to Item 30*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
27 Number of rain barrels/cisterns			
28 Runoff volume retention from rain barrels/cisterns (ft^3) $V_{retention}$ *= Item 27 * 3*			
29 Runoff volume retention from residential rain barrels/Cisterns (ft3):	$V_{retention}$ *=Sum of Item 28 for all BMPs*		
30 Total Retention Volume from Site Design Hydrologic Source Control BMPs:	*Sum of Items 5, 13, 20, 25 and 29*		

See Section 4.3-5 for treatment method and Appendix B for Filterra details.

4.3.2 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 D 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 5.5.1 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).

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Form 4.3-3 Infiltration LID BMP - including underground BMPs (DA 1)

1 Remaining LID DCV not met by site design HSC BMP (ft^3): *V_{unmet} = Form 4.2-1 Item 7 - Form 4.3-2 Item 30*			
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*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
2 Infiltration rate of underlying soils (in/hr) *See Section 5.4.2 and Appendix D of the TGD for WQMP for minimum requirements for assessment methods*			
3 Infiltration safety factor *See TGD Section 5.4.2 and Appendix D*			
4 Design percolation rate (in/hr) *P_{design} = Item 2 / Item 3*			
5 Ponded water drawdown time (hr) *Copy Item 6 in Form 4.2-1*			
6 Maximum ponding depth (ft) *BMP specific, see Table 5-4 of the TGD for WQMP for BMP design details*			
7 Ponding Depth (ft) *d_{BMP} = Minimum of (1/12*Item 4*Item 5) or Item 6*			
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*			
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*			
10 Amended soil porosity			
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*			
12 Gravel porosity			
13 Duration of storm as basin is filling (hrs) *Typical ~ 3hrs*			
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))]*			
15 Underground Retention Volume (ft^3) *Volume determined using manufacturer's specifications and calculations*			
16 Total Retention Volume from LID Infiltration BMPs: *(Sum of Items 14 and 15 for all infiltration BMP included in plan)*			
17 Fraction of DCV achieved with infiltration BMP: % *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 4.3-10; 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.*			

4.3.3 Harvest and Use BMP

Harvest and use BMP may be considered if the full LID DCV cannot be met by maximizing infiltration BMPs. Use Form 4.3-4 to compute on-site retention of runoff from proposed harvest and use BMPs.

Volume retention estimates for harvest and use BMPs are sensitive to the on-site demand for captured stormwater. Since irrigation water demand is low in the wet season, when most rainfall events occur in San Bernardino County, the volume of water that can be used within a specified drawdown period is relatively low. The bottom portion of Form 4.3-4 facilitates the necessary computations to show infeasibility if a minimum incremental benefit of 40 percent of the LID DCV would not be achievable with MEP implementation of on-site harvest and use of stormwater (Section 5.5.4 of the TGD for WQMP).

Form 4.3-4 Harvest and Use BMPs (DA 1)

1 Remaining LID DCV not met by site design HSC or infiltration BMP (ft^3): *V_{unmet} = Form 4.2-1 Item 7 - Form 4.3-2 Item 30 – Form 4.3-3 Item 16*			
BMP Type(s) *Compute runoff volume retention from proposed harvest and use BMP (Select BMPs from Table 5-4 of the TGD for WQMP) - Use additional forms for more BMPs*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
2 Describe cistern or runoff detention facility			
3 Storage volume for proposed detention type (ft^3) *Volume of cistern*			
4 Landscaped area planned for use of harvested stormwater (ft^2)			
5 Average wet season daily irrigation demand (in/day) Use local values, typical ~ 0.1 in/day			
6 Daily water demand (ft^3/day) *Item 4 * (Item 5 / 12)*			
7 Drawdown time (hrs) *Copy Item 6 from Form 4.2-1*			
8 Retention Volume (ft^3) *$V_{retention}$ = Minimum of (Item 3) or (Item 6 * (Item 7 / 24))*			
9 Total Retention Volume (ft^3) from Harvest and Use BMP *Sum of Item 8 for all harvest and use BMP included in plan*			
10 Is the full DCV retained with a combination of LID HSC, retention and infiltration, and harvest & use BMPs? Yes ☐ No ☐ *If yes, demonstrate conformance using Form 4.3-10. If no, then re-evaluate combinations of all LID BMP and optimize their implementation such that the maximum portion of the DCV is retained on-site (using a single BMP type or combination of BMP types). If the full DCV cannot be mitigated after this optimization process, proceed to Section 4.3.4.*			

4.3.4 Biotreatment BMP

Biotreatment BMPs may be considered if the full LID DCV cannot be met by maximizing retention and infiltration, and harvest and use BMPs. 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).

Use Form 4.3-5 to summarize the potential for volume based and/or flow based biotreatment options to biotreat the remaining unmet LID DCV w. Biotreatment computations are included as follows:

- Use Form 4.3-6 to compute biotreatment in small volume based biotreatment BMP (e.g. bioretention w/underdrains);
- Use Form 4.3-7 to compute biotreatment in large volume based biotreatment BMP (e.g. constructed wetlands);
- Use Form 4.3-8 to compute sizing criteria for flow-based biotreatment BMP (e.g. bioswales)

Form 4.3-5 Selection and Evaluation of Biotreatment BMP (DA 1)

1 Remaining LID DCV not met by site design HSC, infiltration, or harvest and use BMP for potential biotreatment (ft^3): 16,990 *Form 4.2-1 Item 7 - Form 4.3-2 Item 30 – Form 4.3-3 Item 16- Form 4.3-4 Item 9*

List pollutants of concern *Copy from Form 2.3-1.*
Pathogens; Nutrients; Aquatic Plants; Sediment; Oil and Grease; Trash/Debris; and Organic Compounds

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 4.3-6 and 4.3-7 to compute treated volume*	Flow-based biotreatment *Use Form 4.3-8 to compute treated volume*
☐ 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 4.3-6 Item 15 + Form 4.3-7 Item 13*

4 Compute remaining LID DCV with implementation of volume based biotreatment BMP (ft^3): 16,990 *Item 1 – Item 3*

5 Remaining fraction of LID DCV for sizing flow based biotreatment BMP: 100% *Item 4 / Item 1*

6 Flow-based biotreatment BMP capacity provided (cfs): 0.91 *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.*

Form 4.3-6 Volume Based Biotreatment (DA 1) – 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*			

Form 4.3-7 Volume Based Biotreatment (DA 1) – 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)*				

Form 4.3-8 Flow Based Biotreatment (DA 1)

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*			

See Appendix B for Filterra details.

4.3.5 Conformance Summary

Complete Form 4.3-9 to demonstrate how on-site LID DCV is met with proposed site design hydrologic source control, infiltration, harvest and use, 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 4.3-9 Conformance Summary and Alternative Compliance Volume Estimate (DA 1)

1 Total LID DCV for the Project DA-1 (ft^3): 16,990 *Copy Item 7 in Form 4.2-1*

2 On-site retention with site design hydrologic source control LID BMP (ft^3): 0 *Copy Item 30 in Form 4.3-2*

3 On-site retention with LID infiltration BMP (ft^3): 0 *Copy Item 16 in Form 4.3-3*

4 On-site retention with LID harvest and use BMP (ft^3): 0 *Copy Item 9 in Form 4.3-4*

5 On-site biotreatment with volume based biotreatment BMP (ft^3): 0 *Copy Item 3 in Form 4.3-5*

6 Flow capacity provided by flow based biotreatment BMP (cfs): 0.91 *Copy Item 6 in Form 4.3-5*

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

- Full retention of LID DCV with site design HSC, infiltration, or harvest and use 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 and biotreatment BMP provide 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

8 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 HSC, retention and infiltration, harvest and use, and biotreatment BMPs provide less than full LID DCV capture: ☐
  Checked yes for Form 4.3-5 Item 7, 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)%*
- An approved Watershed Action Plan (WAP) demonstrates that water quality and hydrologic impacts of urbanization are more effective when managed in at an off-site facility: ☐
  Attach appropriate WAP section, including technical documentation, showing effectiveness comparisons for the project site and regional watershed

4.3.6 Hydromodification Control BMP

Use Form 4.3-10 to compute the remaining runoff volume retention, after LID BMP are implemented, needed to address HCOC, and the increase in time of concentration and decrease in peak runoff necessary to meet targets for protection of waterbodies with a potential HCOC. Describe hydromodification control BMP that address HCOC, which may include off-site BMP and/or in-stream controls. Section 5.6 of the TGD for WQMP provides additional details on selection and evaluation of hydromodification control BMP.

Form 4.3-10 Hydromodification Control BMPs (DA 1)

1 Volume reduction needed for HCOC performance criteria (ft^3): 17,102 *(Form 4.2-2 Item 4 * 0.95) – Form 4.2-2 Item 1*	**2** On-site retention with site design hydrologic source control, infiltration, and harvest and use LID BMP (ft^3): 0 *Sum of Form 4.3-9 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 HCOC volume reduction*
3 Remaining volume for HCOC volume capture (ft^3): 17,102 *Item 1 – Item 2*	**4** Volume capture provided by incorporating additional on-site or off-site retention BMPs (ft^3): 17,102 *Existing downstream BMP may be used to demonstrate additional volume capture (if so, attach to this WQMP a hydrologic analysis showing how the additional volume would be retained during a 2-yr storm event for the regional watershed)* **Volume Provided by onsite basin.**

5 If Item 4 is less than Item 3, incorporate in-stream controls on downstream waterbody segment to prevent impacts due to hydromodification ☐ *Attach in-stream control BMP selection and evaluation to this WQMP*

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

If yes, HCOC 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 or off-site retention BMP ☒ **Will be provided by the proposed detention basin with detailed routing calculations provided at final WQMP design. Preliminary calculations included in Appendix A.**
  BMP upstream of a waterbody segment with a potential HCOC may be used to demonstrate increased time of concentration through hydrograph attenuation (if so, show that the hydraulic residence time provided in BMP for a 2-year storm event is equal or greater than the addition time of concentration requirement in Form 4.2-4 Item 15)
- 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 ☐
- Incorporate appropriate in-stream controls for downstream waterbody segment to prevent impacts due to hydromodification, in a plan approved and signed by a licensed engineer in the State of California ☐

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

If yes, HCOC 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 or off-site retention BMPs ☒ **Will be provided by the proposed detention basin with detailed routing calculations provided at final WQMP design. Preliminary calculations included in Appendix A.**
  BMPs upstream of a waterbody segment with a potential HCOC may be used to demonstrate additional peak runoff reduction through hydrograph attenuation (if so, attach to this WQMP, a hydrograph analysis showing how the peak runoff would be reduced during a 2-yr storm event)
- Incorporate appropriate in-stream controls for downstream waterbody segment to prevent impacts due to hydromodification, in a plan approved and signed by a licensed engineer in the State of California ☐

4.4 Alternative Compliance Plan (if applicable)

Describe an alternative compliance plan (if applicable) for projects not fully able to infiltrate, harvest and use, 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 compliance plans may include one or more of the following elements:

- On-site structural treatment control BMP - All treatment control BMP should be located as close to possible to the pollutant sources and should not be located within receiving waters;
- Off-site structural treatment control BMP - Pollutant removal should occur prior to discharge of runoff to receiving waters;
- Urban runoff fund or In-lieu program, if available

Depending upon the proposed alternative compliance plan, approval by the executive officer may or may not be required (see Section 6 of the TGD for WQMP).

Section 5 Inspection and Maintenance Responsibility for Post Construction BMP

All BMP 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 may require a Maintenance Agreement (consult the jurisdiction's LIP). If a Maintenance Agreement is required, it must also be attached to the WQMP.

Form 5-1 BMP Inspection and Maintenance (use additional forms as necessary)

BMP	Reponsible Party(s)	Inspection/ Maintenance Activities Required	Minimum Frequency of Activities

Section 6 WQMP Attachments

6.1. Site Plan and Drainage Plan

Include a site plan and drainage plan sheet set containing the following minimum information:

- 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

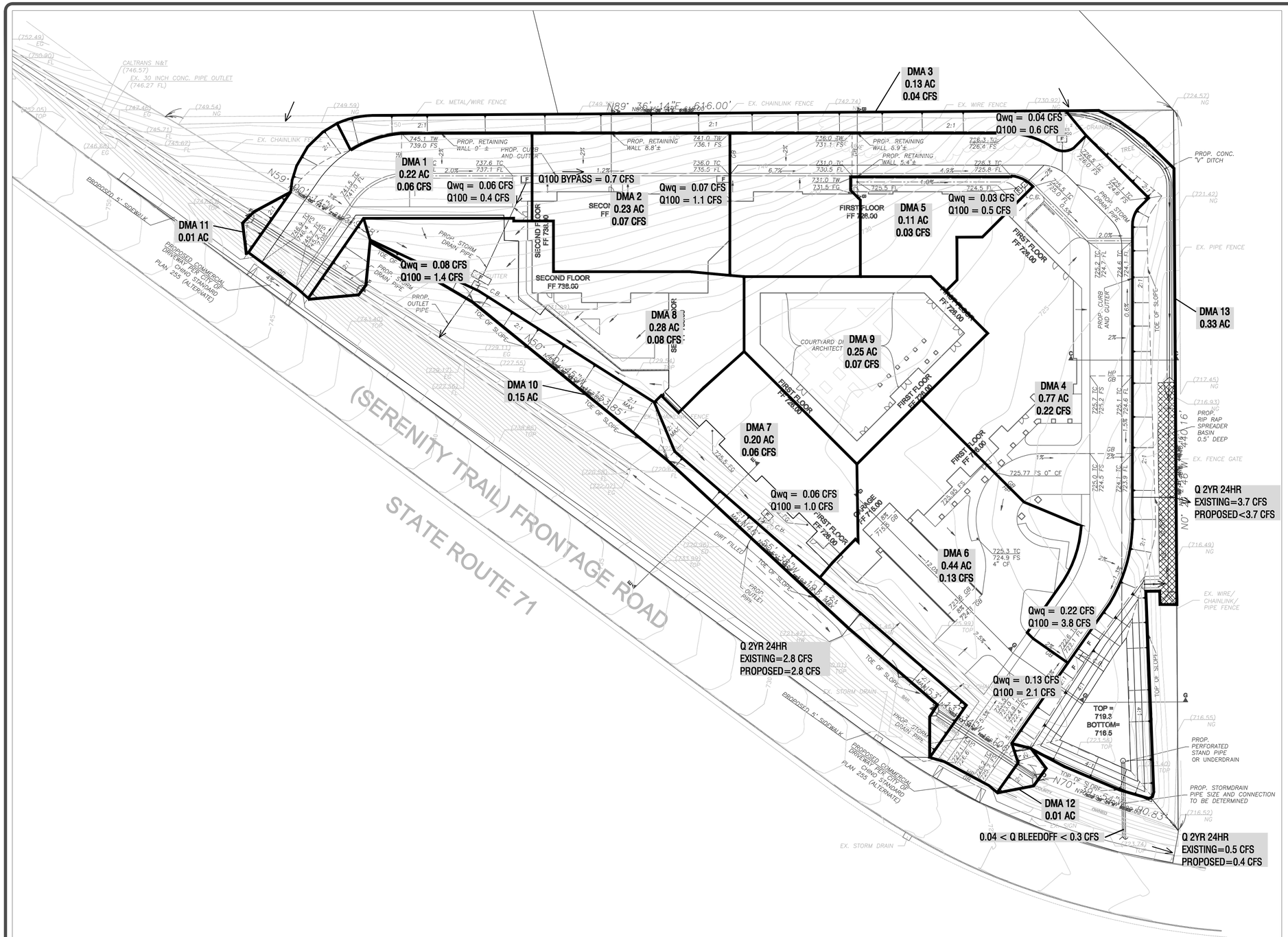
Minimum requirements include submittal of PDF exhibits in addition to hard copies. Format must not require specialized software to open. If the local jurisdiction requires specialized electronic document formats (as described in their local Local Implementation Plan), this section will describe the contents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

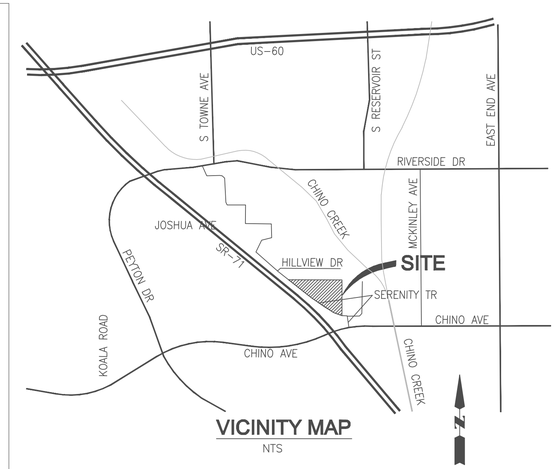
6.3 Post Construction

Attach all O&M Plans and Maintenance Agreements for BMP to the WQMP.

6.4 Other Supporting Documentation

- BMP Educational Materials
- Activity Restriction – C, C&R's & Lease Agreements





LEGEND:

- CONTRIBUTORY AREA
- PROJECT BOUNDARY
- FLOW DIRECTION

NOTES:

– FOR PRELIMINARY CALCULATIONS YIELD PER ACRE 100 YEAR FLOW RATES AND WATER QUALITY FLOW RATES WERE USED. 100 YEAR PEAK RUNOFF = 4.87 CFS/ACRE WATER QUALITY FLOW = 0.288 CFS/ACRE

– THERE IS A BLEED–OFF PIPE OUTFALL FOR THE BASINS DESIGNED TO DISCHARGE BELOW THE EXISTING PEAK RUNOFF IN THE EXISTING STORM DRAIN SYSTEM. FINAL SIZING AND ORIFICE DESIGN TO BE PROVIDED WITH FINAL.

– ALL WATER QUALITY TREATMENT WILL BE HANDLED BY THE FILTERRA TYPE SYSTEM, INDICATED BY THE F SYMBOL IN THE LEGEND, WITH DETAILS IN DRAINAGE REPORT APPENDIX C, OR WQMP APPENDIX B.

– REFER TO APPENDIX A FOR DESIGN DETAILS.

N

30' 15' 0' 30' 60'

GRAPHIC SCALE: 1"=30'

SUBMITTALS:

DESIGNED BY:
DRAWN BY:
CHECKED BY:

REVISIONS		
NO.	DESCRIPTION	DATE

REGISTERED PROFESSIONAL ENGINEER — CHRISTOPHER F. LENZ — NO. 63001 EXP. 6/30/18 CIVIL — STATE OF CALIFORNIA

CHRISTOPHER F. LENZ DATE
R.C.E. No. 63001

LICENSED LAND SURVEYOR — DEAN C. PHILLIPS — EXP. 9/30/17 NO. 6974 — STATE OF CALIFORNIA

DEAN C. PHILLIPS DATE
L.S. No. 6974
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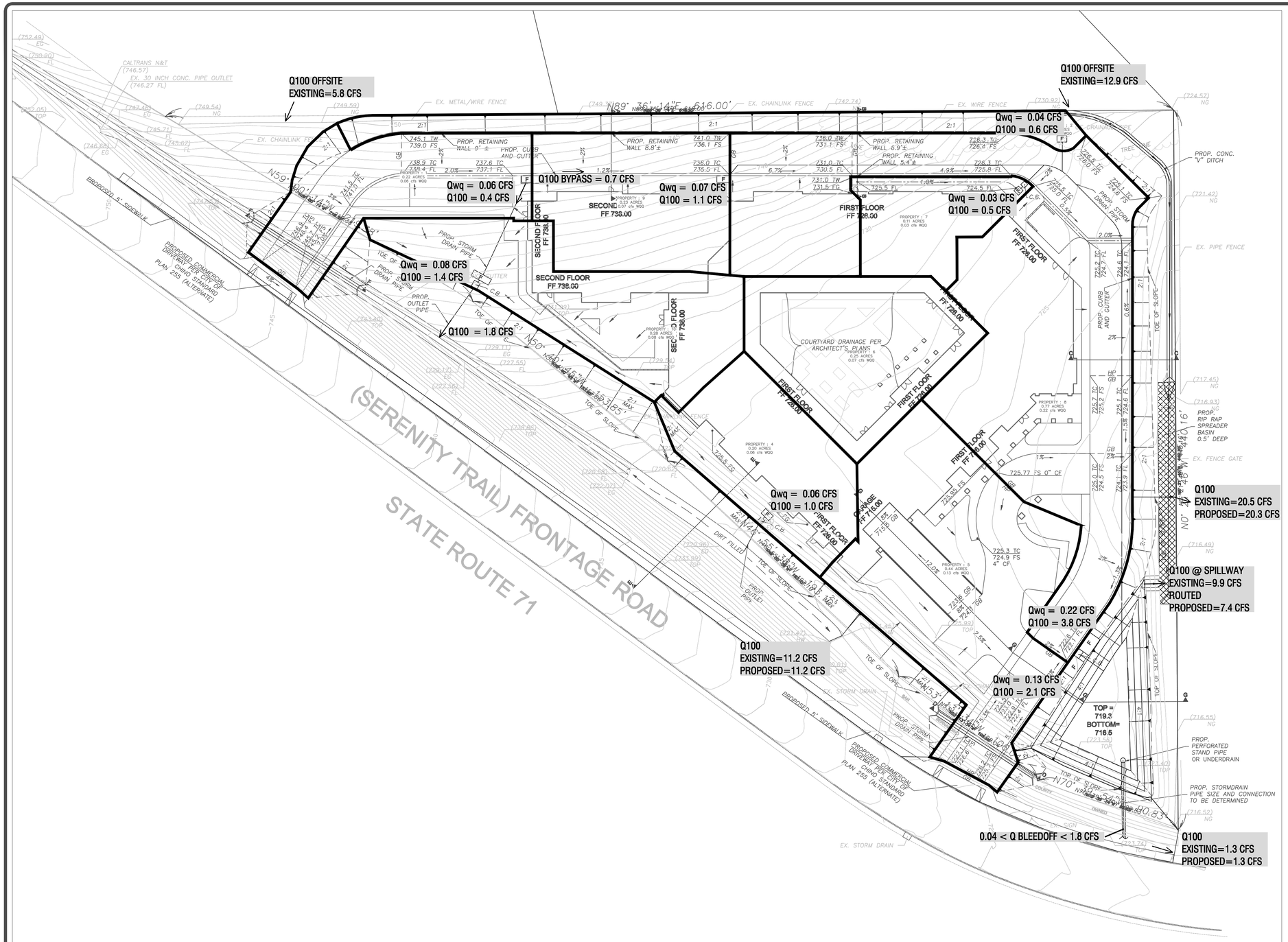
SUMMERLAND - CHINO

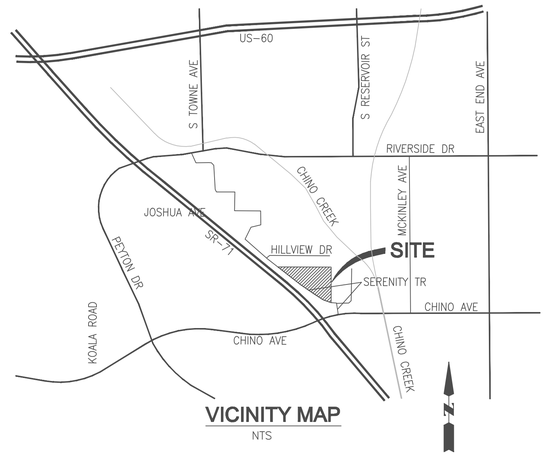
WQMP DMA MAP

DATE
FEBRUARY 2017

SHEET 1 OF 1

PROJECT NUMBER
CA–30105





VICINITY MAP
NTS

LEGEND:

- CONTRIBUTORY AREA
- PROJECT BOUNDARY
- FLOWPATH
- FLOW DIRECTION

NOTES:

– FOR PRELIMINARY CALCULATIONS YIELD PER ACRE 100 YEAR FLOW RATES AND WATER QUALITY FLOW RATES WERE USED. 100 YEAR PEAK RUNOFF = 4.87 CFS/ACRE WATER QUALITY FLOW = 0.288 CFS/ACRE

– THERE IS A BLEED–OFF PIPE OUTFALL FOR THE BASINS DESIGNED TO DISCHARGE BELOW THE EXISTING PEAK RUNOFF IN THE EXISTING STORM DRAIN SYSTEM. FINAL SIZING AND ORIFICE DESIGN TO BE PROVIDED WITH FINAL.

– ALL WATER QUALITY TREATMENT WILL BE HANDLED BY THE FILTERRA TYPE SYSTEM, INDICATED BY THE F SYMBOL IN THE LEGEND, WITH DETAILS IN APPENDIX X.

– REFER TO APPENDIX A FOR DESIGN DETAILS.

N

30' 15' 0' 30' 60'

GRAPHIC SCALE: 1"=30'

SUBMITTALS:

DESIGNED BY:
DRAWN BY:
CHECKED BY:

REVISIONS		
NO.	DESCRIPTION	DATE

REGISTERED PROFESSIONAL ENGINEER — CHRISTOPHER F. LENZ — NO. 63001 EXP. 6/30/18 CIVIL — STATE OF CALIFORNIA

CHRISTOPHER F. LENZ DATE
R.C.E. No. 63001

LICENSED LAND SURVEYOR — DEAN C. PHILLIPS — EXP. 9/30/17 — NO. 6974 — STATE OF CALIFORNIA

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Phone: 909.466.9240
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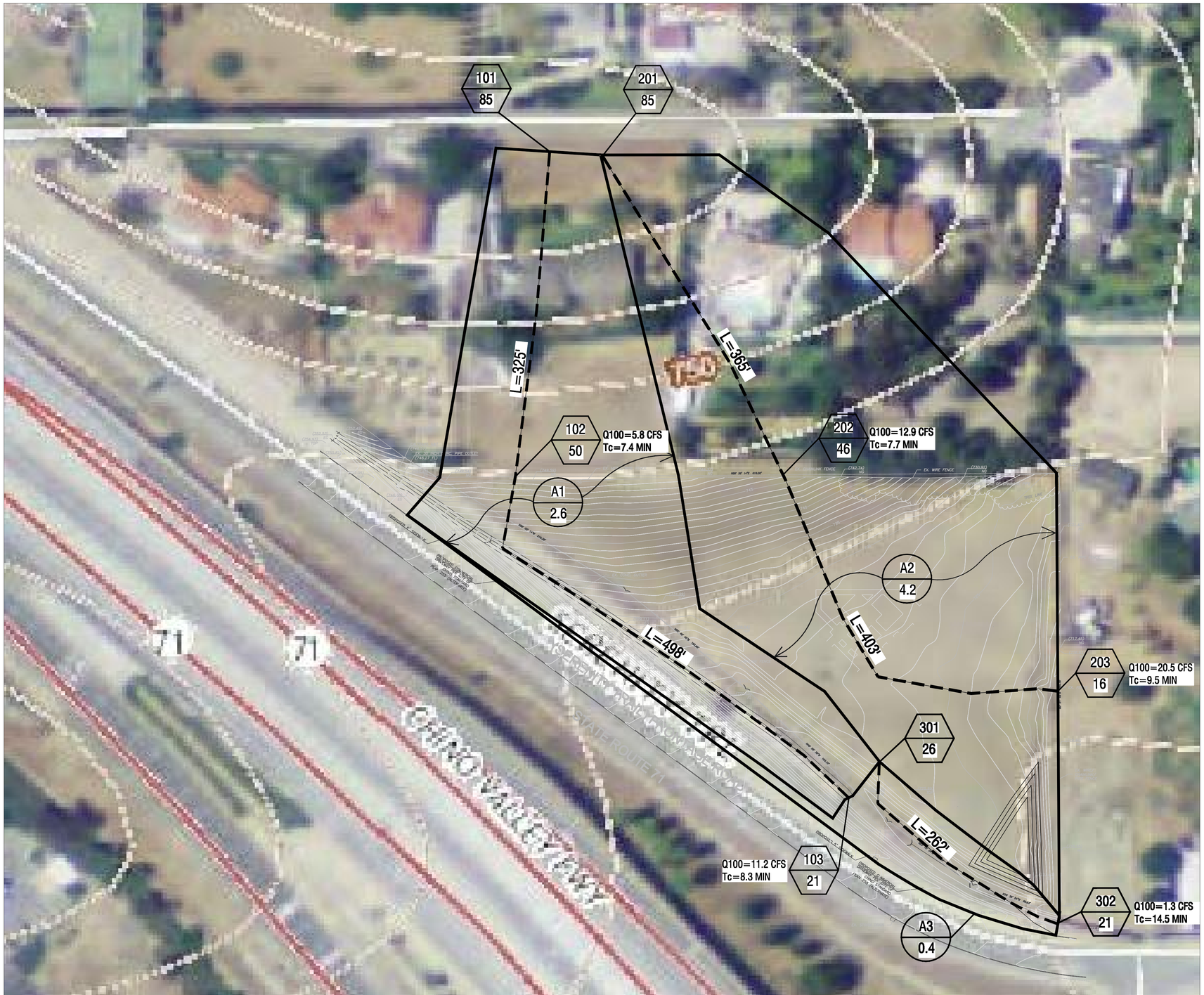
SUMMERLAND - CHINO

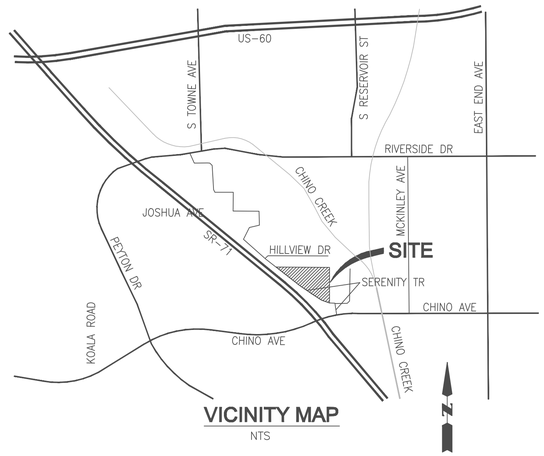
PROPOSED CONDITION EXHIBIT

DATE
FEBRUARY 2017

SHEET 1 OF 1

PROJECT NUMBER
CA–30105





VICINITY MAP
NTS

LEGEND:

- CONTRIBUTORY AREA
- PROJECT BOUNDARY
- FLOWPATH
- FLOW DIRECTION
- 102 / XX — NODE/CONCENTRATION POINT; FLOWLINE ELEVATION 29XX'
- A2 / 24.4 — SUBAREA; ACRES

NOTE: REFER TO APPENDIX A FOR DESIGN DETAILS AND RESULTS OF DESIGN

N

50' 25' 0' 50' 100'
GRAPHIC SCALE: 1"=50'

SUBMITTALS:

DESIGNED BY:
DRAWN BY:
CHECKED BY:

REVISIONS		
NO.	DESCRIPTION	DATE

REGISTERED PROFESSIONAL ENGINEER — CHRISTOPHER F. LENZ — NO. 63001 EXP. 6/30/18 CIVIL — STATE OF CALIFORNIA

CHRISTOPHER F. LENZ DATE
R.C.E. No. 63001

LICENSED LAND SURVEYOR — DEAN C. PHILLIPS — EXP. 9/30/17 NO. 6974 — STATE OF CALIFORNIA

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SUMMERLAND - CHINO

EXITING CONDITION EXHIBIT

DATE
FEBRUARY 2017

SHEET 1 OF 1

PROJECT NUMBER
CA-30105

Appendix A

V. WATER QUALITY

Water quality calculations were prepared based on the San Bernardino County Model Water Quality Management Plan Guidance document. The following calculations were used in preliminary sizing of facilities;

Volume Based

- WQ Contributing area
    - Area – 3.16 acres
- 2 yr 1 hour rainfall – 0.6 ”
- Impervious ratio – 85%
- C_{BMP} = 0.66
- Drainage Area Region – Valley – Regression Coefficient P_6 = 1.9090
- P_6 = 1.9090 x 0.6” = 1.145”
- Regression Constant a = 1.963 for 48 hours
- $P_0 = a * C_{BMP} * P_6 = 1.963 \times 0.66 \times 1.145 = 1.48$
- $V_0 = (P_0 * A)/12$
    - V = (1.48 x 3.16)/12 = 0.39 acft

Flow Based

- WQ Contributing area
    - Area – 3.16 acres
- 2 yr 1 hour rainfall – 0.6 in/hr
- Impervious ratio – 85%
- C_{BMP} = 0.66
- Drainage Area Region – Valley – Regression Coefficient P_6 = 1.9090
- P_6 = 1.9090 x 0.6” = 1.145”
- Drainage Area Region – Valley – Regression Coefficient I = 0.3614
- $I_{bmp} * NOAA\ I * 2 = 0.3614 * 0.6 * 2 = 0.434$ in/hr
- $Q = C_{BMP} * I_{bmp} * A = 0.66 \times 0.434 \times 3.16 = 0.91$ cfs or 0.288 cfs/acre

The soils report prepared by EnGen Corporation dated October 10th, 2016 indicates soil conditions that will be not be suitable for adequate infiltration of water quality runoff volumes. Additional design and a Water Quality Management Plan prepared by a QSP should be prepared with the final design of the project for implementation during and after construction.

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

Study date 02/27/17

++

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

Program License Serial Number 6232

Summerland - Chino
2 yr 24 hr storm event
Pre Development Conditions
Area A1 pts 101-103

Storm Event Year = 2

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 2		
2.60	1	0.59
Rainfall data for year 2		
2.60	6	1.57
Rainfall data for year 2		
2.60	24	2.77

++

```
      ******** 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)
       79.0      61.8          2.60      1.000     0.654    0.800
0.524

      Area-averaged adjusted loss rate Fm (In/Hr) =  0.524

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

      Area       Area          SCS CN    SCS CN      S     Pervious
       (Ac.)      Fract         (AMC2)    (AMC1)           Yield Fr
           2.08   0.800         79.0      61.8       6.18     0.110
           0.52   0.200         98.0      98.0       0.20     0.917

      Area-averaged catchment yield fraction, Y =  0.271
      Area-averaged low loss fraction, Yb =  0.729
      User entry of time of concentration  =   0.138 (hours)
      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
++
      Watershed area =       2.60(Ac.)
      Catchment Lag time =   0.110 hours
      Unit interval =   5.000 minutes
      Unit interval percentage of lag time = 75.4831
      Hydrograph baseflow =     0.00(CFS)
      Average maximum watershed loss rate(Fm) =  0.524(In/Hr)
      Average low loss rate fraction (Yb) = 0.729 (decimal)
      FOOTHILL S-Graph Selected
      Computed peak 5-minute rainfall =  0.220(In)
      Computed peak 30-minute rainfall =  0.451(In)
      Specified peak 1-hour rainfall =  0.595(In)
      Computed peak 3-hour rainfall =  1.079(In)
      Specified peak 6-hour rainfall =  1.570(In)
      Specified peak 24-hour rainfall =  2.770(In)


      Rainfall depth area reduction factors:
      Using a total area of       2.60(Ac.) (Ref: fig. E-4)

      5-minute factor = 1.000     Adjusted rainfall =  0.220(In)
      30-minute factor = 1.000    Adjusted rainfall =  0.451(In)
      1-hour factor = 1.000       Adjusted rainfall =  0.595(In)
      3-hour factor = 1.000       Adjusted rainfall =  1.079(In)
      6-hour factor = 1.000       Adjusted rainfall =  1.570(In)
      24-hour factor = 1.000      Adjusted rainfall =  2.770(In)
      ----------------------------------------------------------------
---

                      U n i t  H y d r o g r a p h
      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Interval          'S' Graph          Unit Hydrograph
      Number            Mean values             ((CFS))
      ----------------------------------------------------------------
---
                 (K =        31.44 (CFS))
```

1	8.132	2.557
2	53.492	14.263
3	79.938	8.315
4	90.197	3.226
5	95.608	1.701
6	98.028	0.761
7	98.885	0.270
8	99.435	0.173
9	99.855	0.132
10	100.000	0.046

Peak Unit Number	Adjusted mass rainfall (In)	Unit rainfall (In)
1	0.2202	0.2202
2	0.2905	0.0704
3	0.3417	0.0512
4	0.3834	0.0417
5	0.4192	0.0358
6	0.4509	0.0317
7	0.4795	0.0287
8	0.5059	0.0263
9	0.5303	0.0244
10	0.5531	0.0228
11	0.5746	0.0215
12	0.5949	0.0203
13	0.6213	0.0264
14	0.6467	0.0254
15	0.6714	0.0246
16	0.6952	0.0239
17	0.7184	0.0232
18	0.7410	0.0226
19	0.7631	0.0220
20	0.7845	0.0215
21	0.8056	0.0210
22	0.8261	0.0206
23	0.8462	0.0201
24	0.8660	0.0197
25	0.8853	0.0194
26	0.9043	0.0190
27	0.9230	0.0187
28	0.9414	0.0184
29	0.9594	0.0181
30	0.9772	0.0178
31	0.9947	0.0175
32	1.0120	0.0173
33	1.0290	0.0170
34	1.0458	0.0168
35	1.0623	0.0165
36	1.0786	0.0163
37	1.0948	0.0161
38	1.1107	0.0159
39	1.1264	0.0157
40	1.1420	0.0156
41	1.1574	0.0154
42	1.1726	0.0152
43	1.1876	0.0150
44	1.2025	0.0149
45	1.2172	0.0147

46	1.2318	0.0146
47	1.2462	0.0144
48	1.2605	0.0143
49	1.2746	0.0142
50	1.2887	0.0140
51	1.3026	0.0139
52	1.3163	0.0138
53	1.3300	0.0136
54	1.3435	0.0135
55	1.3569	0.0134
56	1.3702	0.0133
57	1.3834	0.0132
58	1.3965	0.0131
59	1.4095	0.0130
60	1.4224	0.0129
61	1.4352	0.0128
62	1.4479	0.0127
63	1.4605	0.0126
64	1.4730	0.0125
65	1.4854	0.0124
66	1.4977	0.0123
67	1.5100	0.0122
68	1.5221	0.0122
69	1.5342	0.0121
70	1.5462	0.0120
71	1.5581	0.0119
72	1.5700	0.0118
73	1.5789	0.0089
74	1.5877	0.0088
75	1.5965	0.0088
76	1.6051	0.0087
77	1.6138	0.0086
78	1.6223	0.0086
79	1.6308	0.0085
80	1.6392	0.0084
81	1.6476	0.0084
82	1.6559	0.0083
83	1.6641	0.0082
84	1.6723	0.0082
85	1.6804	0.0081
86	1.6885	0.0081
87	1.6965	0.0080
88	1.7045	0.0080
89	1.7124	0.0079
90	1.7202	0.0079
91	1.7280	0.0078
92	1.7358	0.0078
93	1.7435	0.0077
94	1.7511	0.0077
95	1.7587	0.0076
96	1.7663	0.0076
97	1.7738	0.0075
98	1.7813	0.0075
99	1.7887	0.0074
100	1.7961	0.0074
101	1.8034	0.0073
102	1.8107	0.0073
103	1.8180	0.0072
104	1.8252	0.0072
105	1.8323	0.0072

106	1.8395	0.0071
107	1.8466	0.0071
108	1.8536	0.0070
109	1.8606	0.0070
110	1.8676	0.0070
111	1.8745	0.0069
112	1.8814	0.0069
113	1.8883	0.0069
114	1.8951	0.0068
115	1.9019	0.0068
116	1.9087	0.0068
117	1.9154	0.0067
118	1.9221	0.0067
119	1.9287	0.0067
120	1.9353	0.0066
121	1.9419	0.0066
122	1.9485	0.0066
123	1.9550	0.0065
124	1.9615	0.0065
125	1.9680	0.0065
126	1.9744	0.0064
127	1.9808	0.0064
128	1.9872	0.0064
129	1.9935	0.0063
130	1.9998	0.0063
131	2.0061	0.0063
132	2.0124	0.0063
133	2.0186	0.0062
134	2.0248	0.0062
135	2.0310	0.0062
136	2.0371	0.0061
137	2.0433	0.0061
138	2.0494	0.0061
139	2.0554	0.0061
140	2.0615	0.0060
141	2.0675	0.0060
142	2.0735	0.0060
143	2.0794	0.0060
144	2.0854	0.0059
145	2.0913	0.0059
146	2.0972	0.0059
147	2.1031	0.0059
148	2.1089	0.0058
149	2.1147	0.0058
150	2.1205	0.0058
151	2.1263	0.0058
152	2.1321	0.0058
153	2.1378	0.0057
154	2.1435	0.0057
155	2.1492	0.0057
156	2.1549	0.0057
157	2.1605	0.0056
158	2.1662	0.0056
159	2.1718	0.0056
160	2.1773	0.0056
161	2.1829	0.0056
162	2.1885	0.0055
163	2.1940	0.0055
164	2.1995	0.0055
165	2.2050	0.0055

166	2.2104	0.0055
167	2.2159	0.0054
168	2.2213	0.0054
169	2.2267	0.0054
170	2.2321	0.0054
171	2.2375	0.0054
172	2.2428	0.0053
173	2.2481	0.0053
174	2.2535	0.0053
175	2.2587	0.0053
176	2.2640	0.0053
177	2.2693	0.0053
178	2.2745	0.0052
179	2.2797	0.0052
180	2.2850	0.0052
181	2.2901	0.0052
182	2.2953	0.0052
183	2.3005	0.0052
184	2.3056	0.0051
185	2.3107	0.0051
186	2.3159	0.0051
187	2.3209	0.0051
188	2.3260	0.0051
189	2.3311	0.0051
190	2.3361	0.0050
191	2.3411	0.0050
192	2.3462	0.0050
193	2.3512	0.0050
194	2.3561	0.0050
195	2.3611	0.0050
196	2.3661	0.0050
197	2.3710	0.0049
198	2.3759	0.0049
199	2.3808	0.0049
200	2.3857	0.0049
201	2.3906	0.0049
202	2.3955	0.0049
203	2.4003	0.0048
204	2.4051	0.0048
205	2.4100	0.0048
206	2.4148	0.0048
207	2.4196	0.0048
208	2.4243	0.0048
209	2.4291	0.0048
210	2.4339	0.0048
211	2.4386	0.0047
212	2.4433	0.0047
213	2.4480	0.0047
214	2.4528	0.0047
215	2.4574	0.0047
216	2.4621	0.0047
217	2.4668	0.0047
218	2.4714	0.0046
219	2.4761	0.0046
220	2.4807	0.0046
221	2.4853	0.0046
222	2.4899	0.0046
223	2.4945	0.0046
224	2.4991	0.0046
225	2.5036	0.0046

226	2.5082	0.0046
227	2.5127	0.0045
228	2.5172	0.0045
229	2.5218	0.0045
230	2.5263	0.0045
231	2.5308	0.0045
232	2.5352	0.0045
233	2.5397	0.0045
234	2.5442	0.0045
235	2.5486	0.0044
236	2.5530	0.0044
237	2.5575	0.0044
238	2.5619	0.0044
239	2.5663	0.0044
240	2.5707	0.0044
241	2.5751	0.0044
242	2.5794	0.0044
243	2.5838	0.0044
244	2.5881	0.0043
245	2.5925	0.0043
246	2.5968	0.0043
247	2.6011	0.0043
248	2.6054	0.0043
249	2.6097	0.0043
250	2.6140	0.0043
251	2.6183	0.0043
252	2.6226	0.0043
253	2.6268	0.0043
254	2.6311	0.0042
255	2.6353	0.0042
256	2.6395	0.0042
257	2.6438	0.0042
258	2.6480	0.0042
259	2.6522	0.0042
260	2.6564	0.0042
261	2.6605	0.0042
262	2.6647	0.0042
263	2.6689	0.0042
264	2.6730	0.0042
265	2.6772	0.0041
266	2.6813	0.0041
267	2.6854	0.0041
268	2.6895	0.0041
269	2.6936	0.0041
270	2.6977	0.0041
271	2.7018	0.0041
272	2.7059	0.0041
273	2.7100	0.0041
274	2.7140	0.0041
275	2.7181	0.0041
276	2.7221	0.0040
277	2.7262	0.0040
278	2.7302	0.0040
279	2.7342	0.0040
280	2.7382	0.0040
281	2.7422	0.0040
282	2.7462	0.0040
283	2.7502	0.0040
284	2.7542	0.0040
285	2.7581	0.0040

286	2.7621	0.0040
287	2.7660	0.0040
288	2.7700	0.0039

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0039	0.0029	0.0011
2	0.0040	0.0029	0.0011
3	0.0040	0.0029	0.0011
4	0.0040	0.0029	0.0011
5	0.0040	0.0029	0.0011
6	0.0040	0.0029	0.0011
7	0.0040	0.0029	0.0011
8	0.0040	0.0029	0.0011
9	0.0040	0.0029	0.0011
10	0.0041	0.0030	0.0011
11	0.0041	0.0030	0.0011
12	0.0041	0.0030	0.0011
13	0.0041	0.0030	0.0011
14	0.0041	0.0030	0.0011
15	0.0041	0.0030	0.0011
16	0.0041	0.0030	0.0011
17	0.0042	0.0030	0.0011
18	0.0042	0.0030	0.0011
19	0.0042	0.0030	0.0011
20	0.0042	0.0031	0.0011
21	0.0042	0.0031	0.0011
22	0.0042	0.0031	0.0011
23	0.0042	0.0031	0.0012
24	0.0042	0.0031	0.0012
25	0.0043	0.0031	0.0012
26	0.0043	0.0031	0.0012
27	0.0043	0.0031	0.0012
28	0.0043	0.0031	0.0012
29	0.0043	0.0032	0.0012
30	0.0043	0.0032	0.0012
31	0.0044	0.0032	0.0012
32	0.0044	0.0032	0.0012
33	0.0044	0.0032	0.0012
34	0.0044	0.0032	0.0012
35	0.0044	0.0032	0.0012
36	0.0044	0.0032	0.0012
37	0.0045	0.0032	0.0012
38	0.0045	0.0033	0.0012
39	0.0045	0.0033	0.0012
40	0.0045	0.0033	0.0012
41	0.0045	0.0033	0.0012
42	0.0045	0.0033	0.0012
43	0.0046	0.0033	0.0012
44	0.0046	0.0033	0.0012
45	0.0046	0.0034	0.0012
46	0.0046	0.0034	0.0013
47	0.0046	0.0034	0.0013
48	0.0046	0.0034	0.0013
49	0.0047	0.0034	0.0013
50	0.0047	0.0034	0.0013

51	0.0047	0.0034	0.0013
52	0.0047	0.0034	0.0013
53	0.0048	0.0035	0.0013
54	0.0048	0.0035	0.0013
55	0.0048	0.0035	0.0013
56	0.0048	0.0035	0.0013
57	0.0048	0.0035	0.0013
58	0.0048	0.0035	0.0013
59	0.0049	0.0036	0.0013
60	0.0049	0.0036	0.0013
61	0.0049	0.0036	0.0013
62	0.0049	0.0036	0.0013
63	0.0050	0.0036	0.0013
64	0.0050	0.0036	0.0014
65	0.0050	0.0037	0.0014
66	0.0050	0.0037	0.0014
67	0.0051	0.0037	0.0014
68	0.0051	0.0037	0.0014
69	0.0051	0.0037	0.0014
70	0.0051	0.0037	0.0014
71	0.0052	0.0038	0.0014
72	0.0052	0.0038	0.0014
73	0.0052	0.0038	0.0014
74	0.0052	0.0038	0.0014
75	0.0053	0.0038	0.0014
76	0.0053	0.0038	0.0014
77	0.0053	0.0039	0.0014
78	0.0053	0.0039	0.0014
79	0.0054	0.0039	0.0015
80	0.0054	0.0039	0.0015
81	0.0054	0.0040	0.0015
82	0.0054	0.0040	0.0015
83	0.0055	0.0040	0.0015
84	0.0055	0.0040	0.0015
85	0.0055	0.0040	0.0015
86	0.0056	0.0041	0.0015
87	0.0056	0.0041	0.0015
88	0.0056	0.0041	0.0015
89	0.0057	0.0041	0.0015
90	0.0057	0.0041	0.0015
91	0.0057	0.0042	0.0016
92	0.0058	0.0042	0.0016
93	0.0058	0.0042	0.0016
94	0.0058	0.0042	0.0016
95	0.0059	0.0043	0.0016
96	0.0059	0.0043	0.0016
97	0.0059	0.0043	0.0016
98	0.0060	0.0043	0.0016
99	0.0060	0.0044	0.0016
100	0.0060	0.0044	0.0016
101	0.0061	0.0044	0.0017
102	0.0061	0.0045	0.0017
103	0.0062	0.0045	0.0017
104	0.0062	0.0045	0.0017
105	0.0063	0.0046	0.0017
106	0.0063	0.0046	0.0017
107	0.0063	0.0046	0.0017
108	0.0064	0.0046	0.0017
109	0.0064	0.0047	0.0017
110	0.0065	0.0047	0.0018

111	0.0065	0.0048	0.0018
112	0.0066	0.0048	0.0018
113	0.0066	0.0048	0.0018
114	0.0067	0.0048	0.0018
115	0.0067	0.0049	0.0018
116	0.0068	0.0049	0.0018
117	0.0068	0.0050	0.0019
118	0.0069	0.0050	0.0019
119	0.0069	0.0051	0.0019
120	0.0070	0.0051	0.0019
121	0.0070	0.0051	0.0019
122	0.0071	0.0052	0.0019
123	0.0072	0.0052	0.0019
124	0.0072	0.0053	0.0020
125	0.0073	0.0053	0.0020
126	0.0073	0.0053	0.0020
127	0.0074	0.0054	0.0020
128	0.0075	0.0054	0.0020
129	0.0076	0.0055	0.0021
130	0.0076	0.0055	0.0021
131	0.0077	0.0056	0.0021
132	0.0078	0.0056	0.0021
133	0.0079	0.0057	0.0021
134	0.0079	0.0058	0.0021
135	0.0080	0.0058	0.0022
136	0.0081	0.0059	0.0022
137	0.0082	0.0060	0.0022
138	0.0082	0.0060	0.0022
139	0.0084	0.0061	0.0023
140	0.0084	0.0061	0.0023
141	0.0086	0.0062	0.0023
142	0.0086	0.0063	0.0023
143	0.0088	0.0064	0.0024
144	0.0088	0.0064	0.0024
145	0.0118	0.0086	0.0032
146	0.0119	0.0087	0.0032
147	0.0121	0.0088	0.0033
148	0.0122	0.0089	0.0033
149	0.0123	0.0090	0.0033
150	0.0124	0.0090	0.0034
151	0.0126	0.0092	0.0034
152	0.0127	0.0092	0.0034
153	0.0129	0.0094	0.0035
154	0.0130	0.0095	0.0035
155	0.0132	0.0096	0.0036
156	0.0133	0.0097	0.0036
157	0.0135	0.0099	0.0037
158	0.0136	0.0099	0.0037
159	0.0139	0.0101	0.0038
160	0.0140	0.0102	0.0038
161	0.0143	0.0104	0.0039
162	0.0144	0.0105	0.0039
163	0.0147	0.0107	0.0040
164	0.0149	0.0108	0.0040
165	0.0152	0.0111	0.0041
166	0.0154	0.0112	0.0042
167	0.0157	0.0115	0.0043
168	0.0159	0.0116	0.0043
169	0.0163	0.0119	0.0044
170	0.0165	0.0121	0.0045

171	0.0170	0.0124	0.0046
172	0.0173	0.0126	0.0047
173	0.0178	0.0130	0.0048
174	0.0181	0.0132	0.0049
175	0.0187	0.0136	0.0051
176	0.0190	0.0138	0.0052
177	0.0197	0.0144	0.0054
178	0.0201	0.0147	0.0055
179	0.0210	0.0153	0.0057
180	0.0215	0.0157	0.0058
181	0.0226	0.0165	0.0061
182	0.0232	0.0169	0.0063
183	0.0246	0.0179	0.0067
184	0.0254	0.0185	0.0069
185	0.0203	0.0148	0.0055
186	0.0215	0.0157	0.0058
187	0.0244	0.0178	0.0066
188	0.0263	0.0192	0.0071
189	0.0317	0.0231	0.0086
190	0.0358	0.0261	0.0097
191	0.0512	0.0373	0.0139
192	0.0704	0.0436	0.0267
193	0.2202	0.0436	0.1766
194	0.0417	0.0304	0.0113
195	0.0287	0.0209	0.0078
196	0.0228	0.0166	0.0062
197	0.0264	0.0192	0.0072
198	0.0239	0.0174	0.0065
199	0.0220	0.0160	0.0060
200	0.0206	0.0150	0.0056
201	0.0194	0.0141	0.0053
202	0.0184	0.0134	0.0050
203	0.0175	0.0128	0.0048
204	0.0168	0.0122	0.0046
205	0.0161	0.0117	0.0044
206	0.0156	0.0113	0.0042
207	0.0150	0.0110	0.0041
208	0.0146	0.0106	0.0040
209	0.0142	0.0103	0.0038
210	0.0138	0.0100	0.0037
211	0.0134	0.0098	0.0036
212	0.0131	0.0095	0.0036
213	0.0128	0.0093	0.0035
214	0.0125	0.0091	0.0034
215	0.0122	0.0089	0.0033
216	0.0120	0.0087	0.0033
217	0.0089	0.0065	0.0024
218	0.0087	0.0063	0.0024
219	0.0085	0.0062	0.0023
220	0.0083	0.0060	0.0023
221	0.0081	0.0059	0.0022
222	0.0080	0.0058	0.0022
223	0.0078	0.0057	0.0021
224	0.0077	0.0056	0.0021
225	0.0075	0.0055	0.0020
226	0.0074	0.0054	0.0020
227	0.0072	0.0053	0.0020
228	0.0071	0.0052	0.0019
229	0.0070	0.0051	0.0019
230	0.0069	0.0050	0.0019

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

--

```
      ----------------------------------------------------------------
--
      Total soil rain loss =      1.89(In)
      Total effective rainfall =      0.88(In)
      Peak flow rate in flood hydrograph =      2.84(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       0.0000      0.00  Q         |         |         |
|
    0+10       0.0001      0.02  Q         |         |         |
|
    0+15       0.0003      0.03  Q         |         |         |
|
    0+20       0.0005      0.03  Q         |         |         |
|
    0+25       0.0008      0.03  Q         |         |         |
|
    0+30       0.0010      0.03  Q         |         |         |
|
    0+35       0.0012      0.03  Q         |         |         |
|
    0+40       0.0015      0.03  Q         |         |         |
|
    0+45       0.0017      0.03  Q         |         |         |
|
    0+50       0.0019      0.03  Q         |         |         |
|
    0+55       0.0022      0.03  Q         |         |         |
|
    1+ 0       0.0024      0.03  Q         |         |         |
|
    1+ 5       0.0026      0.03  Q         |         |         |
|
    1+10       0.0029      0.03  Q         |         |         |
|
    1+15       0.0031      0.03  Q         |         |         |
|
    1+20       0.0034      0.04  Q         |         |         |
|
    1+25       0.0036      0.04  Q         |         |         |
|
    1+30       0.0039      0.04  Q         |         |         |
|
    1+35       0.0041      0.04  Q         |         |         |
|
    1+40       0.0043      0.04  Q         |         |         |
```

1+45	0.0046	0.04	Q			
1+50	0.0048	0.04	QV			
1+55	0.0051	0.04	QV			
2+ 0	0.0053	0.04	QV			
2+ 5	0.0056	0.04	QV			
2+10	0.0058	0.04	QV			
2+15	0.0061	0.04	QV			
2+20	0.0063	0.04	QV			
2+25	0.0066	0.04	QV			
2+30	0.0068	0.04	QV			
2+35	0.0071	0.04	QV			
2+40	0.0073	0.04	QV			
2+45	0.0076	0.04	QV			
2+50	0.0079	0.04	QV			
2+55	0.0081	0.04	QV			
3+ 0	0.0084	0.04	QV			
3+ 5	0.0086	0.04	QV			
3+10	0.0089	0.04	QV			
3+15	0.0092	0.04	QV			
3+20	0.0094	0.04	QV			
3+25	0.0097	0.04	Q V			
3+30	0.0100	0.04	Q V			
3+35	0.0102	0.04	Q V			
3+40	0.0105	0.04	Q V			
3+45	0.0108	0.04	Q V			
3+50	0.0110	0.04	Q V			
3+55	0.0113	0.04	Q V			
4+ 0	0.0116	0.04	Q V			
4+ 5	0.0118	0.04	Q V			
4+10	0.0121	0.04	Q V			

4+15	0.0124	0.04	Q V	|	|	|
4+20	0.0127	0.04	Q V	|	|	|
4+25	0.0129	0.04	Q V	|	|	|
4+30	0.0132	0.04	Q V	|	|	|
4+35	0.0135	0.04	Q V	|	|	|
4+40	0.0138	0.04	Q V	|	|	|
4+45	0.0141	0.04	Q V	|	|	|
4+50	0.0143	0.04	Q V	|	|	|
4+55	0.0146	0.04	Q V	|	|	|
5+ 0	0.0149	0.04	Q V	|	|	|
5+ 5	0.0152	0.04	Q V	|	|	|
5+10	0.0155	0.04	Q V	|	|	|
5+15	0.0158	0.04	Q V	|	|	|
5+20	0.0161	0.04	Q V	|	|	|
5+25	0.0164	0.04	Q V	|	|	|
5+30	0.0167	0.04	Q V	|	|	|
5+35	0.0170	0.04	Q V	|	|	|
5+40	0.0172	0.04	Q V	|	|	|
5+45	0.0175	0.04	Q V	|	|	|
5+50	0.0178	0.04	Q V	|	|	|
5+55	0.0181	0.04	Q V	|	|	|
6+ 0	0.0184	0.04	Q V	|	|	|
6+ 5	0.0187	0.04	Q V	|	|	|
6+10	0.0191	0.04	Q V	|	|	|
6+15	0.0194	0.04	Q V	|	|	|
6+20	0.0197	0.04	Q V	|	|	|
6+25	0.0200	0.04	Q V	|	|	|
6+30	0.0203	0.05	Q V	|	|	|
6+35	0.0206	0.05	Q V	|	|	|
6+40	0.0209	0.05	Q V	|	|	|

6+45	0.0212	0.05	Q	V			
6+50	0.0215	0.05	Q	V			
6+55	0.0219	0.05	Q	V			
7+ 0	0.0222	0.05	Q	V			
7+ 5	0.0225	0.05	Q	V			
7+10	0.0228	0.05	Q	V			
7+15	0.0232	0.05	Q	V			
7+20	0.0235	0.05	Q	V			
7+25	0.0238	0.05	Q	V			
7+30	0.0241	0.05	Q	V			
7+35	0.0245	0.05	Q	V			
7+40	0.0248	0.05	Q	V			
7+45	0.0252	0.05	Q	V			
7+50	0.0255	0.05	Q	V			
7+55	0.0258	0.05	Q	V			
8+ 0	0.0262	0.05	Q	V			
8+ 5	0.0265	0.05	Q	V			
8+10	0.0269	0.05	Q	V			
8+15	0.0272	0.05	Q	V			
8+20	0.0276	0.05	Q	V			
8+25	0.0279	0.05	Q	V			
8+30	0.0283	0.05	Q	V			
8+35	0.0286	0.05	Q	V			
8+40	0.0290	0.05	Q	V			
8+45	0.0294	0.05	Q	V			
8+50	0.0297	0.05	Q	V			
8+55	0.0301	0.05	Q	V			
9+ 0	0.0305	0.05	Q	V			
9+ 5	0.0308	0.05	Q	V			
9+10	0.0312	0.05	Q	V			

9+15	0.0316	0.05	Q	V	|	|	|
9+20	0.0320	0.06	Q	V	|	|	|
9+25	0.0324	0.06	Q	V	|	|	|
9+30	0.0327	0.06	Q	V	|	|	|
9+35	0.0331	0.06	Q	V	|	|	|
9+40	0.0335	0.06	Q	V	|	|	|
9+45	0.0339	0.06	Q	V	|	|	|
9+50	0.0343	0.06	Q	V	|	|	|
9+55	0.0347	0.06	Q	V	|	|	|
10+ 0	0.0351	0.06	Q	V	|	|	|
10+ 5	0.0355	0.06	Q	V	|	|	|
10+10	0.0359	0.06	Q	V	|	|	|
10+15	0.0364	0.06	Q	V	|	|	|
10+20	0.0368	0.06	Q	V	|	|	|
10+25	0.0372	0.06	Q	V	|	|	|
10+30	0.0376	0.06	Q	V	|	|	|
10+35	0.0381	0.06	Q	V	|	|	|
10+40	0.0385	0.06	Q	V	|	|	|
10+45	0.0389	0.06	Q	V	|	|	|
10+50	0.0394	0.06	Q	V	|	|	|
10+55	0.0398	0.06	Q	V	|	|	|
11+ 0	0.0403	0.07	Q	V	|	|	|
11+ 5	0.0407	0.07	Q	V	|	|	|
11+10	0.0412	0.07	Q	V	|	|	|
11+15	0.0416	0.07	Q	V	|	|	|
11+20	0.0421	0.07	Q	V	|	|	|
11+25	0.0426	0.07	Q	V	|	|	|
11+30	0.0430	0.07	Q	V	|	|	|
11+35	0.0435	0.07	Q	V	|	|	|
11+40	0.0440	0.07	Q	V	|	|	|

11+45	0.0445	0.07	Q	V|	|	|
11+50	0.0450	0.07	Q	V|	|	|
11+55	0.0455	0.07	Q	V|	|	|
12+ 0	0.0460	0.07	Q	V|	|	|
12+ 5	0.0465	0.08	Q	V|	|	|
12+10	0.0472	0.09	Q	V|	|	|
12+15	0.0478	0.10	Q	V	|	|
12+20	0.0485	0.10	Q	V	|	|
12+25	0.0492	0.10	Q	V	|	|
12+30	0.0499	0.10	Q	V	|	|
12+35	0.0506	0.11	Q	V	|	|
12+40	0.0514	0.11	Q	V	|	|
12+45	0.0521	0.11	Q	V	|	|
12+50	0.0529	0.11	Q	|V	|	|
12+55	0.0536	0.11	Q	|V	|	|
13+ 0	0.0544	0.11	Q	|V	|	|
13+ 5	0.0552	0.11	Q	|V	|	|
13+10	0.0560	0.11	Q	|V	|	|
13+15	0.0568	0.12	Q	|V	|	|
13+20	0.0576	0.12	Q	| V	|	|
13+25	0.0584	0.12	Q	| V	|	|
13+30	0.0592	0.12	Q	| V	|	|
13+35	0.0600	0.12	Q	| V	|	|
13+40	0.0609	0.12	Q	| V	|	|
13+45	0.0618	0.13	Q	| V	|	|
13+50	0.0627	0.13	Q	| V	|	|
13+55	0.0635	0.13	Q	| V	|	|
14+ 0	0.0645	0.13	Q	| V	|	|
14+ 5	0.0654	0.13	Q	| V	|	|
14+10	0.0663	0.14	Q	| V	|	|

14+15	0.0673	0.14	Q	| V	|	|
14+20	0.0683	0.14	Q	| V	|	|
14+25	0.0693	0.15	Q	| V	|	|
14+30	0.0703	0.15	Q	| V	|	|
14+35	0.0713	0.15	Q	| V	|	|
14+40	0.0724	0.16	Q	| V	|	|
14+45	0.0735	0.16	Q	| V	|	|
14+50	0.0747	0.16	Q	| V	|	|
14+55	0.0758	0.17	Q	| V	|	|
15+ 0	0.0770	0.17	Q	| V	|	|
15+ 5	0.0783	0.18	Q	| V	|	|
15+10	0.0795	0.19	Q	| V	|	|
15+15	0.0809	0.19	Q	| V	|	|
15+20	0.0823	0.20	Q	| V	|	|
15+25	0.0837	0.21	Q	| V	|	|
15+30	0.0850	0.19	Q	| V	|	|
15+35	0.0863	0.19	Q	| V	|	|
15+40	0.0877	0.20	Q	| V	|	|
15+45	0.0892	0.22	Q	| V	|	|
15+50	0.0909	0.25	Q	| V|	|	|
15+55	0.0929	0.29	|Q	| V|	|	|
16+ 0	0.0956	0.40	|Q	| V	|	|
16+ 5	0.1025	1.00	| Q	| |V	|	|
16+10	0.1221	2.84	| |Q	|	| V	|
16+15	0.1343	1.77	| Q	|	|	V |
16+20	0.1401	0.85	| Q	|	|	V|
16+25	0.1438	0.54	| Q	|	|	V
16+30	0.1463	0.36	|Q	|	|	V
16+35	0.1481	0.26	|Q	|	|	|V
16+40	0.1497	0.23	Q	|	|	|V

16+45	0.1511	0.21	Q	|	|	|V
16+50	0.1524	0.18	Q	|	|	| V
16+55	0.1535	0.16	Q	|	|	| V
17+ 0	0.1546	0.16	Q	|	|	| V
17+ 5	0.1556	0.15	Q	|	|	| V
17+10	0.1566	0.14	Q	|	|	| V
17+15	0.1576	0.14	Q	|	|	| V
17+20	0.1585	0.13	Q	|	|	| V
17+25	0.1594	0.13	Q	|	|	| V
17+30	0.1602	0.12	Q	|	|	| V
17+35	0.1610	0.12	Q	|	|	| V
17+40	0.1618	0.12	Q	|	|	| V
17+45	0.1626	0.11	Q	|	|	| V
17+50	0.1634	0.11	Q	|	|	| V
17+55	0.1641	0.11	Q	|	|	| V
18+ 0	0.1649	0.11	Q	|	|	| V
18+ 5	0.1656	0.10	Q	|	|	| V
18+10	0.1662	0.09	Q	|	|	| V
18+15	0.1667	0.08	Q	|	|	| V
18+20	0.1673	0.08	Q	|	|	| V
18+25	0.1678	0.07	Q	|	|	| V
18+30	0.1683	0.07	Q	|	|	| V
18+35	0.1687	0.07	Q	|	|	| V
18+40	0.1692	0.07	Q	|	|	| V
18+45	0.1697	0.07	Q	|	|	| V
18+50	0.1701	0.07	Q	|	|	| V
18+55	0.1706	0.06	Q	|	|	| V
19+ 0	0.1710	0.06	Q	|	|	| V
19+ 5	0.1714	0.06	Q	|	|	| V
19+10	0.1718	0.06	Q	|	|	| V

19+15	0.1722	0.06	Q	|	|	|	V
19+20	0.1726	0.06	Q	|	|	|	V
19+25	0.1730	0.06	Q	|	|	|	V
19+30	0.1734	0.06	Q	|	|	|	V
19+35	0.1738	0.06	Q	|	|	|	V
19+40	0.1742	0.06	Q	|	|	|	V
19+45	0.1746	0.05	Q	|	|	|	V
19+50	0.1749	0.05	Q	|	|	|	V
19+55	0.1753	0.05	Q	|	|	|	V
20+ 0	0.1757	0.05	Q	|	|	|	V
20+ 5	0.1760	0.05	Q	|	|	|	V
20+10	0.1764	0.05	Q	|	|	|	V
20+15	0.1767	0.05	Q	|	|	|	V
20+20	0.1771	0.05	Q	|	|	|	V
20+25	0.1774	0.05	Q	|	|	|	V
20+30	0.1777	0.05	Q	|	|	|	V
20+35	0.1781	0.05	Q	|	|	|	V
20+40	0.1784	0.05	Q	|	|	|	V
20+45	0.1787	0.05	Q	|	|	|	V
20+50	0.1790	0.05	Q	|	|	|	V
20+55	0.1794	0.05	Q	|	|	|	V
21+ 0	0.1797	0.05	Q	|	|	|	V
21+ 5	0.1800	0.05	Q	|	|	|	V
21+10	0.1803	0.04	Q	|	|	|	V
21+15	0.1806	0.04	Q	|	|	|	V
21+20	0.1809	0.04	Q	|	|	|	V
21+25	0.1812	0.04	Q	|	|	|	V
21+30	0.1815	0.04	Q	|	|	|	V
21+35	0.1818	0.04	Q	|	|	|	V
21+40	0.1821	0.04	Q	|	|	|	V

21+45	0.1824	0.04	Q				V
21+50	0.1826	0.04	Q				V
21+55	0.1829	0.04	Q				V
22+ 0	0.1832	0.04	Q				V
22+ 5	0.1835	0.04	Q				V
22+10	0.1838	0.04	Q				V
22+15	0.1840	0.04	Q				V
22+20	0.1843	0.04	Q				V
22+25	0.1846	0.04	Q				V
22+30	0.1848	0.04	Q				V
22+35	0.1851	0.04	Q				V
22+40	0.1854	0.04	Q				V
22+45	0.1856	0.04	Q				V
22+50	0.1859	0.04	Q				V
22+55	0.1862	0.04	Q				V
23+ 0	0.1864	0.04	Q				V
23+ 5	0.1867	0.04	Q				V
23+10	0.1869	0.04	Q				V
23+15	0.1872	0.04	Q				V
23+20	0.1874	0.04	Q				V
23+25	0.1877	0.04	Q				V
23+30	0.1879	0.04	Q				V
23+35	0.1881	0.04	Q				V
23+40	0.1884	0.04	Q				V
23+45	0.1886	0.03	Q				V
23+50	0.1889	0.03	Q				V
23+55	0.1891	0.03	Q				V
24+ 0	0.1893	0.03	Q				V
24+ 5	0.1896	0.03	Q				V
24+10	0.1897	0.02	Q				

24+15	0.1897	0.01	Q			
24+20	0.1897	0.00	Q			
24+25	0.1897	0.00	Q			
24+30	0.1897	0.00	Q			
24+35	0.1897	0.00	Q			
24+40	0.1897	0.00	Q			
24+45	0.1897	0.00	Q			

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

Study date 02/27/17

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

Program License Serial Number 6232

Summerland - Chino
2 yr 24 hr storm event
Post Development Condition
Area A1 pts 101-103

Storm Event Year = 2

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 2		
2.48	1	0.59
Rainfall data for year 2		
2.48	6	1.57
Rainfall data for year 2		
2.48	24	2.77

++

******** 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	2.48	1.000	0.812	0.590	0.479

Area-averaged adjusted loss rate Fm (In/Hr) = 0.479

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

Area (Ac.)	Area Fract	SCS CN (AMC2)	SCS CN (AMC1)	S	Pervious Yield Fr
1.46	0.590	69.0	49.8	10.08	0.019
1.02	0.410	98.0	98.0	0.20	0.917

Area-averaged catchment yield fraction, Y = 0.387
Area-averaged low loss fraction, Yb = 0.613
User entry of time of concentration = 0.138 (hours)
++
Watershed area = 2.48(Ac.)
Catchment Lag time = 0.110 hours
Unit interval = 5.000 minutes
Unit interval percentage of lag time = 75.4831
Hydrograph baseflow = 0.00(CFS)
Average maximum watershed loss rate(Fm) = 0.479(In/Hr)
Average low loss rate fraction (Yb) = 0.613 (decimal)
FOOTHILL S-Graph Selected
Computed peak 5-minute rainfall = 0.220(In)
Computed peak 30-minute rainfall = 0.451(In)
Specified peak 1-hour rainfall = 0.595(In)
Computed peak 3-hour rainfall = 1.079(In)
Specified peak 6-hour rainfall = 1.570(In)
Specified peak 24-hour rainfall = 2.770(In)

Rainfall depth area reduction factors:
Using a total area of 2.48(Ac.) (Ref: fig. E-4)

5-minute factor = 1.000 Adjusted rainfall = 0.220(In)
30-minute factor = 1.000 Adjusted rainfall = 0.451(In)
1-hour factor = 1.000 Adjusted rainfall = 0.595(In)
3-hour factor = 1.000 Adjusted rainfall = 1.079(In)
6-hour factor = 1.000 Adjusted rainfall = 1.570(In)
24-hour factor = 1.000 Adjusted rainfall = 2.770(In)

U n i t H y d r o g r a p h
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Interval Number	'S' Graph Mean values	Unit Hydrograph ((CFS))

(K = 29.99 (CFS))

1	8.132	2.439
2	53.492	13.605
3	79.938	7.932
4	90.197	3.077
5	95.608	1.623
6	98.028	0.726
7	98.885	0.257
8	99.435	0.165
9	99.855	0.126
10	100.000	0.043

Peak Unit Number	Adjusted mass rainfall (In)	Unit rainfall (In)
1	0.2202	0.2202
2	0.2905	0.0704
3	0.3417	0.0512
4	0.3834	0.0417
5	0.4192	0.0358
6	0.4509	0.0317
7	0.4795	0.0287
8	0.5059	0.0263
9	0.5303	0.0244
10	0.5531	0.0228
11	0.5746	0.0215
12	0.5949	0.0204
13	0.6213	0.0264
14	0.6467	0.0254
15	0.6714	0.0246
16	0.6952	0.0239
17	0.7184	0.0232
18	0.7410	0.0226
19	0.7631	0.0220
20	0.7846	0.0215
21	0.8056	0.0210
22	0.8261	0.0206
23	0.8462	0.0201
24	0.8660	0.0197
25	0.8853	0.0194
26	0.9043	0.0190
27	0.9230	0.0187
28	0.9414	0.0184
29	0.9594	0.0181
30	0.9772	0.0178
31	0.9947	0.0175
32	1.0120	0.0173
33	1.0290	0.0170
34	1.0458	0.0168
35	1.0623	0.0165
36	1.0786	0.0163
37	1.0948	0.0161
38	1.1107	0.0159
39	1.1264	0.0157
40	1.1420	0.0156
41	1.1574	0.0154
42	1.1726	0.0152
43	1.1876	0.0150
44	1.2025	0.0149
45	1.2172	0.0147

46	1.2318	0.0146
47	1.2462	0.0144
48	1.2605	0.0143
49	1.2746	0.0142
50	1.2887	0.0140
51	1.3026	0.0139
52	1.3163	0.0138
53	1.3300	0.0136
54	1.3435	0.0135
55	1.3569	0.0134
56	1.3702	0.0133
57	1.3834	0.0132
58	1.3965	0.0131
59	1.4095	0.0130
60	1.4224	0.0129
61	1.4352	0.0128
62	1.4479	0.0127
63	1.4605	0.0126
64	1.4730	0.0125
65	1.4854	0.0124
66	1.4977	0.0123
67	1.5100	0.0122
68	1.5221	0.0122
69	1.5342	0.0121
70	1.5462	0.0120
71	1.5581	0.0119
72	1.5700	0.0118
73	1.5789	0.0089
74	1.5877	0.0088
75	1.5965	0.0088
76	1.6051	0.0087
77	1.6138	0.0086
78	1.6223	0.0086
79	1.6308	0.0085
80	1.6392	0.0084
81	1.6476	0.0084
82	1.6559	0.0083
83	1.6641	0.0082
84	1.6723	0.0082
85	1.6804	0.0081
86	1.6885	0.0081
87	1.6965	0.0080
88	1.7045	0.0080
89	1.7124	0.0079
90	1.7202	0.0079
91	1.7280	0.0078
92	1.7358	0.0078
93	1.7435	0.0077
94	1.7511	0.0077
95	1.7588	0.0076
96	1.7663	0.0076
97	1.7738	0.0075
98	1.7813	0.0075
99	1.7887	0.0074
100	1.7961	0.0074
101	1.8034	0.0073
102	1.8107	0.0073
103	1.8180	0.0072
104	1.8252	0.0072
105	1.8323	0.0072

106	1.8395	0.0071
107	1.8466	0.0071
108	1.8536	0.0070
109	1.8606	0.0070
110	1.8676	0.0070
111	1.8745	0.0069
112	1.8814	0.0069
113	1.8883	0.0069
114	1.8951	0.0068
115	1.9019	0.0068
116	1.9087	0.0068
117	1.9154	0.0067
118	1.9221	0.0067
119	1.9287	0.0067
120	1.9353	0.0066
121	1.9419	0.0066
122	1.9485	0.0066
123	1.9550	0.0065
124	1.9615	0.0065
125	1.9680	0.0065
126	1.9744	0.0064
127	1.9808	0.0064
128	1.9872	0.0064
129	1.9935	0.0063
130	1.9998	0.0063
131	2.0061	0.0063
132	2.0124	0.0063
133	2.0186	0.0062
134	2.0248	0.0062
135	2.0310	0.0062
136	2.0371	0.0061
137	2.0433	0.0061
138	2.0494	0.0061
139	2.0554	0.0061
140	2.0615	0.0060
141	2.0675	0.0060
142	2.0735	0.0060
143	2.0794	0.0060
144	2.0854	0.0059
145	2.0913	0.0059
146	2.0972	0.0059
147	2.1031	0.0059
148	2.1089	0.0058
149	2.1147	0.0058
150	2.1205	0.0058
151	2.1263	0.0058
152	2.1321	0.0058
153	2.1378	0.0057
154	2.1435	0.0057
155	2.1492	0.0057
156	2.1549	0.0057
157	2.1605	0.0056
158	2.1662	0.0056
159	2.1718	0.0056
160	2.1773	0.0056
161	2.1829	0.0056
162	2.1885	0.0055
163	2.1940	0.0055
164	2.1995	0.0055
165	2.2050	0.0055

166	2.2104	0.0055
167	2.2159	0.0054
168	2.2213	0.0054
169	2.2267	0.0054
170	2.2321	0.0054
171	2.2375	0.0054
172	2.2428	0.0053
173	2.2481	0.0053
174	2.2535	0.0053
175	2.2587	0.0053
176	2.2640	0.0053
177	2.2693	0.0053
178	2.2745	0.0052
179	2.2798	0.0052
180	2.2850	0.0052
181	2.2901	0.0052
182	2.2953	0.0052
183	2.3005	0.0052
184	2.3056	0.0051
185	2.3107	0.0051
186	2.3159	0.0051
187	2.3209	0.0051
188	2.3260	0.0051
189	2.3311	0.0051
190	2.3361	0.0050
191	2.3411	0.0050
192	2.3462	0.0050
193	2.3512	0.0050
194	2.3561	0.0050
195	2.3611	0.0050
196	2.3661	0.0050
197	2.3710	0.0049
198	2.3759	0.0049
199	2.3808	0.0049
200	2.3857	0.0049
201	2.3906	0.0049
202	2.3955	0.0049
203	2.4003	0.0048
204	2.4051	0.0048
205	2.4100	0.0048
206	2.4148	0.0048
207	2.4196	0.0048
208	2.4243	0.0048
209	2.4291	0.0048
210	2.4339	0.0048
211	2.4386	0.0047
212	2.4433	0.0047
213	2.4480	0.0047
214	2.4528	0.0047
215	2.4574	0.0047
216	2.4621	0.0047
217	2.4668	0.0047
218	2.4714	0.0046
219	2.4761	0.0046
220	2.4807	0.0046
221	2.4853	0.0046
222	2.4899	0.0046
223	2.4945	0.0046
224	2.4991	0.0046
225	2.5036	0.0046

226	2.5082	0.0046
227	2.5127	0.0045
228	2.5172	0.0045
229	2.5218	0.0045
230	2.5263	0.0045
231	2.5308	0.0045
232	2.5352	0.0045
233	2.5397	0.0045
234	2.5442	0.0045
235	2.5486	0.0044
236	2.5530	0.0044
237	2.5575	0.0044
238	2.5619	0.0044
239	2.5663	0.0044
240	2.5707	0.0044
241	2.5751	0.0044
242	2.5794	0.0044
243	2.5838	0.0044
244	2.5881	0.0043
245	2.5925	0.0043
246	2.5968	0.0043
247	2.6011	0.0043
248	2.6054	0.0043
249	2.6097	0.0043
250	2.6140	0.0043
251	2.6183	0.0043
252	2.6226	0.0043
253	2.6268	0.0043
254	2.6311	0.0042
255	2.6353	0.0042
256	2.6395	0.0042
257	2.6438	0.0042
258	2.6480	0.0042
259	2.6522	0.0042
260	2.6564	0.0042
261	2.6605	0.0042
262	2.6647	0.0042
263	2.6689	0.0042
264	2.6730	0.0042
265	2.6772	0.0041
266	2.6813	0.0041
267	2.6854	0.0041
268	2.6895	0.0041
269	2.6936	0.0041
270	2.6977	0.0041
271	2.7018	0.0041
272	2.7059	0.0041
273	2.7100	0.0041
274	2.7140	0.0041
275	2.7181	0.0041
276	2.7221	0.0040
277	2.7262	0.0040
278	2.7302	0.0040
279	2.7342	0.0040
280	2.7382	0.0040
281	2.7422	0.0040
282	2.7462	0.0040
283	2.7502	0.0040
284	2.7542	0.0040
285	2.7581	0.0040

286	2.7621	0.0040
287	2.7660	0.0040
288	2.7700	0.0039

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0039	0.0024	0.0015
2	0.0040	0.0024	0.0015
3	0.0040	0.0024	0.0015
4	0.0040	0.0024	0.0015
5	0.0040	0.0024	0.0015
6	0.0040	0.0025	0.0015
7	0.0040	0.0025	0.0016
8	0.0040	0.0025	0.0016
9	0.0040	0.0025	0.0016
10	0.0041	0.0025	0.0016
11	0.0041	0.0025	0.0016
12	0.0041	0.0025	0.0016
13	0.0041	0.0025	0.0016
14	0.0041	0.0025	0.0016
15	0.0041	0.0025	0.0016
16	0.0041	0.0025	0.0016
17	0.0042	0.0025	0.0016
18	0.0042	0.0026	0.0016
19	0.0042	0.0026	0.0016
20	0.0042	0.0026	0.0016
21	0.0042	0.0026	0.0016
22	0.0042	0.0026	0.0016
23	0.0042	0.0026	0.0016
24	0.0042	0.0026	0.0016
25	0.0043	0.0026	0.0017
26	0.0043	0.0026	0.0017
27	0.0043	0.0026	0.0017
28	0.0043	0.0026	0.0017
29	0.0043	0.0027	0.0017
30	0.0043	0.0027	0.0017
31	0.0044	0.0027	0.0017
32	0.0044	0.0027	0.0017
33	0.0044	0.0027	0.0017
34	0.0044	0.0027	0.0017
35	0.0044	0.0027	0.0017
36	0.0044	0.0027	0.0017
37	0.0045	0.0027	0.0017
38	0.0045	0.0027	0.0017
39	0.0045	0.0028	0.0017
40	0.0045	0.0028	0.0017
41	0.0045	0.0028	0.0018
42	0.0045	0.0028	0.0018
43	0.0046	0.0028	0.0018
44	0.0046	0.0028	0.0018
45	0.0046	0.0028	0.0018
46	0.0046	0.0028	0.0018
47	0.0046	0.0028	0.0018
48	0.0046	0.0028	0.0018
49	0.0047	0.0029	0.0018
50	0.0047	0.0029	0.0018

51	0.0047	0.0029	0.0018
52	0.0047	0.0029	0.0018
53	0.0048	0.0029	0.0018
54	0.0048	0.0029	0.0018
55	0.0048	0.0029	0.0019
56	0.0048	0.0029	0.0019
57	0.0048	0.0030	0.0019
58	0.0048	0.0030	0.0019
59	0.0049	0.0030	0.0019
60	0.0049	0.0030	0.0019
61	0.0049	0.0030	0.0019
62	0.0049	0.0030	0.0019
63	0.0050	0.0030	0.0019
64	0.0050	0.0031	0.0019
65	0.0050	0.0031	0.0019
66	0.0050	0.0031	0.0019
67	0.0051	0.0031	0.0020
68	0.0051	0.0031	0.0020
69	0.0051	0.0031	0.0020
70	0.0051	0.0031	0.0020
71	0.0052	0.0032	0.0020
72	0.0052	0.0032	0.0020
73	0.0052	0.0032	0.0020
74	0.0052	0.0032	0.0020
75	0.0053	0.0032	0.0020
76	0.0053	0.0032	0.0020
77	0.0053	0.0033	0.0021
78	0.0053	0.0033	0.0021
79	0.0054	0.0033	0.0021
80	0.0054	0.0033	0.0021
81	0.0054	0.0033	0.0021
82	0.0054	0.0033	0.0021
83	0.0055	0.0034	0.0021
84	0.0055	0.0034	0.0021
85	0.0055	0.0034	0.0021
86	0.0056	0.0034	0.0022
87	0.0056	0.0034	0.0022
88	0.0056	0.0034	0.0022
89	0.0057	0.0035	0.0022
90	0.0057	0.0035	0.0022
91	0.0057	0.0035	0.0022
92	0.0058	0.0035	0.0022
93	0.0058	0.0036	0.0022
94	0.0058	0.0036	0.0023
95	0.0059	0.0036	0.0023
96	0.0059	0.0036	0.0023
97	0.0059	0.0036	0.0023
98	0.0060	0.0037	0.0023
99	0.0060	0.0037	0.0023
100	0.0060	0.0037	0.0023
101	0.0061	0.0037	0.0024
102	0.0061	0.0038	0.0024
103	0.0062	0.0038	0.0024
104	0.0062	0.0038	0.0024
105	0.0063	0.0038	0.0024
106	0.0063	0.0039	0.0024
107	0.0063	0.0039	0.0025
108	0.0064	0.0039	0.0025
109	0.0064	0.0039	0.0025
110	0.0065	0.0040	0.0025

111	0.0065	0.0040	0.0025
112	0.0066	0.0040	0.0025
113	0.0066	0.0041	0.0026
114	0.0067	0.0041	0.0026
115	0.0067	0.0041	0.0026
116	0.0068	0.0041	0.0026
117	0.0068	0.0042	0.0026
118	0.0069	0.0042	0.0027
119	0.0069	0.0043	0.0027
120	0.0070	0.0043	0.0027
121	0.0070	0.0043	0.0027
122	0.0071	0.0043	0.0027
123	0.0072	0.0044	0.0028
124	0.0072	0.0044	0.0028
125	0.0073	0.0045	0.0028
126	0.0073	0.0045	0.0028
127	0.0074	0.0045	0.0029
128	0.0075	0.0046	0.0029
129	0.0076	0.0046	0.0029
130	0.0076	0.0047	0.0029
131	0.0077	0.0047	0.0030
132	0.0078	0.0048	0.0030
133	0.0079	0.0048	0.0030
134	0.0079	0.0048	0.0031
135	0.0080	0.0049	0.0031
136	0.0081	0.0049	0.0031
137	0.0082	0.0050	0.0032
138	0.0082	0.0051	0.0032
139	0.0084	0.0051	0.0032
140	0.0084	0.0052	0.0033
141	0.0086	0.0052	0.0033
142	0.0086	0.0053	0.0033
143	0.0088	0.0054	0.0034
144	0.0088	0.0054	0.0034
145	0.0118	0.0073	0.0046
146	0.0119	0.0073	0.0046
147	0.0121	0.0074	0.0047
148	0.0122	0.0075	0.0047
149	0.0123	0.0076	0.0048
150	0.0124	0.0076	0.0048
151	0.0126	0.0077	0.0049
152	0.0127	0.0078	0.0049
153	0.0129	0.0079	0.0050
154	0.0130	0.0080	0.0050
155	0.0132	0.0081	0.0051
156	0.0133	0.0082	0.0051
157	0.0135	0.0083	0.0052
158	0.0136	0.0084	0.0053
159	0.0139	0.0085	0.0054
160	0.0140	0.0086	0.0054
161	0.0143	0.0088	0.0055
162	0.0144	0.0088	0.0056
163	0.0147	0.0090	0.0057
164	0.0149	0.0091	0.0058
165	0.0152	0.0093	0.0059
166	0.0154	0.0094	0.0059
167	0.0157	0.0096	0.0061
168	0.0159	0.0098	0.0062
169	0.0163	0.0100	0.0063
170	0.0165	0.0101	0.0064

171	0.0170	0.0104	0.0066
172	0.0173	0.0106	0.0067
173	0.0178	0.0109	0.0069
174	0.0181	0.0111	0.0070
175	0.0187	0.0114	0.0072
176	0.0190	0.0117	0.0074
177	0.0197	0.0121	0.0076
178	0.0201	0.0123	0.0078
179	0.0210	0.0129	0.0081
180	0.0215	0.0132	0.0083
181	0.0226	0.0138	0.0087
182	0.0232	0.0142	0.0090
183	0.0246	0.0151	0.0095
184	0.0254	0.0156	0.0098
185	0.0204	0.0125	0.0079
186	0.0215	0.0132	0.0083
187	0.0244	0.0150	0.0094
188	0.0263	0.0161	0.0102
189	0.0317	0.0194	0.0123
190	0.0358	0.0219	0.0139
191	0.0512	0.0314	0.0198
192	0.0704	0.0399	0.0304
193	0.2202	0.0399	0.1803
194	0.0417	0.0255	0.0161
195	0.0287	0.0176	0.0111
196	0.0228	0.0140	0.0088
197	0.0264	0.0162	0.0102
198	0.0239	0.0146	0.0092
199	0.0220	0.0135	0.0085
200	0.0206	0.0126	0.0080
201	0.0194	0.0119	0.0075
202	0.0184	0.0113	0.0071
203	0.0175	0.0107	0.0068
204	0.0168	0.0103	0.0065
205	0.0161	0.0099	0.0062
206	0.0156	0.0095	0.0060
207	0.0150	0.0092	0.0058
208	0.0146	0.0089	0.0056
209	0.0142	0.0087	0.0055
210	0.0138	0.0084	0.0053
211	0.0134	0.0082	0.0052
212	0.0131	0.0080	0.0051
213	0.0128	0.0078	0.0049
214	0.0125	0.0077	0.0048
215	0.0122	0.0075	0.0047
216	0.0120	0.0074	0.0046
217	0.0089	0.0055	0.0034
218	0.0087	0.0053	0.0034
219	0.0085	0.0052	0.0033
220	0.0083	0.0051	0.0032
221	0.0081	0.0050	0.0031
222	0.0080	0.0049	0.0031
223	0.0078	0.0048	0.0030
224	0.0077	0.0047	0.0030
225	0.0075	0.0046	0.0029
226	0.0074	0.0045	0.0029
227	0.0072	0.0044	0.0028
228	0.0071	0.0044	0.0028
229	0.0070	0.0043	0.0027
230	0.0069	0.0042	0.0027

231	0.0068	0.0042	0.0026
232	0.0067	0.0041	0.0026
233	0.0066	0.0040	0.0026
234	0.0065	0.0040	0.0025
235	0.0064	0.0039	0.0025
236	0.0063	0.0039	0.0024
237	0.0062	0.0038	0.0024
238	0.0061	0.0038	0.0024
239	0.0061	0.0037	0.0023
240	0.0060	0.0037	0.0023
241	0.0059	0.0036	0.0023
242	0.0058	0.0036	0.0023
243	0.0058	0.0035	0.0022
244	0.0057	0.0035	0.0022
245	0.0056	0.0035	0.0022
246	0.0056	0.0034	0.0022
247	0.0055	0.0034	0.0021
248	0.0055	0.0033	0.0021
249	0.0054	0.0033	0.0021
250	0.0053	0.0033	0.0021
251	0.0053	0.0032	0.0020
252	0.0052	0.0032	0.0020
253	0.0052	0.0032	0.0020
254	0.0051	0.0032	0.0020
255	0.0051	0.0031	0.0020
256	0.0050	0.0031	0.0020
257	0.0050	0.0031	0.0019
258	0.0050	0.0030	0.0019
259	0.0049	0.0030	0.0019
260	0.0049	0.0030	0.0019
261	0.0048	0.0030	0.0019
262	0.0048	0.0029	0.0019
263	0.0047	0.0029	0.0018
264	0.0047	0.0029	0.0018
265	0.0047	0.0029	0.0018
266	0.0046	0.0028	0.0018
267	0.0046	0.0028	0.0018
268	0.0046	0.0028	0.0018
269	0.0045	0.0028	0.0017
270	0.0045	0.0027	0.0017
271	0.0044	0.0027	0.0017
272	0.0044	0.0027	0.0017
273	0.0044	0.0027	0.0017
274	0.0043	0.0027	0.0017
275	0.0043	0.0026	0.0017
276	0.0043	0.0026	0.0017
277	0.0043	0.0026	0.0016
278	0.0042	0.0026	0.0016
279	0.0042	0.0026	0.0016
280	0.0042	0.0026	0.0016
281	0.0041	0.0025	0.0016
282	0.0041	0.0025	0.0016
283	0.0041	0.0025	0.0016
284	0.0041	0.0025	0.0016
285	0.0040	0.0025	0.0016
286	0.0040	0.0025	0.0016
287	0.0040	0.0024	0.0015
288	0.0040	0.0024	0.0015

--

```
      ----------------------------------------------------------------
--
      Total soil rain loss =      1.60(In)
      Total effective rainfall =      1.17(In)
      Peak flow rate in flood hydrograph =      2.83(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       0.0000      0.00  Q         |         |         |
|
    0+10       0.0002      0.02  Q         |         |         |
|
    0+15       0.0004      0.04  Q         |         |         |
|
    0+20       0.0007      0.04  Q         |         |         |
|
    0+25       0.0010      0.04  Q         |         |         |
|
    0+30       0.0013      0.05  Q         |         |         |
|
    0+35       0.0017      0.05  Q         |         |         |
|
    0+40       0.0020      0.05  Q         |         |         |
|
    0+45       0.0023      0.05  Q         |         |         |
|
    0+50       0.0026      0.05  Q         |         |         |
|
    0+55       0.0029      0.05  Q         |         |         |
|
    1+ 0       0.0033      0.05  Q         |         |         |
|
    1+ 5       0.0036      0.05  Q         |         |         |
|
    1+10       0.0039      0.05  Q         |         |         |
|
    1+15       0.0043      0.05  Q         |         |         |
|
    1+20       0.0046      0.05  Q         |         |         |
|
    1+25       0.0049      0.05  Q         |         |         |
|
    1+30       0.0052      0.05  Q         |         |         |
|
    1+35       0.0056      0.05  Q         |         |         |
|
    1+40       0.0059      0.05  Q         |         |         |
```

1+45	0.0062	0.05	QV			
1+50	0.0066	0.05	QV			
1+55	0.0069	0.05	QV			
2+ 0	0.0073	0.05	QV			
2+ 5	0.0076	0.05	QV			
2+10	0.0079	0.05	QV			
2+15	0.0083	0.05	QV			
2+20	0.0086	0.05	QV			
2+25	0.0090	0.05	QV			
2+30	0.0093	0.05	QV			
2+35	0.0096	0.05	QV			
2+40	0.0100	0.05	QV			
2+45	0.0103	0.05	QV			
2+50	0.0107	0.05	QV			
2+55	0.0110	0.05	QV			
3+ 0	0.0114	0.05	QV			
3+ 5	0.0118	0.05	QV			
3+10	0.0121	0.05	Q V			
3+15	0.0125	0.05	Q V			
3+20	0.0128	0.05	Q V			
3+25	0.0132	0.05	Q V			
3+30	0.0135	0.05	Q V			
3+35	0.0139	0.05	Q V			
3+40	0.0143	0.05	Q V			
3+45	0.0146	0.05	Q V			
3+50	0.0150	0.05	Q V			
3+55	0.0154	0.05	Q V			
4+ 0	0.0157	0.05	Q V			
4+ 5	0.0161	0.05	Q V			
4+10	0.0165	0.05	Q V			

4+15	0.0169	0.05	Q V	|	|	|
4+20	0.0172	0.05	Q V	|	|	|
4+25	0.0176	0.05	Q V	|	|	|
4+30	0.0180	0.05	Q V	|	|	|
4+35	0.0184	0.06	Q V	|	|	|
4+40	0.0187	0.06	Q V	|	|	|
4+45	0.0191	0.06	Q V	|	|	|
4+50	0.0195	0.06	Q V	|	|	|
4+55	0.0199	0.06	Q V	|	|	|
5+ 0	0.0203	0.06	Q V	|	|	|
5+ 5	0.0207	0.06	Q V	|	|	|
5+10	0.0211	0.06	Q V	|	|	|
5+15	0.0215	0.06	Q V	|	|	|
5+20	0.0219	0.06	Q V	|	|	|
5+25	0.0223	0.06	Q V	|	|	|
5+30	0.0227	0.06	Q V	|	|	|
5+35	0.0231	0.06	Q V	|	|	|
5+40	0.0235	0.06	Q V	|	|	|
5+45	0.0239	0.06	Q V	|	|	|
5+50	0.0243	0.06	Q V	|	|	|
5+55	0.0247	0.06	Q V	|	|	|
6+ 0	0.0251	0.06	Q V	|	|	|
6+ 5	0.0255	0.06	Q V	|	|	|
6+10	0.0259	0.06	Q V	|	|	|
6+15	0.0263	0.06	Q V	|	|	|
6+20	0.0268	0.06	Q V	|	|	|
6+25	0.0272	0.06	Q V	|	|	|
6+30	0.0276	0.06	Q V	|	|	|
6+35	0.0280	0.06	Q V	|	|	|
6+40	0.0284	0.06	Q V	|	|	|

6+45	0.0289	0.06	Q	V			
6+50	0.0293	0.06	Q	V			
6+55	0.0297	0.06	Q	V			
7+ 0	0.0302	0.06	Q	V			
7+ 5	0.0306	0.06	Q	V			
7+10	0.0311	0.06	Q	V			
7+15	0.0315	0.06	Q	V			
7+20	0.0319	0.06	Q	V			
7+25	0.0324	0.07	Q	V			
7+30	0.0328	0.07	Q	V			
7+35	0.0333	0.07	Q	V			
7+40	0.0338	0.07	Q	V			
7+45	0.0342	0.07	Q	V			
7+50	0.0347	0.07	Q	V			
7+55	0.0351	0.07	Q	V			
8+ 0	0.0356	0.07	Q	V			
8+ 5	0.0361	0.07	Q	V			
8+10	0.0365	0.07	Q	V			
8+15	0.0370	0.07	Q	V			
8+20	0.0375	0.07	Q	V			
8+25	0.0380	0.07	Q	V			
8+30	0.0385	0.07	Q	V			
8+35	0.0390	0.07	Q	V			
8+40	0.0394	0.07	Q	V			
8+45	0.0399	0.07	Q	V			
8+50	0.0404	0.07	Q	V			
8+55	0.0409	0.07	Q	V			
9+ 0	0.0414	0.07	Q	V			
9+ 5	0.0419	0.07	Q	V			
9+10	0.0425	0.07	Q	V			

9+15	0.0430	0.07	Q	V			
9+20	0.0435	0.08	Q	V			
9+25	0.0440	0.08	Q	V			
9+30	0.0445	0.08	Q	V			
9+35	0.0451	0.08	Q	V			
9+40	0.0456	0.08	Q	V			
9+45	0.0461	0.08	Q	V			
9+50	0.0467	0.08	Q	V			
9+55	0.0472	0.08	Q	V			
10+ 0	0.0478	0.08	Q	V			
10+ 5	0.0483	0.08	Q	V			
10+10	0.0489	0.08	Q	V			
10+15	0.0495	0.08	Q	V			
10+20	0.0500	0.08	Q	V			
10+25	0.0506	0.08	Q	V			
10+30	0.0512	0.08	Q	V			
10+35	0.0518	0.08	Q	V			
10+40	0.0524	0.09	Q	V			
10+45	0.0529	0.09	Q	V			
10+50	0.0535	0.09	Q	V			
10+55	0.0541	0.09	Q	V			
11+ 0	0.0548	0.09	Q	V			
11+ 5	0.0554	0.09	Q	V			
11+10	0.0560	0.09	Q	V			
11+15	0.0566	0.09	Q	V			
11+20	0.0573	0.09	Q	V			
11+25	0.0579	0.09	Q	V			
11+30	0.0586	0.09	Q	V			
11+35	0.0592	0.10	Q	V			
11+40	0.0599	0.10	Q	V			

11+45	0.0605	0.10	Q	V		
11+50	0.0612	0.10	Q	V		
11+55	0.0619	0.10	Q	V		
12+ 0	0.0626	0.10	Q	V		
12+ 5	0.0633	0.10	Q	V		
12+10	0.0641	0.12	Q	V		
12+15	0.0650	0.13	Q	V		
12+20	0.0660	0.14	Q	V		
12+25	0.0669	0.14	Q	|V		
12+30	0.0679	0.14	Q	|V		
12+35	0.0689	0.14	Q	|V		
12+40	0.0699	0.14	Q	|V		
12+45	0.0709	0.15	Q	|V		
12+50	0.0719	0.15	Q	|V		
12+55	0.0729	0.15	Q	| V		
13+ 0	0.0740	0.15	Q	| V		
13+ 5	0.0750	0.15	Q	| V		
13+10	0.0761	0.16	Q	| V		
13+15	0.0772	0.16	Q	| V		
13+20	0.0783	0.16	Q	| V		
13+25	0.0794	0.16	Q	| V		
13+30	0.0805	0.16	Q	| V		
13+35	0.0817	0.17	Q	| V		
13+40	0.0828	0.17	Q	| V		
13+45	0.0840	0.17	Q	| V		
13+50	0.0852	0.17	Q	| V		
13+55	0.0864	0.18	Q	| V		
14+ 0	0.0877	0.18	Q	| V		
14+ 5	0.0889	0.18	Q	| V		
14+10	0.0902	0.19	Q	| V		

14+15	0.0915	0.19	Q	| V |		
14+20	0.0929	0.19	Q	| V |		
14+25	0.0942	0.20	Q	| V |		
14+30	0.0956	0.20	Q	| V |		
14+35	0.0970	0.21	Q	| V |		
14+40	0.0985	0.21	Q	| V |		
14+45	0.1000	0.22	Q	| V |		
14+50	0.1015	0.22	Q	| V |		
14+55	0.1031	0.23	Q	| V |		
15+ 0	0.1048	0.24	Q	| V |		
15+ 5	0.1064	0.24	Q	| V |		
15+10	0.1082	0.25	|Q	| V |		
15+15	0.1100	0.26	|Q	| V |		
15+20	0.1119	0.28	|Q	| V |		
15+25	0.1139	0.28	|Q	| V |		
15+30	0.1156	0.26	|Q	| V|		
15+35	0.1174	0.26	|Q	| V|		
15+40	0.1193	0.27	|Q	| V|		
15+45	0.1213	0.29	|Q	| V		
15+50	0.1236	0.34	|Q	| V		
15+55	0.1263	0.39	|Q	| V		
16+ 0	0.1299	0.52	| Q	| |V		
16+ 5	0.1374	1.09	| Q	| | V		
16+10	0.1569	2.83	|	|Q |	V	
16+15	0.1694	1.82	| Q	| |	V |	
16+20	0.1758	0.93	| Q	| |	V|	
16+25	0.1800	0.61	| Q	| |	V|	
16+30	0.1830	0.44	|Q	| |	V	
16+35	0.1853	0.34	|Q	| |	V	
16+40	0.1874	0.30	|Q	| |	|V	

16+45	0.1893	0.28	|Q	|	|	|V	
16+50	0.1909	0.24	Q	|	|	|V	
16+55	0.1925	0.22	Q	|	|	|V	
17+ 0	0.1939	0.21	Q	|	|	| V	
17+ 5	0.1953	0.20	Q	|	|	| V	
17+10	0.1967	0.19	Q	|	|	| V	
17+15	0.1980	0.19	Q	|	|	| V	
17+20	0.1992	0.18	Q	|	|	| V	
17+25	0.2004	0.17	Q	|	|	| V	
17+30	0.2016	0.17	Q	|	|	| V	
17+35	0.2027	0.16	Q	|	|	| V	
17+40	0.2038	0.16	Q	|	|	| V	
17+45	0.2048	0.16	Q	|	|	| V	
17+50	0.2059	0.15	Q	|	|	| V	
17+55	0.2069	0.15	Q	|	|	| V	
18+ 0	0.2079	0.14	Q	|	|	| V	
18+ 5	0.2089	0.14	Q	|	|	| V	
18+10	0.2097	0.12	Q	|	|	| V	
18+15	0.2104	0.11	Q	|	|	| V	
18+20	0.2112	0.10	Q	|	|	| V	
18+25	0.2118	0.10	Q	|	|	| V	
18+30	0.2125	0.10	Q	|	|	| V	
18+35	0.2132	0.09	Q	|	|	| V	
18+40	0.2138	0.09	Q	|	|	| V	
18+45	0.2144	0.09	Q	|	|	| V	
18+50	0.2150	0.09	Q	|	|	| V	
18+55	0.2156	0.09	Q	|	|	| V	
19+ 0	0.2162	0.09	Q	|	|	| V	
19+ 5	0.2168	0.08	Q	|	|	| V	
19+10	0.2174	0.08	Q	|	|	| V	

19+15	0.2179	0.08	Q	|	|	|	V
19+20	0.2185	0.08	Q	|	|	|	V
19+25	0.2190	0.08	Q	|	|	|	V
19+30	0.2195	0.08	Q	|	|	|	V
19+35	0.2201	0.08	Q	|	|	|	V
19+40	0.2206	0.08	Q	|	|	|	V
19+45	0.2211	0.07	Q	|	|	|	V
19+50	0.2216	0.07	Q	|	|	|	V
19+55	0.2221	0.07	Q	|	|	|	V
20+ 0	0.2226	0.07	Q	|	|	|	V
20+ 5	0.2231	0.07	Q	|	|	|	V
20+10	0.2236	0.07	Q	|	|	|	V
20+15	0.2240	0.07	Q	|	|	|	V
20+20	0.2245	0.07	Q	|	|	|	V
20+25	0.2250	0.07	Q	|	|	|	V
20+30	0.2254	0.07	Q	|	|	|	V
20+35	0.2259	0.07	Q	|	|	|	V
20+40	0.2263	0.06	Q	|	|	|	V
20+45	0.2267	0.06	Q	|	|	|	V
20+50	0.2272	0.06	Q	|	|	|	V
20+55	0.2276	0.06	Q	|	|	|	V
21+ 0	0.2280	0.06	Q	|	|	|	V
21+ 5	0.2285	0.06	Q	|	|	|	V
21+10	0.2289	0.06	Q	|	|	|	V
21+15	0.2293	0.06	Q	|	|	|	V
21+20	0.2297	0.06	Q	|	|	|	V
21+25	0.2301	0.06	Q	|	|	|	V
21+30	0.2305	0.06	Q	|	|	|	V
21+35	0.2309	0.06	Q	|	|	|	V
21+40	0.2313	0.06	Q	|	|	|	V

|
| 21+45 | 0.2317 | 0.06 | Q | | | | V |
|
| 21+50 | 0.2321 | 0.06 | Q | | | | V |
|
| 21+55 | 0.2325 | 0.06 | Q | | | | V |
|
| 22+ 0 | 0.2328 | 0.06 | Q | | | | V |
|
| 22+ 5 | 0.2332 | 0.05 | Q | | | | V |
|
| 22+10 | 0.2336 | 0.05 | Q | | | | V |
|
| 22+15 | 0.2340 | 0.05 | Q | | | | V |
|
| 22+20 | 0.2343 | 0.05 | Q | | | | V |
|
| 22+25 | 0.2347 | 0.05 | Q | | | | V |
|
| 22+30 | 0.2351 | 0.05 | Q | | | | V |
|
| 22+35 | 0.2354 | 0.05 | Q | | | | V |
|
| 22+40 | 0.2358 | 0.05 | Q | | | |
V|
| 22+45 | 0.2361 | 0.05 | Q | | | |
V|
| 22+50 | 0.2365 | 0.05 | Q | | | |
V|
| 22+55 | 0.2368 | 0.05 | Q | | | |
V|
| 23+ 0 | 0.2372 | 0.05 | Q | | | |
V|
| 23+ 5 | 0.2375 | 0.05 | Q | | | |
V|
| 23+10 | 0.2379 | 0.05 | Q | | | |
V|
| 23+15 | 0.2382 | 0.05 | Q | | | |
V|
| 23+20 | 0.2386 | 0.05 | Q | | | |
V|
| 23+25 | 0.2389 | 0.05 | Q | | | |
V|
| 23+30 | 0.2392 | 0.05 | Q | | | |
V|
| 23+35 | 0.2396 | 0.05 | Q | | | |
V|
| 23+40 | 0.2399 | 0.05 | Q | | | |
V|
| 23+45 | 0.2402 | 0.05 | Q | | | |
V|
| 23+50 | 0.2405 | 0.05 | Q | | | |
V|
| 23+55 | 0.2409 | 0.05 | Q | | | |
V|
| 24+ 0 | 0.2412 | 0.05 | Q | | | |
V|
| 24+ 5 | 0.2415 | 0.04 | Q | | | |
V|
| 24+10 | 0.2416 | 0.02 | Q | | | |

24+15	0.2417	0.01	Q			
24+20	0.2417	0.00	Q			
24+25	0.2417	0.00	Q			
24+30	0.2417	0.00	Q			
24+35	0.2417	0.00	Q			
24+40	0.2417	0.00	Q			
24+45	0.2417	0.00	Q			

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

Study date 02/27/17

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

Program License Serial Number 6232

Summerland - Chino
2 yr 24 hr storm event
Pre Development Conditions
Area A2 Pts 201-203

Storm Event Year = 2

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 2		
4.20	1	0.59
Rainfall data for year 2		
4.20	6	1.57
Rainfall data for year 2		
4.20	24	2.77

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      ******** 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)
       79.0      61.8          4.20      1.000     0.654    0.900
0.589

      Area-averaged adjusted loss rate Fm (In/Hr) =  0.589

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

      Area       Area          SCS CN    SCS CN      S     Pervious
       (Ac.)      Fract         (AMC2)    (AMC1)           Yield Fr
           3.78   0.900         79.0      61.8       6.18     0.110
           0.42   0.100         98.0      98.0       0.20     0.917

      Area-averaged catchment yield fraction, Y =  0.191
      Area-averaged low loss fraction, Yb =  0.809
      User entry of time of concentration  =   0.158 (hours)
      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
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      Watershed area =       4.20(Ac.)
      Catchment Lag time =   0.126 hours
      Unit interval =   5.000 minutes
      Unit interval percentage of lag time = 65.9283
      Hydrograph baseflow =     0.00(CFS)
      Average maximum watershed loss rate(Fm) =  0.589(In/Hr)
      Average low loss rate fraction (Yb) = 0.809 (decimal)
      FOOTHILL S-Graph Selected
      Computed peak 5-minute rainfall =  0.220(In)
      Computed peak 30-minute rainfall =  0.451(In)
      Specified peak 1-hour rainfall =  0.595(In)
      Computed peak 3-hour rainfall =  1.079(In)
      Specified peak 6-hour rainfall =  1.570(In)
      Specified peak 24-hour rainfall =  2.770(In)


      Rainfall depth area reduction factors:
      Using a total area of       4.20(Ac.) (Ref: fig. E-4)

      5-minute factor = 1.000     Adjusted rainfall =  0.220(In)
      30-minute factor = 1.000    Adjusted rainfall =  0.451(In)
      1-hour factor = 1.000       Adjusted rainfall =  0.595(In)
      3-hour factor = 1.000       Adjusted rainfall =  1.079(In)
      6-hour factor = 1.000       Adjusted rainfall =  1.570(In)
      24-hour factor = 1.000      Adjusted rainfall =  2.770(In)
      ------------------------------------------------------------------
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                      U n i t  H y d r o g r a p h
      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
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      Interval          'S' Graph          Unit Hydrograph
      Number            Mean values             ((CFS))
      ------------------------------------------------------------------
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                 (K =        50.79 (CFS))
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1	6.485	3.294
2	43.981	19.046
3	75.030	15.771
4	86.519	5.836
5	93.009	3.297
6	96.641	1.844
7	98.238	0.811
8	98.922	0.347
9	99.391	0.238
10	99.803	0.209
11	100.000	0.100

Peak Unit Number	Adjusted mass rainfall (In)	Unit rainfall (In)
1	0.2202	0.2202
2	0.2905	0.0703
3	0.3417	0.0512
4	0.3833	0.0417
5	0.4191	0.0358
6	0.4508	0.0317
7	0.4795	0.0287
8	0.5058	0.0263
9	0.5302	0.0244
10	0.5530	0.0228
11	0.5745	0.0215
12	0.5949	0.0203
13	0.6212	0.0264
14	0.6467	0.0254
15	0.6713	0.0246
16	0.6952	0.0239
17	0.7184	0.0232
18	0.7410	0.0226
19	0.7630	0.0220
20	0.7845	0.0215
21	0.8055	0.0210
22	0.8261	0.0206
23	0.8462	0.0201
24	0.8659	0.0197
25	0.8853	0.0194
26	0.9043	0.0190
27	0.9230	0.0187
28	0.9414	0.0184
29	0.9594	0.0181
30	0.9772	0.0178
31	0.9947	0.0175
32	1.0120	0.0173
33	1.0290	0.0170
34	1.0458	0.0168
35	1.0623	0.0165
36	1.0786	0.0163
37	1.0948	0.0161
38	1.1107	0.0159
39	1.1264	0.0157
40	1.1420	0.0156
41	1.1573	0.0154
42	1.1725	0.0152
43	1.1876	0.0150
44	1.2025	0.0149

45	1.2172	0.0147
46	1.2318	0.0146
47	1.2462	0.0144
48	1.2605	0.0143
49	1.2746	0.0142
50	1.2887	0.0140
51	1.3025	0.0139
52	1.3163	0.0138
53	1.3300	0.0136
54	1.3435	0.0135
55	1.3569	0.0134
56	1.3702	0.0133
57	1.3834	0.0132
58	1.3965	0.0131
59	1.4095	0.0130
60	1.4224	0.0129
61	1.4352	0.0128
62	1.4479	0.0127
63	1.4605	0.0126
64	1.4730	0.0125
65	1.4854	0.0124
66	1.4977	0.0123
67	1.5100	0.0122
68	1.5221	0.0122
69	1.5342	0.0121
70	1.5462	0.0120
71	1.5581	0.0119
72	1.5700	0.0118
73	1.5789	0.0089
74	1.5877	0.0088
75	1.5964	0.0088
76	1.6051	0.0087
77	1.6137	0.0086
78	1.6223	0.0086
79	1.6308	0.0085
80	1.6392	0.0084
81	1.6476	0.0084
82	1.6559	0.0083
83	1.6641	0.0082
84	1.6723	0.0082
85	1.6804	0.0081
86	1.6885	0.0081
87	1.6965	0.0080
88	1.7045	0.0080
89	1.7124	0.0079
90	1.7202	0.0079
91	1.7280	0.0078
92	1.7358	0.0078
93	1.7435	0.0077
94	1.7511	0.0077
95	1.7587	0.0076
96	1.7663	0.0076
97	1.7738	0.0075
98	1.7813	0.0075
99	1.7887	0.0074
100	1.7961	0.0074
101	1.8034	0.0073
102	1.8107	0.0073
103	1.8180	0.0072
104	1.8252	0.0072

105	1.8323	0.0072
106	1.8395	0.0071
107	1.8465	0.0071
108	1.8536	0.0070
109	1.8606	0.0070
110	1.8676	0.0070
111	1.8745	0.0069
112	1.8814	0.0069
113	1.8883	0.0069
114	1.8951	0.0068
115	1.9019	0.0068
116	1.9086	0.0068
117	1.9154	0.0067
118	1.9221	0.0067
119	1.9287	0.0067
120	1.9353	0.0066
121	1.9419	0.0066
122	1.9485	0.0066
123	1.9550	0.0065
124	1.9615	0.0065
125	1.9680	0.0065
126	1.9744	0.0064
127	1.9808	0.0064
128	1.9872	0.0064
129	1.9935	0.0063
130	1.9998	0.0063
131	2.0061	0.0063
132	2.0124	0.0063
133	2.0186	0.0062
134	2.0248	0.0062
135	2.0310	0.0062
136	2.0371	0.0061
137	2.0433	0.0061
138	2.0493	0.0061
139	2.0554	0.0061
140	2.0615	0.0060
141	2.0675	0.0060
142	2.0735	0.0060
143	2.0794	0.0060
144	2.0854	0.0059
145	2.0913	0.0059
146	2.0972	0.0059
147	2.1031	0.0059
148	2.1089	0.0058
149	2.1147	0.0058
150	2.1205	0.0058
151	2.1263	0.0058
152	2.1321	0.0058
153	2.1378	0.0057
154	2.1435	0.0057
155	2.1492	0.0057
156	2.1549	0.0057
157	2.1605	0.0056
158	2.1662	0.0056
159	2.1718	0.0056
160	2.1773	0.0056
161	2.1829	0.0056
162	2.1884	0.0055
163	2.1940	0.0055
164	2.1995	0.0055

165	2.2050	0.0055
166	2.2104	0.0055
167	2.2159	0.0054
168	2.2213	0.0054
169	2.2267	0.0054
170	2.2321	0.0054
171	2.2374	0.0054
172	2.2428	0.0053
173	2.2481	0.0053
174	2.2534	0.0053
175	2.2587	0.0053
176	2.2640	0.0053
177	2.2693	0.0053
178	2.2745	0.0052
179	2.2797	0.0052
180	2.2850	0.0052
181	2.2901	0.0052
182	2.2953	0.0052
183	2.3005	0.0052
184	2.3056	0.0051
185	2.3107	0.0051
186	2.3158	0.0051
187	2.3209	0.0051
188	2.3260	0.0051
189	2.3311	0.0051
190	2.3361	0.0050
191	2.3411	0.0050
192	2.3462	0.0050
193	2.3512	0.0050
194	2.3561	0.0050
195	2.3611	0.0050
196	2.3661	0.0050
197	2.3710	0.0049
198	2.3759	0.0049
199	2.3808	0.0049
200	2.3857	0.0049
201	2.3906	0.0049
202	2.3955	0.0049
203	2.4003	0.0048
204	2.4051	0.0048
205	2.4100	0.0048
206	2.4148	0.0048
207	2.4196	0.0048
208	2.4243	0.0048
209	2.4291	0.0048
210	2.4339	0.0048
211	2.4386	0.0047
212	2.4433	0.0047
213	2.4480	0.0047
214	2.4527	0.0047
215	2.4574	0.0047
216	2.4621	0.0047
217	2.4668	0.0047
218	2.4714	0.0046
219	2.4761	0.0046
220	2.4807	0.0046
221	2.4853	0.0046
222	2.4899	0.0046
223	2.4945	0.0046
224	2.4991	0.0046

225	2.5036	0.0046
226	2.5082	0.0046
227	2.5127	0.0045
228	2.5172	0.0045
229	2.5218	0.0045
230	2.5263	0.0045
231	2.5307	0.0045
232	2.5352	0.0045
233	2.5397	0.0045
234	2.5442	0.0045
235	2.5486	0.0044
236	2.5530	0.0044
237	2.5575	0.0044
238	2.5619	0.0044
239	2.5663	0.0044
240	2.5707	0.0044
241	2.5751	0.0044
242	2.5794	0.0044
243	2.5838	0.0044
244	2.5881	0.0043
245	2.5925	0.0043
246	2.5968	0.0043
247	2.6011	0.0043
248	2.6054	0.0043
249	2.6097	0.0043
250	2.6140	0.0043
251	2.6183	0.0043
252	2.6226	0.0043
253	2.6268	0.0043
254	2.6311	0.0042
255	2.6353	0.0042
256	2.6395	0.0042
257	2.6438	0.0042
258	2.6480	0.0042
259	2.6522	0.0042
260	2.6563	0.0042
261	2.6605	0.0042
262	2.6647	0.0042
263	2.6689	0.0042
264	2.6730	0.0042
265	2.6772	0.0041
266	2.6813	0.0041
267	2.6854	0.0041
268	2.6895	0.0041
269	2.6936	0.0041
270	2.6977	0.0041
271	2.7018	0.0041
272	2.7059	0.0041
273	2.7100	0.0041
274	2.7140	0.0041
275	2.7181	0.0041
276	2.7221	0.0040
277	2.7262	0.0040
278	2.7302	0.0040
279	2.7342	0.0040
280	2.7382	0.0040
281	2.7422	0.0040
282	2.7462	0.0040
283	2.7502	0.0040
284	2.7542	0.0040

285	2.7581	0.0040	
286	2.7621	0.0040	
287	2.7660	0.0040	
288	2.7700	0.0039	

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0039	0.0032	0.0008
2	0.0040	0.0032	0.0008
3	0.0040	0.0032	0.0008
4	0.0040	0.0032	0.0008
5	0.0040	0.0032	0.0008
6	0.0040	0.0032	0.0008
7	0.0040	0.0033	0.0008
8	0.0040	0.0033	0.0008
9	0.0040	0.0033	0.0008
10	0.0041	0.0033	0.0008
11	0.0041	0.0033	0.0008
12	0.0041	0.0033	0.0008
13	0.0041	0.0033	0.0008
14	0.0041	0.0033	0.0008
15	0.0041	0.0033	0.0008
16	0.0041	0.0033	0.0008
17	0.0042	0.0034	0.0008
18	0.0042	0.0034	0.0008
19	0.0042	0.0034	0.0008
20	0.0042	0.0034	0.0008
21	0.0042	0.0034	0.0008
22	0.0042	0.0034	0.0008
23	0.0042	0.0034	0.0008
24	0.0042	0.0034	0.0008
25	0.0043	0.0035	0.0008
26	0.0043	0.0035	0.0008
27	0.0043	0.0035	0.0008
28	0.0043	0.0035	0.0008
29	0.0043	0.0035	0.0008
30	0.0043	0.0035	0.0008
31	0.0044	0.0035	0.0008
32	0.0044	0.0035	0.0008
33	0.0044	0.0036	0.0008
34	0.0044	0.0036	0.0008
35	0.0044	0.0036	0.0008
36	0.0044	0.0036	0.0008
37	0.0045	0.0036	0.0009
38	0.0045	0.0036	0.0009
39	0.0045	0.0036	0.0009
40	0.0045	0.0036	0.0009
41	0.0045	0.0037	0.0009
42	0.0045	0.0037	0.0009
43	0.0046	0.0037	0.0009
44	0.0046	0.0037	0.0009
45	0.0046	0.0037	0.0009
46	0.0046	0.0037	0.0009
47	0.0046	0.0038	0.0009
48	0.0046	0.0038	0.0009
49	0.0047	0.0038	0.0009

50	0.0047	0.0038	0.0009
51	0.0047	0.0038	0.0009
52	0.0047	0.0038	0.0009
53	0.0048	0.0038	0.0009
54	0.0048	0.0039	0.0009
55	0.0048	0.0039	0.0009
56	0.0048	0.0039	0.0009
57	0.0048	0.0039	0.0009
58	0.0048	0.0039	0.0009
59	0.0049	0.0039	0.0009
60	0.0049	0.0040	0.0009
61	0.0049	0.0040	0.0009
62	0.0049	0.0040	0.0009
63	0.0050	0.0040	0.0009
64	0.0050	0.0040	0.0010
65	0.0050	0.0041	0.0010
66	0.0050	0.0041	0.0010
67	0.0051	0.0041	0.0010
68	0.0051	0.0041	0.0010
69	0.0051	0.0041	0.0010
70	0.0051	0.0041	0.0010
71	0.0052	0.0042	0.0010
72	0.0052	0.0042	0.0010
73	0.0052	0.0042	0.0010
74	0.0052	0.0042	0.0010
75	0.0053	0.0043	0.0010
76	0.0053	0.0043	0.0010
77	0.0053	0.0043	0.0010
78	0.0053	0.0043	0.0010
79	0.0054	0.0043	0.0010
80	0.0054	0.0044	0.0010
81	0.0054	0.0044	0.0010
82	0.0054	0.0044	0.0010
83	0.0055	0.0044	0.0010
84	0.0055	0.0045	0.0010
85	0.0055	0.0045	0.0011
86	0.0056	0.0045	0.0011
87	0.0056	0.0045	0.0011
88	0.0056	0.0046	0.0011
89	0.0057	0.0046	0.0011
90	0.0057	0.0046	0.0011
91	0.0057	0.0046	0.0011
92	0.0058	0.0047	0.0011
93	0.0058	0.0047	0.0011
94	0.0058	0.0047	0.0011
95	0.0059	0.0048	0.0011
96	0.0059	0.0048	0.0011
97	0.0059	0.0048	0.0011
98	0.0060	0.0048	0.0011
99	0.0060	0.0049	0.0011
100	0.0060	0.0049	0.0012
101	0.0061	0.0049	0.0012
102	0.0061	0.0050	0.0012
103	0.0062	0.0050	0.0012
104	0.0062	0.0050	0.0012
105	0.0063	0.0051	0.0012
106	0.0063	0.0051	0.0012
107	0.0063	0.0051	0.0012
108	0.0064	0.0052	0.0012
109	0.0064	0.0052	0.0012

110	0.0065	0.0052	0.0012
111	0.0065	0.0053	0.0012
112	0.0066	0.0053	0.0013
113	0.0066	0.0054	0.0013
114	0.0067	0.0054	0.0013
115	0.0067	0.0054	0.0013
116	0.0068	0.0055	0.0013
117	0.0068	0.0055	0.0013
118	0.0069	0.0056	0.0013
119	0.0069	0.0056	0.0013
120	0.0070	0.0056	0.0013
121	0.0070	0.0057	0.0013
122	0.0071	0.0057	0.0014
123	0.0072	0.0058	0.0014
124	0.0072	0.0058	0.0014
125	0.0073	0.0059	0.0014
126	0.0073	0.0059	0.0014
127	0.0074	0.0060	0.0014
128	0.0075	0.0060	0.0014
129	0.0076	0.0061	0.0014
130	0.0076	0.0062	0.0015
131	0.0077	0.0062	0.0015
132	0.0078	0.0063	0.0015
133	0.0079	0.0064	0.0015
134	0.0079	0.0064	0.0015
135	0.0080	0.0065	0.0015
136	0.0081	0.0065	0.0015
137	0.0082	0.0066	0.0016
138	0.0082	0.0067	0.0016
139	0.0084	0.0068	0.0016
140	0.0084	0.0068	0.0016
141	0.0086	0.0069	0.0016
142	0.0086	0.0070	0.0016
143	0.0088	0.0071	0.0017
144	0.0088	0.0071	0.0017
145	0.0118	0.0096	0.0023
146	0.0119	0.0096	0.0023
147	0.0121	0.0098	0.0023
148	0.0122	0.0098	0.0023
149	0.0123	0.0100	0.0024
150	0.0124	0.0101	0.0024
151	0.0126	0.0102	0.0024
152	0.0127	0.0103	0.0024
153	0.0129	0.0104	0.0025
154	0.0130	0.0105	0.0025
155	0.0132	0.0107	0.0025
156	0.0133	0.0108	0.0025
157	0.0135	0.0109	0.0026
158	0.0136	0.0110	0.0026
159	0.0139	0.0112	0.0027
160	0.0140	0.0113	0.0027
161	0.0143	0.0116	0.0027
162	0.0144	0.0117	0.0028
163	0.0147	0.0119	0.0028
164	0.0149	0.0120	0.0028
165	0.0152	0.0123	0.0029
166	0.0154	0.0124	0.0029
167	0.0157	0.0127	0.0030
168	0.0159	0.0129	0.0030
169	0.0163	0.0132	0.0031

170	0.0165	0.0134	0.0032
171	0.0170	0.0138	0.0032
172	0.0173	0.0140	0.0033
173	0.0178	0.0144	0.0034
174	0.0181	0.0146	0.0034
175	0.0187	0.0151	0.0036
176	0.0190	0.0154	0.0036
177	0.0197	0.0160	0.0038
178	0.0201	0.0163	0.0038
179	0.0210	0.0170	0.0040
180	0.0215	0.0174	0.0041
181	0.0226	0.0183	0.0043
182	0.0232	0.0188	0.0044
183	0.0246	0.0199	0.0047
184	0.0254	0.0206	0.0049
185	0.0203	0.0165	0.0039
186	0.0215	0.0174	0.0041
187	0.0244	0.0197	0.0047
188	0.0263	0.0213	0.0050
189	0.0317	0.0257	0.0060
190	0.0358	0.0290	0.0068
191	0.0512	0.0414	0.0098
192	0.0703	0.0491	0.0213
193	0.2202	0.0491	0.1711
194	0.0417	0.0337	0.0079
195	0.0287	0.0232	0.0055
196	0.0228	0.0185	0.0044
197	0.0264	0.0213	0.0050
198	0.0239	0.0193	0.0046
199	0.0220	0.0178	0.0042
200	0.0206	0.0166	0.0039
201	0.0194	0.0157	0.0037
202	0.0184	0.0149	0.0035
203	0.0175	0.0142	0.0033
204	0.0168	0.0136	0.0032
205	0.0161	0.0130	0.0031
206	0.0156	0.0126	0.0030
207	0.0150	0.0122	0.0029
208	0.0146	0.0118	0.0028
209	0.0142	0.0115	0.0027
210	0.0138	0.0111	0.0026
211	0.0134	0.0109	0.0026
212	0.0131	0.0106	0.0025
213	0.0128	0.0103	0.0024
214	0.0125	0.0101	0.0024
215	0.0122	0.0099	0.0023
216	0.0120	0.0097	0.0023
217	0.0089	0.0072	0.0017
218	0.0087	0.0070	0.0017
219	0.0085	0.0069	0.0016
220	0.0083	0.0067	0.0016
221	0.0081	0.0066	0.0015
222	0.0080	0.0064	0.0015
223	0.0078	0.0063	0.0015
224	0.0077	0.0062	0.0015
225	0.0075	0.0061	0.0014
226	0.0074	0.0060	0.0014
227	0.0072	0.0059	0.0014
228	0.0071	0.0058	0.0014
229	0.0070	0.0057	0.0013

230	0.0069	0.0056	0.0013
231	0.0068	0.0055	0.0013
232	0.0067	0.0054	0.0013
233	0.0066	0.0053	0.0013
234	0.0065	0.0053	0.0012
235	0.0064	0.0052	0.0012
236	0.0063	0.0051	0.0012
237	0.0062	0.0050	0.0012
238	0.0061	0.0050	0.0012
239	0.0061	0.0049	0.0012
240	0.0060	0.0048	0.0011
241	0.0059	0.0048	0.0011
242	0.0058	0.0047	0.0011
243	0.0058	0.0047	0.0011
244	0.0057	0.0046	0.0011
245	0.0056	0.0046	0.0011
246	0.0056	0.0045	0.0011
247	0.0055	0.0045	0.0011
248	0.0055	0.0044	0.0010
249	0.0054	0.0044	0.0010
250	0.0053	0.0043	0.0010
251	0.0053	0.0043	0.0010
252	0.0052	0.0042	0.0010
253	0.0052	0.0042	0.0010
254	0.0051	0.0042	0.0010
255	0.0051	0.0041	0.0010
256	0.0050	0.0041	0.0010
257	0.0050	0.0040	0.0010
258	0.0050	0.0040	0.0009
259	0.0049	0.0040	0.0009
260	0.0049	0.0039	0.0009
261	0.0048	0.0039	0.0009
262	0.0048	0.0039	0.0009
263	0.0047	0.0038	0.0009
264	0.0047	0.0038	0.0009
265	0.0047	0.0038	0.0009
266	0.0046	0.0037	0.0009
267	0.0046	0.0037	0.0009
268	0.0046	0.0037	0.0009
269	0.0045	0.0037	0.0009
270	0.0045	0.0036	0.0009
271	0.0044	0.0036	0.0008
272	0.0044	0.0036	0.0008
273	0.0044	0.0035	0.0008
274	0.0043	0.0035	0.0008
275	0.0043	0.0035	0.0008
276	0.0043	0.0035	0.0008
277	0.0043	0.0034	0.0008
278	0.0042	0.0034	0.0008
279	0.0042	0.0034	0.0008
280	0.0042	0.0034	0.0008
281	0.0041	0.0034	0.0008
282	0.0041	0.0033	0.0008
283	0.0041	0.0033	0.0008
284	0.0041	0.0033	0.0008
285	0.0040	0.0033	0.0008
286	0.0040	0.0032	0.0008
287	0.0040	0.0032	0.0008
288	0.0040	0.0032	0.0008

```
--
      ----------------------------------------------------------------
--
      Total soil rain loss =      2.10(In)
      Total effective rainfall =      0.67(In)
      Peak flow rate in flood hydrograph =      3.72(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       0.0000      0.00  Q         |         |         |
|
    0+10       0.0001      0.02  Q         |         |         |
|
    0+15       0.0003      0.03  Q         |         |         |
|
    0+20       0.0006      0.03  Q         |         |         |
|
    0+25       0.0008      0.04  Q         |         |         |
|
    0+30       0.0011      0.04  Q         |         |         |
|
    0+35       0.0013      0.04  Q         |         |         |
|
    0+40       0.0016      0.04  Q         |         |         |
|
    0+45       0.0019      0.04  Q         |         |         |
|
    0+50       0.0021      0.04  Q         |         |         |
|
    0+55       0.0024      0.04  Q         |         |         |
|
    1+ 0       0.0027      0.04  Q         |         |         |
|
    1+ 5       0.0029      0.04  Q         |         |         |
|
    1+10       0.0032      0.04  Q         |         |         |
|
    1+15       0.0035      0.04  Q         |         |         |
|
    1+20       0.0038      0.04  Q         |         |         |
|
    1+25       0.0040      0.04  Q         |         |         |
|
    1+30       0.0043      0.04  Q         |         |         |
|
    1+35       0.0046      0.04  Q         |         |         |
|
```

1+40	0.0049	0.04	Q			
1+45	0.0051	0.04	Q			
1+50	0.0054	0.04	Q			
1+55	0.0057	0.04	Q			
2+ 0	0.0060	0.04	QV			
2+ 5	0.0063	0.04	QV			
2+10	0.0065	0.04	QV			
2+15	0.0068	0.04	QV			
2+20	0.0071	0.04	QV			
2+25	0.0074	0.04	QV			
2+30	0.0077	0.04	QV			
2+35	0.0080	0.04	QV			
2+40	0.0083	0.04	QV			
2+45	0.0086	0.04	QV			
2+50	0.0089	0.04	QV			
2+55	0.0091	0.04	QV			
3+ 0	0.0094	0.04	QV			
3+ 5	0.0097	0.04	QV			
3+10	0.0100	0.04	QV			
3+15	0.0103	0.04	QV			
3+20	0.0106	0.04	QV			
3+25	0.0109	0.04	QV			
3+30	0.0112	0.04	QV			
3+35	0.0115	0.04	QV			
3+40	0.0118	0.04	Q V			
3+45	0.0121	0.04	Q V			
3+50	0.0124	0.04	Q V			
3+55	0.0127	0.04	Q V			
4+ 0	0.0131	0.04	Q V			
4+ 5	0.0134	0.04	Q V			

4+10	0.0137	0.05	Q V	|	|	|
4+15	0.0140	0.05	Q V	|	|	|
4+20	0.0143	0.05	Q V	|	|	|
4+25	0.0146	0.05	Q V	|	|	|
4+30	0.0149	0.05	Q V	|	|	|
4+35	0.0152	0.05	Q V	|	|	|
4+40	0.0156	0.05	Q V	|	|	|
4+45	0.0159	0.05	Q V	|	|	|
4+50	0.0162	0.05	Q V	|	|	|
4+55	0.0165	0.05	Q V	|	|	|
5+ 0	0.0169	0.05	Q V	|	|	|
5+ 5	0.0172	0.05	Q V	|	|	|
5+10	0.0175	0.05	Q V	|	|	|
5+15	0.0178	0.05	Q V	|	|	|
5+20	0.0182	0.05	Q V	|	|	|
5+25	0.0185	0.05	Q V	|	|	|
5+30	0.0188	0.05	Q V	|	|	|
5+35	0.0192	0.05	Q V	|	|	|
5+40	0.0195	0.05	Q V	|	|	|
5+45	0.0198	0.05	Q V	|	|	|
5+50	0.0202	0.05	Q V	|	|	|
5+55	0.0205	0.05	Q V	|	|	|
6+ 0	0.0209	0.05	Q V	|	|	|
6+ 5	0.0212	0.05	Q V	|	|	|
6+10	0.0215	0.05	Q V	|	|	|
6+15	0.0219	0.05	Q V	|	|	|
6+20	0.0222	0.05	Q V	|	|	|
6+25	0.0226	0.05	Q V	|	|	|
6+30	0.0229	0.05	Q V	|	|	|
6+35	0.0233	0.05	Q V	|	|	|

6+40	0.0237	0.05	Q	V			
6+45	0.0240	0.05	Q	V			
6+50	0.0244	0.05	Q	V			
6+55	0.0247	0.05	Q	V			
7+ 0	0.0251	0.05	Q	V			
7+ 5	0.0255	0.05	Q	V			
7+10	0.0258	0.05	Q	V			
7+15	0.0262	0.05	Q	V			
7+20	0.0266	0.05	Q	V			
7+25	0.0269	0.05	Q	V			
7+30	0.0273	0.05	Q	V			
7+35	0.0277	0.05	Q	V			
7+40	0.0281	0.06	Q	V			
7+45	0.0285	0.06	Q	V			
7+50	0.0288	0.06	Q	V			
7+55	0.0292	0.06	Q	V			
8+ 0	0.0296	0.06	Q	V			
8+ 5	0.0300	0.06	Q	V			
8+10	0.0304	0.06	Q	V			
8+15	0.0308	0.06	Q	V			
8+20	0.0312	0.06	Q	V			
8+25	0.0316	0.06	Q	V			
8+30	0.0320	0.06	Q	V			
8+35	0.0324	0.06	Q	V			
8+40	0.0328	0.06	Q	V			
8+45	0.0332	0.06	Q	V			
8+50	0.0336	0.06	Q	V			
8+55	0.0341	0.06	Q	V			
9+ 0	0.0345	0.06	Q	V			
9+ 5	0.0349	0.06	Q	V			

9+10	0.0353	0.06	Q	V			
9+15	0.0358	0.06	Q	V			
9+20	0.0362	0.06	Q	V			
9+25	0.0366	0.06	Q	V			
9+30	0.0371	0.06	Q	V			
9+35	0.0375	0.06	Q	V			
9+40	0.0379	0.06	Q	V			
9+45	0.0384	0.07	Q	V			
9+50	0.0388	0.07	Q	V			
9+55	0.0393	0.07	Q	V			
10+ 0	0.0398	0.07	Q	V			
10+ 5	0.0402	0.07	Q	V			
10+10	0.0407	0.07	Q	V			
10+15	0.0412	0.07	Q	V			
10+20	0.0416	0.07	Q	V			
10+25	0.0421	0.07	Q	V			
10+30	0.0426	0.07	Q	V			
10+35	0.0431	0.07	Q	V			
10+40	0.0436	0.07	Q	V			
10+45	0.0441	0.07	Q	V			
10+50	0.0446	0.07	Q	V			
10+55	0.0451	0.07	Q	V			
11+ 0	0.0456	0.07	Q	V			
11+ 5	0.0461	0.07	Q	V			
11+10	0.0466	0.08	Q	V			
11+15	0.0471	0.08	Q	V			
11+20	0.0477	0.08	Q	V			
11+25	0.0482	0.08	Q	V			
11+30	0.0487	0.08	Q	V			
11+35	0.0493	0.08	Q	V			

11+40	0.0498	0.08	Q	V			
11+45	0.0504	0.08	Q	V			
11+50	0.0509	0.08	Q	V			
11+55	0.0515	0.08	Q	V			
12+ 0	0.0521	0.08	Q	V			
12+ 5	0.0527	0.09	Q	V			
12+10	0.0534	0.10	Q	V			
12+15	0.0541	0.11	Q	V			
12+20	0.0549	0.11	Q	V			
12+25	0.0557	0.11	Q	V			
12+30	0.0565	0.12	Q	V			
12+35	0.0573	0.12	Q	V			
12+40	0.0581	0.12	Q	V			
12+45	0.0590	0.12	Q	V			
12+50	0.0598	0.12	Q	V			
12+55	0.0607	0.12	Q	V			
13+ 0	0.0615	0.13	Q	V			
13+ 5	0.0624	0.13	Q	V			
13+10	0.0633	0.13	Q	V			
13+15	0.0642	0.13	Q	V			
13+20	0.0651	0.13	Q	V			
13+25	0.0660	0.13	Q	V			
13+30	0.0670	0.14	Q	V			
13+35	0.0679	0.14	Q	V			
13+40	0.0689	0.14	Q	V			
13+45	0.0699	0.14	Q	V			
13+50	0.0709	0.14	Q	V			
13+55	0.0719	0.15	Q	V			
14+ 0	0.0729	0.15	Q	V			
14+ 5	0.0740	0.15	Q	V			

14+10	0.0750	0.15	Q	V			
14+15	0.0761	0.16	Q	V			
14+20	0.0772	0.16	Q	V			
14+25	0.0784	0.16	Q	V			
14+30	0.0795	0.17	Q	V			
14+35	0.0807	0.17	Q	V			
14+40	0.0819	0.18	Q	V			
14+45	0.0832	0.18	Q	V			
14+50	0.0844	0.19	Q	V			
14+55	0.0857	0.19	Q	V			
15+ 0	0.0871	0.20	Q	V			
15+ 5	0.0885	0.20	Q	V			
15+10	0.0899	0.21	Q	V			
15+15	0.0914	0.22	Q	V			
15+20	0.0930	0.23	Q	V			
15+25	0.0946	0.23	Q	V			
15+30	0.0961	0.22	Q	V			
15+35	0.0976	0.21	Q	V			
15+40	0.0992	0.22	Q	V			
15+45	0.1008	0.24	Q	V			
15+50	0.1027	0.27	Q	V			
15+55	0.1049	0.32	Q	V			
16+ 0	0.1079	0.43	Q	V			
16+ 5	0.1161	1.20	Q	V			
16+10	0.1417	3.72		Q	V		
16+15	0.1627	3.05		Q	V		
16+20	0.1719	1.34	Q		V		
16+25	0.1778	0.85	Q		V		
16+30	0.1818	0.58	Q		V		
16+35	0.1844	0.39	Q		V		

16+40	0.1864	0.29	|Q	|	|	| V	|
16+45	0.1882	0.26	|Q	|	|	| V	|
16+50	0.1899	0.24	Q	|	|	| V	|
16+55	0.1913	0.21	Q	|	|	| V	|
17+ 0	0.1925	0.18	Q	|	|	| V	|
17+ 5	0.1937	0.17	Q	|	|	| V	|
17+10	0.1948	0.16	Q	|	|	| V	|
17+15	0.1959	0.16	Q	|	|	| V	|
17+20	0.1970	0.15	Q	|	|	| V	|
17+25	0.1980	0.15	Q	|	|	| V	|
17+30	0.1989	0.14	Q	|	|	| V	|
17+35	0.1999	0.14	Q	|	|	| V	|
17+40	0.2008	0.13	Q	|	|	| V	|
17+45	0.2017	0.13	Q	|	|	| V	|
17+50	0.2026	0.13	Q	|	|	| V	|
17+55	0.2034	0.12	Q	|	|	| V	|
18+ 0	0.2043	0.12	Q	|	|	| V	|
18+ 5	0.2051	0.12	Q	|	|	| V	|
18+10	0.2058	0.10	Q	|	|	| V	|
18+15	0.2064	0.09	Q	|	|	| V	|
18+20	0.2070	0.09	Q	|	|	| V	|
18+25	0.2076	0.08	Q	|	|	| V	|
18+30	0.2082	0.08	Q	|	|	| V	|
18+35	0.2087	0.08	Q	|	|	| V	|
18+40	0.2093	0.08	Q	|	|	| V	|
18+45	0.2098	0.08	Q	|	|	| V	|
18+50	0.2103	0.07	Q	|	|	| V	|
18+55	0.2108	0.07	Q	|	|	| V	|
19+ 0	0.2113	0.07	Q	|	|	| V	|
19+ 5	0.2118	0.07	Q	|	|	| V	|

19+10	0.2123	0.07	Q				V
19+15	0.2127	0.07	Q				V
19+20	0.2132	0.07	Q				V
19+25	0.2136	0.07	Q				V
19+30	0.2141	0.06	Q				V
19+35	0.2145	0.06	Q				V
19+40	0.2150	0.06	Q				V
19+45	0.2154	0.06	Q				V
19+50	0.2158	0.06	Q				V
19+55	0.2162	0.06	Q				V
20+ 0	0.2166	0.06	Q				V
20+ 5	0.2170	0.06	Q				V
20+10	0.2174	0.06	Q				V
20+15	0.2178	0.06	Q				V
20+20	0.2182	0.06	Q				V
20+25	0.2186	0.06	Q				V
20+30	0.2190	0.06	Q				V
20+35	0.2194	0.05	Q				V
20+40	0.2197	0.05	Q				V
20+45	0.2201	0.05	Q				V
20+50	0.2205	0.05	Q				V
20+55	0.2208	0.05	Q				V
21+ 0	0.2212	0.05	Q				V
21+ 5	0.2216	0.05	Q				V
21+10	0.2219	0.05	Q				V
21+15	0.2223	0.05	Q				V
21+20	0.2226	0.05	Q				V
21+25	0.2229	0.05	Q				V
21+30	0.2233	0.05	Q				V
21+35	0.2236	0.05	Q				V

21+40	0.2239	0.05	Q				V
21+45	0.2243	0.05	Q				V
21+50	0.2246	0.05	Q				V
21+55	0.2249	0.05	Q				V
22+ 0	0.2252	0.05	Q				V
22+ 5	0.2255	0.05	Q				V
22+10	0.2259	0.05	Q				V
22+15	0.2262	0.05	Q				V
22+20	0.2265	0.04	Q				V
22+25	0.2268	0.04	Q				V
22+30	0.2271	0.04	Q				V
22+35	0.2274	0.04	Q				V
22+40	0.2277	0.04	Q				V
22+45	0.2280	0.04	Q				V
22+50	0.2283	0.04	Q				V
22+55	0.2286	0.04	Q				V
23+ 0	0.2289	0.04	Q				V
23+ 5	0.2292	0.04	Q				V
23+10	0.2294	0.04	Q				V
23+15	0.2297	0.04	Q				V
23+20	0.2300	0.04	Q				V
23+25	0.2303	0.04	Q				V
23+30	0.2306	0.04	Q				V
23+35	0.2308	0.04	Q				V
23+40	0.2311	0.04	Q				V
23+45	0.2314	0.04	Q				V
23+50	0.2317	0.04	Q				V
23+55	0.2319	0.04	Q				V
24+ 0	0.2322	0.04	Q				V
24+ 5	0.2324	0.04	Q				V

```
   24+10       0.2326      0.02  Q         |          |          |
V|
   24+15       0.2327      0.01  Q         |          |          |
V|
   24+20       0.2327      0.01  Q         |          |          |
V|
   24+25       0.2327      0.00  Q         |          |          |
V|
   24+30       0.2327      0.00  Q         |          |          |
V|
   24+35       0.2327      0.00  Q         |          |          |
V|
   24+40       0.2327      0.00  Q         |          |          |
V|
   24+45       0.2327      0.00  Q         |          |          |
V|
   24+50       0.2327      0.00  Q         |          |          |
V
-------------------------------------------------------------------------
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U n i t H y d r o g r a p h A n a l y s i s

Study date 02/27/17

++

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

Program License Serial Number 6232

Summerland - Chino
2 yr 24 hr storm event
Post Development Condition - Unrouted
Area A2 Pts 201-203

Storm Event Year = 2

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 2		
4.45	1	0.59
Rainfall data for year 2		
4.45	6	1.57
Rainfall data for year 2		
4.45	24	2.77

++

```
      ******** 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          4.45      1.000     0.812    0.400
0.325

      Area-averaged adjusted loss rate Fm (In/Hr) =  0.325

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

      Area       Area          SCS CN    SCS CN      S     Pervious
       (Ac.)      Fract         (AMC2)    (AMC1)           Yield Fr
           1.78   0.400         69.0      49.8      10.08     0.019
           2.67   0.600         98.0      98.0       0.20     0.917

      Area-averaged catchment yield fraction, Y =  0.558
      Area-averaged low loss fraction, Yb =  0.442
      User entry of time of concentration  =   0.135 (hours)
      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
++
      Watershed area =       4.45(Ac.)
      Catchment Lag time =   0.108 hours
      Unit interval =   5.000 minutes
      Unit interval percentage of lag time = 77.1605
      Hydrograph baseflow =     0.00(CFS)
      Average maximum watershed loss rate(Fm) =  0.325(In/Hr)
      Average low loss rate fraction (Yb) = 0.442 (decimal)
      FOOTHILL S-Graph Selected
      Computed peak 5-minute rainfall =  0.220(In)
      Computed peak 30-minute rainfall =  0.451(In)
      Specified peak 1-hour rainfall =  0.595(In)
      Computed peak 3-hour rainfall =  1.079(In)
      Specified peak 6-hour rainfall =  1.570(In)
      Specified peak 24-hour rainfall =  2.770(In)


      Rainfall depth area reduction factors:
      Using a total area of       4.45(Ac.) (Ref: fig. E-4)

      5-minute factor = 1.000     Adjusted rainfall =  0.220(In)
      30-minute factor = 1.000    Adjusted rainfall =  0.451(In)
      1-hour factor = 1.000       Adjusted rainfall =  0.595(In)
      3-hour factor = 1.000       Adjusted rainfall =  1.079(In)
      6-hour factor = 1.000       Adjusted rainfall =  1.570(In)
      24-hour factor = 1.000      Adjusted rainfall =  2.770(In)
      ----------------------------------------------------------------
---

                      U n i t  H y d r o g r a p h
      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Interval          'S' Graph          Unit Hydrograph
      Number            Mean values             ((CFS))
      ----------------------------------------------------------------
---
                 (K =        53.82 (CFS))
```

1	8.448	4.546
2	54.990	25.048
3	80.686	13.829
4	90.748	5.415
5	95.963	2.807
6	98.170	1.187
7	98.974	0.433
8	99.523	0.296
9	99.898	0.202
10	100.000	0.055

Peak Unit Number	Adjusted mass rainfall (In)	Unit rainfall (In)
1	0.2202	0.2202
2	0.2905	0.0703
3	0.3417	0.0512
4	0.3833	0.0417
5	0.4191	0.0358
6	0.4508	0.0317
7	0.4795	0.0287
8	0.5058	0.0263
9	0.5302	0.0244
10	0.5530	0.0228
11	0.5745	0.0215
12	0.5949	0.0203
13	0.6212	0.0264
14	0.6467	0.0254
15	0.6713	0.0246
16	0.6952	0.0239
17	0.7184	0.0232
18	0.7410	0.0226
19	0.7630	0.0220
20	0.7845	0.0215
21	0.8055	0.0210
22	0.8261	0.0206
23	0.8462	0.0201
24	0.8659	0.0197
25	0.8853	0.0194
26	0.9043	0.0190
27	0.9230	0.0187
28	0.9414	0.0184
29	0.9594	0.0181
30	0.9772	0.0178
31	0.9947	0.0175
32	1.0120	0.0173
33	1.0290	0.0170
34	1.0458	0.0168
35	1.0623	0.0166
36	1.0786	0.0163
37	1.0948	0.0161
38	1.1107	0.0159
39	1.1264	0.0157
40	1.1420	0.0156
41	1.1573	0.0154
42	1.1725	0.0152
43	1.1876	0.0150
44	1.2025	0.0149
45	1.2172	0.0147

46	1.2318	0.0146
47	1.2462	0.0144
48	1.2605	0.0143
49	1.2746	0.0142
50	1.2886	0.0140
51	1.3025	0.0139
52	1.3163	0.0138
53	1.3300	0.0136
54	1.3435	0.0135
55	1.3569	0.0134
56	1.3702	0.0133
57	1.3834	0.0132
58	1.3965	0.0131
59	1.4095	0.0130
60	1.4224	0.0129
61	1.4352	0.0128
62	1.4479	0.0127
63	1.4605	0.0126
64	1.4730	0.0125
65	1.4854	0.0124
66	1.4977	0.0123
67	1.5100	0.0122
68	1.5221	0.0122
69	1.5342	0.0121
70	1.5462	0.0120
71	1.5581	0.0119
72	1.5700	0.0118
73	1.5789	0.0089
74	1.5877	0.0088
75	1.5964	0.0088
76	1.6051	0.0087
77	1.6137	0.0086
78	1.6223	0.0086
79	1.6308	0.0085
80	1.6392	0.0084
81	1.6476	0.0084
82	1.6559	0.0083
83	1.6641	0.0082
84	1.6723	0.0082
85	1.6804	0.0081
86	1.6885	0.0081
87	1.6965	0.0080
88	1.7045	0.0080
89	1.7124	0.0079
90	1.7202	0.0079
91	1.7280	0.0078
92	1.7358	0.0078
93	1.7435	0.0077
94	1.7511	0.0077
95	1.7587	0.0076
96	1.7663	0.0076
97	1.7738	0.0075
98	1.7813	0.0075
99	1.7887	0.0074
100	1.7961	0.0074
101	1.8034	0.0073
102	1.8107	0.0073
103	1.8180	0.0072
104	1.8252	0.0072
105	1.8323	0.0072

106	1.8395	0.0071
107	1.8465	0.0071
108	1.8536	0.0070
109	1.8606	0.0070
110	1.8676	0.0070
111	1.8745	0.0069
112	1.8814	0.0069
113	1.8883	0.0069
114	1.8951	0.0068
115	1.9019	0.0068
116	1.9086	0.0068
117	1.9154	0.0067
118	1.9221	0.0067
119	1.9287	0.0067
120	1.9353	0.0066
121	1.9419	0.0066
122	1.9485	0.0066
123	1.9550	0.0065
124	1.9615	0.0065
125	1.9680	0.0065
126	1.9744	0.0064
127	1.9808	0.0064
128	1.9872	0.0064
129	1.9935	0.0063
130	1.9998	0.0063
131	2.0061	0.0063
132	2.0124	0.0063
133	2.0186	0.0062
134	2.0248	0.0062
135	2.0310	0.0062
136	2.0371	0.0061
137	2.0433	0.0061
138	2.0493	0.0061
139	2.0554	0.0061
140	2.0615	0.0060
141	2.0675	0.0060
142	2.0735	0.0060
143	2.0794	0.0060
144	2.0854	0.0059
145	2.0913	0.0059
146	2.0972	0.0059
147	2.1031	0.0059
148	2.1089	0.0058
149	2.1147	0.0058
150	2.1205	0.0058
151	2.1263	0.0058
152	2.1321	0.0058
153	2.1378	0.0057
154	2.1435	0.0057
155	2.1492	0.0057
156	2.1549	0.0057
157	2.1605	0.0056
158	2.1662	0.0056
159	2.1718	0.0056
160	2.1773	0.0056
161	2.1829	0.0056
162	2.1884	0.0055
163	2.1940	0.0055
164	2.1995	0.0055
165	2.2050	0.0055

166	2.2104	0.0055
167	2.2159	0.0054
168	2.2213	0.0054
169	2.2267	0.0054
170	2.2321	0.0054
171	2.2374	0.0054
172	2.2428	0.0053
173	2.2481	0.0053
174	2.2534	0.0053
175	2.2587	0.0053
176	2.2640	0.0053
177	2.2693	0.0053
178	2.2745	0.0052
179	2.2797	0.0052
180	2.2849	0.0052
181	2.2901	0.0052
182	2.2953	0.0052
183	2.3005	0.0052
184	2.3056	0.0051
185	2.3107	0.0051
186	2.3158	0.0051
187	2.3209	0.0051
188	2.3260	0.0051
189	2.3311	0.0051
190	2.3361	0.0050
191	2.3411	0.0050
192	2.3462	0.0050
193	2.3511	0.0050
194	2.3561	0.0050
195	2.3611	0.0050
196	2.3660	0.0050
197	2.3710	0.0049
198	2.3759	0.0049
199	2.3808	0.0049
200	2.3857	0.0049
201	2.3906	0.0049
202	2.3955	0.0049
203	2.4003	0.0048
204	2.4051	0.0048
205	2.4100	0.0048
206	2.4148	0.0048
207	2.4196	0.0048
208	2.4243	0.0048
209	2.4291	0.0048
210	2.4339	0.0048
211	2.4386	0.0047
212	2.4433	0.0047
213	2.4480	0.0047
214	2.4527	0.0047
215	2.4574	0.0047
216	2.4621	0.0047
217	2.4668	0.0047
218	2.4714	0.0046
219	2.4761	0.0046
220	2.4807	0.0046
221	2.4853	0.0046
222	2.4899	0.0046
223	2.4945	0.0046
224	2.4991	0.0046
225	2.5036	0.0046

226	2.5082	0.0046
227	2.5127	0.0045
228	2.5172	0.0045
229	2.5218	0.0045
230	2.5263	0.0045
231	2.5307	0.0045
232	2.5352	0.0045
233	2.5397	0.0045
234	2.5442	0.0045
235	2.5486	0.0044
236	2.5530	0.0044
237	2.5575	0.0044
238	2.5619	0.0044
239	2.5663	0.0044
240	2.5707	0.0044
241	2.5751	0.0044
242	2.5794	0.0044
243	2.5838	0.0044
244	2.5881	0.0043
245	2.5925	0.0043
246	2.5968	0.0043
247	2.6011	0.0043
248	2.6054	0.0043
249	2.6097	0.0043
250	2.6140	0.0043
251	2.6183	0.0043
252	2.6226	0.0043
253	2.6268	0.0043
254	2.6311	0.0042
255	2.6353	0.0042
256	2.6395	0.0042
257	2.6438	0.0042
258	2.6480	0.0042
259	2.6522	0.0042
260	2.6563	0.0042
261	2.6605	0.0042
262	2.6647	0.0042
263	2.6689	0.0042
264	2.6730	0.0042
265	2.6772	0.0041
266	2.6813	0.0041
267	2.6854	0.0041
268	2.6895	0.0041
269	2.6936	0.0041
270	2.6977	0.0041
271	2.7018	0.0041
272	2.7059	0.0041
273	2.7100	0.0041
274	2.7140	0.0041
275	2.7181	0.0041
276	2.7221	0.0040
277	2.7262	0.0040
278	2.7302	0.0040
279	2.7342	0.0040
280	2.7382	0.0040
281	2.7422	0.0040
282	2.7462	0.0040
283	2.7502	0.0040
284	2.7542	0.0040
285	2.7581	0.0040

286	2.7621	0.0040
287	2.7660	0.0040
288	2.7700	0.0039

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0039	0.0017	0.0022
2	0.0040	0.0017	0.0022
3	0.0040	0.0018	0.0022
4	0.0040	0.0018	0.0022
5	0.0040	0.0018	0.0022
6	0.0040	0.0018	0.0022
7	0.0040	0.0018	0.0022
8	0.0040	0.0018	0.0022
9	0.0040	0.0018	0.0023
10	0.0041	0.0018	0.0023
11	0.0041	0.0018	0.0023
12	0.0041	0.0018	0.0023
13	0.0041	0.0018	0.0023
14	0.0041	0.0018	0.0023
15	0.0041	0.0018	0.0023
16	0.0041	0.0018	0.0023
17	0.0042	0.0018	0.0023
18	0.0042	0.0018	0.0023
19	0.0042	0.0018	0.0023
20	0.0042	0.0019	0.0023
21	0.0042	0.0019	0.0023
22	0.0042	0.0019	0.0024
23	0.0042	0.0019	0.0024
24	0.0042	0.0019	0.0024
25	0.0043	0.0019	0.0024
26	0.0043	0.0019	0.0024
27	0.0043	0.0019	0.0024
28	0.0043	0.0019	0.0024
29	0.0043	0.0019	0.0024
30	0.0043	0.0019	0.0024
31	0.0044	0.0019	0.0024
32	0.0044	0.0019	0.0024
33	0.0044	0.0019	0.0024
34	0.0044	0.0019	0.0025
35	0.0044	0.0020	0.0025
36	0.0044	0.0020	0.0025
37	0.0045	0.0020	0.0025
38	0.0045	0.0020	0.0025
39	0.0045	0.0020	0.0025
40	0.0045	0.0020	0.0025
41	0.0045	0.0020	0.0025
42	0.0045	0.0020	0.0025
43	0.0046	0.0020	0.0025
44	0.0046	0.0020	0.0026
45	0.0046	0.0020	0.0026
46	0.0046	0.0020	0.0026
47	0.0046	0.0021	0.0026
48	0.0046	0.0021	0.0026
49	0.0047	0.0021	0.0026
50	0.0047	0.0021	0.0026

51	0.0047	0.0021	0.0026
52	0.0047	0.0021	0.0026
53	0.0048	0.0021	0.0027
54	0.0048	0.0021	0.0027
55	0.0048	0.0021	0.0027
56	0.0048	0.0021	0.0027
57	0.0048	0.0021	0.0027
58	0.0048	0.0021	0.0027
59	0.0049	0.0022	0.0027
60	0.0049	0.0022	0.0027
61	0.0049	0.0022	0.0027
62	0.0049	0.0022	0.0028
63	0.0050	0.0022	0.0028
64	0.0050	0.0022	0.0028
65	0.0050	0.0022	0.0028
66	0.0050	0.0022	0.0028
67	0.0051	0.0022	0.0028
68	0.0051	0.0022	0.0028
69	0.0051	0.0023	0.0028
70	0.0051	0.0023	0.0029
71	0.0052	0.0023	0.0029
72	0.0052	0.0023	0.0029
73	0.0052	0.0023	0.0029
74	0.0052	0.0023	0.0029
75	0.0053	0.0023	0.0029
76	0.0053	0.0023	0.0029
77	0.0053	0.0024	0.0030
78	0.0053	0.0024	0.0030
79	0.0054	0.0024	0.0030
80	0.0054	0.0024	0.0030
81	0.0054	0.0024	0.0030
82	0.0054	0.0024	0.0030
83	0.0055	0.0024	0.0031
84	0.0055	0.0024	0.0031
85	0.0055	0.0025	0.0031
86	0.0056	0.0025	0.0031
87	0.0056	0.0025	0.0031
88	0.0056	0.0025	0.0031
89	0.0057	0.0025	0.0032
90	0.0057	0.0025	0.0032
91	0.0057	0.0025	0.0032
92	0.0058	0.0025	0.0032
93	0.0058	0.0026	0.0032
94	0.0058	0.0026	0.0032
95	0.0059	0.0026	0.0033
96	0.0059	0.0026	0.0033
97	0.0059	0.0026	0.0033
98	0.0060	0.0026	0.0033
99	0.0060	0.0027	0.0034
100	0.0060	0.0027	0.0034
101	0.0061	0.0027	0.0034
102	0.0061	0.0027	0.0034
103	0.0062	0.0027	0.0034
104	0.0062	0.0027	0.0035
105	0.0063	0.0028	0.0035
106	0.0063	0.0028	0.0035
107	0.0063	0.0028	0.0035
108	0.0064	0.0028	0.0036
109	0.0064	0.0028	0.0036
110	0.0065	0.0029	0.0036

111	0.0065	0.0029	0.0036
112	0.0066	0.0029	0.0037
113	0.0066	0.0029	0.0037
114	0.0067	0.0029	0.0037
115	0.0067	0.0030	0.0037
116	0.0068	0.0030	0.0038
117	0.0068	0.0030	0.0038
118	0.0069	0.0030	0.0038
119	0.0069	0.0031	0.0039
120	0.0070	0.0031	0.0039
121	0.0070	0.0031	0.0039
122	0.0071	0.0031	0.0040
123	0.0072	0.0032	0.0040
124	0.0072	0.0032	0.0040
125	0.0073	0.0032	0.0041
126	0.0073	0.0032	0.0041
127	0.0074	0.0033	0.0041
128	0.0075	0.0033	0.0042
129	0.0076	0.0033	0.0042
130	0.0076	0.0034	0.0042
131	0.0077	0.0034	0.0043
132	0.0078	0.0034	0.0043
133	0.0079	0.0035	0.0044
134	0.0079	0.0035	0.0044
135	0.0080	0.0035	0.0045
136	0.0081	0.0036	0.0045
137	0.0082	0.0036	0.0046
138	0.0082	0.0036	0.0046
139	0.0084	0.0037	0.0047
140	0.0084	0.0037	0.0047
141	0.0086	0.0038	0.0048
142	0.0086	0.0038	0.0048
143	0.0088	0.0039	0.0049
144	0.0088	0.0039	0.0049
145	0.0118	0.0052	0.0066
146	0.0119	0.0053	0.0066
147	0.0121	0.0053	0.0067
148	0.0122	0.0054	0.0068
149	0.0123	0.0055	0.0069
150	0.0124	0.0055	0.0069
151	0.0126	0.0056	0.0070
152	0.0127	0.0056	0.0071
153	0.0129	0.0057	0.0072
154	0.0130	0.0057	0.0072
155	0.0132	0.0058	0.0074
156	0.0133	0.0059	0.0074
157	0.0135	0.0060	0.0075
158	0.0136	0.0060	0.0076
159	0.0139	0.0061	0.0077
160	0.0140	0.0062	0.0078
161	0.0143	0.0063	0.0080
162	0.0144	0.0064	0.0080
163	0.0147	0.0065	0.0082
164	0.0149	0.0066	0.0083
165	0.0152	0.0067	0.0085
166	0.0154	0.0068	0.0086
167	0.0157	0.0070	0.0088
168	0.0159	0.0070	0.0089
169	0.0163	0.0072	0.0091
170	0.0166	0.0073	0.0092

171	0.0170	0.0075	0.0095
172	0.0173	0.0076	0.0096
173	0.0178	0.0079	0.0099
174	0.0181	0.0080	0.0101
175	0.0187	0.0083	0.0104
176	0.0190	0.0084	0.0106
177	0.0197	0.0087	0.0110
178	0.0201	0.0089	0.0112
179	0.0210	0.0093	0.0117
180	0.0215	0.0095	0.0120
181	0.0226	0.0100	0.0126
182	0.0232	0.0103	0.0129
183	0.0246	0.0109	0.0137
184	0.0254	0.0113	0.0142
185	0.0203	0.0090	0.0113
186	0.0215	0.0095	0.0120
187	0.0244	0.0108	0.0136
188	0.0263	0.0116	0.0147
189	0.0317	0.0140	0.0177
190	0.0358	0.0158	0.0200
191	0.0512	0.0226	0.0285
192	0.0703	0.0271	0.0433
193	0.2202	0.0271	0.1931
194	0.0417	0.0184	0.0232
195	0.0287	0.0127	0.0160
196	0.0228	0.0101	0.0127
197	0.0264	0.0117	0.0147
198	0.0239	0.0106	0.0133
199	0.0220	0.0097	0.0123
200	0.0206	0.0091	0.0115
201	0.0194	0.0086	0.0108
202	0.0184	0.0081	0.0102
203	0.0175	0.0077	0.0098
204	0.0168	0.0074	0.0094
205	0.0161	0.0071	0.0090
206	0.0156	0.0069	0.0087
207	0.0150	0.0067	0.0084
208	0.0146	0.0064	0.0081
209	0.0142	0.0063	0.0079
210	0.0138	0.0061	0.0077
211	0.0134	0.0059	0.0075
212	0.0131	0.0058	0.0073
213	0.0128	0.0057	0.0071
214	0.0125	0.0055	0.0070
215	0.0122	0.0054	0.0068
216	0.0120	0.0053	0.0067
217	0.0089	0.0039	0.0050
218	0.0087	0.0038	0.0048
219	0.0085	0.0038	0.0047
220	0.0083	0.0037	0.0046
221	0.0081	0.0036	0.0045
222	0.0080	0.0035	0.0044
223	0.0078	0.0035	0.0044
224	0.0077	0.0034	0.0043
225	0.0075	0.0033	0.0042
226	0.0074	0.0033	0.0041
227	0.0072	0.0032	0.0040
228	0.0071	0.0032	0.0040
229	0.0070	0.0031	0.0039
230	0.0069	0.0031	0.0038

231	0.0068	0.0030	0.0038
232	0.0067	0.0030	0.0037
233	0.0066	0.0029	0.0037
234	0.0065	0.0029	0.0036
235	0.0064	0.0028	0.0036
236	0.0063	0.0028	0.0035
237	0.0062	0.0028	0.0035
238	0.0061	0.0027	0.0034
239	0.0061	0.0027	0.0034
240	0.0060	0.0027	0.0033
241	0.0059	0.0026	0.0033
242	0.0058	0.0026	0.0033
243	0.0058	0.0026	0.0032
244	0.0057	0.0025	0.0032
245	0.0056	0.0025	0.0031
246	0.0056	0.0025	0.0031
247	0.0055	0.0024	0.0031
248	0.0055	0.0024	0.0030
249	0.0054	0.0024	0.0030
250	0.0053	0.0024	0.0030
251	0.0053	0.0023	0.0030
252	0.0052	0.0023	0.0029
253	0.0052	0.0023	0.0029
254	0.0051	0.0023	0.0029
255	0.0051	0.0023	0.0028
256	0.0050	0.0022	0.0028
257	0.0050	0.0022	0.0028
258	0.0050	0.0022	0.0028
259	0.0049	0.0022	0.0027
260	0.0049	0.0022	0.0027
261	0.0048	0.0021	0.0027
262	0.0048	0.0021	0.0027
263	0.0047	0.0021	0.0026
264	0.0047	0.0021	0.0026
265	0.0047	0.0021	0.0026
266	0.0046	0.0020	0.0026
267	0.0046	0.0020	0.0026
268	0.0046	0.0020	0.0025
269	0.0045	0.0020	0.0025
270	0.0045	0.0020	0.0025
271	0.0044	0.0020	0.0025
272	0.0044	0.0020	0.0025
273	0.0044	0.0019	0.0024
274	0.0043	0.0019	0.0024
275	0.0043	0.0019	0.0024
276	0.0043	0.0019	0.0024
277	0.0043	0.0019	0.0024
278	0.0042	0.0019	0.0024
279	0.0042	0.0019	0.0023
280	0.0042	0.0018	0.0023
281	0.0041	0.0018	0.0023
282	0.0041	0.0018	0.0023
283	0.0041	0.0018	0.0023
284	0.0041	0.0018	0.0023
285	0.0040	0.0018	0.0023
286	0.0040	0.0018	0.0022
287	0.0040	0.0018	0.0022
288	0.0040	0.0018	0.0022

--

```
      ----------------------------------------------------------------------
--
      Total soil rain loss =      1.15(In)
      Total effective rainfall =      1.62(In)
      Peak flow rate in flood hydrograph =      5.79(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      0.01  Q         |         |         |
|
    0+10       0.0005      0.07  Q         |         |         |
|
    0+15       0.0012      0.10  Q         |         |         |
|
    0+20       0.0019      0.11  Q         |         |         |
|
    0+25       0.0027      0.11  Q         |         |         |
|
    0+30       0.0035      0.12  Q         |         |         |
|
    0+35       0.0043      0.12  Q         |         |         |
|
    0+40       0.0052      0.12  Q         |         |         |
|
    0+45       0.0060      0.12  Q         |         |         |
|
    0+50       0.0068      0.12  Q         |         |         |
|
    0+55       0.0077      0.12  Q         |         |         |
|
    1+ 0       0.0085      0.12  Q         |         |         |
|
    1+ 5       0.0093      0.12  Q         |         |         |
|
    1+10       0.0102      0.12  Q         |         |         |
|
    1+15       0.0110      0.12  Q         |         |         |
|
    1+20       0.0119      0.12  Q         |         |         |
|
    1+25       0.0127      0.12  Q         |         |         |
|
    1+30       0.0136      0.12  Q         |         |         |
|
    1+35       0.0144      0.12  Q         |         |         |
|
    1+40       0.0153      0.13  QV        |         |         |
```

1+45	0.0162	0.13	QV			
1+50	0.0170	0.13	QV			
1+55	0.0179	0.13	QV			
2+ 0	0.0188	0.13	QV			
2+ 5	0.0197	0.13	QV			
2+10	0.0205	0.13	QV			
2+15	0.0214	0.13	QV			
2+20	0.0223	0.13	QV			
2+25	0.0232	0.13	QV			
2+30	0.0241	0.13	QV			
2+35	0.0250	0.13	QV			
2+40	0.0259	0.13	QV			
2+45	0.0268	0.13	QV			
2+50	0.0277	0.13	QV			
2+55	0.0286	0.13	QV			
3+ 0	0.0295	0.13	QV			
3+ 5	0.0304	0.13	Q V			
3+10	0.0313	0.13	Q V			
3+15	0.0323	0.13	Q V			
3+20	0.0332	0.13	Q V			
3+25	0.0341	0.13	Q V			
3+30	0.0350	0.14	Q V			
3+35	0.0360	0.14	Q V			
3+40	0.0369	0.14	Q V			
3+45	0.0379	0.14	Q V			
3+50	0.0388	0.14	Q V			
3+55	0.0398	0.14	Q V			
4+ 0	0.0407	0.14	Q V			
4+ 5	0.0417	0.14	Q V			
4+10	0.0426	0.14	Q V			

4+15	0.0436	0.14	Q V	|	|	|
4+20	0.0446	0.14	Q V	|	|	|
4+25	0.0455	0.14	Q V	|	|	|
4+30	0.0465	0.14	Q V	|	|	|
4+35	0.0475	0.14	Q V	|	|	|
4+40	0.0485	0.14	Q V	|	|	|
4+45	0.0495	0.14	Q V	|	|	|
4+50	0.0505	0.14	Q V	|	|	|
4+55	0.0515	0.15	Q V	|	|	|
5+ 0	0.0525	0.15	Q V	|	|	|
5+ 5	0.0535	0.15	Q V	|	|	|
5+10	0.0545	0.15	Q V	|	|	|
5+15	0.0555	0.15	Q V	|	|	|
5+20	0.0566	0.15	Q V	|	|	|
5+25	0.0576	0.15	Q V	|	|	|
5+30	0.0586	0.15	Q V	|	|	|
5+35	0.0596	0.15	Q V	|	|	|
5+40	0.0607	0.15	Q V	|	|	|
5+45	0.0617	0.15	Q V	|	|	|
5+50	0.0628	0.15	Q V	|	|	|
5+55	0.0638	0.15	Q V	|	|	|
6+ 0	0.0649	0.15	Q V	|	|	|
6+ 5	0.0660	0.15	Q V	|	|	|
6+10	0.0670	0.16	Q V	|	|	|
6+15	0.0681	0.16	Q V	|	|	|
6+20	0.0692	0.16	Q V	|	|	|
6+25	0.0703	0.16	Q V	|	|	|
6+30	0.0714	0.16	Q V	|	|	|
6+35	0.0725	0.16	Q V	|	|	|
6+40	0.0736	0.16	Q V	|	|	|

6+45	0.0747	0.16	Q	V			
6+50	0.0758	0.16	Q	V			
6+55	0.0769	0.16	Q	V			
7+ 0	0.0781	0.16	Q	V			
7+ 5	0.0792	0.16	Q	V			
7+10	0.0803	0.17	Q	V			
7+15	0.0815	0.17	Q	V			
7+20	0.0826	0.17	Q	V			
7+25	0.0838	0.17	Q	V			
7+30	0.0850	0.17	Q	V			
7+35	0.0861	0.17	Q	V			
7+40	0.0873	0.17	Q	V			
7+45	0.0885	0.17	Q	V			
7+50	0.0897	0.17	Q	V			
7+55	0.0909	0.17	Q	V			
8+ 0	0.0921	0.18	Q	V			
8+ 5	0.0933	0.18	Q	V			
8+10	0.0945	0.18	Q	V			
8+15	0.0958	0.18	Q	V			
8+20	0.0970	0.18	Q	V			
8+25	0.0982	0.18	Q	V			
8+30	0.0995	0.18	Q	V			
8+35	0.1008	0.18	Q	V			
8+40	0.1020	0.18	Q	V			
8+45	0.1033	0.19	Q	V			
8+50	0.1046	0.19	Q	V			
8+55	0.1059	0.19	Q	V			
9+ 0	0.1072	0.19	Q	V			
9+ 5	0.1085	0.19	Q	V			
9+10	0.1098	0.19	Q	V			

9+15	0.1111	0.19	Q	V			
9+20	0.1125	0.19	Q	V			
9+25	0.1138	0.20	Q	V			
9+30	0.1152	0.20	Q	V			
9+35	0.1166	0.20	Q	V			
9+40	0.1179	0.20	Q	V			
9+45	0.1193	0.20	Q	V			
9+50	0.1207	0.20	Q	V			
9+55	0.1222	0.20	Q	V			
10+ 0	0.1236	0.21	Q	V			
10+ 5	0.1250	0.21	Q	V			
10+10	0.1265	0.21	Q	V			
10+15	0.1279	0.21	Q	V			
10+20	0.1294	0.21	Q	V			
10+25	0.1309	0.22	Q	V			
10+30	0.1324	0.22	Q	V			
10+35	0.1339	0.22	Q	V			
10+40	0.1354	0.22	Q	V			
10+45	0.1369	0.22	Q	V			
10+50	0.1385	0.23	Q	V			
10+55	0.1400	0.23	Q	V			
11+ 0	0.1416	0.23	Q	V			
11+ 5	0.1432	0.23	Q	V			
11+10	0.1448	0.23	Q	V			
11+15	0.1465	0.24	Q	V			
11+20	0.1481	0.24	Q	V			
11+25	0.1498	0.24	Q	V			
11+30	0.1514	0.24	Q	V			
11+35	0.1531	0.25	Q	V			
11+40	0.1548	0.25	Q	V			

|
| 11+45 | 0.1566 | 0.25 | Q | V | | |
|
| 11+50 | 0.1583 | 0.25 | Q | V | | |
|
| 11+55 | 0.1601 | 0.26 | Q | V | | |
|
| 12+ 0 | 0.1619 | 0.26 | Q | V | | |
|
| 12+ 5 | 0.1637 | 0.27 | Q | V | | |
|
| 12+10 | 0.1659 | 0.31 | Q | V | | |
|
| 12+15 | 0.1682 | 0.34 | Q | V | | |
|
| 12+20 | 0.1707 | 0.35 | Q | V | | |
|
| 12+25 | 0.1731 | 0.36 | Q | V | | |
|
| 12+30 | 0.1756 | 0.37 | Q | V | | |
|
| 12+35 | 0.1782 | 0.37 | Q | V | | |
|
| 12+40 | 0.1808 | 0.37 | Q | V | | |
|
| 12+45 | 0.1834 | 0.38 | Q | V | | |
|
| 12+50 | 0.1860 | 0.38 | Q | V | | |
|
| 12+55 | 0.1887 | 0.39 | Q | V | | |
|
| 13+ 0 | 0.1914 | 0.39 | Q | V | | |
|
| 13+ 5 | 0.1941 | 0.40 | Q | V | | |
|
| 13+10 | 0.1969 | 0.40 | Q | V | | |
|
| 13+15 | 0.1997 | 0.41 | Q | V | | |
|
| 13+20 | 0.2025 | 0.41 | Q | V | | |
|
| 13+25 | 0.2054 | 0.42 | Q | V | | |
|
| 13+30 | 0.2083 | 0.42 | Q | V | | |
|
| 13+35 | 0.2113 | 0.43 | Q | V | | |
|
| 13+40 | 0.2143 | 0.44 | Q | V | | |
|
| 13+45 | 0.2173 | 0.44 | Q | V | | |
|
| 13+50 | 0.2204 | 0.45 | Q | V | | |
|
| 13+55 | 0.2236 | 0.46 | Q | V | | |
|
| 14+ 0 | 0.2268 | 0.47 | Q | V | | |
|
| 14+ 5 | 0.2300 | 0.47 | Q | V | | |
|
| 14+10 | 0.2334 | 0.48 | Q | V | | |

14+15	0.2367	0.49	Q		V	
14+20	0.2402	0.50	Q		V	
14+25	0.2437	0.51	Q		V	
14+30	0.2473	0.52	Q		V	
14+35	0.2510	0.54	Q		V	
14+40	0.2548	0.55	Q		V	
14+45	0.2587	0.56	Q		V	
14+50	0.2627	0.58	Q		V	
14+55	0.2668	0.59	Q		V	
15+ 0	0.2710	0.61	Q		V	
15+ 5	0.2754	0.63	Q		V	
15+10	0.2799	0.66	Q		V	
15+15	0.2846	0.68	Q		V	
15+20	0.2895	0.71	Q		V	
15+25	0.2945	0.73	Q		V	
15+30	0.2992	0.67	Q		V	
15+35	0.3037	0.66	Q		V	
15+40	0.3085	0.70	Q		V	
15+45	0.3138	0.76	Q		V	
15+50	0.3198	0.87	Q		V	
15+55	0.3268	1.02	Q		V	
16+ 0	0.3361	1.35	Q		V	
16+ 5	0.3536	2.54	Q		V	
16+10	0.3935	5.79			Q V	
16+15	0.4188	3.68		Q	V	
16+20	0.4326	2.00	Q		V	
16+25	0.4419	1.35	Q		V	
16+30	0.4489	1.02	Q		V	
16+35	0.4547	0.84	Q		V	
16+40	0.4599	0.76	Q		V	

16+45	0.4646	0.69	Q			V
16+50	0.4689	0.62	Q			V
16+55	0.4729	0.58	Q			V
17+ 0	0.4766	0.55	Q			V
17+ 5	0.4802	0.52	Q			V
17+10	0.4837	0.50	Q			V
17+15	0.4870	0.48	Q			V
17+20	0.4902	0.46	Q			V
17+25	0.4933	0.45	Q			V
17+30	0.4963	0.43	Q			V
17+35	0.4992	0.42	Q			V
17+40	0.5020	0.41	Q			V
17+45	0.5048	0.40	Q			V
17+50	0.5075	0.39	Q			V
17+55	0.5101	0.38	Q			V
18+ 0	0.5127	0.37	Q			V
18+ 5	0.5151	0.36	Q			V
18+10	0.5173	0.31	Q			V
18+15	0.5192	0.28	Q			V
18+20	0.5211	0.27	Q			V
18+25	0.5228	0.26	Q			V
18+30	0.5246	0.25	Q			V
18+35	0.5262	0.24	Q			V
18+40	0.5279	0.24	Q			V
18+45	0.5295	0.23	Q			V
18+50	0.5311	0.23	Q			V
18+55	0.5326	0.22	Q			V
19+ 0	0.5341	0.22	Q			V
19+ 5	0.5356	0.22	Q			V
19+10	0.5371	0.21	Q			V

19+15	0.5385	0.21	Q				V
19+20	0.5399	0.21	Q				V
19+25	0.5413	0.20	Q				V
19+30	0.5427	0.20	Q				V
19+35	0.5441	0.20	Q				V
19+40	0.5454	0.19	Q				V
19+45	0.5467	0.19	Q				V
19+50	0.5480	0.19	Q				V
19+55	0.5493	0.19	Q				V
20+ 0	0.5506	0.18	Q				V
20+ 5	0.5518	0.18	Q				V
20+10	0.5531	0.18	Q				V
20+15	0.5543	0.18	Q				V
20+20	0.5555	0.17	Q				V
20+25	0.5567	0.17	Q				V
20+30	0.5579	0.17	Q				V
20+35	0.5590	0.17	Q				V
20+40	0.5602	0.17	Q				V
20+45	0.5613	0.17	Q				V
20+50	0.5624	0.16	Q				V
20+55	0.5636	0.16	Q				V
21+ 0	0.5647	0.16	Q				V
21+ 5	0.5658	0.16	Q				V
21+10	0.5668	0.16	Q				V
21+15	0.5679	0.16	Q				V
21+20	0.5690	0.15	Q				V
21+25	0.5700	0.15	Q				V
21+30	0.5711	0.15	Q				V
21+35	0.5721	0.15	Q				V
21+40	0.5731	0.15	Q				V

21+45	0.5741	0.15	Q				V
21+50	0.5751	0.15	Q				V
21+55	0.5761	0.14	Q				V
22+ 0	0.5771	0.14	Q				V
22+ 5	0.5781	0.14	Q				V
22+10	0.5790	0.14	Q				V
22+15	0.5800	0.14	Q				V
22+20	0.5810	0.14	Q				V
22+25	0.5819	0.14	Q				V
22+30	0.5828	0.14	Q				V
22+35	0.5838	0.14	Q				V
22+40	0.5847	0.13	Q				V
22+45	0.5856	0.13	Q				V
22+50	0.5865	0.13	Q				V
22+55	0.5874	0.13	Q				V
23+ 0	0.5883	0.13	Q				V
23+ 5	0.5892	0.13	Q				V
23+10	0.5901	0.13	Q				V
23+15	0.5910	0.13	Q				V
23+20	0.5919	0.13	Q				V
23+25	0.5927	0.13	Q				V
23+30	0.5936	0.12	Q				V
23+35	0.5944	0.12	Q				V
23+40	0.5953	0.12	Q				V
23+45	0.5961	0.12	Q				V
23+50	0.5970	0.12	Q				V
23+55	0.5978	0.12	Q				V
24+ 0	0.5986	0.12	Q				V
24+ 5	0.5994	0.11	Q				V
24+10	0.5998	0.05	Q				

24+15	0.5999	0.02	Q			
24+20	0.6000	0.01	Q			
24+25	0.6000	0.00	Q			
24+30	0.6000	0.00	Q			
24+35	0.6000	0.00	Q			
24+40	0.6001	0.00	Q			
24+45	0.6001	0.00	Q			

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

Study date 02/16/17

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

Program License Serial Number 6232

Summerland - Chino
2 yr 24 hr storm event
Pre-Development Conditions
Area A3 pts 301-302

Storm Event Year = 2

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 2		
0.40	1	0.59
Rainfall data for year 2		
0.40	6	1.57
Rainfall data for year 2		
0.40	24	2.77

++

******** 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)
79.0	61.8	0.40	1.000	0.654	0.010	0.007

Area-averaged adjusted loss rate Fm (In/Hr) = 0.007

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

Area (Ac.)	Area Fract	SCS CN (AMC2)	SCS CN (AMC1)	S	Pervious Yield Fr
0.00	0.010	79.0	61.8	6.18	0.110
0.40	0.990	98.0	98.0	0.20	0.917

Area-averaged catchment yield fraction, Y = 0.909
Area-averaged low loss fraction, Yb = 0.091
User entry of time of concentration = 0.242 (hours)
++

Watershed area = 0.40(Ac.)
Catchment Lag time = 0.193 hours
Unit interval = 5.000 minutes
Unit interval percentage of lag time = 43.1029
Hydrograph baseflow = 0.00(CFS)
Average maximum watershed loss rate(Fm) = 0.007(In/Hr)
Average low loss rate fraction (Yb) = 0.091 (decimal)
FOOTHILL S-Graph Selected
Computed peak 5-minute rainfall = 0.220(In)
Computed peak 30-minute rainfall = 0.451(In)
Specified peak 1-hour rainfall = 0.595(In)
Computed peak 3-hour rainfall = 1.079(In)
Specified peak 6-hour rainfall = 1.570(In)
Specified peak 24-hour rainfall = 2.770(In)

Rainfall depth area reduction factors:
Using a total area of 0.40(Ac.) (Ref: fig. E-4)

5-minute factor = 1.000 Adjusted rainfall = 0.220(In)
30-minute factor = 1.000 Adjusted rainfall = 0.451(In)
1-hour factor = 1.000 Adjusted rainfall = 0.595(In)
3-hour factor = 1.000 Adjusted rainfall = 1.079(In)
6-hour factor = 1.000 Adjusted rainfall = 1.570(In)
24-hour factor = 1.000 Adjusted rainfall = 2.770(In)

U n i t H y d r o g r a p h
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Interval Number	'S' Graph Mean values	Unit Hydrograph ((CFS))

(K = 4.84 (CFS))

1	3.475	0.168
2	17.231	0.665
3	52.598	1.711
4	71.760	0.927
5	81.173	0.455
6	87.402	0.301
7	91.763	0.211
8	94.816	0.148
9	96.829	0.097
10	97.987	0.056
11	98.517	0.026
12	98.943	0.021
13	99.235	0.014
14	99.555	0.015
15	99.800	0.012
16	99.936	0.007
17	100.000	0.003

Peak Unit Number	Adjusted mass rainfall (In)	Unit rainfall (In)
1	0.2202	0.2202
2	0.2906	0.0704
3	0.3417	0.0512
4	0.3834	0.0417
5	0.4192	0.0358
6	0.4509	0.0317
7	0.4796	0.0287
8	0.5059	0.0263
9	0.5303	0.0244
10	0.5531	0.0228
11	0.5746	0.0215
12	0.5950	0.0204
13	0.6213	0.0264
14	0.6468	0.0254
15	0.6714	0.0246
16	0.6953	0.0239
17	0.7185	0.0232
18	0.7411	0.0226
19	0.7631	0.0220
20	0.7846	0.0215
21	0.8056	0.0210
22	0.8262	0.0206
23	0.8463	0.0201
24	0.8660	0.0197
25	0.8854	0.0194
26	0.9044	0.0190
27	0.9231	0.0187
28	0.9414	0.0184
29	0.9595	0.0181
30	0.9773	0.0178
31	0.9948	0.0175
32	1.0120	0.0173
33	1.0290	0.0170
34	1.0458	0.0168
35	1.0623	0.0165
36	1.0787	0.0163
37	1.0948	0.0161
38	1.1107	0.0159

39	1.1264	0.0157
40	1.1420	0.0156
41	1.1574	0.0154
42	1.1726	0.0152
43	1.1876	0.0150
44	1.2025	0.0149
45	1.2172	0.0147
46	1.2318	0.0146
47	1.2462	0.0144
48	1.2605	0.0143
49	1.2747	0.0142
50	1.2887	0.0140
51	1.3026	0.0139
52	1.3163	0.0138
53	1.3300	0.0136
54	1.3435	0.0135
55	1.3569	0.0134
56	1.3702	0.0133
57	1.3834	0.0132
58	1.3965	0.0131
59	1.4095	0.0130
60	1.4224	0.0129
61	1.4352	0.0128
62	1.4479	0.0127
63	1.4605	0.0126
64	1.4730	0.0125
65	1.4854	0.0124
66	1.4977	0.0123
67	1.5100	0.0122
68	1.5221	0.0122
69	1.5342	0.0121
70	1.5462	0.0120
71	1.5582	0.0119
72	1.5700	0.0118
73	1.5789	0.0089
74	1.5877	0.0088
75	1.5965	0.0088
76	1.6052	0.0087
77	1.6138	0.0086
78	1.6223	0.0086
79	1.6308	0.0085
80	1.6392	0.0084
81	1.6476	0.0084
82	1.6559	0.0083
83	1.6641	0.0082
84	1.6723	0.0082
85	1.6804	0.0081
86	1.6885	0.0081
87	1.6965	0.0080
88	1.7045	0.0080
89	1.7124	0.0079
90	1.7202	0.0079
91	1.7280	0.0078
92	1.7358	0.0078
93	1.7435	0.0077
94	1.7512	0.0077
95	1.7588	0.0076
96	1.7663	0.0076
97	1.7738	0.0075
98	1.7813	0.0075

99	1.7887	0.0074
100	1.7961	0.0074
101	1.8034	0.0073
102	1.8107	0.0073
103	1.8180	0.0072
104	1.8252	0.0072
105	1.8324	0.0072
106	1.8395	0.0071
107	1.8466	0.0071
108	1.8536	0.0070
109	1.8606	0.0070
110	1.8676	0.0070
111	1.8745	0.0069
112	1.8814	0.0069
113	1.8883	0.0069
114	1.8951	0.0068
115	1.9019	0.0068
116	1.9087	0.0068
117	1.9154	0.0067
118	1.9221	0.0067
119	1.9287	0.0067
120	1.9354	0.0066
121	1.9419	0.0066
122	1.9485	0.0066
123	1.9550	0.0065
124	1.9615	0.0065
125	1.9680	0.0065
126	1.9744	0.0064
127	1.9808	0.0064
128	1.9872	0.0064
129	1.9935	0.0063
130	1.9998	0.0063
131	2.0061	0.0063
132	2.0124	0.0063
133	2.0186	0.0062
134	2.0248	0.0062
135	2.0310	0.0062
136	2.0371	0.0061
137	2.0433	0.0061
138	2.0494	0.0061
139	2.0554	0.0061
140	2.0615	0.0060
141	2.0675	0.0060
142	2.0735	0.0060
143	2.0795	0.0060
144	2.0854	0.0059
145	2.0913	0.0059
146	2.0972	0.0059
147	2.1031	0.0059
148	2.1089	0.0058
149	2.1148	0.0058
150	2.1206	0.0058
151	2.1263	0.0058
152	2.1321	0.0058
153	2.1378	0.0057
154	2.1435	0.0057
155	2.1492	0.0057
156	2.1549	0.0057
157	2.1605	0.0056
158	2.1662	0.0056

159	2.1718	0.0056
160	2.1774	0.0056
161	2.1829	0.0056
162	2.1885	0.0055
163	2.1940	0.0055
164	2.1995	0.0055
165	2.2050	0.0055
166	2.2104	0.0055
167	2.2159	0.0054
168	2.2213	0.0054
169	2.2267	0.0054
170	2.2321	0.0054
171	2.2375	0.0054
172	2.2428	0.0053
173	2.2481	0.0053
174	2.2535	0.0053
175	2.2588	0.0053
176	2.2640	0.0053
177	2.2693	0.0053
178	2.2745	0.0052
179	2.2798	0.0052
180	2.2850	0.0052
181	2.2902	0.0052
182	2.2953	0.0052
183	2.3005	0.0052
184	2.3056	0.0051
185	2.3108	0.0051
186	2.3159	0.0051
187	2.3210	0.0051
188	2.3260	0.0051
189	2.3311	0.0051
190	2.3361	0.0050
191	2.3412	0.0050
192	2.3462	0.0050
193	2.3512	0.0050
194	2.3561	0.0050
195	2.3611	0.0050
196	2.3661	0.0050
197	2.3710	0.0049
198	2.3759	0.0049
199	2.3808	0.0049
200	2.3857	0.0049
201	2.3906	0.0049
202	2.3955	0.0049
203	2.4003	0.0048
204	2.4052	0.0048
205	2.4100	0.0048
206	2.4148	0.0048
207	2.4196	0.0048
208	2.4244	0.0048
209	2.4291	0.0048
210	2.4339	0.0048
211	2.4386	0.0047
212	2.4433	0.0047
213	2.4481	0.0047
214	2.4528	0.0047
215	2.4574	0.0047
216	2.4621	0.0047
217	2.4668	0.0047
218	2.4714	0.0046

219	2.4761	0.0046
220	2.4807	0.0046
221	2.4853	0.0046
222	2.4899	0.0046
223	2.4945	0.0046
224	2.4991	0.0046
225	2.5036	0.0046
226	2.5082	0.0046
227	2.5127	0.0045
228	2.5173	0.0045
229	2.5218	0.0045
230	2.5263	0.0045
231	2.5308	0.0045
232	2.5352	0.0045
233	2.5397	0.0045
234	2.5442	0.0045
235	2.5486	0.0044
236	2.5531	0.0044
237	2.5575	0.0044
238	2.5619	0.0044
239	2.5663	0.0044
240	2.5707	0.0044
241	2.5751	0.0044
242	2.5794	0.0044
243	2.5838	0.0044
244	2.5882	0.0043
245	2.5925	0.0043
246	2.5968	0.0043
247	2.6011	0.0043
248	2.6054	0.0043
249	2.6097	0.0043
250	2.6140	0.0043
251	2.6183	0.0043
252	2.6226	0.0043
253	2.6268	0.0043
254	2.6311	0.0042
255	2.6353	0.0042
256	2.6395	0.0042
257	2.6438	0.0042
258	2.6480	0.0042
259	2.6522	0.0042
260	2.6564	0.0042
261	2.6605	0.0042
262	2.6647	0.0042
263	2.6689	0.0042
264	2.6730	0.0042
265	2.6772	0.0041
266	2.6813	0.0041
267	2.6854	0.0041
268	2.6895	0.0041
269	2.6936	0.0041
270	2.6977	0.0041
271	2.7018	0.0041
272	2.7059	0.0041
273	2.7100	0.0041
274	2.7140	0.0041
275	2.7181	0.0041
276	2.7221	0.0040
277	2.7262	0.0040
278	2.7302	0.0040

279	2.7342	0.0040
280	2.7382	0.0040
281	2.7422	0.0040
282	2.7462	0.0040
283	2.7502	0.0040
284	2.7542	0.0040
285	2.7581	0.0040
286	2.7621	0.0040
287	2.7661	0.0040
288	2.7700	0.0039

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0039	0.0004	0.0036
2	0.0040	0.0004	0.0036
3	0.0040	0.0004	0.0036
4	0.0040	0.0004	0.0036
5	0.0040	0.0004	0.0036
6	0.0040	0.0004	0.0036
7	0.0040	0.0004	0.0037
8	0.0040	0.0004	0.0037
9	0.0040	0.0004	0.0037
10	0.0041	0.0004	0.0037
11	0.0041	0.0004	0.0037
12	0.0041	0.0004	0.0037
13	0.0041	0.0004	0.0037
14	0.0041	0.0004	0.0037
15	0.0041	0.0004	0.0037
16	0.0041	0.0004	0.0038
17	0.0042	0.0004	0.0038
18	0.0042	0.0004	0.0038
19	0.0042	0.0004	0.0038
20	0.0042	0.0004	0.0038
21	0.0042	0.0004	0.0038
22	0.0042	0.0004	0.0038
23	0.0042	0.0004	0.0039
24	0.0042	0.0004	0.0039
25	0.0043	0.0004	0.0039
26	0.0043	0.0004	0.0039
27	0.0043	0.0004	0.0039
28	0.0043	0.0004	0.0039
29	0.0043	0.0004	0.0039
30	0.0043	0.0004	0.0039
31	0.0044	0.0004	0.0040
32	0.0044	0.0004	0.0040
33	0.0044	0.0004	0.0040
34	0.0044	0.0004	0.0040
35	0.0044	0.0004	0.0040
36	0.0044	0.0004	0.0040
37	0.0045	0.0004	0.0041
38	0.0045	0.0004	0.0041
39	0.0045	0.0004	0.0041
40	0.0045	0.0004	0.0041
41	0.0045	0.0004	0.0041
42	0.0045	0.0004	0.0041
43	0.0046	0.0004	0.0041

44	0.0046	0.0004	0.0042
45	0.0046	0.0004	0.0042
46	0.0046	0.0004	0.0042
47	0.0046	0.0004	0.0042
48	0.0046	0.0004	0.0042
49	0.0047	0.0004	0.0042
50	0.0047	0.0004	0.0043
51	0.0047	0.0004	0.0043
52	0.0047	0.0004	0.0043
53	0.0048	0.0004	0.0043
54	0.0048	0.0004	0.0043
55	0.0048	0.0004	0.0044
56	0.0048	0.0004	0.0044
57	0.0048	0.0004	0.0044
58	0.0048	0.0004	0.0044
59	0.0049	0.0004	0.0044
60	0.0049	0.0004	0.0044
61	0.0049	0.0004	0.0045
62	0.0049	0.0005	0.0045
63	0.0050	0.0005	0.0045
64	0.0050	0.0005	0.0045
65	0.0050	0.0005	0.0046
66	0.0050	0.0005	0.0046
67	0.0051	0.0005	0.0046
68	0.0051	0.0005	0.0046
69	0.0051	0.0005	0.0046
70	0.0051	0.0005	0.0047
71	0.0052	0.0005	0.0047
72	0.0052	0.0005	0.0047
73	0.0052	0.0005	0.0047
74	0.0052	0.0005	0.0047
75	0.0053	0.0005	0.0048
76	0.0053	0.0005	0.0048
77	0.0053	0.0005	0.0048
78	0.0053	0.0005	0.0048
79	0.0054	0.0005	0.0049
80	0.0054	0.0005	0.0049
81	0.0054	0.0005	0.0049
82	0.0054	0.0005	0.0049
83	0.0055	0.0005	0.0050
84	0.0055	0.0005	0.0050
85	0.0055	0.0005	0.0050
86	0.0056	0.0005	0.0051
87	0.0056	0.0005	0.0051
88	0.0056	0.0005	0.0051
89	0.0057	0.0005	0.0052
90	0.0057	0.0005	0.0052
91	0.0057	0.0005	0.0052
92	0.0058	0.0005	0.0052
93	0.0058	0.0005	0.0053
94	0.0058	0.0005	0.0053
95	0.0059	0.0005	0.0053
96	0.0059	0.0005	0.0054
97	0.0059	0.0005	0.0054
98	0.0060	0.0005	0.0054
99	0.0060	0.0005	0.0055
100	0.0060	0.0005	0.0055
101	0.0061	0.0005	0.0055
102	0.0061	0.0005	0.0056
103	0.0062	0.0005	0.0056

104	0.0062	0.0005	0.0057
105	0.0063	0.0005	0.0057
106	0.0063	0.0005	0.0057
107	0.0063	0.0005	0.0058
108	0.0064	0.0005	0.0058
109	0.0064	0.0005	0.0059
110	0.0065	0.0005	0.0059
111	0.0065	0.0005	0.0060
112	0.0066	0.0005	0.0060
113	0.0066	0.0005	0.0061
114	0.0067	0.0005	0.0061
115	0.0067	0.0005	0.0062
116	0.0068	0.0005	0.0062
117	0.0068	0.0005	0.0063
118	0.0069	0.0005	0.0063
119	0.0069	0.0005	0.0064
120	0.0070	0.0005	0.0064
121	0.0070	0.0005	0.0065
122	0.0071	0.0005	0.0065
123	0.0072	0.0005	0.0066
124	0.0072	0.0005	0.0067
125	0.0073	0.0005	0.0067
126	0.0073	0.0005	0.0068
127	0.0074	0.0005	0.0069
128	0.0075	0.0005	0.0069
129	0.0076	0.0005	0.0070
130	0.0076	0.0005	0.0071
131	0.0077	0.0005	0.0072
132	0.0078	0.0005	0.0072
133	0.0079	0.0005	0.0073
134	0.0079	0.0005	0.0074
135	0.0080	0.0005	0.0075
136	0.0081	0.0005	0.0075
137	0.0082	0.0005	0.0076
138	0.0082	0.0005	0.0077
139	0.0084	0.0005	0.0078
140	0.0084	0.0005	0.0079
141	0.0086	0.0005	0.0080
142	0.0086	0.0005	0.0081
143	0.0088	0.0005	0.0082
144	0.0088	0.0005	0.0083
145	0.0118	0.0005	0.0113
146	0.0119	0.0005	0.0114
147	0.0121	0.0005	0.0115
148	0.0122	0.0005	0.0116
149	0.0123	0.0005	0.0118
150	0.0124	0.0005	0.0119
151	0.0126	0.0005	0.0121
152	0.0127	0.0005	0.0121
153	0.0129	0.0005	0.0123
154	0.0130	0.0005	0.0124
155	0.0132	0.0005	0.0127
156	0.0133	0.0005	0.0128
157	0.0135	0.0005	0.0130
158	0.0136	0.0005	0.0131
159	0.0139	0.0005	0.0133
160	0.0140	0.0005	0.0135
161	0.0143	0.0005	0.0137
162	0.0144	0.0005	0.0139
163	0.0147	0.0005	0.0142

164	0.0149	0.0005	0.0143
165	0.0152	0.0005	0.0147
166	0.0154	0.0005	0.0148
167	0.0157	0.0005	0.0152
168	0.0159	0.0005	0.0154
169	0.0163	0.0005	0.0158
170	0.0165	0.0005	0.0160
171	0.0170	0.0005	0.0165
172	0.0173	0.0005	0.0167
173	0.0178	0.0005	0.0172
174	0.0181	0.0005	0.0175
175	0.0187	0.0005	0.0181
176	0.0190	0.0005	0.0185
177	0.0197	0.0005	0.0192
178	0.0201	0.0005	0.0196
179	0.0210	0.0005	0.0205
180	0.0215	0.0005	0.0209
181	0.0226	0.0005	0.0220
182	0.0232	0.0005	0.0227
183	0.0246	0.0005	0.0241
184	0.0254	0.0005	0.0249
185	0.0204	0.0005	0.0198
186	0.0215	0.0005	0.0209
187	0.0244	0.0005	0.0239
188	0.0263	0.0005	0.0258
189	0.0317	0.0005	0.0312
190	0.0358	0.0005	0.0353
191	0.0512	0.0005	0.0506
192	0.0704	0.0005	0.0698
193	0.2202	0.0005	0.2197
194	0.0417	0.0005	0.0411
195	0.0287	0.0005	0.0281
196	0.0228	0.0005	0.0223
197	0.0264	0.0005	0.0258
198	0.0239	0.0005	0.0233
199	0.0220	0.0005	0.0215
200	0.0206	0.0005	0.0200
201	0.0194	0.0005	0.0188
202	0.0184	0.0005	0.0178
203	0.0175	0.0005	0.0170
204	0.0168	0.0005	0.0162
205	0.0161	0.0005	0.0156
206	0.0156	0.0005	0.0150
207	0.0150	0.0005	0.0145
208	0.0146	0.0005	0.0140
209	0.0142	0.0005	0.0136
210	0.0138	0.0005	0.0132
211	0.0134	0.0005	0.0129
212	0.0131	0.0005	0.0125
213	0.0128	0.0005	0.0122
214	0.0125	0.0005	0.0120
215	0.0122	0.0005	0.0117
216	0.0120	0.0005	0.0115
217	0.0089	0.0005	0.0083
218	0.0087	0.0005	0.0081
219	0.0085	0.0005	0.0079
220	0.0083	0.0005	0.0078
221	0.0081	0.0005	0.0076
222	0.0080	0.0005	0.0074
223	0.0078	0.0005	0.0073

224	0.0077	0.0005	0.0071
225	0.0075	0.0005	0.0070
226	0.0074	0.0005	0.0068
227	0.0072	0.0005	0.0067
228	0.0071	0.0005	0.0066
229	0.0070	0.0005	0.0065
230	0.0069	0.0005	0.0064
231	0.0068	0.0005	0.0062
232	0.0067	0.0005	0.0061
233	0.0066	0.0005	0.0060
234	0.0065	0.0005	0.0059
235	0.0064	0.0005	0.0059
236	0.0063	0.0005	0.0058
237	0.0062	0.0005	0.0057
238	0.0061	0.0005	0.0056
239	0.0061	0.0005	0.0055
240	0.0060	0.0005	0.0054
241	0.0059	0.0005	0.0054
242	0.0058	0.0005	0.0053
243	0.0058	0.0005	0.0053
244	0.0057	0.0005	0.0052
245	0.0056	0.0005	0.0051
246	0.0056	0.0005	0.0051
247	0.0055	0.0005	0.0050
248	0.0055	0.0005	0.0050
249	0.0054	0.0005	0.0049
250	0.0053	0.0005	0.0049
251	0.0053	0.0005	0.0048
252	0.0052	0.0005	0.0048
253	0.0052	0.0005	0.0047
254	0.0051	0.0005	0.0047
255	0.0051	0.0005	0.0046
256	0.0050	0.0005	0.0046
257	0.0050	0.0005	0.0045
258	0.0050	0.0005	0.0045
259	0.0049	0.0004	0.0045
260	0.0049	0.0004	0.0044
261	0.0048	0.0004	0.0044
262	0.0048	0.0004	0.0043
263	0.0047	0.0004	0.0043
264	0.0047	0.0004	0.0043
265	0.0047	0.0004	0.0042
266	0.0046	0.0004	0.0042
267	0.0046	0.0004	0.0042
268	0.0046	0.0004	0.0041
269	0.0045	0.0004	0.0041
270	0.0045	0.0004	0.0041
271	0.0044	0.0004	0.0040
272	0.0044	0.0004	0.0040
273	0.0044	0.0004	0.0040
274	0.0043	0.0004	0.0040
275	0.0043	0.0004	0.0039
276	0.0043	0.0004	0.0039
277	0.0043	0.0004	0.0039
278	0.0042	0.0004	0.0038
279	0.0042	0.0004	0.0038
280	0.0042	0.0004	0.0038
281	0.0041	0.0004	0.0038
282	0.0041	0.0004	0.0037
283	0.0041	0.0004	0.0037

```
      284              0.0041           0.0004              0.0037
      285              0.0040           0.0004              0.0037
      286              0.0040           0.0004              0.0036
      287              0.0040           0.0004              0.0036
      288              0.0040           0.0004              0.0036
      ------------------------------------------------------------------
--
      ------------------------------------------------------------------
--
      Total soil rain loss =      0.14(In)
      Total effective rainfall =      2.63(In)
      Peak flow rate in flood hydrograph =      0.52(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       0.0000      0.00  Q         |         |         |
|
    0+10       0.0000      0.00  Q         |         |         |
|
    0+15       0.0001      0.01  Q         |         |         |
|
    0+20       0.0002      0.01  Q         |         |         |
|
    0+25       0.0003      0.01  Q         |         |         |
|
    0+30       0.0004      0.02  Q         |         |         |
|
    0+35       0.0005      0.02  Q         |         |         |
|
    0+40       0.0006      0.02  Q         |         |         |
|
    0+45       0.0007      0.02  Q         |         |         |
|
    0+50       0.0008      0.02  Q         |         |         |
|
    0+55       0.0010      0.02  Q         |         |         |
|
    1+ 0       0.0011      0.02  Q         |         |         |
|
    1+ 5       0.0012      0.02  Q         |         |         |
|
    1+10       0.0013      0.02  Q         |         |         |
|
    1+15       0.0014      0.02  Q         |         |         |
|
    1+20       0.0016      0.02  Q         |         |         |
|
```

1+25	0.0017	0.02	Q			
1+30	0.0018	0.02	Q			
1+35	0.0019	0.02	Q			
1+40	0.0021	0.02	Q			
1+45	0.0022	0.02	QV			
1+50	0.0023	0.02	QV			
1+55	0.0024	0.02	QV			
2+ 0	0.0026	0.02	QV			
2+ 5	0.0027	0.02	QV			
2+10	0.0028	0.02	QV			
2+15	0.0030	0.02	QV			
2+20	0.0031	0.02	QV			
2+25	0.0032	0.02	QV			
2+30	0.0034	0.02	QV			
2+35	0.0035	0.02	QV			
2+40	0.0036	0.02	QV			
2+45	0.0037	0.02	QV			
2+50	0.0039	0.02	QV			
2+55	0.0040	0.02	QV			
3+ 0	0.0041	0.02	QV			
3+ 5	0.0043	0.02	QV			
3+10	0.0044	0.02	Q V			
3+15	0.0045	0.02	Q V			
3+20	0.0047	0.02	Q V			
3+25	0.0048	0.02	Q V			
3+30	0.0049	0.02	Q V			
3+35	0.0051	0.02	Q V			
3+40	0.0052	0.02	Q V			
3+45	0.0054	0.02	Q V			
3+50	0.0055	0.02	Q V			

3+55	0.0056	0.02	Q V			
4+ 0	0.0058	0.02	Q V			
4+ 5	0.0059	0.02	Q V			
4+10	0.0061	0.02	Q V			
4+15	0.0062	0.02	Q V			
4+20	0.0063	0.02	Q V			
4+25	0.0065	0.02	Q V			
4+30	0.0066	0.02	Q V			
4+35	0.0068	0.02	Q V			
4+40	0.0069	0.02	Q V			
4+45	0.0071	0.02	Q V			
4+50	0.0072	0.02	Q V			
4+55	0.0073	0.02	Q V			
5+ 0	0.0075	0.02	Q V			
5+ 5	0.0076	0.02	Q V			
5+10	0.0078	0.02	Q V			
5+15	0.0079	0.02	Q V			
5+20	0.0081	0.02	Q V			
5+25	0.0082	0.02	Q V			
5+30	0.0084	0.02	Q V			
5+35	0.0085	0.02	Q V			
5+40	0.0087	0.02	Q V			
5+45	0.0088	0.02	Q V			
5+50	0.0090	0.02	Q V			
5+55	0.0091	0.02	Q V			
6+ 0	0.0093	0.02	Q V			
6+ 5	0.0095	0.02	Q V			
6+10	0.0096	0.02	Q V			
6+15	0.0098	0.02	Q V			
6+20	0.0099	0.02	Q V			

6+25	0.0101	0.02	Q	V			
6+30	0.0102	0.02	Q	V			
6+35	0.0104	0.02	Q	V			
6+40	0.0106	0.02	Q	V			
6+45	0.0107	0.02	Q	V			
6+50	0.0109	0.02	Q	V			
6+55	0.0110	0.02	Q	V			
7+ 0	0.0112	0.02	Q	V			
7+ 5	0.0114	0.02	Q	V			
7+10	0.0115	0.02	Q	V			
7+15	0.0117	0.02	Q	V			
7+20	0.0119	0.02	Q	V			
7+25	0.0120	0.02	Q	V			
7+30	0.0122	0.02	Q	V			
7+35	0.0124	0.02	Q	V			
7+40	0.0126	0.02	Q	V			
7+45	0.0127	0.03	Q	V			
7+50	0.0129	0.03	Q	V			
7+55	0.0131	0.03	Q	V			
8+ 0	0.0133	0.03	Q	V			
8+ 5	0.0134	0.03	Q	V			
8+10	0.0136	0.03	Q	V			
8+15	0.0138	0.03	Q	V			
8+20	0.0140	0.03	Q	V			
8+25	0.0141	0.03	Q	V			
8+30	0.0143	0.03	Q	V			
8+35	0.0145	0.03	Q	V			
8+40	0.0147	0.03	Q	V			
8+45	0.0149	0.03	Q	V			
8+50	0.0151	0.03	Q	V			

8+55	0.0153	0.03	Q	V			
9+ 0	0.0154	0.03	Q	V			
9+ 5	0.0156	0.03	Q	V			
9+10	0.0158	0.03	Q	V			
9+15	0.0160	0.03	Q	V			
9+20	0.0162	0.03	Q	V			
9+25	0.0164	0.03	Q	V			
9+30	0.0166	0.03	Q	V			
9+35	0.0168	0.03	Q	V			
9+40	0.0170	0.03	Q	V			
9+45	0.0172	0.03	Q	V			
9+50	0.0174	0.03	Q	V			
9+55	0.0176	0.03	Q	V			
10+ 0	0.0178	0.03	Q	V			
10+ 5	0.0181	0.03	Q	V			
10+10	0.0183	0.03	Q	V			
10+15	0.0185	0.03	Q	V			
10+20	0.0187	0.03	Q	V			
10+25	0.0189	0.03	Q	V			
10+30	0.0191	0.03	Q	V			
10+35	0.0194	0.03	Q	V			
10+40	0.0196	0.03	Q	V			
10+45	0.0198	0.03	Q	V			
10+50	0.0200	0.03	Q	V			
10+55	0.0203	0.03	Q	V			
11+ 0	0.0205	0.03	Q	V			
11+ 5	0.0207	0.03	Q	V			
11+10	0.0210	0.03	Q	V			
11+15	0.0212	0.03	Q	V			
11+20	0.0215	0.04	Q	V			

11+25	0.0217	0.04	Q	V|			
11+30	0.0220	0.04	Q	V			
11+35	0.0222	0.04	Q	V			
11+40	0.0225	0.04	Q	V			
11+45	0.0227	0.04	Q	V			
11+50	0.0230	0.04	Q	V			
11+55	0.0232	0.04	Q	V			
12+ 0	0.0235	0.04	Q	V			
12+ 5	0.0238	0.04	Q	V			
12+10	0.0241	0.04	Q	V			
12+15	0.0244	0.05	Q	|V			
12+20	0.0247	0.05	Q	|V			
12+25	0.0251	0.05	Q	|V			
12+30	0.0255	0.05	Q	|V			
12+35	0.0259	0.06	Q	|V			
12+40	0.0262	0.06	Q	|V			
12+45	0.0266	0.06	Q	| V			
12+50	0.0270	0.06	Q	| V			
12+55	0.0274	0.06	Q	| V			
13+ 0	0.0278	0.06	Q	| V			
13+ 5	0.0283	0.06	Q	| V			
13+10	0.0287	0.06	Q	| V			
13+15	0.0291	0.06	Q	| V			
13+20	0.0295	0.06	Q	| V			
13+25	0.0300	0.06	Q	| V			
13+30	0.0304	0.06	Q	| V			
13+35	0.0309	0.07	Q	| V			
13+40	0.0313	0.07	Q	| V			
13+45	0.0318	0.07	Q	| V			
13+50	0.0323	0.07	Q	| V			

13+55	0.0327	0.07	Q	| V |		
14+ 0	0.0332	0.07	Q	| V |		
14+ 5	0.0337	0.07	Q	| V |		
14+10	0.0342	0.07	Q	| V |		
14+15	0.0347	0.07	Q	| V |		
14+20	0.0353	0.08	Q	| V |		
14+25	0.0358	0.08	Q	| V |		
14+30	0.0364	0.08	Q	| V |		
14+35	0.0369	0.08	Q	| V |		
14+40	0.0375	0.08	Q	| V |		
14+45	0.0381	0.09	Q	| V |		
14+50	0.0387	0.09	Q	| V |		
14+55	0.0393	0.09	Q	| V |		
15+ 0	0.0399	0.09	Q	| V |		
15+ 5	0.0406	0.10	Q	| V |		
15+10	0.0413	0.10	Q	| V |		
15+15	0.0420	0.10	Q	| V|		
15+20	0.0427	0.11	Q	| V|		
15+25	0.0435	0.11	Q	| V|		
15+30	0.0442	0.11	Q	| V |		
15+35	0.0450	0.11	Q	| V |		
15+40	0.0457	0.11	Q	| V |		
15+45	0.0465	0.11	Q	| |V |		
15+50	0.0473	0.12	Q	| |V |		
15+55	0.0483	0.14	Q	| | V |		
16+ 0	0.0494	0.17	Q	| | V |		
16+ 5	0.0511	0.24	Q	| | V |		
16+10	0.0535	0.36	|Q	| | V |		
16+15	0.0571	0.52	| Q	| | V |		
16+20	0.0596	0.36	|Q	| | V |		

16+25	0.0613	0.25	Q	|	|	V |	
16+30	0.0627	0.20	Q	|	|	V |	
16+35	0.0639	0.18	Q	|	|	V|	
16+40	0.0650	0.15	Q	|	|	V|	
16+45	0.0659	0.13	Q	|	|	V	
16+50	0.0667	0.12	Q	|	|	V	
16+55	0.0674	0.10	Q	|	|	V	
17+ 0	0.0681	0.10	Q	|	|	|V	
17+ 5	0.0687	0.09	Q	|	|	|V	
17+10	0.0693	0.09	Q	|	|	|V	
17+15	0.0699	0.08	Q	|	|	|V	
17+20	0.0705	0.08	Q	|	|	| V	
17+25	0.0710	0.07	Q	|	|	| V	
17+30	0.0715	0.07	Q	|	|	| V	
17+35	0.0719	0.07	Q	|	|	| V	
17+40	0.0724	0.07	Q	|	|	| V	
17+45	0.0728	0.06	Q	|	|	| V	
17+50	0.0733	0.06	Q	|	|	| V	
17+55	0.0737	0.06	Q	|	|	| V	
18+ 0	0.0741	0.06	Q	|	|	| V	
18+ 5	0.0745	0.06	Q	|	|	| V	
18+10	0.0749	0.05	Q	|	|	| V	
18+15	0.0752	0.05	Q	|	|	| V	
18+20	0.0755	0.04	Q	|	|	| V	
18+25	0.0758	0.04	Q	|	|	| V	
18+30	0.0761	0.04	Q	|	|	| V	
18+35	0.0764	0.04	Q	|	|	| V	
18+40	0.0766	0.04	Q	|	|	| V	
18+45	0.0769	0.04	Q	|	|	| V	
18+50	0.0771	0.04	Q	|	|	| V	

18+55	0.0774	0.03	Q	|	|	|	V |
19+ 0	0.0776	0.03	Q	|	|	|	V |
19+ 5	0.0778	0.03	Q	|	|	|	V |
19+10	0.0780	0.03	Q	|	|	|	V |
19+15	0.0783	0.03	Q	|	|	|	V |
19+20	0.0785	0.03	Q	|	|	|	V |
19+25	0.0787	0.03	Q	|	|	|	V |
19+30	0.0789	0.03	Q	|	|	|	V |
19+35	0.0791	0.03	Q	|	|	|	V |
19+40	0.0793	0.03	Q	|	|	|	V |
19+45	0.0795	0.03	Q	|	|	|	V |
19+50	0.0797	0.03	Q	|	|	|	V |
19+55	0.0799	0.03	Q	|	|	|	V |
20+ 0	0.0801	0.03	Q	|	|	|	V |
20+ 5	0.0803	0.03	Q	|	|	|	V |
20+10	0.0805	0.03	Q	|	|	|	V |
20+15	0.0806	0.03	Q	|	|	|	V |
20+20	0.0808	0.03	Q	|	|	|	V |
20+25	0.0810	0.03	Q	|	|	|	V |
20+30	0.0812	0.03	Q	|	|	|	V |
20+35	0.0813	0.03	Q	|	|	|	V |
20+40	0.0815	0.02	Q	|	|	|	V |
20+45	0.0817	0.02	Q	|	|	|	V |
20+50	0.0818	0.02	Q	|	|	|	V |
20+55	0.0820	0.02	Q	|	|	|	V |
21+ 0	0.0822	0.02	Q	|	|	|	V |
21+ 5	0.0823	0.02	Q	|	|	|	V |
21+10	0.0825	0.02	Q	|	|	|	V |
21+15	0.0827	0.02	Q	|	|	|	V |
21+20	0.0828	0.02	Q	|	|	|	V |

21+25	0.0830	0.02	Q				V
21+30	0.0831	0.02	Q				V
21+35	0.0833	0.02	Q				V
21+40	0.0834	0.02	Q				V
21+45	0.0836	0.02	Q				V
21+50	0.0837	0.02	Q				V
21+55	0.0839	0.02	Q				V
22+ 0	0.0840	0.02	Q				V
22+ 5	0.0842	0.02	Q				V
22+10	0.0843	0.02	Q				V
22+15	0.0845	0.02	Q				V
22+20	0.0846	0.02	Q				V
22+25	0.0847	0.02	Q				V
22+30	0.0849	0.02	Q				V
22+35	0.0850	0.02	Q				V
22+40	0.0852	0.02	Q				V
22+45	0.0853	0.02	Q				V
22+50	0.0854	0.02	Q				V
22+55	0.0856	0.02	Q				V
23+ 0	0.0857	0.02	Q				V
23+ 5	0.0858	0.02	Q				V
23+10	0.0860	0.02	Q				V
23+15	0.0861	0.02	Q				V
23+20	0.0862	0.02	Q				V
23+25	0.0863	0.02	Q				V
23+30	0.0865	0.02	Q				V
23+35	0.0866	0.02	Q				V
23+40	0.0867	0.02	Q				V
23+45	0.0868	0.02	Q				V
23+50	0.0870	0.02	Q				V

23+55	0.0871	0.02	Q	|	|	| V|
24+ 0	0.0872	0.02	Q	|	|	| V|
24+ 5	0.0873	0.02	Q	|	|	| V|
24+10	0.0874	0.01	Q	|	|	| V|
24+15	0.0875	0.01	Q	|	|	| V|
24+20	0.0875	0.00	Q	|	|	| V|
24+25	0.0875	0.00	Q	|	|	| V|
24+30	0.0876	0.00	Q	|	|	| V|
24+35	0.0876	0.00	Q	|	|	| V|
24+40	0.0876	0.00	Q	|	|	| V|
24+45	0.0876	0.00	Q	|	|	| V|
24+50	0.0876	0.00	Q	|	|	| V|
24+55	0.0876	0.00	Q	|	|	| V|
25+ 0	0.0876	0.00	Q	|	|	| V|
25+ 5	0.0876	0.00	Q	|	|	| V|
25+10	0.0876	0.00	Q	|	|	| V|
25+15	0.0876	0.00	Q	|	|	| V|
25+20	0.0876	0.00	Q	|	|	| V|

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

Study date 02/16/17

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

Program License Serial Number 6232

Summerland - Chino
2 yr 24 hr storm event
Post Development Conditions
Area A3 pts 301-302

Storm Event Year = 2

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 2		
0.28	1	0.59
Rainfall data for year 2		
0.28	6	1.57
Rainfall data for year 2		
0.28	24	2.77

++

```
      ******** 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          0.28      1.000     0.812    0.010
0.008

      Area-averaged adjusted loss rate Fm (In/Hr) =  0.008

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

      Area       Area          SCS CN    SCS CN      S     Pervious
       (Ac.)      Fract         (AMC2)    (AMC1)           Yield Fr
           0.00   0.010         69.0      49.8      10.08     0.019
           0.28   0.990         98.0      98.0       0.20     0.917

      Area-averaged catchment yield fraction, Y =  0.908
      Area-averaged low loss fraction, Yb =  0.092
      User entry of time of concentration  =   0.242 (hours)
      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
++
      Watershed area =       0.28(Ac.)
      Catchment Lag time =   0.193 hours
      Unit interval =   5.000 minutes
      Unit interval percentage of lag time = 43.1029
      Hydrograph baseflow =     0.00(CFS)
      Average maximum watershed loss rate(Fm) =  0.008(In/Hr)
      Average low loss rate fraction (Yb) = 0.092 (decimal)
      FOOTHILL S-Graph Selected
      Computed peak 5-minute rainfall =  0.220(In)
      Computed peak 30-minute rainfall =  0.451(In)
      Specified peak 1-hour rainfall =  0.595(In)
      Computed peak 3-hour rainfall =  1.079(In)
      Specified peak 6-hour rainfall =  1.570(In)
      Specified peak 24-hour rainfall =  2.770(In)


      Rainfall depth area reduction factors:
      Using a total area of       0.28(Ac.) (Ref: fig. E-4)

      5-minute factor = 1.000     Adjusted rainfall =  0.220(In)
      30-minute factor = 1.000    Adjusted rainfall =  0.451(In)
      1-hour factor = 1.000       Adjusted rainfall =  0.595(In)
      3-hour factor = 1.000       Adjusted rainfall =  1.079(In)
      6-hour factor = 1.000       Adjusted rainfall =  1.570(In)
      24-hour factor = 1.000      Adjusted rainfall =  2.770(In)
      ----------------------------------------------------------------
---

                      U n i t  H y d r o g r a p h
      ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++
      Interval          'S' Graph          Unit Hydrograph
      Number            Mean values             ((CFS))
      ----------------------------------------------------------------
---
                 (K =         3.39 (CFS))
```

1	3.475	0.118
2	17.231	0.466
3	52.598	1.198
4	71.760	0.649
5	81.173	0.319
6	87.402	0.211
7	91.763	0.148
8	94.816	0.103
9	96.829	0.068
10	97.987	0.039
11	98.517	0.018
12	98.943	0.014
13	99.235	0.010
14	99.555	0.011
15	99.800	0.008
16	99.936	0.005
17	100.000	0.002

Peak Unit Number	Adjusted mass rainfall (In)	Unit rainfall (In)
1	0.2202	0.2202
2	0.2906	0.0704
3	0.3417	0.0512
4	0.3834	0.0417
5	0.4192	0.0358
6	0.4509	0.0317
7	0.4796	0.0287
8	0.5059	0.0263
9	0.5303	0.0244
10	0.5531	0.0228
11	0.5746	0.0215
12	0.5950	0.0204
13	0.6213	0.0264
14	0.6468	0.0254
15	0.6714	0.0246
16	0.6953	0.0239
17	0.7185	0.0232
18	0.7411	0.0226
19	0.7631	0.0220
20	0.7846	0.0215
21	0.8056	0.0210
22	0.8262	0.0206
23	0.8463	0.0201
24	0.8660	0.0197
25	0.8854	0.0194
26	0.9044	0.0190
27	0.9231	0.0187
28	0.9414	0.0184
29	0.9595	0.0181
30	0.9773	0.0178
31	0.9948	0.0175
32	1.0120	0.0173
33	1.0290	0.0170
34	1.0458	0.0168
35	1.0623	0.0165
36	1.0787	0.0163
37	1.0948	0.0161
38	1.1107	0.0159

39	1.1264	0.0157
40	1.1420	0.0155
41	1.1574	0.0154
42	1.1726	0.0152
43	1.1876	0.0150
44	1.2025	0.0149
45	1.2172	0.0147
46	1.2318	0.0146
47	1.2462	0.0144
48	1.2605	0.0143
49	1.2747	0.0142
50	1.2887	0.0140
51	1.3026	0.0139
52	1.3163	0.0138
53	1.3300	0.0136
54	1.3435	0.0135
55	1.3569	0.0134
56	1.3702	0.0133
57	1.3834	0.0132
58	1.3965	0.0131
59	1.4095	0.0130
60	1.4224	0.0129
61	1.4352	0.0128
62	1.4479	0.0127
63	1.4605	0.0126
64	1.4730	0.0125
65	1.4854	0.0124
66	1.4977	0.0123
67	1.5100	0.0122
68	1.5221	0.0122
69	1.5342	0.0121
70	1.5462	0.0120
71	1.5582	0.0119
72	1.5700	0.0118
73	1.5789	0.0089
74	1.5877	0.0088
75	1.5965	0.0088
76	1.6052	0.0087
77	1.6138	0.0086
78	1.6223	0.0086
79	1.6308	0.0085
80	1.6392	0.0084
81	1.6476	0.0084
82	1.6559	0.0083
83	1.6641	0.0082
84	1.6723	0.0082
85	1.6804	0.0081
86	1.6885	0.0081
87	1.6965	0.0080
88	1.7045	0.0080
89	1.7124	0.0079
90	1.7202	0.0079
91	1.7280	0.0078
92	1.7358	0.0078
93	1.7435	0.0077
94	1.7512	0.0077
95	1.7588	0.0076
96	1.7663	0.0076
97	1.7738	0.0075
98	1.7813	0.0075

99	1.7887	0.0074
100	1.7961	0.0074
101	1.8034	0.0073
102	1.8107	0.0073
103	1.8180	0.0072
104	1.8252	0.0072
105	1.8324	0.0072
106	1.8395	0.0071
107	1.8466	0.0071
108	1.8536	0.0070
109	1.8606	0.0070
110	1.8676	0.0070
111	1.8745	0.0069
112	1.8814	0.0069
113	1.8883	0.0069
114	1.8951	0.0068
115	1.9019	0.0068
116	1.9087	0.0068
117	1.9154	0.0067
118	1.9221	0.0067
119	1.9287	0.0067
120	1.9354	0.0066
121	1.9419	0.0066
122	1.9485	0.0066
123	1.9550	0.0065
124	1.9615	0.0065
125	1.9680	0.0065
126	1.9744	0.0064
127	1.9808	0.0064
128	1.9872	0.0064
129	1.9935	0.0063
130	1.9998	0.0063
131	2.0061	0.0063
132	2.0124	0.0063
133	2.0186	0.0062
134	2.0248	0.0062
135	2.0310	0.0062
136	2.0371	0.0061
137	2.0433	0.0061
138	2.0494	0.0061
139	2.0554	0.0061
140	2.0615	0.0060
141	2.0675	0.0060
142	2.0735	0.0060
143	2.0795	0.0060
144	2.0854	0.0059
145	2.0913	0.0059
146	2.0972	0.0059
147	2.1031	0.0059
148	2.1089	0.0058
149	2.1148	0.0058
150	2.1206	0.0058
151	2.1263	0.0058
152	2.1321	0.0058
153	2.1378	0.0057
154	2.1435	0.0057
155	2.1492	0.0057
156	2.1549	0.0057
157	2.1605	0.0056
158	2.1662	0.0056

159	2.1718	0.0056
160	2.1774	0.0056
161	2.1829	0.0056
162	2.1885	0.0055
163	2.1940	0.0055
164	2.1995	0.0055
165	2.2050	0.0055
166	2.2104	0.0055
167	2.2159	0.0054
168	2.2213	0.0054
169	2.2267	0.0054
170	2.2321	0.0054
171	2.2375	0.0054
172	2.2428	0.0053
173	2.2481	0.0053
174	2.2535	0.0053
175	2.2588	0.0053
176	2.2640	0.0053
177	2.2693	0.0053
178	2.2745	0.0052
179	2.2798	0.0052
180	2.2850	0.0052
181	2.2902	0.0052
182	2.2953	0.0052
183	2.3005	0.0052
184	2.3056	0.0051
185	2.3108	0.0051
186	2.3159	0.0051
187	2.3210	0.0051
188	2.3260	0.0051
189	2.3311	0.0051
190	2.3361	0.0050
191	2.3412	0.0050
192	2.3462	0.0050
193	2.3512	0.0050
194	2.3561	0.0050
195	2.3611	0.0050
196	2.3661	0.0050
197	2.3710	0.0049
198	2.3759	0.0049
199	2.3808	0.0049
200	2.3857	0.0049
201	2.3906	0.0049
202	2.3955	0.0049
203	2.4003	0.0048
204	2.4052	0.0048
205	2.4100	0.0048
206	2.4148	0.0048
207	2.4196	0.0048
208	2.4244	0.0048
209	2.4291	0.0048
210	2.4339	0.0048
211	2.4386	0.0047
212	2.4433	0.0047
213	2.4481	0.0047
214	2.4528	0.0047
215	2.4574	0.0047
216	2.4621	0.0047
217	2.4668	0.0047
218	2.4714	0.0046

219	2.4761	0.0046
220	2.4807	0.0046
221	2.4853	0.0046
222	2.4899	0.0046
223	2.4945	0.0046
224	2.4991	0.0046
225	2.5036	0.0046
226	2.5082	0.0046
227	2.5127	0.0045
228	2.5173	0.0045
229	2.5218	0.0045
230	2.5263	0.0045
231	2.5308	0.0045
232	2.5352	0.0045
233	2.5397	0.0045
234	2.5442	0.0045
235	2.5486	0.0044
236	2.5531	0.0044
237	2.5575	0.0044
238	2.5619	0.0044
239	2.5663	0.0044
240	2.5707	0.0044
241	2.5751	0.0044
242	2.5794	0.0044
243	2.5838	0.0044
244	2.5882	0.0043
245	2.5925	0.0043
246	2.5968	0.0043
247	2.6011	0.0043
248	2.6054	0.0043
249	2.6097	0.0043
250	2.6140	0.0043
251	2.6183	0.0043
252	2.6226	0.0043
253	2.6268	0.0043
254	2.6311	0.0042
255	2.6353	0.0042
256	2.6395	0.0042
257	2.6438	0.0042
258	2.6480	0.0042
259	2.6522	0.0042
260	2.6564	0.0042
261	2.6605	0.0042
262	2.6647	0.0042
263	2.6689	0.0042
264	2.6730	0.0042
265	2.6772	0.0041
266	2.6813	0.0041
267	2.6854	0.0041
268	2.6895	0.0041
269	2.6936	0.0041
270	2.6977	0.0041
271	2.7018	0.0041
272	2.7059	0.0041
273	2.7100	0.0041
274	2.7140	0.0041
275	2.7181	0.0041
276	2.7221	0.0040
277	2.7262	0.0040
278	2.7302	0.0040

279	2.7342	0.0040
280	2.7382	0.0040
281	2.7422	0.0040
282	2.7462	0.0040
283	2.7502	0.0040
284	2.7542	0.0040
285	2.7581	0.0040
286	2.7621	0.0040
287	2.7661	0.0040
288	2.7700	0.0039

Unit Period (number)	Unit Rainfall (In)	Unit Soil-Loss (In)	Effective Rainfall (In)
1	0.0039	0.0004	0.0036
2	0.0040	0.0004	0.0036
3	0.0040	0.0004	0.0036
4	0.0040	0.0004	0.0036
5	0.0040	0.0004	0.0036
6	0.0040	0.0004	0.0036
7	0.0040	0.0004	0.0036
8	0.0040	0.0004	0.0037
9	0.0040	0.0004	0.0037
10	0.0041	0.0004	0.0037
11	0.0041	0.0004	0.0037
12	0.0041	0.0004	0.0037
13	0.0041	0.0004	0.0037
14	0.0041	0.0004	0.0037
15	0.0041	0.0004	0.0037
16	0.0041	0.0004	0.0038
17	0.0042	0.0004	0.0038
18	0.0042	0.0004	0.0038
19	0.0042	0.0004	0.0038
20	0.0042	0.0004	0.0038
21	0.0042	0.0004	0.0038
22	0.0042	0.0004	0.0038
23	0.0042	0.0004	0.0038
24	0.0042	0.0004	0.0039
25	0.0043	0.0004	0.0039
26	0.0043	0.0004	0.0039
27	0.0043	0.0004	0.0039
28	0.0043	0.0004	0.0039
29	0.0043	0.0004	0.0039
30	0.0043	0.0004	0.0039
31	0.0044	0.0004	0.0040
32	0.0044	0.0004	0.0040
33	0.0044	0.0004	0.0040
34	0.0044	0.0004	0.0040
35	0.0044	0.0004	0.0040
36	0.0044	0.0004	0.0040
37	0.0045	0.0004	0.0040
38	0.0045	0.0004	0.0041
39	0.0045	0.0004	0.0041
40	0.0045	0.0004	0.0041
41	0.0045	0.0004	0.0041
42	0.0045	0.0004	0.0041
43	0.0046	0.0004	0.0041

44	0.0046	0.0004	0.0042
45	0.0046	0.0004	0.0042
46	0.0046	0.0004	0.0042
47	0.0046	0.0004	0.0042
48	0.0046	0.0004	0.0042
49	0.0047	0.0004	0.0042
50	0.0047	0.0004	0.0043
51	0.0047	0.0004	0.0043
52	0.0047	0.0004	0.0043
53	0.0048	0.0004	0.0043
54	0.0048	0.0004	0.0043
55	0.0048	0.0004	0.0044
56	0.0048	0.0004	0.0044
57	0.0048	0.0004	0.0044
58	0.0048	0.0004	0.0044
59	0.0049	0.0005	0.0044
60	0.0049	0.0005	0.0044
61	0.0049	0.0005	0.0045
62	0.0049	0.0005	0.0045
63	0.0050	0.0005	0.0045
64	0.0050	0.0005	0.0045
65	0.0050	0.0005	0.0045
66	0.0050	0.0005	0.0046
67	0.0051	0.0005	0.0046
68	0.0051	0.0005	0.0046
69	0.0051	0.0005	0.0046
70	0.0051	0.0005	0.0047
71	0.0052	0.0005	0.0047
72	0.0052	0.0005	0.0047
73	0.0052	0.0005	0.0047
74	0.0052	0.0005	0.0047
75	0.0053	0.0005	0.0048
76	0.0053	0.0005	0.0048
77	0.0053	0.0005	0.0048
78	0.0053	0.0005	0.0048
79	0.0054	0.0005	0.0049
80	0.0054	0.0005	0.0049
81	0.0054	0.0005	0.0049
82	0.0054	0.0005	0.0049
83	0.0055	0.0005	0.0050
84	0.0055	0.0005	0.0050
85	0.0055	0.0005	0.0050
86	0.0056	0.0005	0.0050
87	0.0056	0.0005	0.0051
88	0.0056	0.0005	0.0051
89	0.0057	0.0005	0.0051
90	0.0057	0.0005	0.0052
91	0.0057	0.0005	0.0052
92	0.0058	0.0005	0.0052
93	0.0058	0.0005	0.0053
94	0.0058	0.0005	0.0053
95	0.0059	0.0005	0.0053
96	0.0059	0.0005	0.0054
97	0.0059	0.0005	0.0054
98	0.0060	0.0006	0.0054
99	0.0060	0.0006	0.0055
100	0.0060	0.0006	0.0055
101	0.0061	0.0006	0.0055
102	0.0061	0.0006	0.0056
103	0.0062	0.0006	0.0056

104	0.0062	0.0006	0.0056
105	0.0063	0.0006	0.0057
106	0.0063	0.0006	0.0057
107	0.0063	0.0006	0.0058
108	0.0064	0.0006	0.0058
109	0.0064	0.0006	0.0058
110	0.0065	0.0006	0.0059
111	0.0065	0.0006	0.0059
112	0.0066	0.0006	0.0060
113	0.0066	0.0006	0.0060
114	0.0067	0.0006	0.0060
115	0.0067	0.0006	0.0061
116	0.0068	0.0006	0.0061
117	0.0068	0.0006	0.0062
118	0.0069	0.0006	0.0062
119	0.0069	0.0006	0.0063
120	0.0070	0.0006	0.0063
121	0.0070	0.0007	0.0064
122	0.0071	0.0007	0.0064
123	0.0072	0.0007	0.0065
124	0.0072	0.0007	0.0065
125	0.0073	0.0007	0.0066
126	0.0073	0.0007	0.0067
127	0.0074	0.0007	0.0067
128	0.0075	0.0007	0.0068
129	0.0076	0.0007	0.0069
130	0.0076	0.0007	0.0069
131	0.0077	0.0007	0.0070
132	0.0078	0.0007	0.0071
133	0.0079	0.0007	0.0072
134	0.0079	0.0007	0.0072
135	0.0080	0.0007	0.0073
136	0.0081	0.0007	0.0074
137	0.0082	0.0007	0.0075
138	0.0082	0.0007	0.0076
139	0.0084	0.0007	0.0077
140	0.0084	0.0007	0.0077
141	0.0086	0.0007	0.0079
142	0.0086	0.0007	0.0079
143	0.0088	0.0007	0.0081
144	0.0088	0.0007	0.0081
145	0.0118	0.0007	0.0112
146	0.0119	0.0007	0.0112
147	0.0121	0.0007	0.0114
148	0.0122	0.0007	0.0115
149	0.0123	0.0007	0.0117
150	0.0124	0.0007	0.0117
151	0.0126	0.0007	0.0119
152	0.0127	0.0007	0.0120
153	0.0129	0.0007	0.0122
154	0.0130	0.0007	0.0123
155	0.0132	0.0007	0.0125
156	0.0133	0.0007	0.0126
157	0.0135	0.0007	0.0129
158	0.0136	0.0007	0.0130
159	0.0139	0.0007	0.0132
160	0.0140	0.0007	0.0133
161	0.0143	0.0007	0.0136
162	0.0144	0.0007	0.0138
163	0.0147	0.0007	0.0140

164	0.0149	0.0007	0.0142
165	0.0152	0.0007	0.0145
166	0.0154	0.0007	0.0147
167	0.0157	0.0007	0.0151
168	0.0159	0.0007	0.0152
169	0.0163	0.0007	0.0157
170	0.0165	0.0007	0.0159
171	0.0170	0.0007	0.0163
172	0.0173	0.0007	0.0166
173	0.0178	0.0007	0.0171
174	0.0181	0.0007	0.0174
175	0.0187	0.0007	0.0180
176	0.0190	0.0007	0.0183
177	0.0197	0.0007	0.0191
178	0.0201	0.0007	0.0195
179	0.0210	0.0007	0.0203
180	0.0215	0.0007	0.0208
181	0.0226	0.0007	0.0219
182	0.0232	0.0007	0.0225
183	0.0246	0.0007	0.0239
184	0.0254	0.0007	0.0248
185	0.0204	0.0007	0.0197
186	0.0215	0.0007	0.0208
187	0.0244	0.0007	0.0237
188	0.0263	0.0007	0.0256
189	0.0317	0.0007	0.0310
190	0.0358	0.0007	0.0351
191	0.0512	0.0007	0.0505
192	0.0704	0.0007	0.0697
193	0.2202	0.0007	0.2195
194	0.0417	0.0007	0.0410
195	0.0287	0.0007	0.0280
196	0.0228	0.0007	0.0222
197	0.0264	0.0007	0.0257
198	0.0239	0.0007	0.0232
199	0.0220	0.0007	0.0213
200	0.0206	0.0007	0.0199
201	0.0194	0.0007	0.0187
202	0.0184	0.0007	0.0177
203	0.0175	0.0007	0.0168
204	0.0168	0.0007	0.0161
205	0.0161	0.0007	0.0154
206	0.0155	0.0007	0.0149
207	0.0150	0.0007	0.0144
208	0.0146	0.0007	0.0139
209	0.0142	0.0007	0.0135
210	0.0138	0.0007	0.0131
211	0.0134	0.0007	0.0127
212	0.0131	0.0007	0.0124
213	0.0128	0.0007	0.0121
214	0.0125	0.0007	0.0118
215	0.0122	0.0007	0.0116
216	0.0120	0.0007	0.0113
217	0.0089	0.0007	0.0082
218	0.0087	0.0007	0.0080
219	0.0085	0.0007	0.0078
220	0.0083	0.0007	0.0076
221	0.0081	0.0007	0.0074
222	0.0080	0.0007	0.0073
223	0.0078	0.0007	0.0071

224	0.0077	0.0007	0.0070
225	0.0075	0.0007	0.0068
226	0.0074	0.0007	0.0067
227	0.0072	0.0007	0.0066
228	0.0071	0.0007	0.0065
229	0.0070	0.0006	0.0064
230	0.0069	0.0006	0.0063
231	0.0068	0.0006	0.0062
232	0.0067	0.0006	0.0061
233	0.0066	0.0006	0.0060
234	0.0065	0.0006	0.0059
235	0.0064	0.0006	0.0058
236	0.0063	0.0006	0.0057
237	0.0062	0.0006	0.0057
238	0.0061	0.0006	0.0056
239	0.0061	0.0006	0.0055
240	0.0060	0.0006	0.0054
241	0.0059	0.0005	0.0054
242	0.0058	0.0005	0.0053
243	0.0058	0.0005	0.0052
244	0.0057	0.0005	0.0052
245	0.0056	0.0005	0.0051
246	0.0056	0.0005	0.0051
247	0.0055	0.0005	0.0050
248	0.0055	0.0005	0.0050
249	0.0054	0.0005	0.0049
250	0.0053	0.0005	0.0049
251	0.0053	0.0005	0.0048
252	0.0052	0.0005	0.0048
253	0.0052	0.0005	0.0047
254	0.0051	0.0005	0.0047
255	0.0051	0.0005	0.0046
256	0.0050	0.0005	0.0046
257	0.0050	0.0005	0.0045
258	0.0050	0.0005	0.0045
259	0.0049	0.0005	0.0045
260	0.0049	0.0004	0.0044
261	0.0048	0.0004	0.0044
262	0.0048	0.0004	0.0043
263	0.0047	0.0004	0.0043
264	0.0047	0.0004	0.0043
265	0.0047	0.0004	0.0042
266	0.0046	0.0004	0.0042
267	0.0046	0.0004	0.0042
268	0.0046	0.0004	0.0041
269	0.0045	0.0004	0.0041
270	0.0045	0.0004	0.0041
271	0.0044	0.0004	0.0040
272	0.0044	0.0004	0.0040
273	0.0044	0.0004	0.0040
274	0.0043	0.0004	0.0039
275	0.0043	0.0004	0.0039
276	0.0043	0.0004	0.0039
277	0.0043	0.0004	0.0039
278	0.0042	0.0004	0.0038
279	0.0042	0.0004	0.0038
280	0.0042	0.0004	0.0038
281	0.0041	0.0004	0.0038
282	0.0041	0.0004	0.0037
283	0.0041	0.0004	0.0037

```
      284              0.0041           0.0004              0.0037
      285              0.0040           0.0004              0.0037
      286              0.0040           0.0004              0.0036
      287              0.0040           0.0004              0.0036
      288              0.0040           0.0004              0.0036
      ------------------------------------------------------------------
--
      ------------------------------------------------------------------
--
      Total soil rain loss =      0.16(In)
      Total effective rainfall =      2.61(In)
      Peak flow rate in flood hydrograph =      0.37(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       0.0000      0.00  Q         |         |         |
|
    0+10       0.0000      0.00  Q         |         |         |
|
    0+15       0.0001      0.01  Q         |         |         |
|
    0+20       0.0001      0.01  Q         |         |         |
|
    0+25       0.0002      0.01  Q         |         |         |
|
    0+30       0.0003      0.01  Q         |         |         |
|
    0+35       0.0003      0.01  Q         |         |         |
|
    0+40       0.0004      0.01  Q         |         |         |
|
    0+45       0.0005      0.01  Q         |         |         |
|
    0+50       0.0006      0.01  Q         |         |         |
|
    0+55       0.0007      0.01  Q         |         |         |
|
    1+ 0       0.0008      0.01  Q         |         |         |
|
    1+ 5       0.0008      0.01  Q         |         |         |
|
    1+10       0.0009      0.01  Q         |         |         |
|
    1+15       0.0010      0.01  Q         |         |         |
|
    1+20       0.0011      0.01  Q         |         |         |
|
```

1+25	0.0012	0.01	Q			
1+30	0.0013	0.01	Q			
1+35	0.0014	0.01	Q			
1+40	0.0014	0.01	Q			
1+45	0.0015	0.01	QV			
1+50	0.0016	0.01	QV			
1+55	0.0017	0.01	QV			
2+ 0	0.0018	0.01	QV			
2+ 5	0.0019	0.01	QV			
2+10	0.0020	0.01	QV			
2+15	0.0021	0.01	QV			
2+20	0.0022	0.01	QV			
2+25	0.0023	0.01	QV			
2+30	0.0023	0.01	QV			
2+35	0.0024	0.01	QV			
2+40	0.0025	0.01	QV			
2+45	0.0026	0.01	QV			
2+50	0.0027	0.01	QV			
2+55	0.0028	0.01	QV			
3+ 0	0.0029	0.01	QV			
3+ 5	0.0030	0.01	QV			
3+10	0.0031	0.01	Q V			
3+15	0.0032	0.01	Q V			
3+20	0.0033	0.01	Q V			
3+25	0.0034	0.01	Q V			
3+30	0.0035	0.01	Q V			
3+35	0.0036	0.01	Q V			
3+40	0.0037	0.01	Q V			
3+45	0.0037	0.01	Q V			
3+50	0.0038	0.01	Q V			

3+55	0.0039	0.01	Q V			
4+ 0	0.0040	0.01	Q V			
4+ 5	0.0041	0.01	Q V			
4+10	0.0042	0.01	Q V			
4+15	0.0043	0.01	Q V			
4+20	0.0044	0.01	Q V			
4+25	0.0045	0.01	Q V			
4+30	0.0046	0.01	Q V			
4+35	0.0047	0.01	Q V			
4+40	0.0048	0.01	Q V			
4+45	0.0049	0.01	Q V			
4+50	0.0050	0.01	Q V			
4+55	0.0051	0.01	Q V			
5+ 0	0.0052	0.01	Q V			
5+ 5	0.0053	0.01	Q V			
5+10	0.0054	0.01	Q V			
5+15	0.0055	0.02	Q V			
5+20	0.0057	0.02	Q V			
5+25	0.0058	0.02	Q V			
5+30	0.0059	0.02	Q V			
5+35	0.0060	0.02	Q V			
5+40	0.0061	0.02	Q V			
5+45	0.0062	0.02	Q V			
5+50	0.0063	0.02	Q V			
5+55	0.0064	0.02	Q V			
6+ 0	0.0065	0.02	Q V			
6+ 5	0.0066	0.02	Q V			
6+10	0.0067	0.02	Q V			
6+15	0.0068	0.02	Q V			
6+20	0.0069	0.02	Q V			

6+25	0.0070	0.02	Q	V			
6+30	0.0072	0.02	Q	V			
6+35	0.0073	0.02	Q	V			
6+40	0.0074	0.02	Q	V			
6+45	0.0075	0.02	Q	V			
6+50	0.0076	0.02	Q	V			
6+55	0.0077	0.02	Q	V			
7+ 0	0.0078	0.02	Q	V			
7+ 5	0.0080	0.02	Q	V			
7+10	0.0081	0.02	Q	V			
7+15	0.0082	0.02	Q	V			
7+20	0.0083	0.02	Q	V			
7+25	0.0084	0.02	Q	V			
7+30	0.0085	0.02	Q	V			
7+35	0.0087	0.02	Q	V			
7+40	0.0088	0.02	Q	V			
7+45	0.0089	0.02	Q	V			
7+50	0.0090	0.02	Q	V			
7+55	0.0091	0.02	Q	V			
8+ 0	0.0093	0.02	Q	V			
8+ 5	0.0094	0.02	Q	V			
8+10	0.0095	0.02	Q	V			
8+15	0.0096	0.02	Q	V			
8+20	0.0098	0.02	Q	V			
8+25	0.0099	0.02	Q	V			
8+30	0.0100	0.02	Q	V			
8+35	0.0101	0.02	Q	V			
8+40	0.0103	0.02	Q	V			
8+45	0.0104	0.02	Q	V			
8+50	0.0105	0.02	Q	V			

8+55	0.0107	0.02	Q	V	|	|	|
9+ 0	0.0108	0.02	Q	V	|	|	|
9+ 5	0.0109	0.02	Q	V	|	|	|
9+10	0.0111	0.02	Q	V	|	|	|
9+15	0.0112	0.02	Q	V	|	|	|
9+20	0.0113	0.02	Q	V	|	|	|
9+25	0.0115	0.02	Q	V	|	|	|
9+30	0.0116	0.02	Q	V	|	|	|
9+35	0.0118	0.02	Q	V	|	|	|
9+40	0.0119	0.02	Q	V	|	|	|
9+45	0.0120	0.02	Q	V	|	|	|
9+50	0.0122	0.02	Q	V	|	|	|
9+55	0.0123	0.02	Q	V	|	|	|
10+ 0	0.0125	0.02	Q	V	|	|	|
10+ 5	0.0126	0.02	Q	V	|	|	|
10+10	0.0128	0.02	Q	V	|	|	|
10+15	0.0129	0.02	Q	V	|	|	|
10+20	0.0130	0.02	Q	V	|	|	|
10+25	0.0132	0.02	Q	V	|	|	|
10+30	0.0134	0.02	Q	V	|	|	|
10+35	0.0135	0.02	Q	V	|	|	|
10+40	0.0137	0.02	Q	V	|	|	|
10+45	0.0138	0.02	Q	V	|	|	|
10+50	0.0140	0.02	Q	V	|	|	|
10+55	0.0141	0.02	Q	V	|	|	|
11+ 0	0.0143	0.02	Q	V	|	|	|
11+ 5	0.0145	0.02	Q	V	|	|	|
11+10	0.0146	0.02	Q	V	|	|	|
11+15	0.0148	0.02	Q	V	|	|	|
11+20	0.0149	0.02	Q	V	|	|	|

11+25	0.0151	0.02	Q	V|			
11+30	0.0153	0.02	Q	V			
11+35	0.0155	0.03	Q	V			
11+40	0.0156	0.03	Q	V			
11+45	0.0158	0.03	Q	V			
11+50	0.0160	0.03	Q	V			
11+55	0.0162	0.03	Q	V			
12+ 0	0.0164	0.03	Q	V			
12+ 5	0.0165	0.03	Q	V			
12+10	0.0167	0.03	Q	V			
12+15	0.0170	0.03	Q	|V			
12+20	0.0172	0.04	Q	|V			
12+25	0.0175	0.04	Q	|V			
12+30	0.0177	0.04	Q	|V			
12+35	0.0180	0.04	Q	|V			
12+40	0.0182	0.04	Q	|V			
12+45	0.0185	0.04	Q	| V			
12+50	0.0188	0.04	Q	| V			
12+55	0.0191	0.04	Q	| V			
13+ 0	0.0194	0.04	Q	| V			
13+ 5	0.0196	0.04	Q	| V			
13+10	0.0199	0.04	Q	| V			
13+15	0.0202	0.04	Q	| V			
13+20	0.0205	0.04	Q	| V			
13+25	0.0208	0.04	Q	| V			
13+30	0.0211	0.04	Q	| V			
13+35	0.0215	0.05	Q	| V			
13+40	0.0218	0.05	Q	| V			
13+45	0.0221	0.05	Q	| V			
13+50	0.0224	0.05	Q	| V			

13+55	0.0228	0.05	Q	|	V	|
14+ 0	0.0231	0.05	Q	|	V	|
14+ 5	0.0234	0.05	Q	|	V	|
14+10	0.0238	0.05	Q	|	V	|
14+15	0.0241	0.05	Q	|	V	|
14+20	0.0245	0.05	Q	|	V	|
14+25	0.0249	0.05	Q	|	V	|
14+30	0.0253	0.06	Q	|	V	|
14+35	0.0256	0.06	Q	|	V	|
14+40	0.0260	0.06	Q	|	V	|
14+45	0.0265	0.06	Q	|	V	|
14+50	0.0269	0.06	Q	|	V	|
14+55	0.0273	0.06	Q	|	V	|
15+ 0	0.0277	0.06	Q	|	V	|
15+ 5	0.0282	0.07	Q	|	V	|
15+10	0.0287	0.07	Q	|	V	|
15+15	0.0292	0.07	Q	|	V|	|
15+20	0.0297	0.07	Q	|	V|	|
15+25	0.0302	0.08	Q	|	V|	|
15+30	0.0307	0.08	Q	|	V	|
15+35	0.0312	0.07	Q	|	V	|
15+40	0.0317	0.07	Q	|	V	|
15+45	0.0323	0.08	Q	|	|V	|
15+50	0.0329	0.09	Q	|	|V	|
15+55	0.0335	0.10	Q	|	| V	|
16+ 0	0.0343	0.12	Q	|	| V	|
16+ 5	0.0355	0.17	Q	|	| V	|
16+10	0.0372	0.25	|Q	|	| V	|
16+15	0.0397	0.37	|Q	|	| V	|
16+20	0.0415	0.25	|Q	|	| V	|

16+25	0.0427	0.17	Q	|	|	V |	|
16+30	0.0436	0.14	Q	|	|	V |	|
16+35	0.0445	0.12	Q	|	|	V|	|
16+40	0.0452	0.11	Q	|	|	V|	|
16+45	0.0459	0.09	Q	|	|	V	|
16+50	0.0464	0.08	Q	|	|	V	|
16+55	0.0469	0.07	Q	|	|	V	|
17+ 0	0.0474	0.07	Q	|	|	|V	|
17+ 5	0.0478	0.06	Q	|	|	|V	|
17+10	0.0483	0.06	Q	|	|	|V	|
17+15	0.0487	0.06	Q	|	|	|V	|
17+20	0.0490	0.05	Q	|	|	| V	|
17+25	0.0494	0.05	Q	|	|	| V	|
17+30	0.0497	0.05	Q	|	|	| V	|
17+35	0.0500	0.05	Q	|	|	| V	|
17+40	0.0504	0.05	Q	|	|	| V	|
17+45	0.0507	0.04	Q	|	|	| V	|
17+50	0.0510	0.04	Q	|	|	| V	|
17+55	0.0513	0.04	Q	|	|	| V	|
18+ 0	0.0516	0.04	Q	|	|	| V	|
18+ 5	0.0518	0.04	Q	|	|	| V	|
18+10	0.0521	0.04	Q	|	|	| V	|
18+15	0.0523	0.03	Q	|	|	| V	|
18+20	0.0525	0.03	Q	|	|	| V	|
18+25	0.0527	0.03	Q	|	|	| V	|
18+30	0.0529	0.03	Q	|	|	| V	|
18+35	0.0531	0.03	Q	|	|	| V	|
18+40	0.0533	0.03	Q	|	|	| V	|
18+45	0.0535	0.03	Q	|	|	| V	|
18+50	0.0536	0.02	Q	|	|	| V	|

18+55	0.0538	0.02	Q				V
19+ 0	0.0540	0.02	Q				V
19+ 5	0.0541	0.02	Q				V
19+10	0.0543	0.02	Q				V
19+15	0.0544	0.02	Q				V
19+20	0.0546	0.02	Q				V
19+25	0.0547	0.02	Q				V
19+30	0.0549	0.02	Q				V
19+35	0.0550	0.02	Q				V
19+40	0.0551	0.02	Q				V
19+45	0.0553	0.02	Q				V
19+50	0.0554	0.02	Q				V
19+55	0.0555	0.02	Q				V
20+ 0	0.0557	0.02	Q				V
20+ 5	0.0558	0.02	Q				V
20+10	0.0559	0.02	Q				V
20+15	0.0561	0.02	Q				V
20+20	0.0562	0.02	Q				V
20+25	0.0563	0.02	Q				V
20+30	0.0564	0.02	Q				V
20+35	0.0566	0.02	Q				V
20+40	0.0567	0.02	Q				V
20+45	0.0568	0.02	Q				V
20+50	0.0569	0.02	Q				V
20+55	0.0570	0.02	Q				V
21+ 0	0.0571	0.02	Q				V
21+ 5	0.0573	0.02	Q				V
21+10	0.0574	0.02	Q				V
21+15	0.0575	0.02	Q				V
21+20	0.0576	0.02	Q				V

21+25	0.0577	0.02	Q	|	|	|	V |
21+30	0.0578	0.02	Q	|	|	|	V |
21+35	0.0579	0.02	Q	|	|	|	V |
21+40	0.0580	0.02	Q	|	|	|	V |
21+45	0.0581	0.02	Q	|	|	|	V |
21+50	0.0582	0.02	Q	|	|	|	V |
21+55	0.0583	0.01	Q	|	|	|	V |
22+ 0	0.0584	0.01	Q	|	|	|	V |
22+ 5	0.0585	0.01	Q	|	|	|	V |
22+10	0.0586	0.01	Q	|	|	|	V |
22+15	0.0587	0.01	Q	|	|	|	V |
22+20	0.0588	0.01	Q	|	|	|	V |
22+25	0.0589	0.01	Q	|	|	|	V |
22+30	0.0590	0.01	Q	|	|	|	V |
22+35	0.0591	0.01	Q	|	|	|	V |
22+40	0.0592	0.01	Q	|	|	|	V |
22+45	0.0593	0.01	Q	|	|	|	V |
22+50	0.0594	0.01	Q	|	|	|	V|
22+55	0.0595	0.01	Q	|	|	|	V|
23+ 0	0.0596	0.01	Q	|	|	|	V|
23+ 5	0.0597	0.01	Q	|	|	|	V|
23+10	0.0598	0.01	Q	|	|	|	V|
23+15	0.0599	0.01	Q	|	|	|	V|
23+20	0.0600	0.01	Q	|	|	|	V|
23+25	0.0601	0.01	Q	|	|	|	V|
23+30	0.0601	0.01	Q	|	|	|	V|
23+35	0.0602	0.01	Q	|	|	|	V|
23+40	0.0603	0.01	Q	|	|	|	V|
23+45	0.0604	0.01	Q	|	|	|	V|
23+50	0.0605	0.01	Q	|	|	|	V|

```
   23+55       0.0606      0.01  Q         |         |         |
V|
   24+ 0       0.0607      0.01  Q         |         |         |
V|
   24+ 5       0.0607      0.01  Q         |         |         |
V|
   24+10       0.0608      0.01  Q         |         |         |
V|
   24+15       0.0609      0.01  Q         |         |         |
V|
   24+20       0.0609      0.00  Q         |         |         |
V|
   24+25       0.0609      0.00  Q         |         |         |
V|
   24+30       0.0609      0.00  Q         |         |         |
V|
   24+35       0.0609      0.00  Q         |         |         |
V|
   24+40       0.0609      0.00  Q         |         |         |
V|
   24+45       0.0609      0.00  Q         |         |         |
V|
   24+50       0.0609      0.00  Q         |         |         |
V|
   24+55       0.0609      0.00  Q         |         |         |
V|
   25+ 0       0.0609      0.00  Q         |         |         |
V|
   25+ 5       0.0609      0.00  Q         |         |         |
V|
   25+10       0.0609      0.00  Q         |         |         |
V|
   25+15       0.0609      0.00  Q         |         |         |
V|
   25+20       0.0609      0.00  Q         |         |         |
V
-------------------------------------------------------------------------
```

Appendix B

Filterra Sizing Spreadsheet
Uniform Intensity Approach
Storm Intensity = 0.20 in/hr

Filterra Infiltration Rate = 100 (in/hr)
Filterra Flow per Square Foot = 0.0023 (ft3/sec/ft2)

Filterra Flow Rate, Q = 0.0023 ft3/sec x Filterra Surface Area
Rational Method, Q = C x I x A

Site Flowrate, Q = (C x DI x DA x 43560) / (12 x3600)
OR DA = (12 x 3600 x Q) / (C x 43560 x DI)

where
Q = Flow (ft3/sec)
DA = Drainage Area (acres)
DI = Design Intensity (in/hr)
C = Runoff coefficient (dimensionless)

			DI 0.2	C 1.00	C 0.85	C 0.50
Available Filterra Box Sizes			**Filterra Flow Rate, Q (ft3/sec)**	100% Imperv. DA (acres)	Commercial max DA (acres)	Residential max DA (acres)
L (ft)	W (ft)	Filterra Surface Area (ft2)				
4	4	16	**0.0370**	0.184	0.216	0.367
6	4	24	**0.0556**	0.275	0.324	0.551
6.5	4	26	**0.0602**	0.298	0.351	0.597
8	4	32	**0.0741**	0.367	0.432	0.735
12	4	48	**0.1111**	0.551	0.648	1.102
6	6	36	**0.0833**	0.413	0.486	0.826
8	6	48	**0.1111**	0.551	0.648	1.102
10	6	60	**0.1389**	0.689	0.810	1.377
12	6	72	**0.1667**	0.826	0.972	1.653
13	7	91	**0.2106**	1.045	1.229	2.089
12	8	96	**0.2222**	1.102	1.296	2.204




CONTECH®
ENGINEERED SOLUTIONS

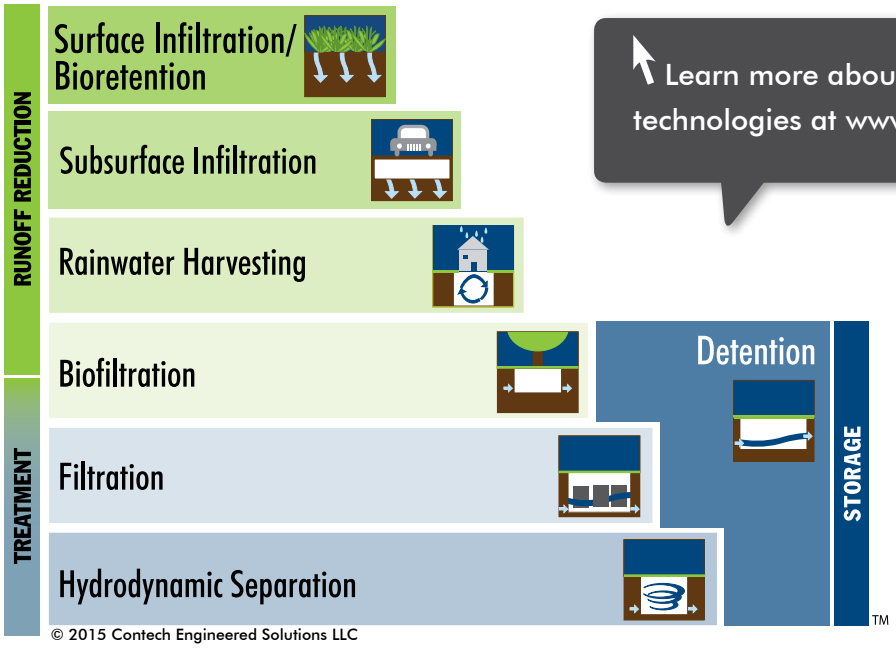
Filterra® Bioretention System

Solutions Guide

Stormwater Solutions from Contech

Selecting the Right Stormwater Solution Just Got Easier...

It's simple to choose the right stormwater solution to achieve your goals with the Contech Stormwater Solutions Staircase. First, select the runoff reduction practices that are most appropriate for your site, paying particular attention to pretreatment needs. If the entire design storm cannot be retained, select a treatment best management practice (BMP) for the balance. Finally, select a detention system to address any outstanding downstream erosion.



Learn more about all of our stormwater technologies at www.ContechES.com/stormwater

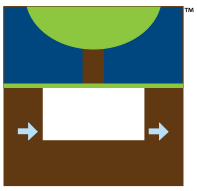
Low Impact Development Site Planner

The Low Impact Development (LID) Site Planner is a free, web-based tool intended to guide you in preliminary selection of the most effective and likely to be approved stormwater control measures that are technically feasible given known site constraints. To utilize this tool, visit www.conteches.com/lidsiteplanner

Benefits of the tool include:

- A fast, easy-to-use tool that follows a Low Impact Development design approach consistent with regulations that prioritize Green Infrastructure.
- Helps minimize the cost and delay of redesigns by prompting users to consider a wide range of common site constraints early in the design process.
- Captures specific site conditions precluding the use of infeasible BMPs.
- Allows flexibility to select flow through treatment controls where runoff reduction is not feasible.
- Provides a summary report with links to design guides, standard details, and specifications for stormwater management approaches that are likely to be feasible and approved on the project.

Bioretention as a Stormwater Management Strategy



Filtration and Biological Treatment in One System

Stormwater management regulations such as Low Impact Development (LID) and Green Infrastructure (GI) have proliferated throughout the United States.

Implementing LID and GI in urban environments is challenging, as they often require a large footprint. That doesn't mean LID/GI is not possible, it just means the solution may take a more engineered form. Contech has addressed this need by developing a unique solution – the Filterra Bioretention System.

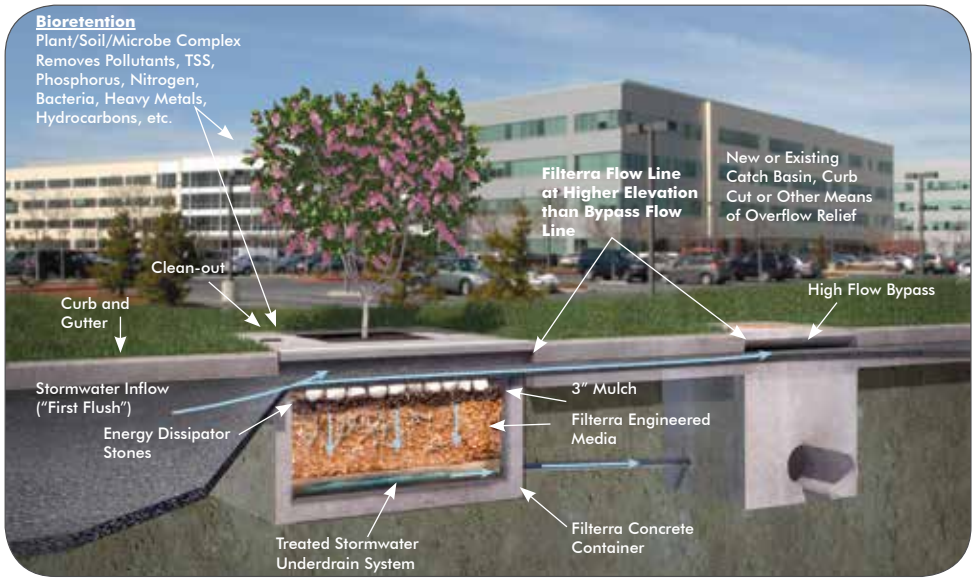
What is Filterra?

Filterra is an engineered biofiltration device with components that make it similar to bioretention in pollutant removal and application, but has been optimized for high volume/flow treatment in a compact system. Its small footprint allows Filterra to be used on highly developed sites such as commercial parking lots, residential streets, parking lots, and urban streetscapes. Filterra is adaptable and can be used alone or in combination with perforated pipes or chambers to optimize runoff reduction.

How The Standard Offline Filterra Systems Works

Stormwater runoff enters the Standard Offline Filterra system through a curb-inlet opening and flows through a specially designed filter media mixture contained in a landscaped modular container. The biofiltration media captures and immobilizes pollutants; some of these pollutants are then decomposed, volatilized and incorporated into the biomass of the Filterra system's micro/macro fauna and flora. Stormwater runoff flows through the media and into an underdrain system at the bottom of the container, where the treated water is discharged. The Standard Offline Filterra system utilizes a downstream catch basin or curb inlet for bypass flows allowing for the shallowest profile and most flexible design of any of the Filterra configurations.

In areas where runoff reduction and infiltration are mandated or desirable, Filterra can be paired with other Contech products such as ChamberMaxx or an Urban Green Rainwater Harvesting system to provide even greater alignment with LID/GI goals.



Learn more at www.ContechES.com/filterra

Filterra® Features & Benefits

- **Regulatory Compliance** – Multiple third-party field tests confirmed Filterra meets regulatory requirements for pollutant removal under TAPE, TARP, and NJCAT testing.
- **Value** – Filterra offers a cost effective stormwater treatment system featuring easy installation and simple maintenance.
- **Aesthetics** – Landscaping enhances the appearance of your site making it more attractive while removing pollutants.
- **Flexible** – Multiple sizes and a variety of configurations available to meet site-specific needs.
- **Versatile** – Filterra is ideal for both new construction and urban retrofits, as well as:
  - » Streetscapes
  - » Urban settings
  - » Parking lots
  - » Roof drains
  - » Roadways
  - » Residential subdivisions
- **Easy Installation** – Delivered on-site, ready to lift and place.
- **Activation** – Performed by Contech-certified providers to ensure effective performance from the start.
- **Maintenance** – Simple and safe (no confined space access), and the first year of maintenance is included with the purchase of every system.

Third-party field testing confirmed Filterra meets regulatory requirements for pollutant removal under nationally recognized TAPE, TARP, and NJCAT testing protocols.

Additional Filterra® Configurations

Filterra is offered in multiple configurations to meet site specific needs. These additional configurations make Filterra a versatile yet effective stormwater BMP with a low life-cycle cost.

Filterra Internal Bypass – Curb

The Filterra Internal Bypass – Curb incorporates a curb inlet treatment chamber and internal high flow bypass in a single structure. This eliminates the need for a separate bypass structure and enables placement on grade or in a "sag" or "sump" condition.

Filterra Internal Bypass – Pipe

The Filterra Internal Bypass – Pipe treats stormwater runoff from rooftops or other sub-grade sources such as area drains. Higher flows bypass the biofiltration treatment system via an overflow/bypass pipe.

Filterra Street Tree

The Filterra Street Tree accommodates trees larger than the standard small-medium-sized trees used in standard Filterra units. These larger trees can provide benefits to site landscape designs on canopy cover, tree count, or percentage of green area.

Filterra Sedimentation Chamber

The Filterra Sedimentation Chamber includes a pre-treatment chamber that provides settling for debris and sediment, meeting water quality volume temporary hold requirements in some jurisdictions.

Filterra Bioscape®

The Filterra Bioscape system available with or without the concrete vault provides an option for larger drainage areas where standard Filterra is not feasible. Contech provides activation and maintenance services to ensure quality and ease of Filterra component placement.

Learn more at www.ContechES.com/filterra

Filterra® Media – Proven Pollutant Removal

At the heart of the Filterra system is Filterra engineered biofiltration media; a specified gradation of washed aggregate and organic material homogeneously blended under strict quality controlled conditions. Using data from independent, third-party studies including the University of Virginia (TARP), Herrera Environmental Consultants (TAPE), Terraphase Engineering (NJCAT), North Carolina State University (TAPE & TARP) and Geosyntec Consultants, the filter media has been optimized to operate under high flow rates while maintaining pollutant removal performance. Filterra media is tested for hydraulic functionality, fertility, and particle size distribution to ensure uniform performance.

Filterra media also supports a vegetation component consisting of grasses, shrubs, or trees that assist with the adsorption of pollutants through biological uptake/storage and pollutant consumption by microbes within the plant root zone.

MEASURED POLLUTANT REMOVAL PERFORMANCE			
Pollutant	**Median Removal Efficiency**	**Median Effluent Concentration (mg/L)**	**Third Party Reference Studies**
Total Suspended Solids	86%	3.3	UVA 2006, Herrera 2009, Herrera 2014, NC State 2015
Total Phosphorus (TAPE)	70%	0.05	Herrera 2014, NC State 2015
Total Nitrogen	34%	0.54	NC State 2015
Total Copper	55%	0.004	UVA 2006, Herrera 2009
Dissolved Copper	43%	0.003	Herrera 2009
Total Zinc	56%	0.04	UVA 2006, Herrera 2009, NC State 2015
Dissolved Zinc	54%	0.1	Herrera 2009
Total Petroleum Hydrocarbons	87%	0.71	Herrera 2009

Information above is based on results from third party field studies following industry recognized protocols such as TAPE and TARP. Relevant studies are noted for each pollutant, and corresponding data was aggregated to provide realistic and repeatable performance expectations.

Some jurisdictions recognize higher removal rates - see your Contech Stormwater Consultant for performance expectations.

Filterra media has been **optimized** to operate under high flow rates while maintaining pollutant removal performance.

Filterra® – Regulatory Approvals

Based on more than 20 years of research and development, testing and field monitoring, Filterra's performance has been recognized by some of the nation's most significant regulatory agencies, including the states of Washington, Virginia, Maryland and New Jersey, the District of Columbia, the Texas Commission on Environmental Quality and the Atlanta (GA) Regional Commission, and the City of Portland (OR). Highlights regarding these approvals include:

- Granted ESD (Environmental Site Design) status by the state of Maryland Department of the Environment (MDE).
- GULD-approved for ALL pollutants of concern with the state of Washington Department of Ecology (WA-Ecology) with (2) TAPE field tests.
- Multiple third-party nationally recognized field/lab tests completed: (1) TARP, (2) TAPE, (1) NJCAT and (1) NC-DENR.

Filterra® – In the Field

We make it easy! The Filterra system is delivered to the job site with all components except vegetation and mulch.

Filterra – Installation

- Contractor off-loads top and vault separately.
- Set vault to grade on 6" compacted stone, install piping, backfill, set top.
- Leave protective throat plate and tree grate covers in place.

Filterra – Activation

- Contractor completes and returns Activation Checklist paperwork.
- Vegetation selection guidance based on your climate zone.
- Contech-certified providers conduct on-site activation with installation of mulch and plant vegetation.

Filterra – Maintenance

- The first year of maintenance is included with every system.
- Maintenance is low-cost, low-tech and simple:
  - » Remove trash, sediment, and mulch.
  - » Replace with a fresh 3" layer of mulch.
  - » Can be completed by landscape contractor.
  - » No confined space entry.

The **first year of maintenance** is **included** with the purchase of every Filterra system.

Learn more at www.ContechES.com/filterra

Next Steps

Dig Deeper

Find all the information you need at www.ContechES.com, including field and laboratory test results, approvals, brochures, design guides, standard details and specifications within the product section of our site.

Connect with Us

We're here to make your job easier – and that includes being able to get in touch with us when you need to. www.ContechES.com/localresources.

While you're there, be sure to check out our upcoming seminar schedule or request an in-house technical presentation.

Start a Project

If you are ready to begin a project, contact your local representative to get started. Or you can check out our design toolbox for all our online resources at www.ContechES.com/startaproject.

Links to Stormwater Design Tools:

To use the Land Value Calculator, visit: www.ContechES.com/lvc

To use the Design Your Own Detention System tool, visit: www.ContechES.com/dyods

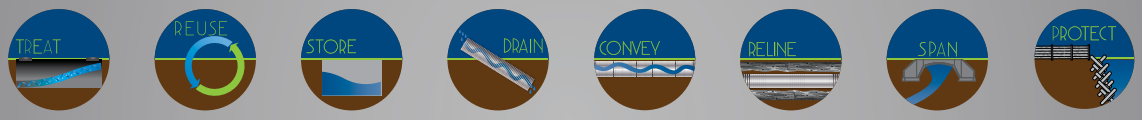
To use the Design Your Own Hydrodynamic Separator tool, visit: www.ContechES.com/dyohds

To use the Rainwater Harvesting Runoff Reduction Calculator tool, visit: www.ContechES.com/rwh-calculator

To use the Low Impact Development Site Planner tool, visit: www.ContechES.com/lidsiteplanner

CONTECH® ENGINEERED SOLUTIONS

COMPLETE SITE SOLUTIONS



STORMWATER SOLUTIONS

Helping to satisfy stormwater management requirements on land development projects

- Stormwater Treatment
- Detention/Infiltration
- Rainwater Harvesting
- Biofiltration/Bioretention

PIPE SOLUTIONS

Meeting project needs for durability, hydraulics, corrosion resistance, and stiffness

- Corrugated Metal Pipe (CMP)
- Steel Reinforced Polyethylene (SRPE)
- High Density Polyethylene (HDPE)
- Polyvinyl Chloride (PVC)

STRUCTURES SOLUTIONS

Providing innovative options and support for crossings, culverts, and bridges

- Plate, Precast & Truss bridges
- Hard Armor
- Retaining Walls
- Tunnel Liner Plate

Get Social With Us!

Filterra Brochure 3M 11/16

CONTECH® ENGINEERED SOLUTIONS

We print our brochures entirely on Forest Stewardship Council certified paper. FSC certification ensures that the paper in our brochures contain fiber from well-managed and responsibly harvested forests that meet strict environmental and socioeconomic standards.

FSC

Operation & Maintenance (OM) Manual v01

filterra®

Bioretention Systems

CONTECH®

ENGINEERED SOLUTIONS

filterra®
Bioretention Systems

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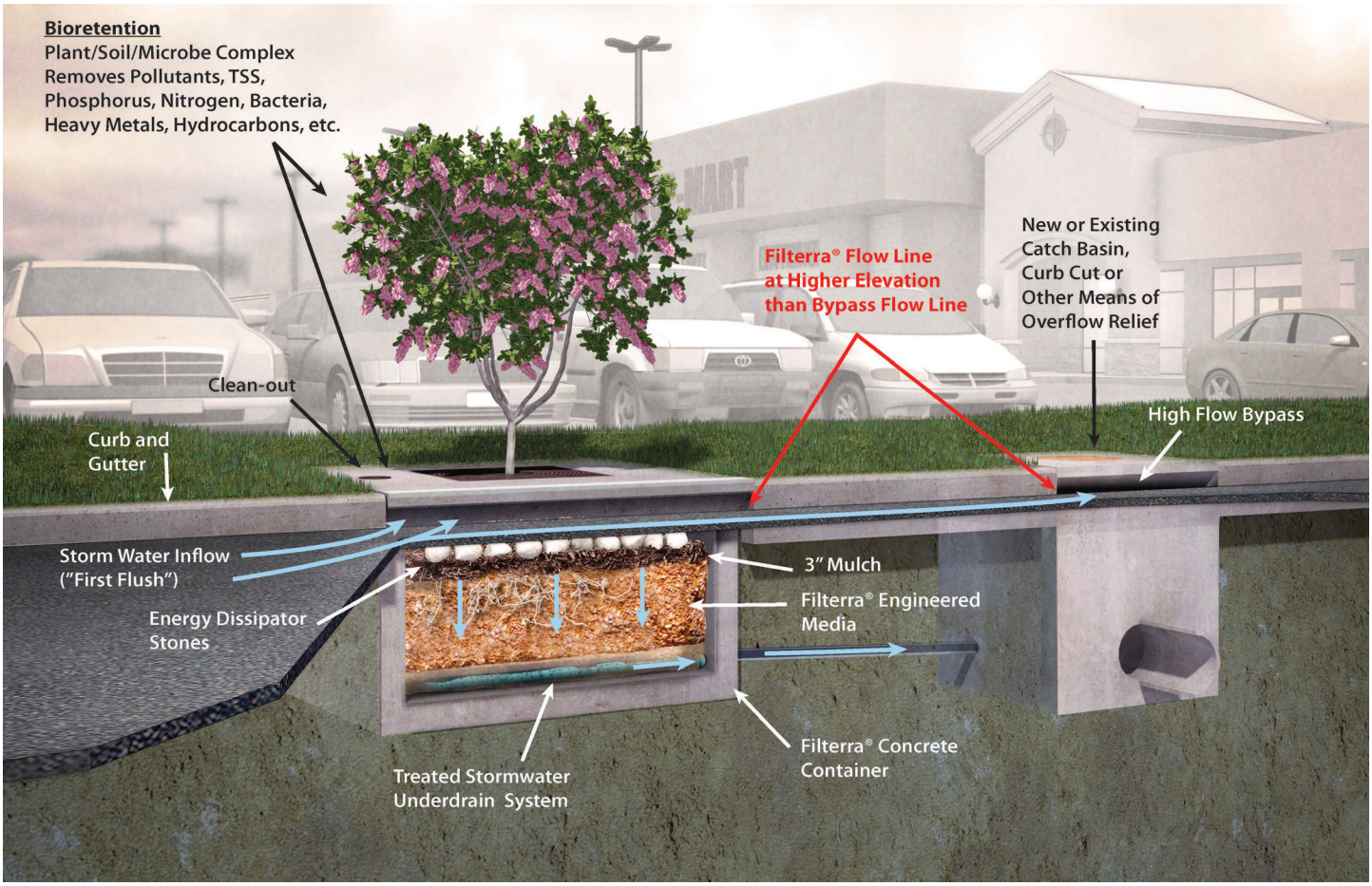
CONTECH®
ENGINEERED SOLUTIONS

General Description

The following general specifications describe the general operations and maintenance requirements for the Contech Engineered Solutions LLC stormwater bioretention filtration system, the Filterra®. The system utilizes physical, chemical and biological mechanisms of a soil, plant and microbe complex to remove pollutants typically found in urban stormwater runoff. The treatment system is a fully equipped, pre-constructed drop-in place unit designed for applications in the urban landscape to treat contaminated runoff.



Stormwater flows through a specially designed filter media mixture contained in a landscaped concrete container. The mixture immobilizes pollutants which are then decomposed, volatilized and incorporated into the biomass of the Filterra® system's micro/macro fauna and flora. Stormwater runoff flows through the media and into an underdrain system at the bottom of the container, where the treated water is discharged. Higher flows bypass the Filterra® to a downstream inlet or outfall. Maintenance is a simple, inexpensive and safe operation that does not require confined space access, pumping or vacuum equipment or specialized tools. Properly trained landscape personnel can effectively maintain Filterra® Stormwater systems by following instructions in this manual.

Basic Operations

Filterra® is a bioretention system in a concrete box. Contaminated stormwater runoff enters the filter box through the curb inlet spreading over the 3-inch layer of mulch on the surface of the filter media. As the water passes through the mulch layer, most of the larger sediment particles and heavy metals are removed through sedimentation and chemical reactions with the organic material in the mulch. Water passes through the soil media where the finer particles are removed and other chemical reactions take place to immobilize and capture pollutants in the soil media. The cleansed water passes into an underdrain and flows to a pipe system or other appropriate discharge point. Once the pollutants are in the soil, the bacteria begin to break down and metabolize the materials and the plants begin to uptake and metabolize the pollutants. Some pollutants such as heavy metals, which are chemically bound to organic particles in the mulch, are released over time as the organic matter decomposes to release the metals to the feeder roots of the plants and the cells of the bacteria in the soil where they remain and are recycled. Other pollutants such as phosphorus are chemically bound to the soil particles and released slowly back to the plants and bacteria and used in their metabolic processes. Nitrogen goes through a very complex variety of biochemical processes where it can ultimately end up in the plant/bacteria biomass, turned to nitrogen gas or dissolves back into the water column as nitrates depending on soil temperature, pH and the availability of oxygen. The pollutants ultimately are retained in the mulch, soil and biomass with some passing out of the system into the air or back into the water.

Design and Installation

Each project presents different scopes for the use of Filterra® systems. To ensure the safe and specified function of the stormwater BMP, Contech reviews each application before supply. Information and help may be provided to the design engineer during the planning process. Correct Filterra® box sizing (by rainfall region) is essential to predict pollutant removal rates for a given area. The engineer shall submit calculations for approval by the local jurisdiction. The contractor is responsible for the correct installation of Filterra units as shown in approved plans. A comprehensive installation manual is available at www.conteches.com.

Maintenance

Why Maintain?

All stormwater treatment systems require maintenance for effective operation. This necessity is often incorporated in your property's permitting process as a legally binding BMP maintenance agreement.

- Avoid legal challenges from your jurisdiction's maintenance enforcement program.
- Prolong the expected lifespan of your Filterra media.
- Avoid more costly media replacement.
- Help reduce pollutant loads leaving your property.

Simple maintenance of the Filterra® is required to continue effective pollutant removal from stormwater runoff before discharge into downstream waters. This procedure will also extend the longevity of the living biofilter system. The unit will recycle and accumulate pollutants within the biomass, but is also subjected to other materials entering the throat. This may include trash, silt and leaves etc. which will be contained within the void below the top grate and above the mulch layer. Too much silt may inhibit the Filterra's® flow rate, which is the reason for site stabilization before activation. Regular replacement of the mulch stops accumulation of such sediment.

When to Maintain?

Contech includes a 1-year maintenance plan with each system purchase. Annual included maintenance consists of a maximum of two (2) scheduled visits. Additional maintenance may be necessary depending on sediment and trash loading (by Owner or at additional cost). The start of the maintenance plan begins when the system is activated for full operation. Full operation is defined as the unit installed, curb and gutter and transitions in place and activation (by Supplier) when mulch and plant are added and temporary throat protection removed.

Activation cannot be carried out until the site is fully stabilized (full landscaping, grass cover, final paving and street sweeping completed). Maintenance visits are scheduled seasonally; the spring visit aims to clean up after winter loads including salts and sands while the fall visit helps the system by removing excessive leaf litter.

It has been found that in regions which receive between 30-50 inches of annual rainfall, (2) two visits are generally required; regions with less rainfall often only require (1) one visit per annum. Varying land uses can affect maintenance frequency; e.g. some fast food restaurants require more frequent trash removal. Contributing drainage areas which are subject to new development wherein the recommended erosion and sediment control measures have not been implemented may require additional maintenance visits.

Some sites may be subjected to extreme sediment or trash loads, requiring more frequent maintenance visits. This is the reason for detailed notes of maintenance actions per unit, helping the Supplier and Owner predict future maintenance frequencies, reflecting individual site conditions.

Owners must promptly notify the (maintenance) Supplier of any damage to the plant(s), which constitute(s) an integral part of the bioretention technology. Owners should also advise other landscape or maintenance contractors to leave all maintenance to the Supplier (i.e. no pruning or fertilizing).

Exclusion of Services

It is the responsibility of the owner to provide adequate irrigation when necessary to the plant of the Filterra® system.

Clean up due to major contamination such as oils, chemicals, toxic spills, etc. will result in additional costs and are not covered under the Supplier maintenance contract. Should a major contamination event occur the Owner must block off the outlet pipe of the Filterra® (where the cleaned runoff drains to, such as drop inlet) and block off the throat of the Filterra®. The Supplier should be informed immediately.

Maintenance Visit Summary

Each maintenance visit consists of the following simple tasks (detailed instructions below).

1. Inspection of Filterra® and surrounding area
2. Removal of tree grate and erosion control stones
3. Removal of debris, trash and mulch
4. Mulch replacement
5. Plant health evaluation and pruning or replacement as necessary
6. Clean area around Filterra®
7. Complete paperwork

Maintenance Tools, Safety Equipment and Supplies

Ideal tools include: camera, bucket, shovel, broom, pruners, hoe/rake, and tape measure. Appropriate Personal Protective Equipment (PPE) should be used in accordance with local or company procedures. This may include impervious gloves where the type of trash is unknown, high visibility clothing and barricades when working in close proximity to traffic and also safety hats and shoes. A T-Bar or crowbar should be used for moving the tree grates (up to 170 lbs ea.). Most visits require minor trash removal and a full replacement of mulch. See below for actual number of bagged mulch that is required in each unit size. Mulch should be a double shredded, hardwood variety; do not use colored or dyed mulch. Some visits may require additional Filterra® engineered soil media available from the Supplier.

Box Length	Box Width	Filter Surface Area (ft^2)	Volume at 3″ (ft^3)	# of 2 ft^3 Mulch Bags
4	4	16	4	2
6	4	24	6	3
8	4	32	8	4
6	6	36	9	5
8	6	48	12	6
10	6	60	15	8
12	6	72	18	9
13	7	91	23	12

Maintenance Visit Procedure

Keep sufficient documentation of maintenance actions to predict location specific maintenance frequencies and needs. An example Maintenance Report is included in this manual.

1. Inspection of Filterra® and surrounding area

- Record individual unit before maintenance with photograph (numbered). Record on Maintenance Report (see example in this document) the following:

Record on Maintenance Report the following:

Standing Water	yes | no
Damage to Box Structure	yes | no
Damage to Grate	yes | no
Is Bypass Clear	yes | no

If yes answered to any of these observations, record with close-up photograph (numbered).

2. Removal of tree grate and erosion control stones

- Remove cast iron grates for access into Filterra® box.
- Dig out silt (if any) and mulch and remove trash & foreign items.

Record on Maintenance Report the following:

Silt/Clay	yes | no
Cups/ Bags	yes | no
Leaves	yes | no
# of Buckets Removed	_____

3. Removal of debris, trash and mulch

- After removal of mulch and debris, measure distance from the top of the Filterra® engineered media soil to the bottom of the top slab. If this distance is greater than 12", add Filterra® media (not top soil or other) to recharge to a 9" distance

Record on Maintenance Report the following:

Distance of Bottom of Top Slab (inches)	_____
# of Buckets of Media Added	_____

4. Mulch replacement

- Please see mulch specifications.
- Add double shredded mulch evenly across the entire unit to a depth of 3".
- Ensure correct repositioning of erosion control stones by the Filterra® inlet to allow for entry of trash during a storm event.
- Replace Filterra® grates correctly using appropriate lifting or moving tools, taking care not to damage the plant.

5. Plant health evaluation and pruning or replacement as necessary

- Examine the plant's health and replace if dead.
- Prune as necessary to encourage growth in the correct directions

Record on Maintenance Report the following:

Height above Grate	_____(ft)
Width at Widest Point	_____(ft)
Health	alive | dead
Damage to Plant	yes | no
Plant Replaced	yes | no

6. Clean area around Filterra®

- Clean area around unit and remove all refuse to be disposed of appropriately.

7. Complete paperwork

- Deliver Maintenance Report and photographs to appropriate location (normally Contech during maintenance contract period).
- Some jurisdictions may require submission of maintenance reports in accordance with approvals. It is the responsibility of the Owner to comply with local regulations.

Maintenance Checklist

Drainage System Failure	Problem	Conditions to Check	Condition that Should Exist	Actions
Inlet	Excessive sediment or trash accumulation.	Accumulated sediments or trash impair free flow of water into Filterra.	Inlet should be free of obstructions allowing free distributed flow of water into Filterra.	Sediments and/or trash should be removed.
Mulch Cover	Trash and floatable debris accumulation.	Excessive trash and/or debris accumulation.	Minimal trash or other debris on mulch cover.	Trash and debris should be removed and mulch cover raked level. Ensure bark nugget mulch is not used.
Mulch Cover	"Ponding" of water on mulch cover.	"Ponding" in unit could be indicative of clogging due to excessive fine sediment accumulation or spill of petroleum oils.	Stormwater should drain freely and evenly through mulch cover.	Recommend contact manufacturer and replace mulch as a minimum.
Vegetation	Plants not growing or in poor condition.	Soil/mulch too wet, evidence of spill. Incorrect plant selection. Pest infestation. Vandalism to plants.	Plants should be healthy and pest free.	Contact manufacturer for advice.
Vegetation	Plant growth excessive.	Plants should be appropriate to the species and location of Filterra.		Trim/prune plants in accordance with typical landscaping and safety needs.
Structure	Structure has visible cracks.	Cracks wider than 1/2 inch or evidence of soil particles entering the structure through the cracks.		Vault should be repaired.
Maintenance is ideally to be performed twice annually.				

CONTECH®
ENGINEERED SOLUTIONS

Revised 6/22/2015

Filterra® Maintenance Steps

1. Inspection of Filterra and surrounding area

2. Removal of tree grate and erosion control stones

3. Removal of debris, trash and mulch

4. Mulch replacement

5. Clean area around Filterra

6. Complete paperwork and record plant height and width

Contech has created a network of Certified Maintenance Providers (CCMP's) to provide maintenance on Filterra systems. To find a CCMP in your area please visit www.conteches.com/maintenance

Appendix C

SDVOSB
Service Disabled Veteran Owned Small Business

EnGEN CORPORATION

41625 Enterprise Circle South,
B-2, Temecula California 92590
951.296.3511
www.engencorp.com

IN MEMORY OF

*Chris Stevens * Tyrone Woods*
*Sean Smith * Glen Doherty*
Ann Smedingoff

PRELIMINARY GEOTECHNICAL FEASIBILITY STUDY

Summerland Senior Living Facility

13225 Serenity Trail, Chino, California

APN: 1023-011-051

Project Number: 4219GFS

October 10th, 2016

Prepared For:

Mr. Steven Steward
Summerland Senior Living
1439 West Chapman Avenue, Suite 15
Orange, California 92468

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EnGEN CORPORATION

October 10th, 2016

Mr. Steven Steward
Summerland Senior Living
1439 West Chapman Avenue, Suite 15
Orange, California 92468
843.425.7951

Regarding: **Preliminary Geotechnical Feasibility Study – Summerland Senior Living Facility**
3.61 Acres Located North of Serenity Drive, City of Chino, County of San Bernardino, California – Assessor's Parcel Number: 1023-011-51
Project Number: 4219GFS

References: ***United Engineering Group, Conceptual Grading Plan***, Summerland Senior Living, dated: September 26th, 2016, scale: 1"=30'.

Mr. Steward:

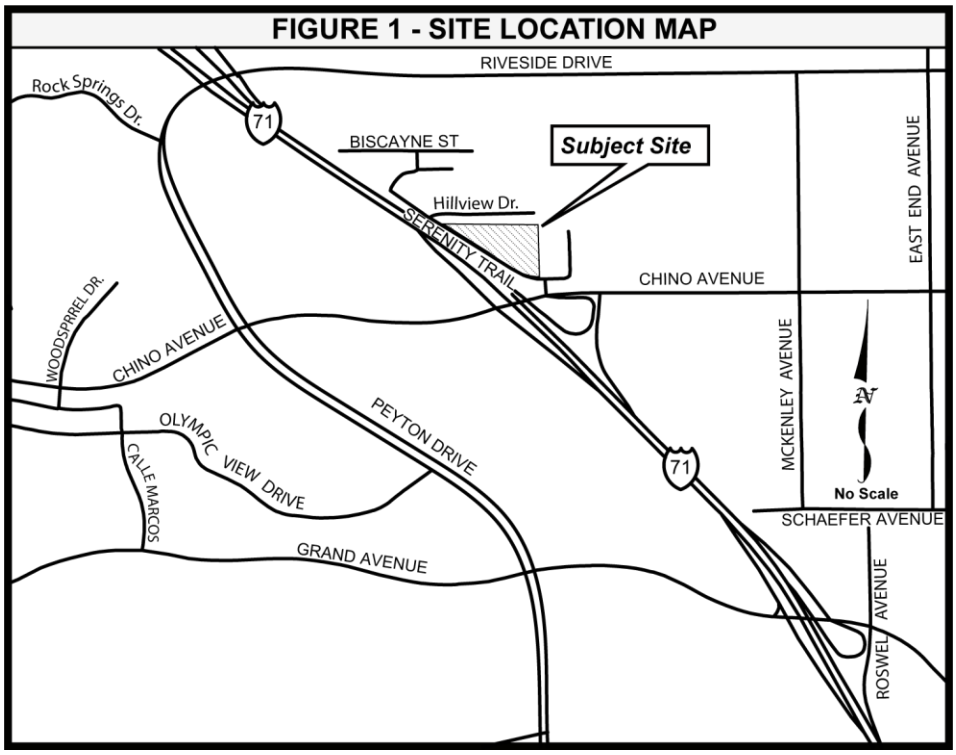
Per your request and signed authorization, we have performed a Preliminary Geotechnical Feasibility Study for the subject project. The purpose of this study was to evaluate the existing geotechnical and geologic conditions of the site to determine if the proposed development is feasible from a geotechnical standpoint. Submitted, herewith, are the results of our findings and recommendations, along with the supporting data.

1.0 EXECUTIVE SUMMARY

1.1 **General:** A preliminary geotechnical feasibility study of the subsurface conditions at the subject site has been performed for the proposed development. Subsurface exploration was limited to approximately 20 feet below the ground surface due to limited site access. Once site access can be provided, it is recommended that supplemental borings be advanced to a minimum depth of 50-feet (or refusal) from surface elevation with sampling and testing to analyze for liquefaction and settlement potential.

1.2 **Site Location and Description:** The subject property is situated at Latitude 34°01304 N and Longitude -117°73355 W and is comprised of approximately 3.16 acres of undeveloped land north of Serenity Trail, in the City of Chino, San Bernardino County, California. Topographic relief across the subject property is moderate to gently sloping to the south at a gradient of less than 12 percent.

1.3 **Proposed Development**: It is represented that the proposed development will be two (2) multi-story senior living and memory care facilities with a subterranean garage, associated parking, hardscape and landscape improvements. For the purposes of this report the structures are assumed to consist of wood or steel-framed and/or concrete block type design.



1.4 **Drilling Operations**: Attempts were made to enter the site with a drill rig on November 3rd, 2015. Due to poor site access the drilling operations were cancelled after consultation with the client and only backhoe test pits were advanced across the site. Accordingly, the conclusions and recommendations presented in this report are interim until such a time that deeper borings can be performed.

1.5 **Exploratory Test Pits**: The site was explored on September 29th, 2015 when six (6) exploratory backhoe test pits were excavated across the subject property (see Plate 1), samples were obtained and transported to our laboratory facility to be examined by professionals of this firm, then selected for laboratory testing. The data obtained during this study has been analyzed with respect to the project information furnished to us for the proposed development.

1.6 **Findings:** The majority of the study site is underlain by undocumented fill which varies in thickness from approximately 1 foot in the northerly area of the site to greater than 20 feet in the southerly portion, (see Plate 1). The origin of the undocumented fill is unknown at this writing but it is likely the result of earth materials generated from the construction or grading improvements along Serenity Trail and State Highway 71. Compaction tests taken in the undocumented fill were below the 90 percent compaction requirement for engineered fill, (see Exploratory Test Pit Logs). The native ground underlying the undocumented fill consist of silt with fine sand with clay to the maximum depth explored. Free

groundwater was not encountered to the maximum depth explored. The subject site is not located in a State or County Designated Fault Hazards Zone. Based on the limited depth of subsurface exploration additional analysis should be performed to properly evaluate liquefaction and settlement characteristics. The proposed development is feasible from a geotechnical standpoint, provided the recommendations presented in this report are implemented within the design and construction of the project.

1.7 **Recommendations**: It is recommended that supplemental exploration and testing be conducted prior to construction operations to complete the geotechnical findings and recommendations of this report. The supplemental work should include advancing a minimum of 4 exploratory borings. Two (2) should be advanced to a depth of at least 30 feet from surface elevation and two (2) no less than 50-feet from surface elevation. In-situ samples should be obtained at no greater than 5-foot intervals to the maximum depth explored. However, based on the preliminary subsurface exploration and testing conducted and information obtained through standard research conducted for this investigation, future proposed structures at the subject site can be supported on conventional continuous and isolated foundations with slab-at-grade design founded on properly compacted native earth materials. Due to the loose condition of the undocumented fill, it is recommended that all undocumented fill be removal to competent natural ground (defined as having a minimum relative compaction of 85% or higher). Preliminary recommendations for site grading are provided under § 8.3 of this report. Preliminary recommendations for bearing and lateral resistance are provided in § 8.4.5 and 8.4.7 of this report.

1.7.1 **Project Plans:** This office should review the proposed and/or approved project grading plans for the subject site prior to conducting further subsurface exploration and testing.

2.0 INTRODUCTION

2.1 **Authorization:** This report presents the results of the geologic and geotechnical engineering study performed on the subject site for the referenced proposed project. Authorization to perform this study was obtained in the form of a signed contract, dated July 28th, 2015. After initial attempts to enter the site with a CME 75 truck-mounted drill rig failed, the scope of work was modified to exclude deep borings until such a time that access could be provided. This study provides preliminary findings to be supplemented with additional exploration and testing at a later date.

2.2 **Scope of Work:** The scope of work performed for this study was designed to evaluate the surface and subsurface conditions within the subject site with respect to its geotechnical characteristics and suitability to support future structures for human occupancy. In order to provide this evaluation and prepare the preliminary recommendations for use by the design engineer and architect for site design and construction, the scope of work included the following: a site reconnaissance, surface geologic mapping; subsurface exploration; sampling of on-site earth materials; laboratory testing; engineering analysis of field and laboratory data, and the preparation of this report.

2.3 **Previous Site Studies:** To our knowledge, there are no previous geotechnical/geologic studies known to have been performed for this site.

3.0 PROPOSED DEVELOPMENT / PROJECT DESCRIPTION

3.1 **Grading Plans:** A grading plan was not available to aid in our understanding of the proposed development of the site. A site plan prepared by Douglas Pancake Architects was utilized to appraise the proposed development from a geotechnical perspective. The final grading plans should be made available to this office for subsequent review so that additional recommendations may be prepared, if necessary.

3.1.2 **Proposed Development:** It is our understanding that the development of the subject site will be a multi-story senior living facility. Foundation plans were not available prior to this writing and should be reviewed by this office once available so that supplemental recommendations can be given. For the purposes of this report foundations bearing load criteria will be based on the following criteria:

Maximum Structure Bearing Loads	
Description	**Maximum Loads**
Maximum Wall Loads	2 kips per linear foot
Maximum Column Loads	30 kips
Maximum Floor Slab Pressure	150 pounds per cubic foot
Parking and Traffic Structural Loads (Design Life of 20 Years)	
Description	**Maximum Loads**
Concrete and Asphalt Pavement Areas	Equivalent Single Axle Loads = 18 kips
Concrete and Asphalt Pavement Areas	Maximum Loads = 60,000

It is represented that the proposed development will include infrastructure such as street, storm drains and utility improvements.

3.1.3 **Project Description:** It is assumed for the purposes of this report that the foundation bearing loads are not anticipated to exceed 2,000 pounds per lineal foot (plf) for continuous footings, or 30 kips per isolated column footing. It is represented that retaining walls and a subterranean parking structure are planned. The above project descriptions and assumptions were not available prior to mobilization of the field study for this project and may not be sufficient for the proposed development at this writing. This office should be notified if structures, foundation loads, grading, and/or details other than those represented herein are proposed for final development of the site so that a review can be performed, supplemental evaluation prepared, and revised recommendations submitted, if required.

4.0 SITE DESCRIPTION

4.1 **General:** The subject site is an unimproved essentially triangular shaped approximately 3.16-acre parcel of land located north of Serenity Trail, in the City of Chino, San Bernardino County, California.

Topographic relief across the subject site drains from a high of approximately 740 feet above mean sea level (amsl) near the northerly property boundary to a low of approximately 700 amsl near the southerly property boundary, resulting in a vertical relief of approximately 40 feet to the south across the subject site. At the time the field investigation was conducted, the subject property was covered with a light to moderate growth of natural grasses and weeds.

5.0 FIELD STUDY

5.1 **Field Exploration and Sampling Program:** Field reconnaissance, geologic mapping subsurface exploration and sampling was conducted on September 29th, 2015 by our field Geologist. The work was conducted to evaluate the underlying earth strata and search for the presence of groundwater. Eight exploratory test pits were excavated across the site by **Levering Grading** using a John Deere, 310ASE, wheel-mounted backhoe with a 24-inch bucket. The test pits we're excavated to a maximum depth of 6 feet below existing ground surface and density tests were performed at 2-foot intervals to assess the relative density of near surface soils. Due to the potential of caving of the test pits, tests were generally only performed to a depth of approximately 6 feet.

5.1.1 **Depth of Exploration & Geotechnical Conditions Encountered:** The maximum depth of on-site exploration was approximately 20 feet below the existing ground surface (bgs). The earth materials, to the maximum depth explored consisted of loose (in the upper 3 feet) to dense, silt with fine sand (undocumented fill). For further details, see the Test Pit Logs in the Appendix of this report.

5.2.1 **Soil Samples (Bulk):** Six bulk samples were collected from the backhoe test pit locations. All soil samples were subsequently returned to our soils laboratory for verification of field classifications and selected testing. Bulk samples were obtained from cuttings developed during the excavation process and represent a mixture of the soils within the depth indicated on the logs. The approximate locations of the test pits are denoted on the Geotechnical Report Site Plan, (Plate 1).

5.2.2 **Backfilling of Test Pits:** Upon completion of field operations, the test pits were marked with caution tape and left for the client to backfill per EnGEN's standard terms and conditions.

6.0 LABORATORY TESTING

6.1 **General:** The results of laboratory tests performed on samples of earth material obtained during the field investigation are presented in the Appendix of this report. Following is a listing and brief explanation of the laboratory tests which were performed. The samples obtained during the field investigation will be discarded 30 days after the date of this report. This office should be notified immediately if retention of samples will be needed beyond 30 days.

6.2 **Classification:** The field classification of soil materials encountered in the exploratory borings was verified in the laboratory in general accordance with the Unified Soils Classification System, ASTM D 2488-00, Standard Practice for Determination and Identification of Soils (Visual-Manual Procedures).

6.3 **In-Situ Moisture Content and Density Test:** The in-situ moisture content and dry density were determined in general accordance with ASTM D 2216-98 and ASTM D 2937-00 procedures, respectively, for each selected undisturbed sample obtained. The dry density is determined in pounds per cubic foot and the moisture content is determined as a percentage of the oven dry weight of the soil.

6.4 **Maximum Dry Density / Optimum Moisture Content Relationship Test:** Maximum dry density/optimum moisture content relationship determinations were performed on samples of near-surface earth material in general accordance with ASTM D 1557-02 procedures using a 4.0-inch diameter mold. Samples were prepared at various moisture contents and compacted in five (5) layers using a 10-pound weight dropping 18-inches and with 25 blows per layer. A plot of the compacted dry density versus the moisture content of the specimens is constructed and the maximum dry density and optimum moisture content determined from the plot.

6.5 **In-Situ Direct Shear Test:** Direct shear tests were performed on selected samples of near-surface earth material in general accordance with ASTM D 3080-03 procedures. The shear machine is of the constant strain type. The shear machine is designed to receive a 1.0-inch high, 2.416-inch diameter ring sample. Specimens from the sample were sheared at various pressures normal to the face of the specimens. The specimens were tested in a submerged condition. The maximum shear stresses were plotted versus the normal confining stresses to determine the shear strength (cohesion and angle of internal friction).

6.6 **Expansion Test:** Laboratory expansion tests were performed on samples of near-surface earth material in general accordance with the California Building Code Standard (CBC 18-2). In this testing procedure, a remolded sample is compacted in two (2) layers in a 4.0-inch diameter mold to a total compacted thickness of approximately 1.0-inch by using a 5.5-pound weight dropping 12-inches and with 15 blows per layer. The sample is compacted at a saturation of between 49 and 51 percent. After remolding, the sample is confined under a pressure of 144 pounds per square foot (psf) and allowed to soak for 24 hours. The resulting volume change due to the increase in moisture content within the sample is recorded and the Expansion Index (EI) calculated.

6.7 **Soluble Sulfates:** Samples of near surface earth materials were obtained for soluble sulfate testing at the site. The concentration of soluble sulfate was determined in general conformance with California Test Method 417 procedures.

6.8 **pH/Minimum Resistivity:** Samples of near surface earth materials were obtained of near soils that will be in contact with the proposed footings and tested for pH and minimum resistivity in general conformance to CTM 643.

6.9 **Chloride Content:** Samples of near surface earth materials were obtained of near soils that will be in contact with the proposed footings and tested for chloride content in general conformance to CTM 422.

6.10 **R-Value Test:** An evaluation was performed on a selected representative soil sample in general accordance with California Test Method 301. The resistance (R-Value) test method is used to measure the potential strength of subgrade, subbase, and base course materials for use in road pavements.

6.11 **Grain Size Distribution Test:** An evaluation was performed on selected representative soil samples in general accordance with ASTM D 422-63 (2002). This "grain-size" or "sieve analysis" test method determines the distribution of particle sizes in soils which allows for the proper classification per the Unified Soils Classification System (USCS). In this test procedure, a weighed sample is processed through multiple sieves designated by their size generally ranging from a No. 4 (0.25-inch) to a No. 200 sieve by means of a lateral and vertical motion of the sieve on a mechanical shaker. The percentage of material passing each sieve is weighed and recorded with the results plotted in graph form.

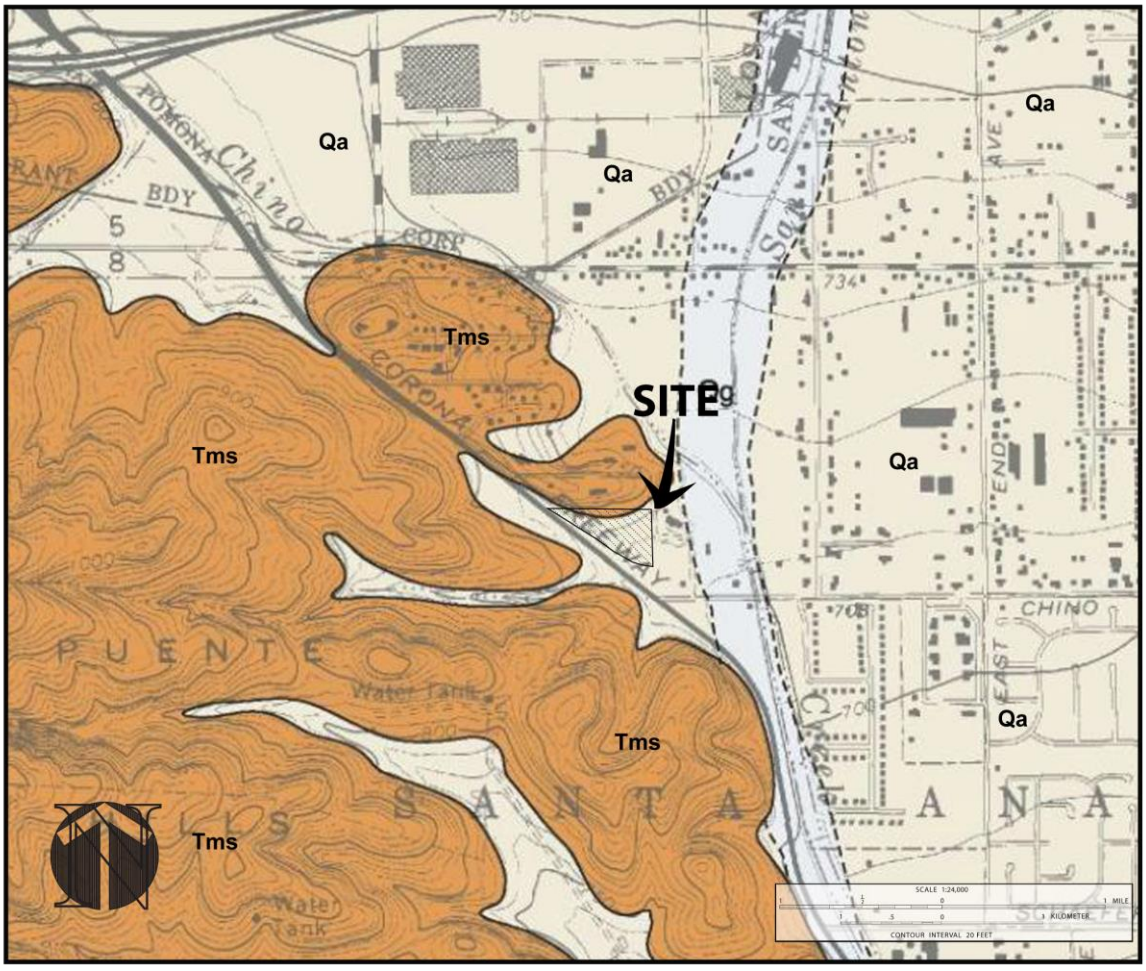
7.0 GEOLOGY

7.1 **Geologic Setting:** The subject site Is located in the Chino Basin. The Chino Basin Is situated within the upper Santa Ana Valley of the Peninsular Ranges Geomorphic province and is a relatively flat alluvial plain formed from sediments deposited by the Santa Ana River and its tributaries such as Chino Creek, within the Perris Block. The Peninsular Ranges are the southernmost segment of the chain of North American Mesozoic batholiths that extend from Alaska to the southern tip of Baja California, and are a series of northwest-southeast trending mountain ranges separated by similarly trending valleys. These geomorphic structures in the area are sub-parallel to the major fault systems such as the Elsinore Fault zone, which Includes the Whittier, Chino-Central Avenue and the San Jacinto Fault zone. The Perris Block Is composed chiefly of crystalline rocks of Cretaceous and earlier ages with thin mantles of sedimentary and volcanic rocks. The Perris Block Is bound on the northeast by the San Jacinto fault zone and, on the north by the Sierra Madre-Cucamonga fault zone, on the west by the Elsinore Fault zone. The southern boundary Is undefined.

7.2 **Faulting:** The site is not located within an Alquist-Priolo Earthquake Fault Zone (AP Zone). No known active faults traverse the property. Several USGS maps and interactive mapping resources

were reviewed to locate the subject site relative to known mapped faults (see references in the Appendix to this report). However, the subject site is not mapped on any AP Zone maps. For the purposes of this report Figure 3 was prepared to illustrate the mapped faults near the subject site. The closest mapped fault is the Central Avenue Fault which is mapped approximate ¾ of a mile (1.3 kilometers) northeast of the subject site. The northern branch of the Elsinore Fault Zone (Chino Branch – Chino Fault) is mapped approximately 3.1 miles (4.9 km) southwest of the subject site, (see Figure 3).

FIGURE 2 - REGIONAL GEOLOGIC MAP



Base Map: Preliminary Geologic Map of San Dimas and Ontario Quandrangles, Thomas W. Dibblee, Jr. 2002

LEGEND

Qa = **Alluvial Gravel and sand, (Holcene)**

Tms = **Soquel sandstone facies, (Miocene)**, partly intertonged into Tmy, light grey to tan

Tmy = **Yorba Shale Member, (Miocene)**, light grey, thin bedded

7.3 **Seismicity**: The project lies within an active area of faulting and seismicity in the Southern California region. The seismicity has included approximately eight (8) earthquakes of Richter

magnitude 6.0 or greater within approximately 70 miles of the site and approximately 10 earthquakes of Richter magnitude, ranging from 5.0 to 6.0 within 50 miles of the site. Numerous earthquakes ranging in magnitude from 4.0 to 5.0 within 30 miles of the subject site have been recorded during the periods of 1932 through 1972. This predominance of seismic activity has been associated with the San Jacinto Fault Zone along its southeast section in the vicinity of the Salton Sea, and within the northwest portion near its junction with the San Andreas Fault Zone. The predominance of the remaining recorded activity has been associated with the San Andreas Fault Zone.

7.3.1 **Seismic Risk**: Well-delineated fault lines cross through the region as shown on the Regional Fault Location Map, (Figure 3). However, no active faults are mapped in the immediate vicinity of the subject site. Therefore, active fault rupture is unlikely to occur at the project site. While fault rupture would most likely occur along previously established fault traces, future fault rupture could occur at other locations.

7.4 **Earth Materials:** A brief description of the earth materials encountered in the exploratory excavation is presented in the following sections. A more detailed description of the earth materials encountered is presented on the Backhoe Test Pit Logs in the Appendix. The earth material strata as shown on the log represent the conditions in the actual exploratory location. Lines of demarcation between the earth materials on the log represent the approximate boundary between the material types; however, the transitions may be gradual.

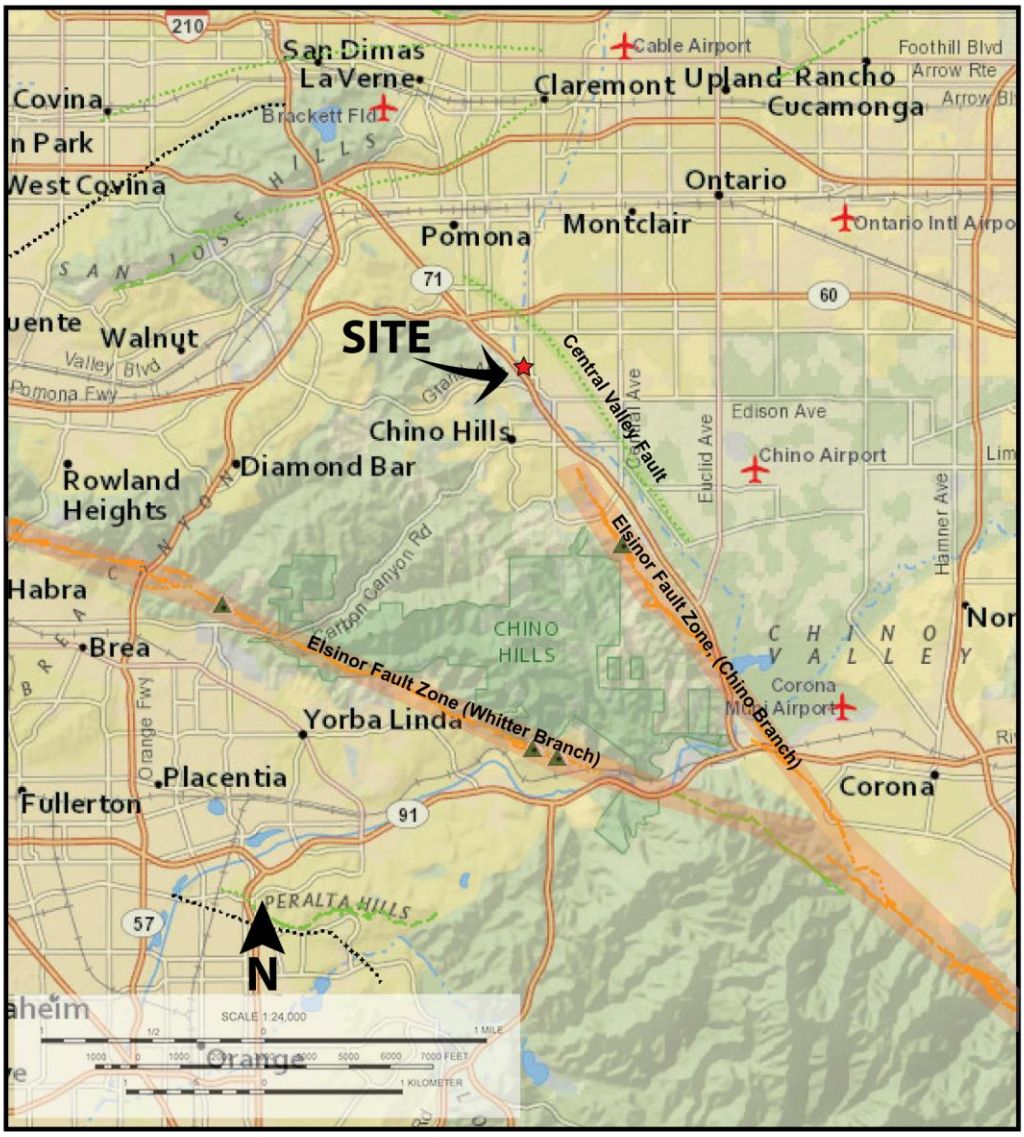
7.4.1 **Undocumented Fill (Af):** Undocumented fill underlies the westerly ¾ of the subject property (see Plate 1) which is believed to have been derived from flood control, freeway and road improvements along Serenity Trail adjacent to and west of the subject site. As seen in the six (6) exploratory backhoe pits advanced across the subject site. The undocumented fill material consists of light grey silt with fine sand (see logs in the Appendix) that was moist, loose to dense.

7.4.2 **Yorba Shale Formation Bedrock:** The Yorba Shale Formation Bedrock consists sandstone, conglomerate, siltstone and shale of the Sycamore Canyon Member (Fife, et al, 1976). The bedrock encountered on site consist of a thinly bedded siltstone that was massive and homogeneous in place.

7.5 **Groundwater:** Groundwater or evidence of historic high groundwater conditions was not observed within any of the exploratory backhoe test pits advanced at the subject site to the maximum depth explored (20 feet). Data from the nearest state well (02S08W23C006S) which is situated at an elevation of 629.22 AMSL and located approximately 2.25-miles southwest of the subject site indicates the depth to groundwater at that location to be approximately 65 feet in 2015, (California Department of Water Resources, 2016). Based on the information researched

for this study groundwater is not anticipated to rise within 100 feet from surface elevation at the subject site.

FIGURE 3 - REGIONAL FAULT LOCATION MAP



SOURCE: U.S. Geologic Survey and California Geologic Survey, Quaternary Fault and Fold Database of the United States March 2016 (http://earthquake.usgs.gove/hazards/qfaults

7.6 **Liquefaction Potential:** Liquefaction is a phenomenon where a sudden large decrease of shearing resistance takes place in fine-grained cohesionless and/or low plastic cohesive soils due to the cyclic stresses produced by earthquakes causing a sudden, but temporary, increase of porewater pressure. The increased porewater pressure occurs below the water table, but can cause propagation of groundwater upward into overlying soil and possibly to the ground surface and cause sand boils as excess porewater escapes. Potential hazards due to liquefaction include significant

total and/or differential settlements of the ground surface and structures as well as possible collapse of structures due to loss of support of foundations. It has been shown by laboratory testing and from the analysis of soil conditions at sites where liquefaction has occurred that the soil types most susceptible to liquefaction are saturated, fine-grained sand to sandy silt with a mean grain size ranging from approximately 0.075 mm to 0.5 mm. These soils derive their shear strength from intergranular friction and do not drain quickly during earthquakes. Published studies and field and laboratory test data indicate that coarse-grained sands and silty or clayey sands beyond the above-mentioned grain size range are considerably less vulnerable to liquefaction. , the relative density of the soil also controls the susceptibility to liquefaction for a given number of cycles and acceleration levels during a seismic event. Other characteristics such as confining pressure and the stresses created within the soil during a seismic event also affect the liquefaction potential of a site. Liquefaction of soil does not generally occur at depths greater than 50-feet bgs due to the confining pressure at that depth. Chapter 6 of Special Publication 117A (2008) provides the procedures recommended for the screening of seismic hazards when a site is mapped a State designated seismic hazards zone. While the subject site is not mapped within a seismic hazards zone, it is the responsibility of the geotechnical consultant to screen each site for its potential to be impacted by geologic and geotechnical hazards associated seismic events. We have screened the subject property using guidelines provided in SP117A in order to assess the need for a quantitative analysis of liquefaction potential. Relevant screening criteria is provided as follows:

1. *If present, are the potentially liquefiable soils saturated or might they become saturated?*

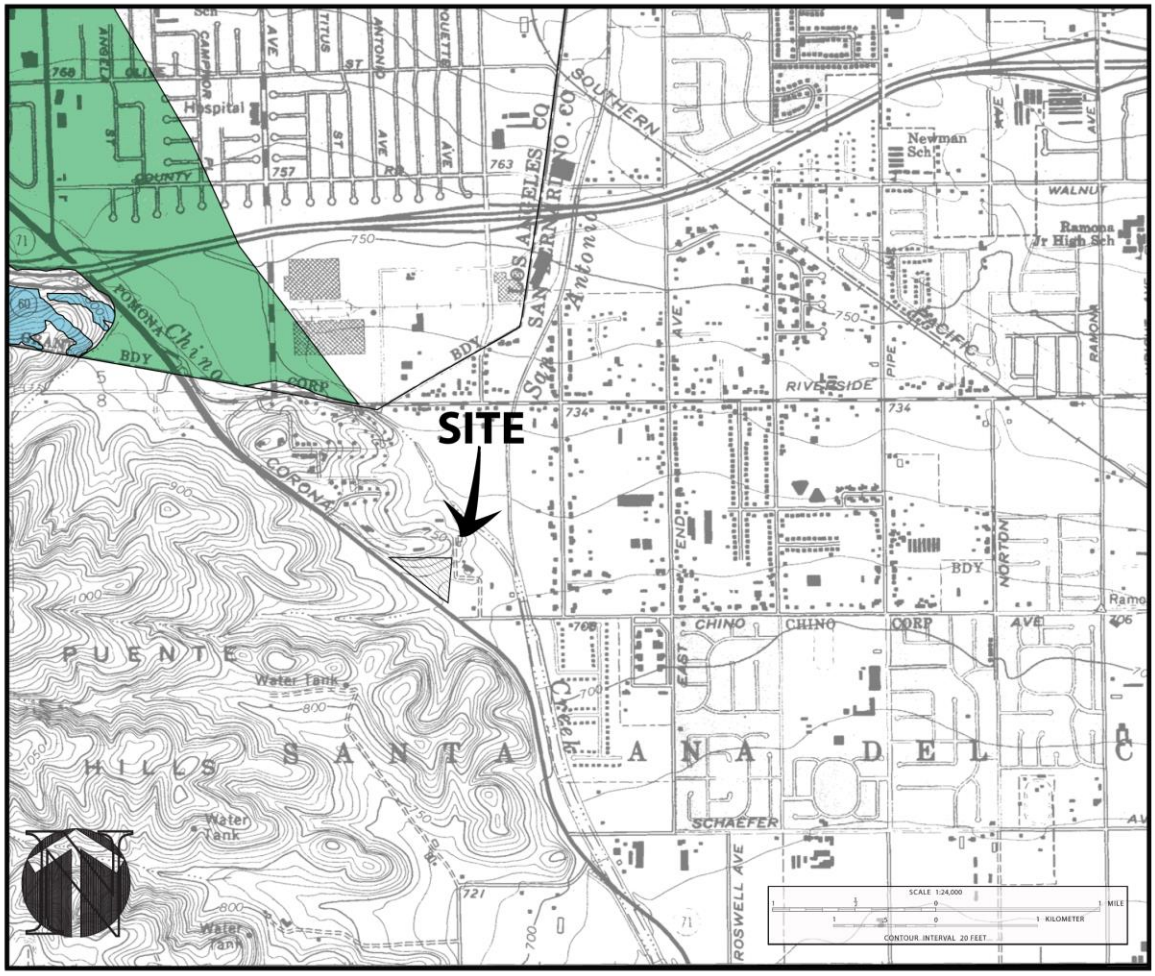
   The soil type present from the surface to the maximum depth explored (20-feet) consist of silt with fine sand and was not saturated. Based on historical groundwater data researched for this investigation, groundwater is not anticipated to encroach within 50-feet of surface elevation at the subject site.

2. *Are the in-situ soil densities sufficiently high to preclude liquefaction?*

   While the soil type on site is not considered to have properties that would be susceptible to liquefaction, the soil in question is undocumented fill and covers most the subject site. The undocumented fill was tested during the field portion of this investigation and found to be loose from the surface to a depth of approximately 6-feet. In-situ testing was not possible from a depth greater than 5 feet from surface elevations due to personnel safety. Observations made during the logging of the test pit from a depth of 6-feet to the maximum depth explored indicate that the soils became more dense with depth. Based on the initial test results, the density of the existing on-site soils are **not** sufficient to preclude settlement during a seismic event though the soil properties themselves are not susceptible to liquefaction potential.

Based the screening outlined above it is recommended that supplemental subsurface exploration and testing be conducted in order to determine if quantitative liquefaction analysis is necessary for the subject site.

FIGURE 4 - SEISMIC HAZARDS MAP



Base Map: State of California Seismic Hazards Zone Map, Ontario Quadrangle, California Department of Conservation, USGS, 2000.

LEGEND

= Areas requiring Liquefaction Analysis

= Areas requiring slope stability Analysis

7.7 **Secondary Effects of Seismic Activity:** The secondary effects of seismic activity normally considered as possible hazards to a site include various types of ground failure and flooding induced from dam failure. The site is not located near any large confined bodies of water. Therefore, the potential for seismically-induced flooding and earthquake-induced surface flooding due to seiche activity is considered to be low. Due to the distance from the Pacific Ocean, the probability of a tsunami impacting the site is nil. The probability of occurrence of each type of ground failure depends on the severity of the earthquake, the distance of the site from the zone of

maximum energy release of the earthquake, the topography of the site, the subsurface materials at the site, and the groundwater conditions beneath the site, besides other factors. Since there are no faults mapped on or near the site, the probability of hazards due to fault generated ground surface rupture at the site is low. Due to the low topographic relief of the site, the potential for earthquake-induced landslides is considered to be very low.

8.0 CONCLUSIONS AND RECOMMENDATIONS

8.1 **General:** The conclusions and recommendations presented in this report are based on the results of field and laboratory data obtained from the exploratory excavations located across the property, the project description and assumptions presented in § 3.0, of this report. Based on the field and laboratory data and the engineering analysis performed, it is considered that the proposed development is feasible from a geotechnical engineering standpoint. The actual conditions of the near-surface supporting material across the site may vary. The nature and extent of variations of the surface and subsurface conditions between the exploratory excavations may not become evident until construction. If variations of the material become evident during grading, this office should be notified so that **EnGEN Corporation** can evaluate the characteristics of the material and, if needed, prepare revisions to the recommendations presented herein. Recommendations for general site grading, foundations, slab support, pavement design, slope maintenance, etc., are presented in the subsequent paragraphs.

8.2 **Supplemental Subsurface Exploration and Testing**: It is recommended that deeper exploration and testing of the site be conducted to complement the work conducted for this investigation to specifically address supportive soil characteristics at depth and site specific groundwater conditions as provided under § 1.1, 1.4 and 5.1.1 of this report.

8.3 **Earthwork Recommendations:**

8.3.1 **General:** The grading recommendations presented in this report are intended for: 1) the use of a conventional shallow foundation system and concrete slabs cast on-grade; and 2) the rework of unsuitable near-surface earth materials to create an engineered building pad and suitable support for exterior hardscape (sidewalks, patios, etc.) and pavement. If pavement subgrade soils are prepared at the time of rough grading of the building site and the areas are not paved immediately, additional observations and testing of the subgrade soil must be performed before placing aggregate base material or asphaltic concrete or PCC pavement to locate areas which may have been damaged by construction traffic, construction activities, and/or seasonal wetting and drying. The following recommendations may need to be modified and/or supplemented during rough grading as field conditions require.

8.3.2 **Clearing:** All debris, refuse, roots, grasses, weeds, brush and other deleterious materials should be removed from the proposed structure, exterior hardscape and pavement areas, as well as any areas to receive structural fill before grading is performed. No discing or mixing of organic material into the soils should be performed. Man-made objects encountered should be over-excavated and exported from the site.

8.3.3 **Excavation Characteristics:** Excavation within the study site is anticipated to be relatively easy.

8.3.4 **Suitability of On-Site Materials as Fill:** In general, the on-site earth materials present are considered suitable for reuse as new engineered fill. Fill materials should be free of significant amounts of organic materials and/or debris. Fill materials should not contain rocks greater than 6-inches in maximum diameter. There are no oversize rocks greater than 12-inches maximum diameter anticipated to be encountered at the subject site, therefore recommendation for disposal is not provided in this report. Should oversized material be encountered during site preparation, recommendations will be made during site grading under exposed conditions.

8.3.5 **Removal and Re-Compaction:** All existing unsuitable, loose, or disturbed near-surface soil in proposed structure area should be removed. The approved final grading plans should be made available for review by this office to prepare additional recommendations, if necessary. The following recommendations are based on field and laboratory test results:

1. All undocumented fill material encountered on-site will require removal to competent alluvium or siltstone bedrock.
2. Foundations for the proposed structures should not be founded on a transition between cut and fill. The majority of the subject site is underlain by undocumented fill that will require removal and re-compaction. The Refenced No. 1 Conceptual Grading Plan was reviewed for this report. However, once preliminary grading plans are available, this office should review them and provide appropriate recommendations for the depths of removal and re-compaction operations prior to construction.
3. Removal bottoms should be tested for competency. At least two confirmatory density tests within the proposed building pad should be performed. A competent removal bottom should be defined as an undisturbed bottom which is a minimum of 85 percent compaction, and free of large or abundant pores. Bottoms with densities less that 85 percent should be deepened.
4. Removals in the hardscape portions of the site that are located in natural ground, should be performed to 2-feet below proposed grade in areas where natural ground is exposed.
5. All exposed removal and over-excavation bottoms should be inspected by the Project Geotechnical Engineer and/or his representative prior to placement of any fill.

6. The approved exposed bottoms of all removal areas should be scarified 12-inches, brought to near optimum moisture content, and compacted to a minimum of 90 percent relative compaction before placement of fill. Maximum dry density and optimum moisture content for compacted materials should be determined in accordance with ASTM D 1557-02 procedures.
7. Final determination of removal and over-excavation depths should be made during grading.
8. If import material is planned to be used, this firm should be notified immediately to perform additional testing and provide further recommendations, as necessary.

8.3.6 **Fill Placement Requirements:** All fill material, whether on-site material or import, should be approved by the Project Geotechnical Engineer and/or his representative before placement. All fill should be free of vegetation, organic material, and debris. Import fill should be no more expansive than the existing on-site material. Approved fill material should be placed in horizontal lifts not exceeding 10-inches in compacted thickness and watered or aerated to obtain near optimum moisture content (±2.0 percent of optimum). Each lift should be spread evenly and should be thoroughly mixed to ensure uniformity of soil moisture. Structural fill should meet a minimum relative compaction of 90 percent. Maximum dry density and optimum moisture content for compacted materials should be determined in accordance with ASTM D 1557-02 procedures. Moisture content of fill materials should not vary more than 2.0 percent from optimum, unless approved by the Project Geotechnical Engineer.

8.3.7 **Oversize Material:** Oversize material is defined as rock, or other irreducible material with a dimension greater than 12-inches. Oversize material is not anticipated to be encountered for the subject project and recommendations for the disposal of oversized material are not considered necessary. Should oversized material be encountered during site grading, recommendations will be made in the field under exposed conditions.

8.3.8 **Compaction Equipment:** It is anticipated that fill compaction for the project will be achieved using a combination of rubber-tired and track-mounted heavy construction equipment. Compaction by rubber-tired or track-mounted equipment, by itself, may not be sufficient. Adequate water trucks, water pulls, and/or other suitable equipment should be available to provide sufficient moisture and dust control. The actual selection of equipment is the responsibility of the contractor performing the work and should be such that uniform and proper compaction of the fill is achieved.

8.3.9 **Shrinkage and Subsidence:** There will be a material loss due to the clearing and grubbing operations. Based on fill compaction of a minimum density of 90 percent, an average shrinkage of soils within the undocumented fill areas of the site that are excavated and replaced as compacted fill should be anticipated. It is estimated that the average shrinkage of these materials will be on the order of 8 percent. A higher relative compaction would mean a larger shrinkage value. No

estimations can be given for the landscape material due to its unknown nature, however, due to the limited nature of the proposed grading operations, shrinkage is not anticipated to be of any significant impact to the site grading operations.

8.3.10 **Cut and Fill Slopes:** It is the opinion of this firm that as long as the recommendations provided in this report are implemented during the site grading operations, any cut or fill slopes in accordance with standard CCB code requirements will be grossly stable from a slope stability standpoint. This firm should review any future grading plans proposed for the subject site.

8.3.11 **Keyways:** A keyway excavated into competent soil should be constructed at the toe of all fill slopes that are proposed on natural grades of 5:1 (horizontal to vertical) or steeper prior to placing fill. A typical detail for keyway construction is included in the Appendix of this report.

8.3.12 **Subdrains:** Although the need for subdrains is not anticipated at this time, final recommendations should be made during grading by the Project Geotechnical Engineer and/or his authorized representative.

8.3.13 **Observation and Testing:** During grading, observation and testing should be conducted by the Project Geotechnical Engineer and/or his representative to verify that the grading is being performed per the recommendations presented in this report. The Project Geotechnical Engineer and/or his representative should observe the scarification and the placement of fill and should take tests to verify the moisture content, density, uniformity and degree of compaction obtained. Where testing demonstrates insufficient density, additional compaction effort, with the adjustment of the moisture content where necessary, should be applied until retesting shows that satisfactory relative compaction has been obtained. The results of observations and testing services should be presented in a formal Finish Grading Report following completion of the grading operations. Grading operations undertaken at the site without the Project Geotechnical Engineer and/or his representative present may result in exclusions of the affected areas from the finish grading report for the project. The presence of the Project Geotechnical Engineer and/or his representative will be for the purpose of providing observations and field testing and will not include any supervision or directing of the actual work of the contractor or the contractor's employees or agents. Neither the presence and/or the non-presence of the Project Geotechnical Engineer and/or his field representative nor the field observations and testing shall excuse the contractor in any way for defects discovered in the contractor's work.

8.3.14 **Soil Expansion Potential:** Upon completion of fine grading of the building pad, near-surface samples should be obtained for expansion potential testing to identify the expansion potential for the pad and assign appropriate foundation and slab-on-grade recommendations for construction. Our Expansion Index (EI) testing of near surface on-site soils indicate an expansion of EI=96, which is classified as a high expansion potential. **Final foundation design parameters should**

be based on EI testing of soils that will be in direct contact with the foundation system and be performed at the conclusion of rough grading.

8.3.15 **Corrosive Soils:** Organic clays and clayey soils as well as soils containing a high degree of organic material are most typically identified with having corrosive properties. Because of the nature of grading for any type of development, it is not known if these soils will be in contact with the proposed footings until near finished grade elevations have been achieved. It is recommended that soils that will be in contact with the proposed footings be sampled and tested for corrosive properties at near final grade elevations. If test results indicate that corrosive soils will be in contact with the proposed footings, appropriate recommendations should be provided in the rough grading report for final minimum foundation design based on soil properties. Preliminary testing for corrosive properties of the on-site soils have been performed and test results for pH, minimum resistivity, sulfate content, and chloride content (CTM 417, CT 643, CTM 422 procedures) were analyzed by Soil Core, Inc. A negligible concentration (0.002% by weight) of water soluble sulfates was reported. Thus, normal Type II cement may be used in concrete that will come in contact with native soils. Additional corrosivity related results included a pH of 7.7, a minimum resistivity of 1,200 ohm-cm, and a chloride content of 60 ppm. Should additional corrosivity analysis be required, a Corrosion Engineer should be consulted. Laboratory analytical results are included in the Appendix.

8.4 **Preliminary Foundation Design Recommendations:**

8.4.1 **General:** Foundations for the proposed structures may consist of conventional column footings and continuous wall footings founded upon properly compacted fill, as recommended in § 8.3, Earthwork Recommendations, of this report. The recommendations presented in the subsequent paragraphs for foundation design and construction are based on geotechnical characteristics and a high expansion potential for the supporting soils and are not intended to preclude more restrictive structural requirements. The Structural Engineer for the project should determine the actual footing width and depth to resist design vertical, horizontal, and uplift forces.

8.4.2 **Foundation Size:** Continuous footings should have a minimum width of 15-inches for single story structures and 18-inches for 2-story structures. Continuous footings should be continuously reinforced with a minimum of two (2) No. 5 steel reinforcing bars located near the top and two (2) No. 5 steel reinforcing bars located near the bottom of the footings to minimize the effects of slight differential movements which may occur due to minor variations in the engineering characteristics or seasonal moisture change in the supporting soils. Final foundation size and reinforcing should be determined based on the expansive potential of the supporting soils. Column footings should have a minimum width of 18-inches by 18-inches and be suitably reinforced, based on structural requirements. A grade beam, founded at the same depths and reinforced the same as the adjacent footings, should be provided across the doorways, or any other types of perimeter openings.

8.4.3 **Depth of Embedment:** Exterior and interior footings founded in properly compacted fill should extend to a minimum depth of 18-inches below lowest adjacent finish grade for one story structures and 18-inches below lowest adjacent final grade for two story structures. Deeper footings may be necessary for structural reasons or for expansive soils purposes, depending on the final determination of pad specific expansive potential.

8.4.4 **Pre-saturation**: Moisture conditioning of the foundation and slab areas should be performed until a minimum of 120% of optimum moisture content extending to a minimum depth of 24-inches of finish grad elevations is achieved prior to trenching operations.

8.4.5 **Bearing Capacity:** Provided the recommendations for site earthwork, minimum footing width, and minimum depth of embedment for footings are incorporated into the project design and construction, the allowable bearing value for design of continuous and column footings for the total dead plus frequently-applied live loads is 1,500 psf for continuous footings, and 1,500 psf for column footings in properly compacted fill. The allowable bearing value has a factor of safety of at least 3.0 and may be increased by 33.3 percent for short durations of live and/or dynamic loading, such as wind or seismic forces.

8.4.6 **Settlement:** Footings designed per the recommended bearing values and the maximum assumed wall and column loads are not expected to exceed a maximum settlement of 0.50-inch or a differential settlement of 0.25-inch over 40-feet in properly compacted fill under static load conditions. Liquefaction settlement is not analyzed due to the limited nature of this investigation. Therefore, it is recommended that supplemental exploration and testing be conducted prior to finalizing the foundation design which should include at least 1 boring to a depth of 50-feet below lowest surface elevation on site.

8.4.7 **Preliminary Lateral Capacity:** Preliminary additional foundation design parameters for resistance to static lateral forces are as follows:

Allowable Lateral Pressure (Equivalent Fluid Pressure, Passive Case
Compacted Fill – 150 pcf

Allowable Coefficient of Friction – Compacted Fill – 0.35

Lateral load resistance may be developed by a combination of friction acting on the base of foundations and slabs and passive earth pressure developed on the sides of the footings and stem walls below grade when in contact with properly compacted fill. The above values are allowable design values and have safety factors of at least 2.0 incorporated into them and may be used in combination without reduction in evaluating the resistance to lateral loads. The allowable values may be increased by 33.3 percent for short durations of live and/or dynamic loading, such as wind or seismic forces. For the calculation of passive earth resistance, the upper 1.0-foot of material should

be neglected unless confined by a concrete slab or pavement. The maximum recommended allowable passive pressure without further analysis is 5.0 times the recommended design value.

8.4.8 **Seismic Design Parameters:** The following minimum seismic design factors apply:

Description	Design Parameters
Site Latitude:	34.01304ºN
Site Longitude:	-117.73355ºW
Site Class:	D
Spectral Response (Short):	(0.2 sec) – Ss: 2.198 g
Spectral Response • (One Second):	(1.0 sec) – S_1: 0.795 g
Short Period Site Coefficient:	Fa: 1.0
1-Second Period Site Coefficient:	Va: 1.5
Adjusted Spectral Response:	(Short Period) - 0.2 sec – S_{ms}: 2.198 g
Adjusted Spectral Response:	(One Sec) – S_{m1}: 1.192 g
Design Spectral Response:	(Short Period) 0.2 sec – S_{ds}: 0.795 g
Design Spectral Response:	(One Sec) 1.0 sec – S_{d1}: 0.905 g

8.4.9 **Slab-on-Grade Recommendations:** The recommendations for concrete slabs, both interior and exterior, excluding PCC pavement, are based upon the expansion potential for the supporting material. Concrete slabs should be designed to minimize cracking as a result of shrinkage. Joints (isolation, contraction, and construction) should be placed in accordance with the American Concrete Institute (ACI) guidelines. Special precautions should be taken during placement and curing of all concrete slabs. Excessive slump (high water/cement ratio) of the concrete and/or improper curing procedures used during either hot or cold weather conditions could result in excessive shrinkage, cracking, or curling in the slabs. It is recommended that all concrete proportioning, placement, and curing be performed in accordance with ACI recommendations and procedures.

8.4.10 **Interior Slabs:** Interior concrete slabs-on-grade should be a minimum of 6.0-inches nominal in thickness and be underlain by a 1.0 to 2.0-inches of clean coarse sand or other approved granular material placed on properly prepared subgrade per Section 8.2 of this report. Minimum slab reinforcement should consist of No. 4 reinforcing bars placed 18-inches on center in either directions, or a suitable equivalent as determined by the Project Structural Engineer. Final pad identification and slab construction requirements will be presented in the compaction report upon completion of grading. It is essential that the reinforcing be placed at mid-depth in the slab. The concrete section and/or reinforcing steel should be increased appropriately for anticipated excessive or concentrated floor loads. In areas where moisture sensitive floor coverings are anticipated over the slab, we recommend the use of a polyethylene vapor barrier with a minimum of 10.0 mil in thickness be placed beneath the slab. The moisture barrier should be overlapped or sealed at splices and covered top and bottom by a 1.0 to 2.0-inch minimum layer of clean, moist (not saturated) sand to aid in concrete curing and to minimize potential punctures of the barrier material.

If practical, a post-tensioned slab & foundation system can be used instead of the conventional reinforced slab recommended in this section.

8.4.11 **Exterior Slabs:** All exterior concrete slabs at finish subgrade (patios, sidewalks, etc., except for PCC pavement) should be a minimum of 4.0-inches nominal in thickness and underlain by a minimum of 24 inches of soil that has been prepared in accordance with Section 8.2 of this report. Reinforcing in the slabs and the use of a compacted sand or gravel base beneath the slabs should be per the current local standards.

8.5 **Utility Trench Recommendations:** Utility trenches within the zone of influence of foundations or under building floor slabs, exterior hardscape, and/or pavement areas should be backfilled with properly compacted soil. All utility trenches within the building pad and extending 5.0-feet beyond the building exterior footings should be backfilled with on-site or similar soil. Where interior or exterior utility trenches are proposed to pass beneath or parallel to building, retaining wall, and/or decorative concrete block perimeter wall footings, the bottom of the trench should not be located below a 1:1 plane projected downward from the outside bottom edge of the adjacent footing unless the utility lines are designed for the footing surcharge loads. It is recommended that all utility trenches excavated to depths of 5.0-feet or deeper be cut back per Section 8.9, Temporary Construction Excavation Recommendations, of this report or be properly shored during construction. Backfill material should be placed in a lift thickness appropriate for the type of backfill material and compaction equipment used. Backfill material should be compacted to a minimum of 90 percent relative compaction by mechanical means. In public roadway areas, backfill material should be compacted to a minimum 95-percent relative compaction. Jetting or flooding of the backfill material will not be considered a satisfactory method for compaction unless the procedures are reviewed and approved in writing by the Project Geotechnical Engineer. Maximum dry density and optimum moisture content for backfill material should be determined per ASTM D 1557-02 procedures.

8.6 **Preliminary Pavement Design Recommendations:** The following structural pavement section is for proposed parking, driveway and street improvements areas for the subject development and are presented for preliminary design purposes only. *The final design should be based on R-Values testing performed at subgrade upon completion of grading***.** The preliminary pavement sections as presented below are based on the City of Chino Standards and Specifications and an R-Value of 7.5. The sections listed are provided for reference purposes and are calculated as a minimum based on varying Traffic Indexes:

Street Type	Traffic Index	Minimum Section
Major Arterials	10.0	7.0” A.C. over 20-inches of Class II Base
Secondary Arterials	8.5	6.0” A.C. over 20-Inches of Class II Base
Collector (Industrial)	7.5	5.0” A.C. over 17-Inches of Class II Base
Collector (Residential)	6.0	6.0” A.C. over 7-Inches of Class II Base
Local (Residential)	5.0	4.0” A.C. over 7-Inches of Class II Base

8.6.1 **CalTrans Standard Specification:** Asphalt concrete pavement materials should be as specified in Sections 39-2.01 and 39-2.02 of the current **CalTrans** Standard Specifications or a suitable equivalent. Aggregate base should conform to ¾-inch Class-2 material as specified in Section 26-1.02B of the current **CalTrans** Standard Specifications or a suitable equivalent. **In privately maintained areas the subgrade soil, including utility trench backfill, should be compacted to a minimum of 90-percent relative compaction.** In public roadways, the subgrade soil, including utility trench backfill, should be compacted to at least 95 percent relative compaction. The aggregate base material should be compacted to at least 95 percent relative compaction. Maximum dry density and optimum moisture content for subgrade and aggregate base materials should be determined per ASTM D 1557-02 procedures. If pavement subgrade soils are prepared at the time of rough grading of the building site and the areas are not paved immediately, additional observations and testing will have to be performed before placing aggregate base material, asphaltic concrete, or PCC pavement to locate areas that may have been damaged by construction traffic, construction activities, and/or seasonal wetting and drying. In the proposed pavement areas, soil samples should be obtained at the time the subgrade is graded for R-Value testing per California Test Method 301 procedures to verify the pavement design recommendations.

8.7 **Finish Lot Drainage Recommendations:** Positive drainage should be established away from the tops of slopes, the exterior walls of structures, the back of retaining walls, and the decorative concrete block perimeter walls. Finish lot surface gradients in unpaved areas should be provided next to tops of slopes and buildings to guide surface water away from foundations and slabs and from flowing over the tops of slopes. The surface water should be directed toward suitable drainage facilities. Ponding of surface water should not be allowed next to structures or on pavements. In unpaved areas, a minimum positive gradient of 2.0 percent away from the structures and tops of slopes for a minimum distance of 10-feet and a minimum of 1.0 percent pad drainage off the property in a non-erosive manner should be provided. Landscape trees and plants with high water needs should be planted at least 5.0-feet away from the walls of the structures. Downspouts from roof drains should discharge to a surface which slopes away from the structure a minimum of 5.0-feet from the exterior building walls. In no case should downspouts from roof drains discharge into planter areas immediately adjacent to the building unless there is positive drainage away from the structure at a minimum gradient of 2.0 percent, directed onto a permanent all-weather surface or subdrain system.

8.8 **Planter Recommendations:** Planters around the perimeter of the structures should be designed to ensure that adequate drainage is maintained and minimal irrigation water is allowed to percolate into the soils underlying the buildings.

8.9 **Temporary Construction Excavation Recommendations:** Temporary construction excavations for rough grading, foundations, retaining walls, utility trenches, etc., more than 5.0-feet in depth and to a maximum depth of 15-feet should be properly shored or cut back to the following inclinations:

Earth Material	Observed/Anticipated CalOSHA Soil Classification	Inclination
Alluvium or Compacted Fill	Type B	1:1

No surcharge loads (spoil piles, earthmoving equipment, trucks, etc.) should be allowed within a horizontal distance measured from the top of the excavation slope equal to 1.5 times the depth of the excavation. Excavations should be initially observed by the Project Geotechnical Engineer, Project Engineering Geologist, and/or their representative to verify our recommendations or to make additional recommendations to maintain stability and safety. Moisture variations, differences in the cohesive or cementation characteristics, or changes in the coarseness of the deposits may require slope flattening or, conversely, permit steepening upon review by the Project Geotechnical Engineer, Project Engineering Geologist, and/or their representative. Deep utility trenches may experience caving which will require special considerations to stabilize the walls and expedite trenching operations. Surface drainage should be controlled along the top of the slope to preclude erosion of the slope face. If excavations are to be left open for long periods, the slopes should be sprayed with a protective compound and/or covered to minimize drying out, raveling, and/or erosion of the slopes. For excavations more than 5.0-feet in depth which will not be cut back to the recommended slope inclination, the contractor should submit to the owner and/or the owner's designated representative detailed drawings showing the design of shoring, bracing, sloping, or other provisions to be made for worker protection. If the drawings do not vary from the requirements of the OSHA Construction Safety Orders (CAL OSHA or FED OSHA, whichever is applicable for the project at the time of construction), a statement signed by a registered Civil or Structural Engineer in the State of California, engaged by the contractor at his expense, should be submitted certifying that the contractor's excavation safety drawings comply with OSHA Construction Orders. If the drawings vary from the applicable OSHA Construction Safety Orders, the drawings should be prepared, signed, and sealed by a Registered Civil or Structural Engineer in the State of California. The contractor should not proceed with any excavations until the project owner or his designated representative has received and acknowledged the properly prepared excavation safety drawings.

8.10 **Stormwater Infiltration:** We were unable to verify that the infiltration test areas consisted of undisturbed natural ground. However, two test areas were selected for infiltration testing based on conceptual renderings provided by the project engineer. A total of four (4) infiltration tests were performed at the subject site at locations and elevations represented to be near the bottom of future infiltration basin. Soils within the test areas and throughout the subject site consist of silt with fine sand. The test results revealed impermeable soil conditions making infiltration unfeasible for this project. Accordingly, suitable alternatives need to be developed by the water quality consultant.

9.0 PLAN REVIEW

Grading and foundation plans for the proposed development should be provided for review by **EnGEN Corporation** to verify compatibility with site geotechnical conditions and conformance with the recommendations contained in this report. If **EnGEN Corporation** is not accorded the opportunity to make the recommended review, we will assume no responsibility for misinterpretation of the recommendations presented in this report.

10.0 PRE-BID CONFERENCE

It may be desirable to hold a pre-bid conference with the owner or an authorized representative, the Project Architect, the Project Civil Engineer, the Project Geotechnical Engineer, and the proposed contractors present. This conference will provide continuity in the bidding process and clarify questions relative to the grading and construction requirements of the project.

11.0 PRE-GRADING CONFERENCE

Before the start of grading, a conference should be held with the owner or an authorized representative, the contractor, the Project Architect, the Project Civil Engineer, and the Project Geotechnical Engineer present. The purpose of this meeting should be to clarify questions relating to the intent of the grading recommendations and to verify that the project specifications comply with the recommendations of this Geotechnical Engineering Report. Any special grading procedures and/or difficulties seen, anticipated or proposed by the contractor can also be discussed at that time.

12.0 CONSTRUCTION OBSERVATIONS AND TESTING

12.1 **Rough Grading:** Rough grading of the property should be performed under engineering observation and testing performed by **EnGEN Corporation.** Rough grading includes, but is not limited to, over-excavation cuts and observations prior to placement of compacted fill, fill placement, and excavation of temporary and permanent cut and fill slopes. In addition, **EnGEN Corporation** should observe all foundation excavations.

12.2 **Footing Inspections**: Inspection of the footing excavations should be made before installation of concrete forms and/or reinforcing steel to verify and/or modify the conclusions and recommendations in this report.

12.3 **Over-excavation and Fill Placement**: Observations of over-excavation cuts, fill placement, finish grading, utility or other trench backfill, pavement subgrade and base course, retaining wall backfill, slab presaturation, or other earthwork completed for the subject development should be performed by **EnGEN Corporation.** If the observations and testing to verify site geotechnical conditions are not performed by **EnGEN Corporation**, liability for the performance of the development is limited to the actual portions of the project observed and/or tested by **EnGEN Corporation.** If parties other than **EnGEN Corporation** are engaged to perform soils and materials observations and testing, they must be notified that they will be required to assume complete responsibility for the geotechnical aspects of the project by concurring with the recommendations in this report or providing alternative recommendations. Neither the presence of the Project Geotechnical Engineer and/or his field representative, nor the field observations and testing, shall excuse the contractor in any way for defects discovered in the contractor's work. The Project Geotechnical Engineer and/or his representative shall not be responsible for job or project safety. Job or project safety shall be the sole responsibility of the contractor.

13.0 CLOSURE

This report has been prepared for use by the parties or project named or described in this document. It may or may not contain sufficient information for other parties or purposes. If changes in the assumed nature, design, or location of the proposed development as described in this report are planned, the conclusions and recommendations contained in this report will not be considered valid unless the changes are reviewed and the conclusions and recommendations of this report modified or verified in writing. This study was conducted in general accordance with the applicable standards of our profession and the accepted geotechnical engineering principles and practices at the time this report was prepared. No other warranty, implied or expressed beyond the representations of this report, is made. Although every effort has been made to obtain information regarding the geotechnical and subsurface conditions of the site, limitations exist with respect to the knowledge of unknown regional or localized off-site conditions which may have an impact at the site. The recommendations presented in this report are valid as of the date of the report. However, changes in the conditions of a property can occur with the passage of time, whether they are due to natural processes or to the works of man on this and/or adjacent properties.

If conditions are observed or information becomes available during the design and construction process which are not reflected in this report, **EnGEN Corporation** should be notified so that supplemental evaluations can be performed and the conclusions and recommendations presented in this report can be modified or verified in writing. This report is not intended for use as a bid document. Any person or company using this report for bidding or construction purposes should perform such independent studies and explorations as he deems necessary to satisfy himself as to the surface and subsurface conditions to be encountered and the procedures to be used in the performance of the work on this project. Changes in applicable or appropriate standards of care or practice occur, whether they result from legislation or the broadening of knowledge and experience. Accordingly, the conclusions and recommendations presented in this report may be invalidated, wholly or in part, by changes outside the control of **EnGEN Corporation** which occur in the future.

Thank you for the opportunity to provide our services. Often, because of design and construction details which occur on a project, questions arise concerning the geotechnical conditions on the site. If we can be of further service or should you have questions regarding this report, please do not hesitate to contact this office at your convenience. Because of our involvement in the project to date, we would be pleased to discuss engineering testing and observation services that may be applicable on the project.

Respectfully submitted,
EnGEN Corporation

H. Wayne Bainbridge, Principal
Project Manager, REPA 424679

Osbjorn Bratene, Principal
Project Geotechnical Engineer, GE162

HWB/OB:pm
Distribution: (4) Addressee

FILE: engen server\server projects\4200 series\4219gfs

REGISTERED PROFESSIONAL ENGINEER
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GEOTECHNICAL
STATE OF CALIFORNIA

APPENDIX

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BACKHOE TEST PIT LOGS

(TP1 through TP6)

TEST PIT LOG
Test Pit No.: 1

PROJECT	PROJECT NO.
SUMMERLAND SENIOR LIVING - CHINO	42119GFS
CLIENT	DATE
SUMMERLAND SENIOR LIVING	09-29-2015
LOCATION	ELEV.
	728
EXCAVATION METHOD	LOGGER
	HWB
DEPTH TO - Water: n/a When checked: 09-30-2015	Caving:

ELEVATION/ DEPTH	GRAPHIC	USCS	DESCRIPTION	R-VALUE	% NAT. MOIST.	% OPT. MOIST.	MAX. DEN. (pcf)	DRY. DEN. (pcf)	% REL. COMPACTION	TEST METHOD
0		SM	UNDOCUMENDED FILL (Af) Very silty fine sand, dry, loose, porous, light grey (10YR 7/1)							
			Intermitent layers of very silty fine sand and silt with fine sand, medium dense, slightly moist	7.5	2.1	11.1	127.4	110.4	86.7	Nuke
		ML	Silt with fine sand, slightly stiff, moist, light grey (10YR 7/1)							
4		SM-ML	Very silty fine sand, moist, medium dense, light grey (10YR 7/1)		4.3	11.1	127.4	111.7	87.7	Nuke
			dense		8.8	11.1	127.4	112.8	88.6	Nuke
8										
12										
16										
20			BOTTOM OF EXCAVATION @20'. NO GROUNDWATER AND NO INDICATIONS OF HIGH GROUNDWATER CONDITIONS OBSERVED TO THE MAXIMUM DEPTH EXPLORED							
24										

Notes: Based on the topographic relief mapped on the USGS map, it's likely that the fill is derived from roadwork.

TEST PIT LOG
Test Pit No.: 2

PROJECT	PROJECT NO.
SUMMERLAND SENIOR LIVING - CHINO	42119GFS
CLIENT	DATE
SUMMERLAND SENIOR LIVING	09-29-2015
LOCATION	ELEV.
	725.5
EXCAVATION METHOD	LOGGER
	HWB

DEPTH TO - Water: n/a When checked: 09-30-2015 Caving:

ELEVATION/ DEPTH	GRAPHIC	USCS	DESCRIPTION	R-VALUE	% NAT. MOIST.	% OPT. MOIST.	MAX. DEN. (pcf)	DRY. DEN. (pcf)	% REL. COMPACTION	TEST METHOD
0		SM	UNDOCUMENTED FILL (Af) Very silty fine sand, dry, loose, light grey (10YR-7/1).							
		SM-ML	Intermitent layers of very silty fine sand and silt with fine sand, medium dense, slightly moist, light grey (10YR-7/1)		3.8	11.1	127.4	108.1	84.8	Nuke
4			Medium dense		4.7	11.1	127.4	111.7	87.0	Nuke
			dense		7.0	11.1	127.4	112.8	89.2	Nuke
8										
12										
			BOTTOM OF EXCAVATION @13.5'. NO GROUNDWATER AND NO INDICATIONS OF HIGH GROUNDWATER CONDITIONS OBSERVED TO THE MAXIMUM DEPTH EXPLORED							
16										
20										
24										

Notes: Based on the topographic relief mapped on the USGS map, it's likely that the fill is derived from roadwork.

TEST PIT LOG
Test Pit No.: 3

PROJECT	PROJECT NO.
SUMMERLAND SENIOR LIVING - CHINO	42119GFS
CLIENT	DATE
SUMMERLAND SENIOR LIVING	09-29-2015
LOCATION	ELEV.
	723.5
EXCAVATION METHOD	LOGGER
	HWB

DEPTH TO - Water: n/a When checked: 09-30-2015 Caving:

ELEVATION/ DEPTH	GRAPHIC	USCS	DESCRIPTION	R-VALUE	% NAT. MOIST.	% OPT. MOIST.	MAX. DEN. (pcf)	DRY. DEN. (pcf)	% REL. COMPACTION	TEST METHOD
0		ML	UNDOCUMENTD FILL (Af) Silty with fine sand, dry, soft, light grey (10YR-7/1)							
		SM-ML	Intermitent layers of very silty fine sand and silt with fine sand, medium dense, slightly moist, light grey (10YR-7/1)		3.5	11.1	127.4	105.2	82.5	Nuke
4			Medium dense		5.1	11.1	127.4	107.4	84.3	Nuke
			dense		7.9	11.1	127.4	110.3	86.4	Nuke
8										
12										
16			BOTTOM OF EXCAVATION @15'. NO GROUNDWATER AND NO INDICATIONS OF HIGH GROUNDWATER CONDITIONS OBSERVED TO THE MAXIMUM DEPTH EXPLORED							
20										
24										

Notes: Based on the topographic relief mapped on the USGS map, it's likely that the fill is derived from roadwork.

TEST PIT LOG
Test Pit No.: 4

PROJECT	PROJECT NO.
SUMMERLAND SENIOR LIVING - CHINO	42119GFS
CLIENT	DATE
SUMMERLAND SENIOR LIVING	09-29-2015
LOCATION	ELEV.
	725
EXCAVATION METHOD	LOGGER
	HWB

DEPTH TO - Water: n/a When checked: 09-30-2015 Caving:

ELEVATION/ DEPTH	GRAPHIC	USCS	DESCRIPTION	R-VALUE	% NAT. MOIST.	% OPT. MOIST.	MAX. DEN. (pcf)	DRY. DEN. (pcf)	% REL. COMPACTION	TEST METHOD
0		ML	UNDOCUMENTED FILL (Af) Silt with fine sand, dry, soft, light grey (10YR-7/1)							
		SM-ML	Intermitent thin layers of very silty fine sand and silt with fine sand, medium dense, slightly moist, light grey (10YR-7/ 1)		2.8	11.1	127.4	100.9	79.2	Nuke
4			Medium dense		4.4	11.1	127.4	101.3	79.5	Nuke
			dense		5.4	11.1	127.4	105.5	82.8	Nuke
8										
12										
16			BOTTOM OF EXCAVATION @15'. NO GROUNDWATER AND NO INDICATIONS OF HIGH GROUNDWATER CONDITIONS OBSERVED TO THE MAXIMUM DEPTH EXPLORED							
20										
24										

Notes: Based on the topographic relief mapped on the USGS map, it's likely that the fill is derived from roadwork.

TEST PIT LOG
Test Pit No.: 5

PROJECT	PROJECT NO.
SUMMERLAND SENIOR LIVING - CHINO	42119GFS
CLIENT	DATE
SUMMERLAND SENIOR LIVING	09-29-2015
LOCATION	ELEV.
	733.5
EXCAVATION METHOD	LOGGER
	HWB

DEPTH TO - Water: n/a When checked: 09-30-2015 Caving:

ELEVATION/ DEPTH	GRAPHIC	USCS	DESCRIPTION	R-VALUE	% NAT. MOIST.	% OPT. MOIST.	MAX. DEN. (pcf)	DRY. DEN. (pcf)	% REL. COMPACTION	TEST METHOD
0		ML	UNDOCUMENTED FILL (Af) Silt with fine sand, dry, soft, light grey (10YR-7/1)							
					3.0	11.1	127.4	104.9	82.3	Nuke
4		ML	Stiff		4.4	11.1	127.4	109.4	85.9	Nuke
					5.4	11.1	127.4	114.5	89.8	Nuke
8			BEDROCK - (Yorba/Soquel Formation/Tms-Tmy) siltstone, dry, blocky, indurated							
			BOTTOM OF EXCAVATION @10'. NO GROUNDWATER AND NO INDICATIONS OF HIGH GROUNDWATER CONDITIONS OBSERVED TO THE MAXIMUM DEPTH EXPLORED							
12										
16										
20										
24										

Notes: Based on the topographic relief mapped on the USGS map, it's likely that the fill is derived from roadwork.

TEST PIT LOG
Test Pit No.: 6

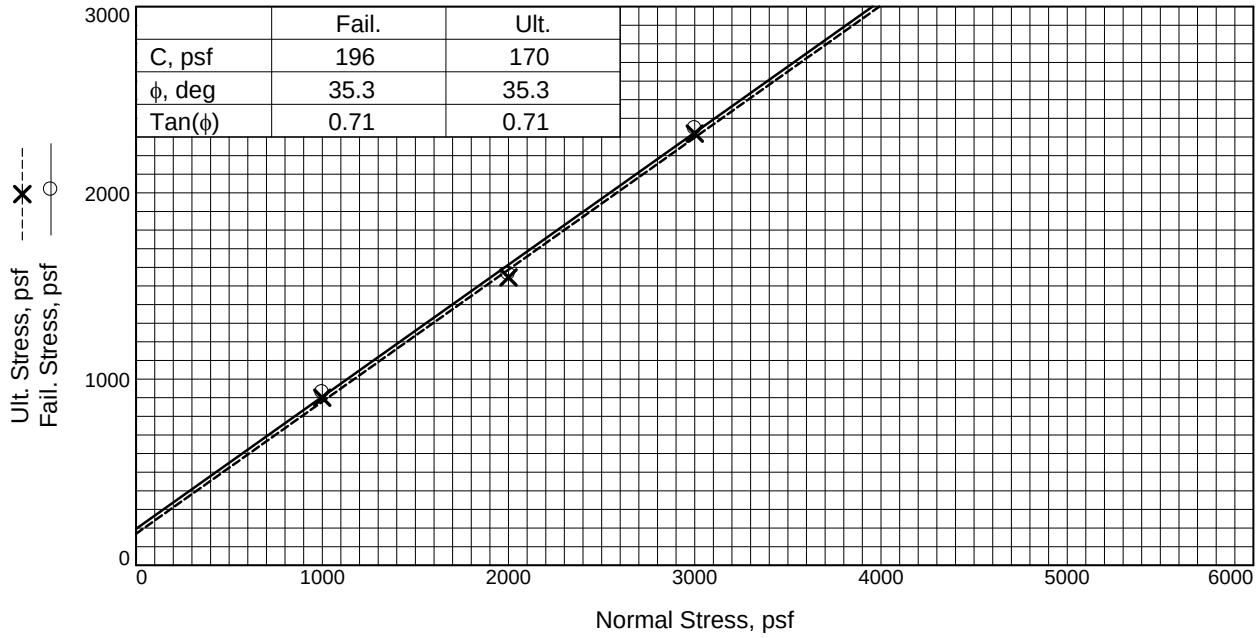
PROJECT	PROJECT NO.
SUMMERLAND SENIOR LIVING - CHINO	42119GFS
CLIENT	DATE
SUMMERLAND SENIOR LIVING	09-29-2015
LOCATION	ELEV.
	743.5
EXCAVATION METHOD	LOGGER
	HWB

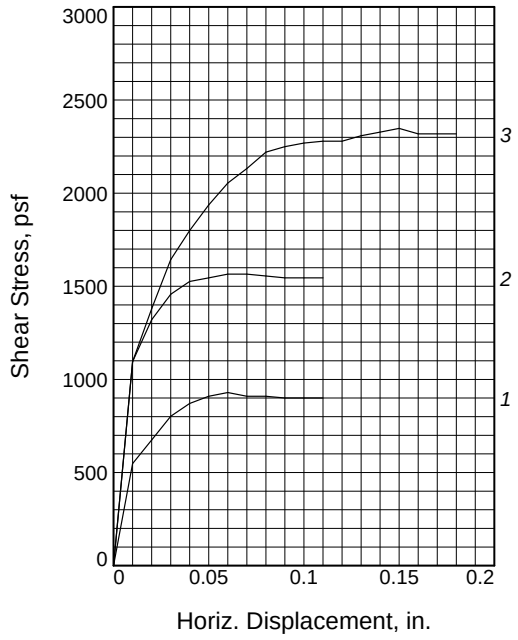
DEPTH TO - Water: n/a When checked: 09-30-2015 Caving:

ELEVATION/ DEPTH	GRAPHIC	USCS	DESCRIPTION	R-VALUE	% NAT. MOIST.	% OPT. MOIST.	MAX. DEN. (pcf)	DRY. DEN. (pcf)	% REL. COMPACTION	TEST METHOD
0		ML	UNDOCUMENTED FILL (Af) Silt with fine sand, dry, soft, light grey (10YR-7 1)							
					1.7	16.8	103.6	88.8	82.3	Nuke
4			Medium Stiff		4.4	11.1	127.4	94.9	91.6	Nuke
			Stiff		5.4	11.1	127.4	95.5	92.2	Nuke
8			BEDROCK - (Yorba/Soquel Formation/Tms-Tmy) siltstone, dry, blocky, indurated							
12			BOTTOM OF EXCAVATION @10'. NO GROUNDWATER AND NO INDICATIONS OF HIGH GROUNDWATER CONDITIONS OBSERVED TO THE MAXIMUM DEPTH EXPLORED							
16										
20										
24										

Notes: Based on the topographic relief mapped on the USGS map, it's likely that the fill is derived from roadwork.

LABORATORY TEST RESULTS





Sample No.		1	2	3
Initial	Water Content, %	12.4	12.4	12.4
	Dry Density, pcf	118.2	118.4	117.7
	Saturation, %	84.4	84.9	83.2
	Void Ratio	0.3840	0.3814	0.3892
	Diameter, in.	2.42	2.42	2.42
	Height, in.	1.00	1.00	1.00
At Test	Water Content, %	18.5	17.4	17.8
	Dry Density, pcf	118.2	118.4	117.7
	Saturation, %	125.9	119.4	120.1
	Void Ratio	0.3840	0.3814	0.3892
	Diameter, in.	2.42	2.42	2.42
	Height, in.	1.00	1.00	1.00
Normal Stress, psf		1000	2000	3000
Fail. Stress, psf		929	1565	2348
Displacement, in.		0.06	0.06	0.15
Ult. Stress, psf		900	1545	2318
Displacement, in.		0.09	0.09	0.16
Strain rate, in./min.		0.10	0.10	0.10

Sample Type: REMOLD
Description: Very silty fine sand, grey

Specific Gravity= 2.62
Remarks: SAMPLE# A-1
SAMPLED BY WB
SAMPLED ON 9/29/15

Figure A-1

Client: United Engineering Group

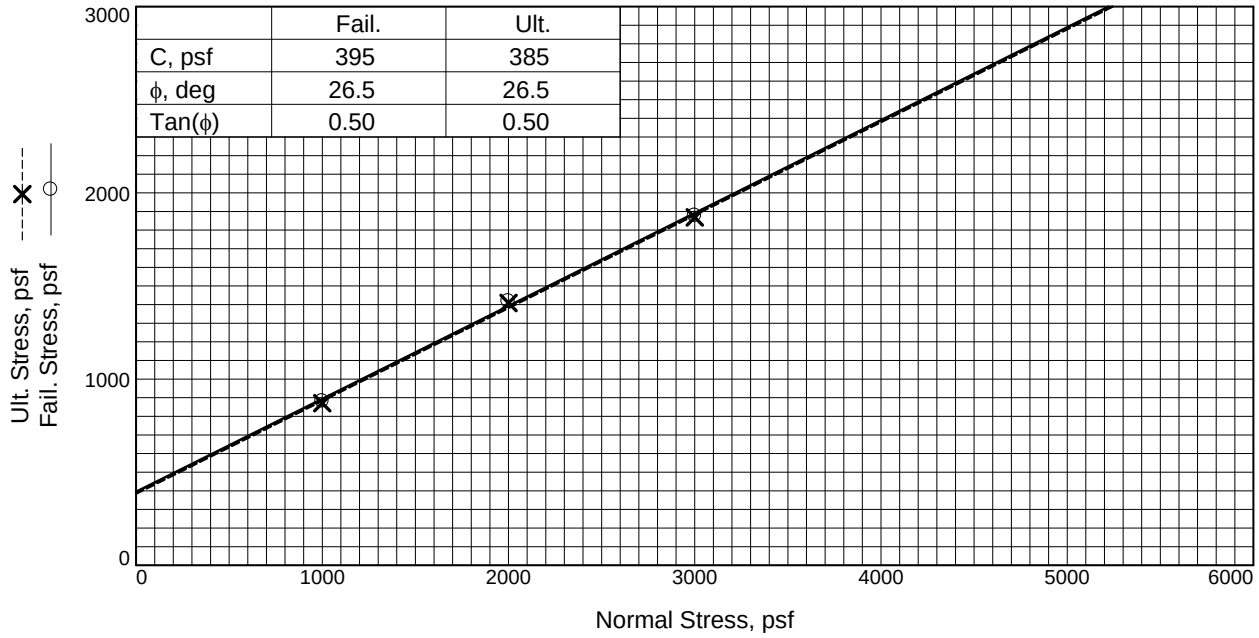
Project: Summerland Senior Living

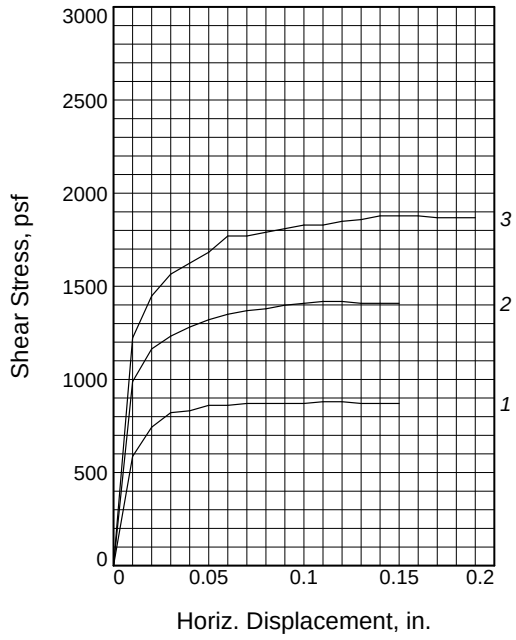
Location: TP-1
Sample Number: A-1
Proj. No.: 4219-GFS **Date Sampled:** 9/29/15

DIRECT SHEAR TEST REPORT

EnGEN Corporation

Tested By: PB **Checked By:** PB





Sample No.		1	2	3
Initial	Water Content, %	18.7	18.7	18.7
	Dry Density, pcf	100.5	97.9	97.4
	Saturation, %	78.0	73.1	72.1
	Void Ratio	0.6282	0.6701	0.6797
	Diameter, in.	2.42	2.42	2.42
	Height, in.	1.00	1.00	1.00
At Test	Water Content, %	30.5	30.9	29.2
	Dry Density, pcf	100.5	97.9	97.4
	Saturation, %	127.0	120.7	112.4
	Void Ratio	0.6282	0.6701	0.6797
	Diameter, in.	2.42	2.42	2.42
	Height, in.	1.00	1.00	1.00
Normal Stress, psf		1000	2000	3000
Fail. Stress, psf		880	1418	1878
Displacement, in.		0.11	0.11	0.15
Ult. Stress, psf		871	1409	1868
Displacement, in.		0.13	0.13	0.17
Strain rate, in./min.		0.10	0.10	0.10

Sample Type:
Description: Silt with fine sand, light grey.

Specific Gravity= 2.62
Remarks: SAMPLE# A-2
SAMPLED BY WB
SAMPLED ON 9/29/15

Figure A-2

Client: United Engineering Group

Project: Summerland Senior Living

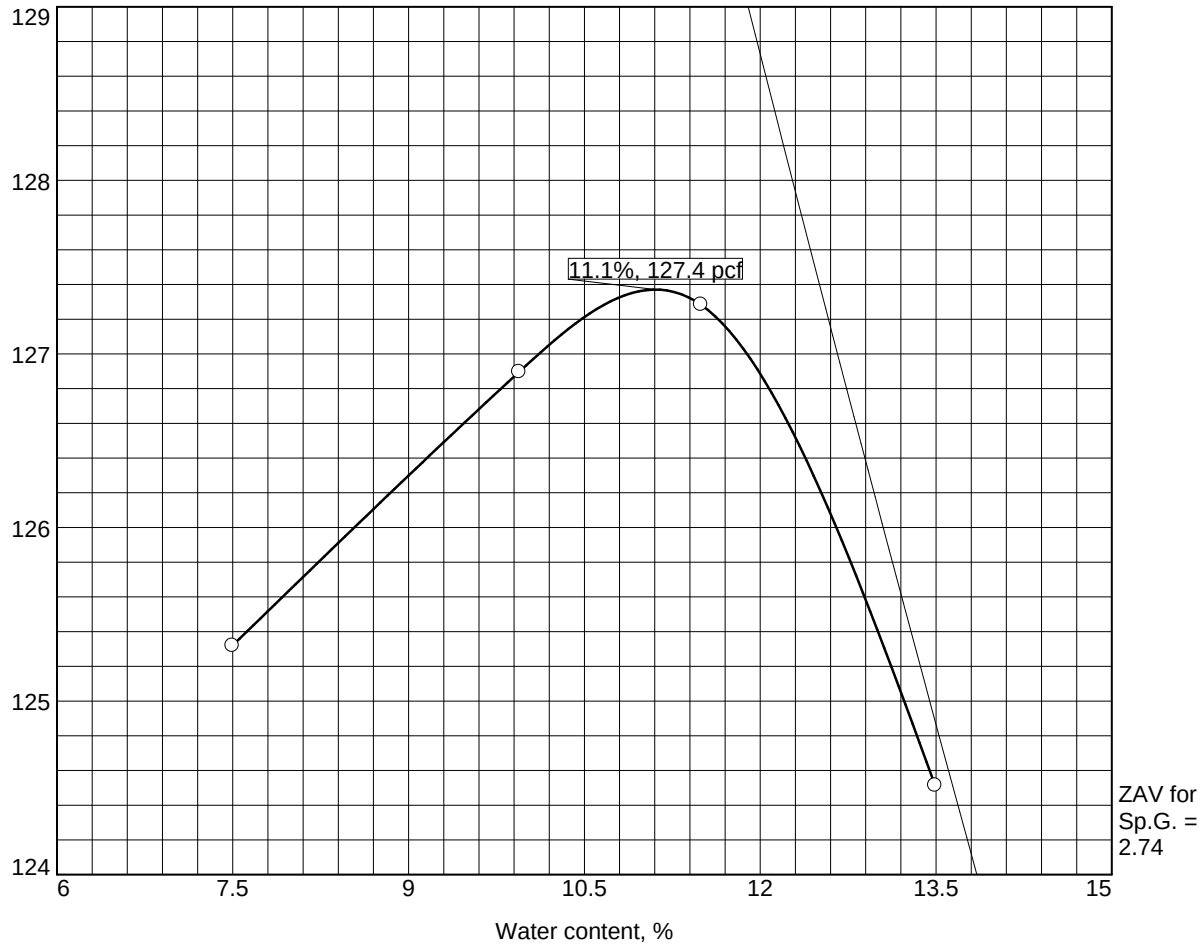
Location: TP-5
Sample Number: A-2 **Depth:** -2'
Proj. No.: 4219-GFS **Date Sampled:** 9/29/15

DIRECT SHEAR TEST REPORT

EnGEN Corporation

Tested By: PB **Checked By:** PB

MAXIMUM DENSITY - OPTIMUM MOISTURE REPORT



Test specification: ASTM D 1557-00 Method A Modified

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > #4	% < No.200
	USCS	AASHTO						
	SM		11.5					

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 127.4 pcf Optimum moisture = 11.1 %	Very silty fine sand, grey

Project No. 4219-GFS **Client:** United Engineering Group
Project: Summerland Senior Living

○**Location:** TP-1 **Sample Number:** A-1

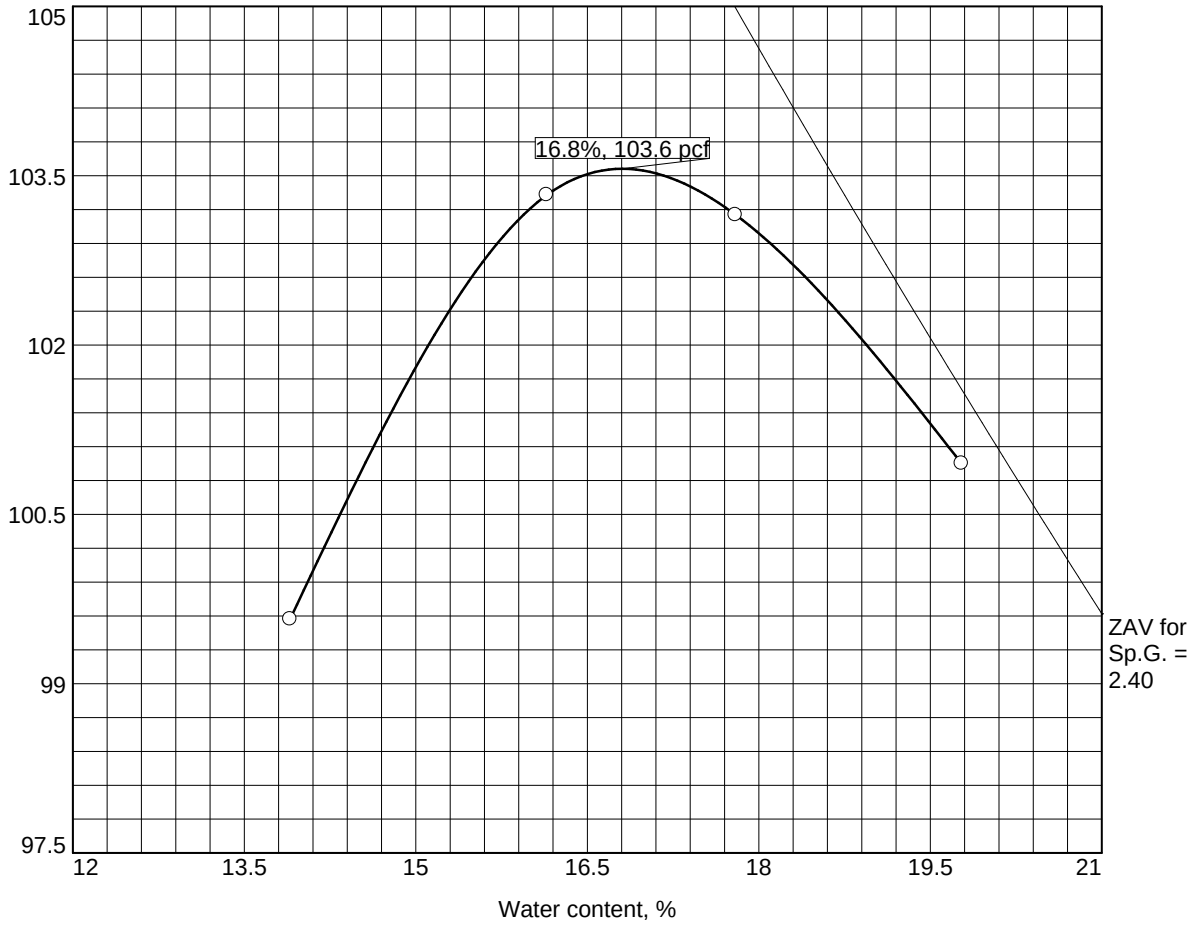
Remarks:
SAMPLE# A-1
SAMPLED BY WB
SAMPLED ON 9/29/15

EnGEN Corporation

Figure

Tested By: PB **Checked By:** PB

MAXIMUM DENSITY - OPTIMUM MOISTURE REPORT



Test specification: ASTM D 1557-00 Method A Modified

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > #4	% < No.200
	USCS	AASHTO						
-2'	ML		11.8					

TEST RESULTS

Maximum dry density = 103.6 pcf

Optimum moisture = 16.8 %

MATERIAL DESCRIPTION

Silt with fine sand, light grey.

Project No. 4219-GFS **Client:** United Engineering Group

Project: Summerland Senior Living

○**Location:** TP-5 **Sample Number:** A-2

Remarks:

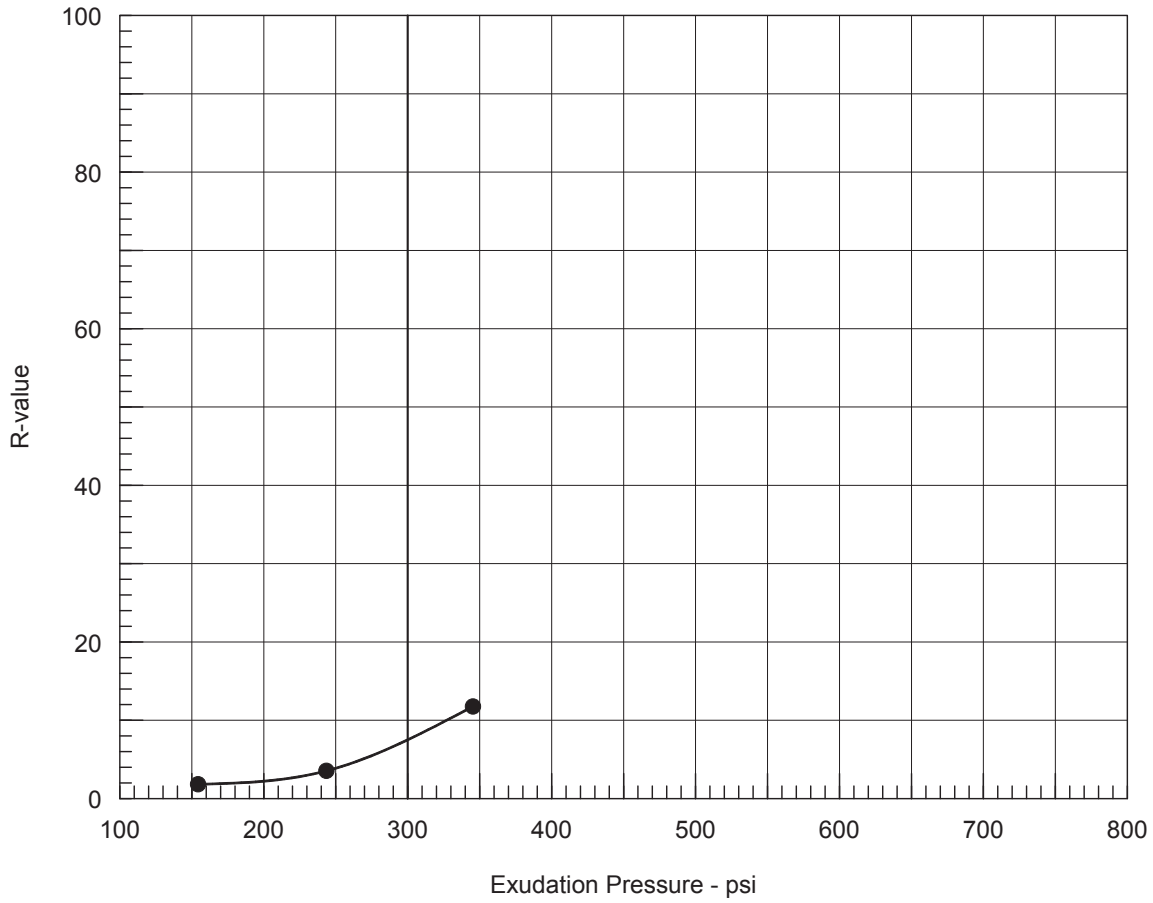
SAMPLE# A-2
SAMPLED BY WB
SAMPLED ON 9/29/15

EnGEN Corporation

Figure

Tested By: PB **Checked By:** PB

R-VALUE TEST REPORT



Resistance R-Value and Expansion Pressure - ASTM D 2844

No.	Compact. Pressure psi	Density pcf	Moist. %	Expansion Pressure psi	Horizontal Press. psi @ 160 psi	Sample Height in.	Exud. Pressure psi	R Value	R Value Corr.
1	200	121.1	16.5	0.00	150	2.70	154	1.7	1.8
2	300	118.0	15.5	0.00	143	2.43	244	3.7	3.5
3	350	120.1	14.4	0.00	120	2.50	345	11.8	11.8

Test Results	Material Description
R-value at 300 psi exudation pressure = 7.5	Very silty fine sand, light grey

Project No.: 4219-GFS
Project: Summerland Senior Living
Location: TP-1
Sample Number: A-1
Date: 2/29/15

Tested by: PB
Checked by: PB

Remarks:
SAMPLE# A-1
SAMPLED BY WB
SAMPLED ON 9/29/15

R-VALUE TEST REPORT

EnGEN Corporation

Figure A-1

CBC 1803

10/26/2015

Job Number: 4219-C
Job Name: Summerland Senior Living
Location: N. of Serenity Trail, Chino
Sample Source: TP-1
Sampled by: WB (9/29/15)
Lab Technician: PB
Sample Descr: Very silty fine sand, light grey
Sample #: A-1

Wet Compacted Wt.:	616.3
Ring Wt.:	199.1
Net Wet Wt.:	417.2
Wet Density:	126.0
Wet Soil:	223.6
Dry Soil:	205.1
Initial Moisture (%):	9.0%
Initial Dry Density:	115.6
% Saturation:	53.2%
Final Wt. & Ring Wt.:	649.7
Net Final Wt.:	450.6
Dry Wt.:	382.7
Loss:	67.9
Net Dry Wt.:	379.6
Final Density:	114.6
Saturated Moisture:	17.9%

	Dial	Change	Time
Reading 1:	0.100	N/A	12:00
Reading 2:	0.121	0.021	12:15
Reading 3:	0.128	0.028	12:30
Reading 4:	0.133	0.033	21-Oct

Expansion Index:	33
Adjusted Index:	34.9
(UBC 18-2)	

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Temecula, California 92590
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www.engencorp.com

CBC 1803 10/26/2015

Job Number: 4219-GS
Job Name: Summerland Senior Living
Location: N. of Serenity Trail - Chino
Sample Source: TP-2
Sampled by: WB (9/29/15)
Lab Technician: PB
Sample Descr: Silt with fine sand, light grey
Sample #: A-2

Wet Compacted Wt.:	545.6
Ring Wt.:	197.0
Net Wet Wt.:	348.6
Wet Density:	105.3
Wet Soil:	227.1
Dry Soil:	199.5
Initial Moisture (%):	13.8%
Initial Dry Density:	92.5
% Saturation:	45.5%
Final Wt. & Ring Wt.:	606.6
Net Final Wt.:	409.6
Dry Wt.:	306.2
Loss:	103.4
Net Dry Wt.:	300.4
Final Density:	90.7
Saturated Moisture:	34.4%

	Dial	Change	Time
Reading 1:	0.100	N/A	1:00
Reading 2:	0.175	0.075	1:15
Reading 3:	0.190	0.090	1:30
Reading 4:	0.201	0.101	27-Oct

Expansion Index:	101
Adjusted Index:	96.7
(UBC 18-2)	

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SoilCor
CORROSION & THERMAL SCIENCES
41765 Hawthorn Street Murrieta, CA 92562
ph (951) 894-2682 • fx (951) 894-2683

Work Order No.: 16C1332
Client: EnGEN Corporation
Project No.: 4102-65
Project Name: EMWD
Report Date: March 30, 2016

Laboratory Test(s) Results Summary

The subject soil samples were processed in accordance with California Test Method CTM 643 and tested for pH / Minimum Resistivity (CTM 643), Sulfate Content (CTM 417) and Chloride Content (CTM 422). The test results follow:

Sample Identification	pH	Minimum Resistivity (ohm-cm)	Sulfate Content (mg/kg)	Sulfate Content (% by wgt)	Chloride Content (ppm)
Sample A-1	7.2	3,200	10	0.001	ND
Sample A-2	7.2	1,400	40	0.004	40

*ND=No Detection

We appreciate the opportunity to serve you. Please do not hesitate to contact us with any questions or clarifications regarding these results or procedures.

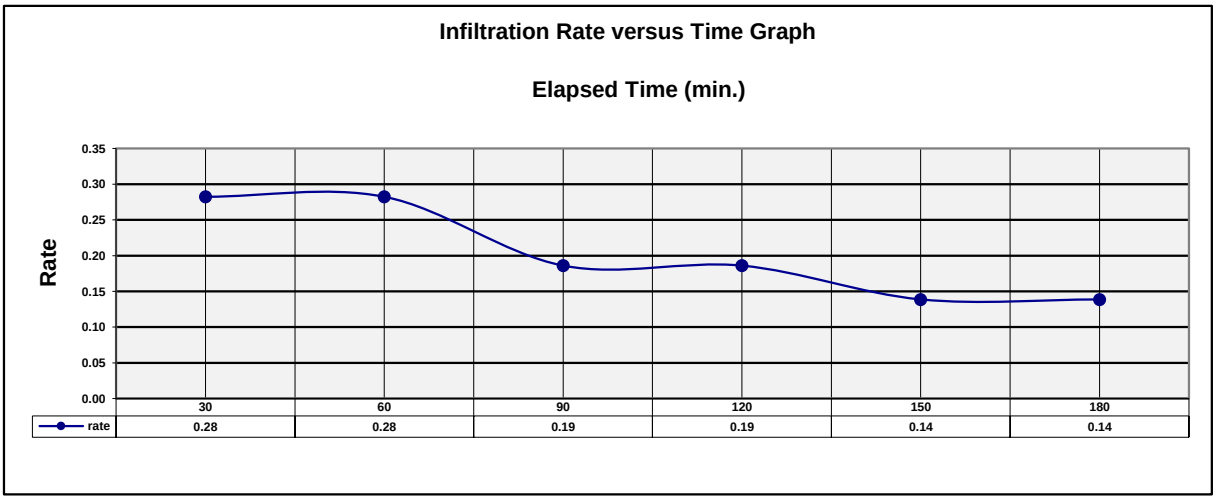
Ahmet K. Kaya, Laboratory Manager

INFILTRATION TEST RESULTS

PERCOLATION TEST RESULTS
TEST NO. 4

Project Number:	4219IP	**Tested by:**	DJ	Date of Test:	10/1/2015
Test Location:	See Plate 1	**USCS Class:**	ML	**Elevation of Test Hole**	**1309 AMSL**
Test Number:	4	**Diameter Hole:**	8"	**Temperature:**	58 ^{0} F
SLOPE ACROSS SITE IS:	2%	Weather	Clear	**Starting Time:**	09:50.
PASSED SANDY SOIL CRITERIA TEST - THE CHANGE IN WATER LEVEL DROPPED GREATER THAN 6-INCHES IN TWO CONSECUTIVE READINGS					

Δt (min)	Reading No.	Total Depth of Test Pit (Inches)	Depth of Test Hole (Inches)	Initial Height of Water (H_o) (Inches)	Final Height of Water (H_f) (Inches)	Change in Height (ΔH) (Inches)	Average Head (H_{avg}) (Inches)	Converted Infiltration Rate in/hr (I_t)
30.00	1	24.00	21.00	20.00	18.50	1.50	19.25	0.3
30.00	2	24.00	21.00	20.00	18.50	1.50	19.25	0.3
30.00	3	24.00	21.00	20.00	19.00	1.00	19.50	0.2
30.00	4	24.00	21.00	20.00	19.00	1.00	19.50	0.2
30.00	5	24.00	21.00	20.00	19.25	0.75	19.63	0.1
30.00	6	24.00	21.00	20.00	19.25	0.75	19.63	0.1

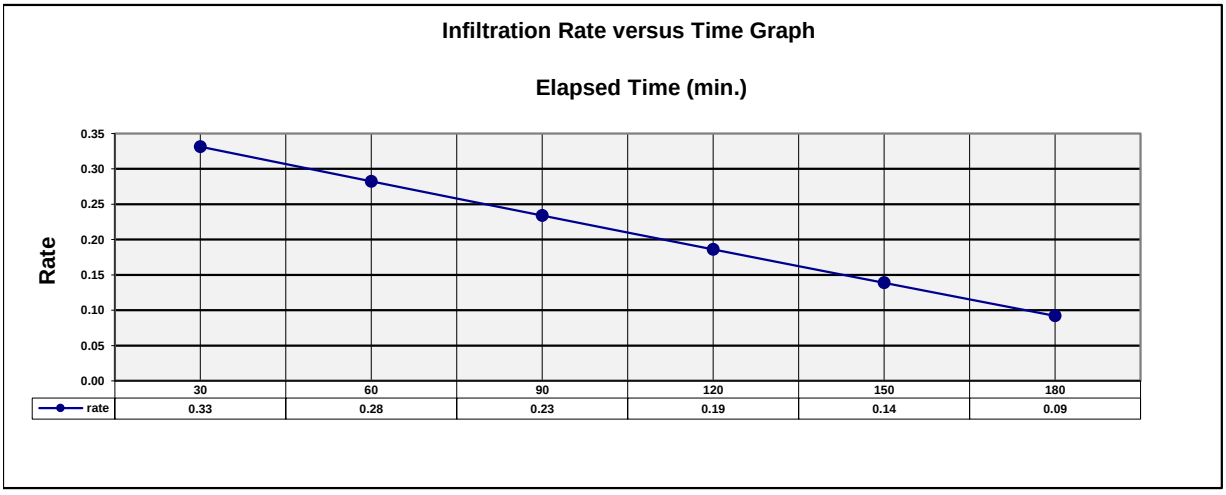


Notes:

PERCOLATION TEST RESULTS
TEST NO. 3

Project Number:	4219IP	**Tested by:**	DJ	Date of Test:	10/1/2015
Test Location:	See Plate 1	**USCS Class:**	ML	**Elevation of Test Hole**	227.5 AMSL
Test Number:	3	**Diameter Hole:**	8"	**Temperature:**	58 ^{0} F
SLOPE ACROSS SITE IS:	2%	Weather	Clear	**Starting Time:**	09:50.
PASSED SANDY SOIL CRITERIA TEST - THE CHANGE IN WATER LEVEL DROPPED GREATER THAN 6-INCHES IN TWO CONSECUTIVE READINGS					

Δt (min)	Reading No.	Total Depth of Test Pit (Inches)	Depth of Test Hole (Inches)	Initial Height of Water (H_o) (Inches)	Final Height of Water (H_f) (Inches)	Change in Height (ΔH) (Inches)	Average Head (H_{avg}) (Inches)	Converted Infiltration Rate in/hr (I_t)
30.00	1	24.00	21.00	20.00	18.25	1.75	19.13	0.3
30.00	2	24.00	21.00	20.00	18.50	1.50	19.25	0.3
30.00	3	24.00	21.00	20.00	18.75	1.25	19.38	0.2
30.00	4	24.00	21.00	20.00	19.00	1.00	19.50	0.2
30.00	5	24.00	21.00	20.00	19.25	0.75	19.63	0.1
30.00	6	24.00	21.00	20.00	19.50	0.50	19.75	0.1

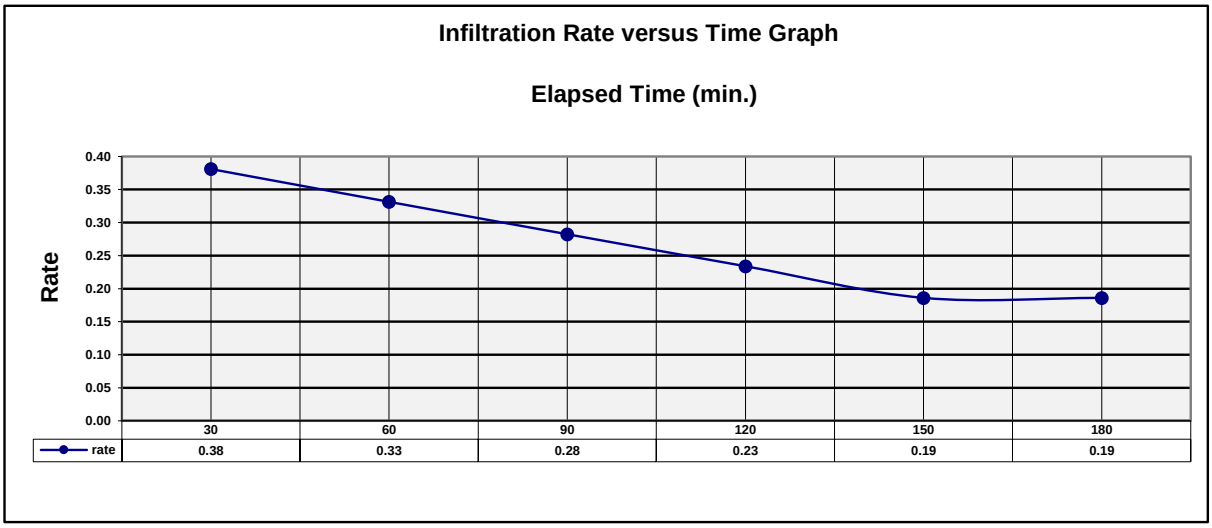


Notes:

PERCOLATION TEST RESULTS
TEST NO. 2

Project Number:	4219IP	**Tested by:**	DJ	Date of Test:	10/1/2015
Test Location:	See Plate 1	**USCS Class:**	ML	**Elevation of Test Hole**	**724.5 AMSL**
Test Number:	2	**Diameter Hole:**	8"	**Temperature:**	58 ^{0} F
SLOPE ACROSS SITE IS:	2%	Weather	Clear	**Starting Time:**	09:45.

Δt (min)	**Reading No.**	**Total Depth of Test Pit (Inches)**	**Depth of Test Hole (Inches)**	**Initial Height of Water (H_o) (Inches)**	**Final Height of Water (H_f) (Inches)**	**Change in Height (ΔH) (Inches)**	**Average Head (H_{avg}) (Inches)**	**Converted Infiltration Rate in/hr (I_t)**
30.00	1	36.00	21.00	20.00	18.00	2.00	19.00	0.4
30.00	2	36.00	21.00	20.00	18.25	1.75	19.13	0.3
30.00	3	36.00	21.00	20.00	18.50	1.50	19.25	0.3
30.00	4	36.00	21.00	20.00	18.75	1.25	19.38	0.2
30.00	5	36.00	21.00	20.00	19.00	1.00	19.50	0.2
30.00	6	36.00	21.00	20.00	19.00	1.00	19.50	0.2

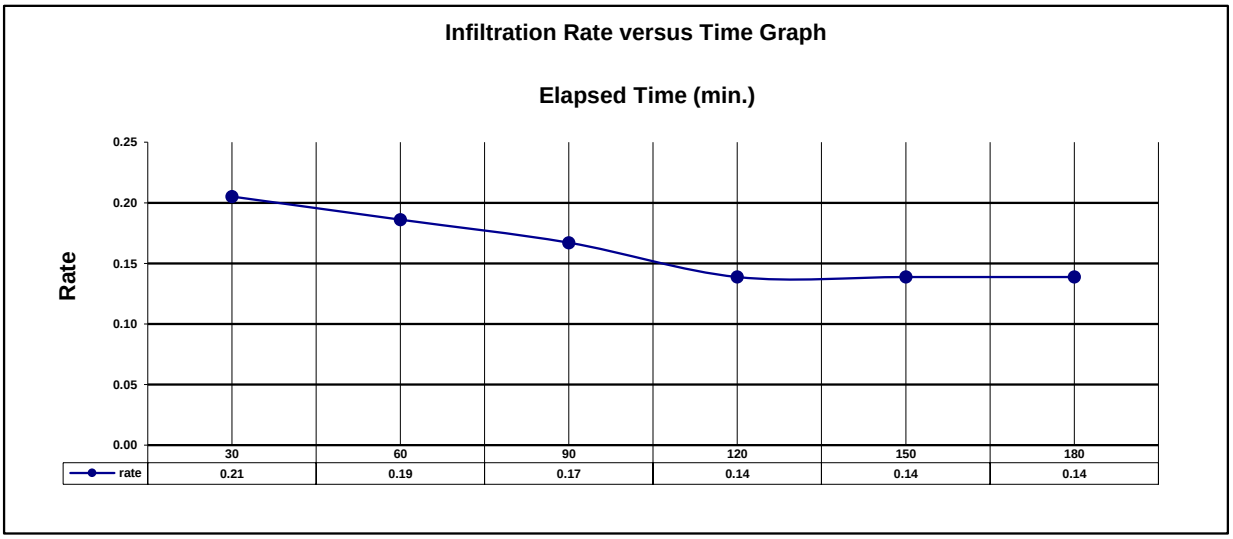


Notes:

PERCOLATION TEST RESULTS
TEST NO. 1

Project Number:	4219IP	**Tested by:**	DJ	Date of Test:	10/1/2015
Test Location:	See Plate 1	**USCS Class:**	ML	**Elevation of Test Hole**	**724 AMSL**
Test Number:	1	**Diameter Hole:**	8"	**Temperature:**	58 ^{0} F
SLOPE ACROSS SITE IS:	2%	Weather	Clear	**Starting Time:**	09:45.

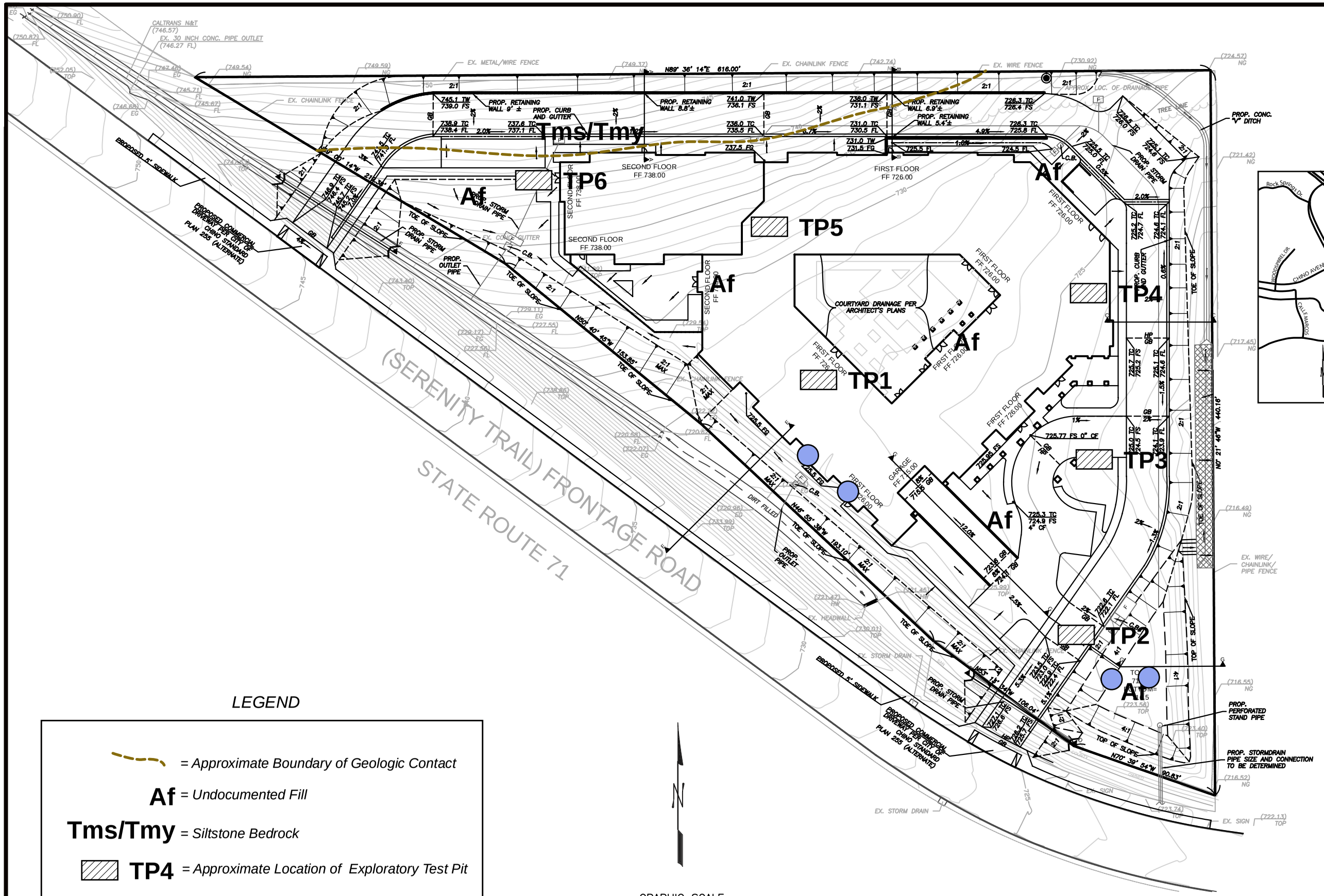
Δt (min)	**Reading No.**	**Total Depth of Test Pit (Inches)**	**Depth of Test Hole (Inches)**	**Initial Height of Water (H_o) (Inches)**	**Final Height of Water (H_f) (Inches)**	**Change in Height (ΔH) (Inches)**	**Average Head (H_{avg}) (Inches)**	**Converted Infiltration Rate in/hr (I_t)**
30.00	1	36.00	21.00	20.00	18.90	1.10	19.45	0.2
30.00	2	36.00	21.00	20.00	19.00	1.00	19.50	0.2
30.00	3	36.00	21.00	20.00	19.10	0.90	19.55	0.2
30.00	4	36.00	21.00	20.00	19.25	0.75	19.63	0.1
30.00	5	36.00	21.00	20.00	19.25	0.75	19.63	0.1
30.00	6	36.00	21.00	20.00	19.25	0.75	19.63	0.1

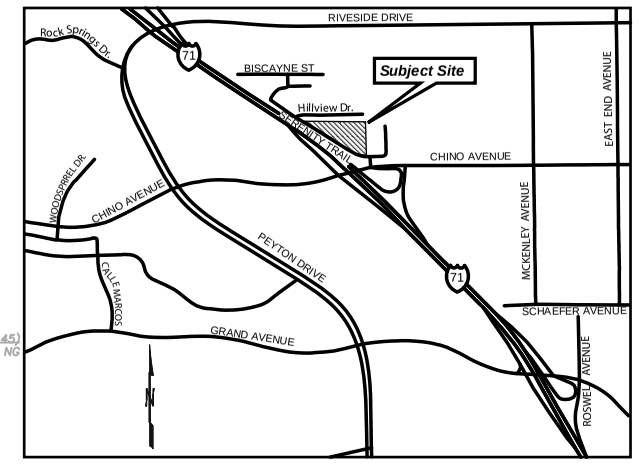


Notes:

PLATE 1

PLATE 1





VICINITY MAP
N.T.S.

LEGEND

- = *Approximate Boundary of Geologic Contact*
- **Af** = *Undocumented Fill*
- **Tms/Tmy** = *Siltstone Bedrock*
- **TP4** = *Approximate Location of Exploratory Test Pit*
- **P4** = *Approximate Location of Infiltration Test*

GRAPHIC SCALE
1" = 40'
0 20 40 80 120 180

GEOTECHNICAL FEASIBILITY STUDY SITE PLAN

PROJECT NAME: **Summerland Senior Living**		DATE: **October 2016**
PROJECT NUMBER: **4219-GFS**	CLIENT: **United Engineering Group**	
Legal Description: **13225 Serinity Trail, Chino**		Plate No. **1**

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