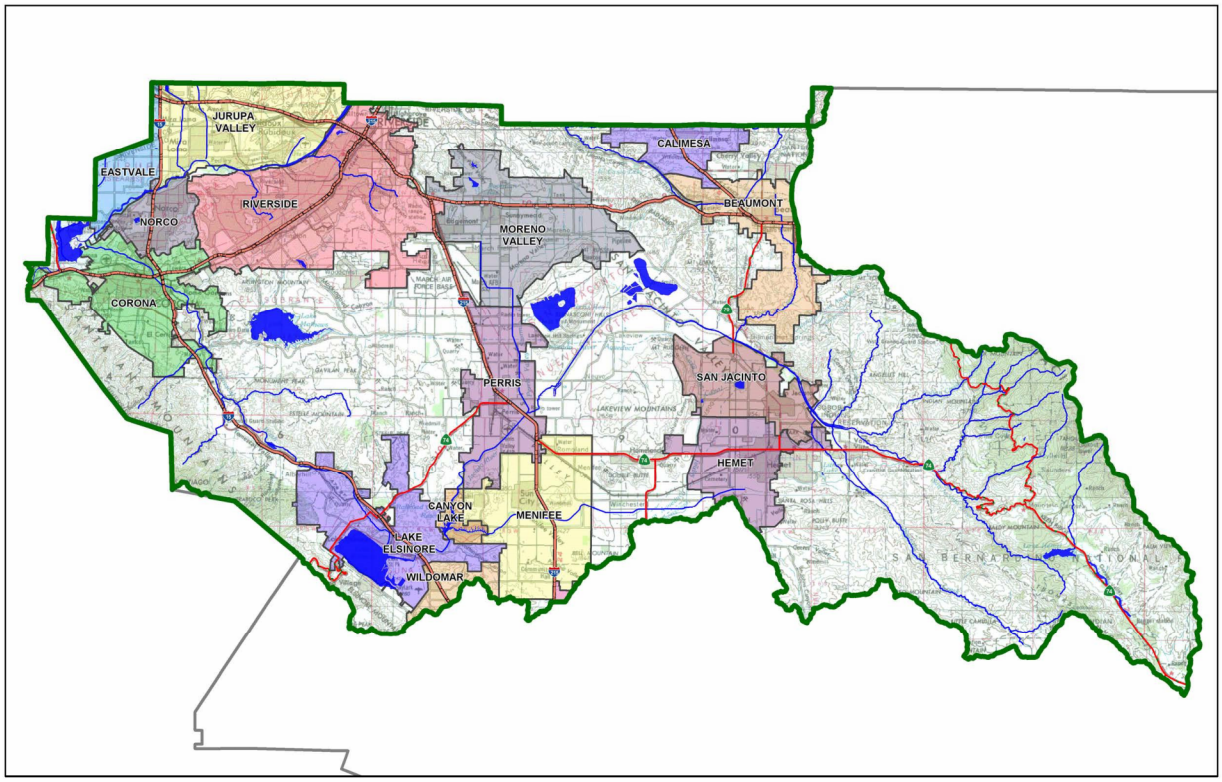
Project Specific Water Quality Management Plan

*A Template for Projects located within the **Santa Ana Watershed** Region of Riverside County*

Project Title: Tract 38955, Farm Bureau 139

Development No: PEN24-0058, PEN24-0059

Design Review/Case No: LWQ24-0026



☒ **Preliminary**
☐ **Final**

Original Date Prepared: March 14, 2024

Revision Date(s): June 2024, October 2024

Prepared for Compliance with
Regional Board Order No. **R8-2010-0033**
Template revised June 30, 2016

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OWNER'S CERTIFICATION

This Project-Specific Water Quality Management Plan (WQMP) has been prepared for Foremost Pacific Group by Adkan Engineers for the Tract 38955, located at 21160 Box Springs Road.

This WQMP is intended to comply with the requirements of City of Moreno Valley Ordinance 827 which includes the requirement for the preparation and implementation of a Project-Specific WQMP.

The undersigned, while owning the property/project described in the preceding paragraph, shall be responsible for the implementation and funding of this WQMP and will ensure that this WQMP is amended as appropriate to reflect up-to-date conditions on the site. In addition, the property owner accepts responsibility for interim operation and maintenance of Stormwater BMPs until such time as this responsibility is formally transferred to a subsequent owner. This WQMP will be reviewed with the facility operator, facility supervisors, employees, tenants, maintenance and service contractors, or any other party (or parties) having responsibility for implementing portions of this WQMP. At least one copy of this WQMP will be maintained at the project site or project office in perpetuity. The undersigned is authorized to certify and to approve implementation of this WQMP. The undersigned is aware that implementation of this WQMP is enforceable under City of Moreno Valley Water Quality Ordinance (Municipal Code Chapter 8.10).

"I, the undersigned, certify under penalty of law that the provisions of this WQMP have been reviewed and accepted and that the WQMP will be transferred to future successors in interest."

Signed by:
Bryan Bergeron
AF5139C09474FC...

Owner's Signature

12/2/2024
Date

Bryan Bergeron
Owner's Printed Name

Vice President
Owner's Title/Position

PREPARER'S CERTIFICATION

"The selection, sizing and design of stormwater treatment and other stormwater quality and quantity control measures in this plan meet the requirements of Regional Water Quality Control Board Order No. **R8-2010-0033** and any subsequent amendments thereto."

DocuSigned by:
Michael Brendecke
3F3448523EFC439...

Preparer's Signature

12/2/2024
Date

Michael Brendecke
Preparer's Printed Name

Senior Project Manager
Preparer's Title/Position

Preparer's Licensure:



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Section A: Project and Site Information

PROJECT INFORMATION	
Type of Project:	Multi-Family Residential
Planning Area:	Northwest Riverside county
Community Name:	Seneca
Development Name:	TRACT 38955, Farm Bureau 140
PROJECT LOCATION	
Latitude & Longitude (DMS): 33°56'48"N 117°17'35"W	
Project Watershed and Sub-Watershed: Santa Ana Watershed/ Tequesquite Arroyo	
Gross Acres: 9.33 APN(s): 256-200-002, 256-200-003 & 256-200-004	
Map Book and Page No.: Book 50 of Record of Survey, Page 20	
PROJECT CHARACTERISTICS	
Proposed or Potential Land Use(s)	High Density Residential
Proposed or Potential SIC Code(s)	N/A
Area of Project Footprint (SF)	405,998
Total Area of proposed Impervious Surfaces within the Project Footprint (SF)/or Replacement	293,174
Does the project consist of offsite road improvements?	☐ Y ☒ N
Does the project propose to construct unpaved roads?	☐ Y ☒ N
Is the project part of a larger common plan of development (phased project)?	☐ Y ☒ N
EXISTING SITE CHARACTERISTICS	
Total area of existing Impervious Surfaces within the Project limits Footprint (SF)	50,254
Is the project located within any MSHCP Criteria Cell?	☐ Y ☒ N
If so, identify the Cell number:	
Are there any natural hydrologic features on the project site?	☐ Y ☒ N
Is a Geotechnical Report attached?	☐ Y ☒ N
If no Geotech. Report, list the NRCS soils type(s) present on the site (A, B, C and/or D)	**Type D**
What is the Water Quality Design Storm Depth for the project?	0.64 in

Existing flows onsite are split with a portion of existing flows draining north where they flow into an existing storm drain channel north of the property boundary. Remaining flows drain to the south of the property and flow into Box Springs Road. Proposed flows onsite are split in a similar manner, with a portion of flows being directed to a bioretention facility at the northwest corner of the site for cleaning and detention before being directed into the existing offsite channel. The remaining flows are directed to bioretention facilities along the south of the property where flows are treated before being released into Box Springs Road.

A.1 Maps and Site Plans

When completing your Project-Specific WQMP, include a map of the local vicinity and existing site. In addition, include all grading, drainage, landscape/plant palette and other pertinent construction plans in Appendix 2. At a **minimum**, your WQMP Site Plan should include the following:

- Drainage Management Areas
- Proposed Structural BMPs
- Drainage Path
- Drainage Infrastructure, Inlets, Overflows
- Source Control BMPs
- Buildings, Roof Lines, Downspouts
- Impervious Surfaces
- Standard Labeling
- BMP Locations (Lat/Long)

A.2 Identify Receiving Waters

Using Table A.1 below, list in order of upstream to downstream, the receiving waters that the project site is tributary to. Continue to fill each row with the Receiving Water's 303(d) listed impairments (if any), designated beneficial uses, and proximity, if any, to a RARE beneficial use. Include a map of the receiving waters in Appendix 1.

Table A.1 Identification of Receiving Waters

Receiving Waters	EPA Approved 303(d) List Impairments	Designated Beneficial Uses	Proximity to RARE Beneficial Use
Sycamore Creek		WILD, GWR, RARE, REC1, REC2, SPWN, WARM	7.4 mi
Santa Ana Reach 3	Cooper, Lead, Indicator Bacterial	AGR, GWR, REC1, REC2, WARM, WILD, RARE, SPWN	25.2 mi
Prado Basin Management	pH	REC1, REC2, WARM, WILD, RARE	32.2 mi
Santa Ana Reach 2		AGR, GWR, REC1, REC2, WARM, WILD, RARE, SPWN	55.6 mi
Santa Ana Reach 1		REC1, REC2, WARM, WILD	

A.3 Additional Permits/Approvals required for the Project:

Table A.2 Other Applicable Permits

Agency	Permit Required	
State Department of Fish and Game, 1602 Streambed Alteration Agreement	☐ Y	☒ N
State Water Resources Control Board, Clean Water Act (CWA) Section 401 Water Quality Cert.	☐ Y	☒ N
US Army Corps of Engineers, CWA Section 404 Permit	☐ Y	☒ N
US Fish and Wildlife, Endangered Species Act Section 7 Biological Opinion	☐ Y	☒ N
Statewide Construction General Permit Coverage	☒ Y	☐ N
Statewide Industrial General Permit Coverage	☐ Y	☒ N
Western Riverside MSHCP Consistency Approval (e.g., JPR, DBESP)	☐ Y	☒ N
Other *(please list in the space below as required)* City of Moreno Valley Building permit City of Moreno Valley Grading permit City of Moreno Valley Construction Permit	☒ Y	☐ N

If yes is answered to any of the questions above, the Co-Permittee may require proof of approval/coverage from those agencies as applicable including documentation of any associated requirements that may affect this Project-Specific WQMP.

Site Optimization

Did you identify and preserve existing drainage patterns? If so, how? If not, why?

Yes. Existing flows onsite are split with a portion of existing flows draining north where they flow into an existing storm drain channel north of the property boundary. Remaining flows drain to the south of the property and flow into Box Springs Road. Proposed flows onsite are split in a similar manner, with each drainage area being collected into a bioretention facility before being outletted to the northerly storm drain channel and Box Spring Road.

Did you identify and protect existing vegetation? If so, how? If not, why?

Existing vegetation onsite is limited. Proposed design will add landscaping above what currently exists.

Did you identify and preserve natural infiltration capacity? If so, how? If not, why?

No, the natural infiltration rates were too low to allow for the use of infiltration BMPs due to the types of soils C & D found on site. Soils rated type C & D have very low infiltration rates.

Did you identify and minimize impervious area? If so, how? If not, why?

Impervious areas were minimized to the maximum extent practicable. Landscaping is being incorporated into the site in all feasible areas.

Did you identify and disperse runoff to adjacent pervious areas? If so, how? If not, why?

The proposed site will have two drainage areas. Runoff drainage flowing to the north will be conveyed to a proposed bioretention basin. Runoff drainage flowing to the south will be conveyed to one of 3 separate bioretention trenches located along the project frontage.

Section B: Delineate Drainage Management Areas (DMAs)

Utilizing the procedure in Section 3.3 of the WQMP Guidance Document which discusses the methods of delineating and mapping your project site into individual DMAs, complete Table C.1 below to appropriately categorize the types of classification (e.g., Type A, Type B, etc.) per DMA for your project site. Upon completion of this table, this information will then be used to populate and tabulate the corresponding tables for their respective DMA classifications.

Table B.1 DMA Classifications

DMA Name or ID	Surface Type(s)[1][2]	Area (Sq. Ft.)	DMA Type
DMA A-1	Roofs	257,523	D
DMA A-2	Concrete/Asphalt	79,909,	D
DMA A-3	Landscaping	87,983	D
DMA B-1	Roofs	5,319	D
DMA B-2	Concrete/Asphalt	6,333	D
DMA B-3	Landscaping	2,355	D
DMA C-1	Roofs	15,957	D
DMA C-2	Concrete/Asphalt	24,621	D
DMA C-3	Landscaping	7,249	D
DMA D-1	Roofs	23,469	D
DMA D-2	Concrete/Asphalt	19,655	D
DMA D-3	Landscaping	13,301	D

[1]*Reference Table 2-1 in the WQMP Guidance Document to populate this column*
[2]*If multi-surface provide back-up*

Table B.2 Type 'A', Self-Treating Areas

DMA Name or ID	Area (Sq. Ft.)	Stabilization Type	Irrigation Type (if any)
DMA E	22,470	NATURAL SOIL	
DMA F	2,325	NATURAL SOIL	

Table B.3 Type 'B', Self-Retaining Areas

Self-Retaining Area				**Type 'C' DMAs that are draining to the Self-Retaining Area**		
DMA Name/ ID	Post-project surface type	Area (square feet) [A]	Storm Depth (inches) [B]	DMA Name / ID	[C] from Table C.4 = [C]	Required Retention Depth (inches) [D]

$$[D] = [B] + \frac{[B] \cdot [C]}{[A]}$$

Table B.4 Type 'C', Areas that Drain to Self-Retaining Areas

DMA					**Receiving Self-Retaining DMA**		
DMA Name/ ID	Area (square feet)	Post-project surface type	Impervious fraction	Product		Area (square feet)	Ratio
	[A]		[B]	[C] = [A] x [B]	DMA name /ID	[D]	[C]/[D]

Table B.5 Type 'D', Areas Draining to BMPs

DMA Name or ID	BMP Name or ID
DMA A-1	BIORETENTION BASIN
DMA A-2	BIORETENTION BASIN
DMA A-3	BIORETENTION BASIN
DMA B-1	BIORETENTION TRENCH 1
DMA B-2	BIORETENTION TRENCH 1
DMA B-3	BIORETENTION TRENCH 1
DMA C-1	BIORETENTION TRENCH 2
DMA C-2	BIORETENTION TRENCH 2
DMA C-3	BIORETENTION TRENCH 2
DMA D-1	BIORETENTION TRENCH 3
DMA D-2	BIORETENTION TRENCH 3
DMA D-3	BIORETENTION TRENCH 3

Note: More than one drainage management area can drain to a single LID BMP, however, one drainage management area may not drain to more than one BMP.

Section C: Implement LID BMPs

C.1 Infiltration Applicability

Is there an approved downstream 'Highest and Best Use' for stormwater runoff (see discussion in Chapter 2.4.4 of the WQMP Guidance Document for further details)? Y ☒ N

If yes has been checked, Infiltration BMPs shall not be used for the site; proceed to section D.3

If no, continue working through this section to implement your LID BMPs. It is recommended that you contact your Co-Permittee to verify whether or not your project discharges to an approved downstream 'Highest and Best Use' feature.

Geotechnical Report

A Geotechnical Report or Phase I Environmental Site Assessment may be required by the Copermittee to confirm present and past site characteristics that may affect the use of Infiltration BMPs. In addition, the Co-Permittee, at their discretion, may not require a geotechnical report for small projects as described in Chapter 2 of the WQMP Guidance Document. If a geotechnical report has been prepared, include it in Appendix 3. In addition, if a Phase I Environmental Site Assessment has been prepared, include it in Appendix 4.

Is this project classified as a small project consistent with the requirements of Chapter 2 of the WQMP Guidance Document? ☐ Y ☒ N

Infiltration Feasibility

Table D.1 below is meant to provide a simple means of assessing which DMAs on your site support Infiltration BMPs and is discussed in the WQMP Guidance Document in Chapter 2.4.5. Check the appropriate box for each question and then list affected DMAs as applicable. If additional space is needed, add a row below the corresponding answer.

Table C.1 Infiltration Feasibility

Does the project site…	YES	NO
…have any DMAs with a seasonal high groundwater mark shallower than 10 feet?		NO
If Yes, list affected DMAs:		
…have any DMAs located within 100 feet of a water supply well?		NO
If Yes, list affected DMAs:		
…have any areas identified by the geotechnical report as posing a public safety risk where infiltration of stormwater could have a negative impact?		NO
If Yes, list affected DMAs:		
…have measured in-situ infiltration rates of less than 1.6 inches / hour?	YES	
If Yes, list affected DMAs: DMA A & DMA B		
…have significant cut and/or fill conditions that would preclude in-situ testing of infiltration rates at the final infiltration surface?		NO
If Yes, list affected DMAs:		
…geotechnical report identify other site-specific factors that would preclude effective and safe infiltration?		NO
Describe here:		

If you answered "Yes" to any of the questions above for any DMA, Infiltration BMPs should not be used for those DMAs and you should proceed to the assessment for Harvest and Use below.

C.2 Harvest and Use Assessment

Please check what applies*:*

☐ Reclaimed water will be used for the non-potable water demands for the project.

☐Downstream water rights may be impacted by Harvest and Use as approved by the Regional Board (verify with the Copermittee).

☐The Design Capture Volume will be addressed using Infiltration Only BMPs. In such a case, Harvest and Use BMPs are still encouraged, but it would not be required if the Design Capture Volume will be infiltrated or evapotranspired.

If any of the above boxes have been checked, Harvest and Use BMPs need not be assessed for the site. If none of the above criteria applies, follow the steps below to assess the feasibility of irrigation use, toilet use and other non-potable uses (e.g., industrial use).

Irrigation Use Feasibility

Complete the following steps to determine the feasibility of harvesting stormwater runoff for Irrigation Use BMPs on your site:

Step 1: Identify the total area of irrigated landscape on the site, and the type of landscaping used.

***Total Area of Irrigated Landscape*: 2.54**

Type of Landscaping (Conservation Design or Active Turf): Conservation design

Step 2: Identify the planned total of all impervious areas on the proposed project from which runoff might be feasibly captured and stored for irrigation use. Depending on the configuration of buildings and other impervious areas on the site, you may consider the site as a whole, or parts of the site, to evaluate reasonable scenarios for capturing and storing runoff and directing the stored runoff to the potential use(s) identified in Step 1 above.

***Total Area of Impervious Surfaces:* 6.77**

Step 3: Cross reference the Design Storm depth for the project site (see Exhibit A of the WQMP Guidance Document) with the left column of Table 2-3 in Chapter 2 to determine the minimum area of Effective Irrigated Area per Tributary Impervious Area (EIATIA).

***Enter your EIATIA factor*: 1.05**

Step 4: Multiply the unit value obtained from Step 3 by the total of impervious areas from Step 2 to develop the minimum irrigated area that would be required.

***Minimum required irrigated area*: 7.10**

Step 5: Determine if harvesting stormwater runoff for irrigation use is feasible for the project by comparing the total area of irrigated landscape (Step 1) to the minimum required irrigated area (Step 4).

Minimum required irrigated area (Step 4)	Available Irrigated Landscape (Step 1)
7.1	**2.54**

Toilet Use Feasibility

Complete the following steps to determine the feasibility of harvesting stormwater runoff for toilet flushing uses on your site:

Step 1: Identify the projected total number of daily toilet users during the wet season, and account for any periodic shut downs or other lapses in occupancy:

Projected Number of Daily Toilet Users: 420

Project Type: High Density Residential

Step 2: Identify the planned total of all impervious areas on the proposed project from which runoff might be feasibly captured and stored for toilet use. Depending on the configuration of buildings and other impervious areas on the site, you may consider the site as a whole, or parts of the site, to evaluate reasonable scenarios for capturing and storing runoff and directing the stored runoff to the potential use(s) identified in Step 1 above.

Total Area of Impervious Surfaces: 6.77 Acres

Step 3: Enter the Design Storm depth for the project site (see Exhibit A) into the left column of Table 2-2 in Chapter 2 to determine the minimum number or toilet users per tributary impervious acre (TUTIA).

Enter your TUTIA factor: 108

Step 4: Multiply the unit value obtained from Step 3 by the total of impervious areas from Step 2 to develop the minimum number of toilet users that would be required.

Minimum number of toilet users: 731

Step 5: Determine if harvesting stormwater runoff for toilet flushing use is feasible for the project by comparing the Number of Daily Toilet Users (Step 1) to the minimum required number of toilet users (Step 4).

Minimum required Toilet Users (Step 4)	Projected number of toilet users (Step 1)
731	**420**

Other Non-Potable Use Feasibility

Are there other non-potable uses for stormwater runoff on the site (e.g. industrial use)? See Chapter 2 of the Guidance for further information. If yes, describe below. If no, write N/A.

N/A

Step 1: Identify the projected average daily non-potable demand, in gallons per day, during the wet season and accounting for any periodic shut downs or other lapses in occupancy or operation.

Average Daily Demand: N/A

Step 2: Identify the planned total of all impervious areas on the proposed project from which runoff might be feasibly captured and stored for the identified non-potable use. Depending on the configuration of buildings and other impervious areas on the site, you may consider the site as a whole, or parts of the site, to evaluate reasonable scenarios for capturing and storing runoff and directing the stored runoff to the potential use(s) identified in Step 1 above.

Total Area of Impervious Surfaces: N/A

Step 3: Enter the Design Storm depth for the project site (see Exhibit A) into the left column of Table 2-4 in Chapter 2 to determine the minimum demand for non-potable uses per tributary impervious acre.

Enter the factor from Table 2-4: N/A

Step 4: Multiply the unit value obtained from Step 3 by the total of impervious areas from Step 2 to develop the minimum number of gallons per day of non-potable use that would be required.

Minimum required use: N/A

Step 5: Determine if harvesting stormwater runoff for other non-potable use is feasible for the project by comparing the projected average daily use (Step 1) to the minimum required non-potable use (Step 4).

Minimum required non-potable use (Step 4)	**Projected average daily use (Step 1)**
N/A	N/A

If Irrigation, Toilet and Other Use feasibility anticipated demands are less than the applicable minimum values, Harvest and Use BMPs are not required and you should proceed to utilize LID Bioretention and Biotreatment per Section 3.4.2 of the WQMP Guidance Document.

C.3 Bioretention and Biotreatment Assessment

Other LID Bioretention and Biotreatment BMPs as described in Chapter 2.4.7 of the WQMP Guidance Document are feasible on nearly all development sites with sufficient advance planning.

Select one of the following:

☒ LID Bioretention/Biotreatment BMPs will be used for some or all DMAs of the project as noted below in Section D.4 (note the requirements of Section 3.4.2 in the WQMP Guidance Document).

☐ A site-specific analysis demonstrating the technical infeasibility of all LID BMPs has been performed and is included in Appendix 5. If you plan to submit an analysis demonstrating the technical infeasibility of LID BMPs, request a pre-submittal meeting with the Copermittee to discuss this option. Proceed to Section E to document your alternative compliance measures.

C.4 Feasibility Assessment Summaries

From the Infiltration, Harvest and Use, Bioretention and Biotreatment Sections above, complete Table D.2 below to summarize which LID BMPs are technically feasible, and which are not, based upon the established hierarchy.

Table C.2 LID Prioritization Summary Matrix

DMA Name/ID	LID BMP Hierarchy				No LID (Alternative Compliance)
	1. Infiltration	2. Harvest and use	3. Bioretention	4. Biotreatment	
DMA A-1	☐	☐	☒	☐	☐
DMA A-2	☐	☐	☒	☐	☐
DMA A-3	☐	☐	☒	☐	☐
DMA B-1	☐	☐	☒	☐	☐
DMA B-2	☐	☐	☒	☐	☐
DMA B-3	☐	☐	☒	☐	☐
DMA C-1	☐	☐	☒	☐	☐
DMA C-2	☐	☐	☒	☐	☐
DMA C-3	☐	☐	☒	☐	☐
DMA D-1	☐	☐	☒	☐	☐
DMA D-2	☐	☐	☒	☐	☐
DMA D-3	☐	☐	☒	☐	☐

For those DMAs where LID BMPs are not feasible, provide a brief narrative below summarizing why they are not feasible, include your technical infeasibility criteria in Appendix 5, and proceed to Section E below to document Alternative Compliance measures for those DMAs. Recall that each proposed DMA must pass through the LID BMP hierarchy before alternative compliance measures may be considered.

N/A

C.5 LID BMP Sizing

Each LID BMP must be designed to ensure that the Design Capture Volume will be addressed by the selected BMPs. First**,** calculate the Design Capture Volume for each LID BMP using the V_{BMP} worksheet in Appendix F of the LID BMP Design Handbook. Second**,** design the LID BMP to meet the required V_{BMP} using a method approved by the Copermittee. Utilize the worksheets found in the LID BMP Design Handbook or consult with your Copermittee to assist you in correctly sizing your LID BMPs. Complete Table D.3 below to document the Design Capture Volume and the Proposed Volume for each LID BMP. Provide the completed design procedure sheets for each LID BMP in Appendix 6. You may add additional rows to the table below as needed.

Table C.3 DCV Calculations for LID BMPs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*DA A: Bioretention Basin*		
	[A]		[B]	[C]	[A] x [C]			
A-1	*89631*	*ROOFS*	*1.00*	*0.89*	*79950.9*	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
A-2	*79909*	*CONCRETE OR ASPHALT*	*1.00*	*0.89*	*71278.8*			
A-3	*87983*	*ORNAMENTAL LANDSCAPING*	*0.10*	*0.11*	*9718.4*			
	257523				160948.1	0.64	8583.9	***10355.5***

[B], [C] is obtained as described in Section 2.3.1 of the WQMP Guidance Document

[E] is obtained from Exhibit A in the WQMP Guidance Document

[G] is obtained from a design procedure sheet, such as in LID BMP Design Handbook and placed in Appendix 6

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*DA B: Bioretention Trench 1*		
	[A]		[B]	[C]	[A] x [C]			
B-1	*5319*	*ROOFS*	*1.00*	*0.89*	*4744.5*	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
B-2	*6333*	*CONCRETE OR ASPHALT*	*1.00*	*0.89*	*5649*			
B-3	*2355*	*ORNAMENTAL LANDSCAPING*	*0.10*	*0.11*	*260.1*			
	14007				10653.6	0.64	568.2	***602***

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*DA C: Bioretention Trench 2*		
	[A]		[B]	[C]	[A] x [C]			
C-1	*15957*	*ROOFS*	*1.00*	*0.89*	*14233.6*	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
C-2	*24621*	*CONCRETE OR ASPHALT*	*1.00*	*0.89*	*21961.9*			
C-3	*7249*	*ORNAMENTAL LANDSCAPING*	*0.10*	*0.11*	*800.7*			
	47827				36996.2	0.64	1973.1	***2223***

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*DA D: Bioretention Trench 3*		
	[A]		[B]	[C]	[A] x [C]			
D-1	*23469*	*ROOFS*	*1.00*	*0.89*	*20934.3*	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
D-2	*19655*	*CONCRETE OR ASPHALT*	*1.00*	*0.89*	*17532.3*			
D-3	*13301*	*ORNAMENTAL LANDSCAPING*	*0.10*	*0.11*	*1469.2*			
	56425				39935.8	0.64	2129.9	***3454***

Section D: Alternative Compliance (LID Waiver Program)

LID BMPs are expected to be feasible on virtually all projects. Where LID BMPs have been demonstrated to be infeasible as documented in Section D, other Treatment Control BMPs must be used (subject to LID waiver approval by the Copermittee). Check one of the following Boxes:

☒ LID Principles and LID BMPs have been incorporated into the site design to fully address all Drainage Management Areas. No alternative compliance measures are required for this project and thus this Section is not required to be completed.

- *Or* -

☐ The following Drainage Management Areas are unable to be addressed using LID BMPs. A site-specific analysis demonstrating technical infeasibility of LID BMPs has been approved by the Co-Permittee and included in Appendix 5. Additionally, no downstream regional and/or sub-regional LID BMPs exist or are available for use by the project. The following alternative compliance measures on the following pages are being implemented to ensure that any pollutant loads expected to be discharged by not incorporating LID BMPs, are fully mitigated.

List DMAs here.

D.1 Identify Pollutants of Concern

Utilizing Table A.1 from Section A above which noted your project's receiving waters and their associated EPA approved 303(d) listed impairments, cross reference this information with that of your selected Priority Development Project Category in Table E.1 below. If the identified General Pollutant Categories are the same as those listed for your receiving waters, then these will be your Pollutants of Concern and the appropriate box or boxes will be checked on the last row. The purpose of this is to document compliance and to help you appropriately plan for mitigating your Pollutants of Concern in lieu of implementing LID BMPs.

Table D.1 Potential Pollutants by Land Use Type

Priority Development Project Categories and/or Project Features (check those that apply)	**General Pollutant Categories**							
	Bacterial Indicators	**Metals**	**Nutrients**	**Pesticides**	**Toxic Organic Compounds**	**Sediments**	**Trash & Debris**	**Oil & Grease**
☐ Detached Residential Development	P	N	P	P	N	P	P	P
☐ Attached Residential Development	P	N	P	P	N	P	P	P(2)
☐ Commercial/Industrial Development	P(3)	P	P(1)	P(1)	P(5)	P(1)	P	P
☐ Automotive Repair Shops	N	P	N	N	P(4, 5)	N	P	P
☐ Restaurants (>5,000 ft^2)	P	N	N	N	N	N	P	P
☐ Hillside Development (>5,000 ft^2)	P	N	P	P	N	P	P	P
☐ Parking Lots (>5,000 ft^2)	P(6)	P	P(1)	P(1)	P(4)	P(1)	P	P
☐ Retail Gasoline Outlets	N	P	N	N	P	N	P	P
Project Priority Pollutant(s) of Concern	☐	☐	☐	☐	☐	☐	☐	☐

P = Potential

N = Not Potential

(1) A potential Pollutant if non-native landscaping exists or is proposed onsite; otherwise not expected

(2) A potential Pollutant if the project includes uncovered parking areas; otherwise not expected

(3) A potential Pollutant is land use involving animal waste

(4) Specifically petroleum hydrocarbons

(5) Specifically solvents

(6) Bacterial indicators are routinely detected in pavement runoff

D.2 Stormwater Credits

Projects that cannot implement LID BMPs but nevertheless implement smart growth principles are potentially eligible for Stormwater Credits. Utilize Table 3-8 within the WQMP Guidance Document to identify your Project Category and its associated Water Quality Credit. If not applicable, write N/A.

Table D.2 Water Quality Credits

Qualifying Project Categories	Credit Percentage[2]
N/A	
Total Credit Percentage[1]	

[1]Cannot Exceed 50%

[2]Obtain corresponding data from Table 3-8 in the WQMP Guidance Document

D.3 Sizing Criteria

After you appropriately considered Stormwater Credits for your project, utilize Table E.3 below to appropriately size them to the DCV, or Design Flow Rate, as applicable. Please reference Chapter 3.5.2 of the WQMP Guidance Document for further information.

Table D.3 Treatment Control BMP Sizing

DMA Type/ID	**DMA Area (square feet)**	**Post-Project Surface Type**	**Effective Impervious Fraction, I_f**	**DMA Runoff Factor**	**DMA Area x Runoff Factor**		***Enter BMP Name / Identifier Here***		
	[A]		[B]	[C]	[A] x [C]				
						Design Storm Depth (in)	*Minimum Design Capture Volume or Design Flow Rate (cubic feet or cfs)*	*Total Storm Water Credit % Reduction*	*Proposed Volume or Flow on Plans (cubic feet or cfs)*
	A_T = Σ[A]				Σ= [D]	[E]	$[F] = \frac{[D]x[E]}{[G]}$	[F] X (1-[H])	[I]

[B], [C] is obtained as described in Section 2.3.1 from the WQMP Guidance Document

[E] is for Flow-Based Treatment Control BMPs [E] = .2, for Volume-Based Control Treatment BMPs, [E] obtained from Exhibit A in the WQMP Guidance Document

[G] is for Flow-Based Treatment Control BMPs [G] = 43,560, for Volume-Based Control Treatment BMPs, [G] = 12

[H] is from the Total Credit Percentage as Calculated from Table E.2 above

[I] as obtained from a design procedure sheet from the BMP manufacturer and should be included in Appendix 6

D.4 Treatment Control BMP Selection

Treatment Control BMPs typically provide proprietary treatment mechanisms to treat potential pollutants in runoff, but do not sustain significant biological processes. Treatment Control BMPs must have a removal efficiency of a medium or high effectiveness as quantified below:

- **High**: equal to or greater than 80% removal efficiency
- **Medium**: between 40% and 80% removal efficiency

Such removal efficiency documentation (e.g., studies, reports, etc.) as further discussed in Chapter 3.5.2 of the WQMP Guidance Document, must be included in Appendix 6. In addition, ensure that proposed Treatment Control BMPs are properly identified on the WQMP Site Plan in Appendix 1.

Table D.4 Treatment Control BMP Selection

Selected Treatment Control BMP Name or ID[1]	Priority Pollutant(s) of Concern to Mitigate[2]	Removal Efficiency Percentage[3]

[1] Treatment Control BMPs must not be constructed within Receiving Waters. In addition, a proposed Treatment Control BMP may be listed more than once if they possess more than one qualifying pollutant removal efficiency.
[2] Cross Reference Table E.1 above to populate this column.
[3] As documented in a Co-Permittee Approved Study and provided in Appendix 6.

Section E: Hydromodification

E.1 Hydrologic Conditions of Concern (HCOC) Analysis

HCOC EXEMPTION 1: The Priority Development Project disturbs less than one acre. The Copermittee has the discretion to require a Project-Specific WQMP to address HCOCs on projects less than one acre on a case by case basis. The disturbed area calculation should include all disturbances associated with larger common plans of development.

Does the project qualify for this HCOC Exemption? ☐ Y ☒ N

If Yes, HCOC criteria do not apply.

HCOC EXEMPTION 2: The volume and time of concentration[1] of storm water runoff for the post-development condition is not significantly different from the pre-development condition for a 2-year return frequency storm (a difference of 5% or less is considered insignificant) using one of the following methods to calculate:

- Riverside County Hydrology Manual
- Technical Release 55 (TR-55): Urban Hydrology for Small Watersheds (NRCS 1986), or derivatives thereof, such as the Santa Barbara Urban Hydrograph Method
- Other methods acceptable to the Co-Permittee

Does the project qualify for this HCOC Exemption? ☐ Y ☒ N

If Yes, report results in Table F.1 below and provide your substantiated hydrologic analysis in Appendix 7.

Table E.1 Hydrologic Conditions of Concern Summary

	2 year – 24 hour		
	Pre-condition	**Post-condition**	**% Difference**
Time of Concentration			
Volume (Cubic Feet)			

[1] Time of concentration is defined as the time after the beginning of the rainfall when all portions of the drainage basin are contributing to flow at the outlet.

HCOC EXEMPTION 3: All downstream conveyance channels to an adequate sump (for example, Prado Dam, Lake Elsinore, Canyon Lake, Santa Ana River, or other lake, reservoir or naturally erosion resistant feature) that will receive runoff from the project are engineered and regularly maintained to ensure design flow capacity; no sensitive stream habitat areas will be adversely affected; or are not identified on the Co-Permittees Hydromodification Susceptibility Maps.

Does the project qualify for this HCOC Exemption? ☐ Y ☒ N

If Yes, HCOC criteria do not apply and note below which adequate sump applies to this HCOC qualifier:

INSERT TEXT HERE

E.2 HCOC Mitigation

If none of the above HCOC Exemption Criteria are applicable, HCOC criteria is considered mitigated if they meet one of the following conditions:

a. Additional LID BMPS are implemented onsite or offsite to mitigate potential erosion or habitat impacts as a result of HCOCs. This can be conducted by an evaluation of site-specific conditions utilizing accepted professional methodologies published by entities such as the California Stormwater Quality Association (CASQA), the Southern California Coastal Water Research Project (SCCRWP), or other Co-Permittee approved methodologies for site-specific HCOC analysis.

b. The project is developed consistent with an approved Watershed Action Plan that addresses HCOC in Receiving Waters.

C. Mimicking the pre-development hydrograph with the post-development hydrograph, for a 2-year return frequency storm. Generally, the hydrologic conditions of concern are not significant, if the post-development hydrograph is no more than 10% greater than pre-development hydrograph. In cases where excess volume cannot be infiltrated or captured and reused, discharge from the site must be limited to a flow rate no greater than 110% of the pre-development 2-year peak flow.

Be sure to include all pertinent documentation used in your analysis of the items a, b or c in Appendix 7.

BIORETENTION BASINS

DMA	Storm Event	Existing		Proposed		Basin Routing		
		Volume ac.ft.	Q cfs	Volume ac.ft.	Q cfs	Volume ac.ft.	Q cfs	Depth ft.
A	2yr24hr	0.0985	0.162	0.6107	1.005	0.4100	0.238	3.12
B	2yr24hr	0.0053	0.009	0.0331	0.054	0.0220	0.049	3.50
C	2yr24hr	0.0908	0.149	0.1075	0.177	0.0750	0.183	3.51
D	2yr24hr	0.0817	0.134	0.1333	0.219	0.1250	0.022	3.50
TOTAL CFS	2yr24hr		0.454		1.455		0.492	

Total Existing vs. Routed Flow % Difference: 108%

As detailed above, the sum of existing vs proposed Qs for all proposed drainage areas meets the required 110% max increase in accordance with hydro-modification requirements. It is noted that each individual DMA area may not meet this requirement, but the site has been designed to over-mitigate in available areas to offset the more constrained DMAs. The project flows that leave the project site at the North and South both join together just downstream of the project site, roughly 700 ft west of our project site in the existing drainage area just west of Morton Road. There are no anticipated negative impacts to downstream watercourses. Calculations to support the routed flows can be found in Appendix 7 of this report.

Section F: Source Control BMPs

Source control BMPs include permanent, structural features that may be required in your project plans — such as roofs over and berms around trash and recycling areas — and Operational BMPs, such as regular sweeping and "housekeeping", that must be implemented by the site's occupant or user. The MEP standard typically requires both types of BMPs. In general, Operational BMPs cannot be substituted for a feasible and effective permanent BMP. Using the Pollutant Sources/Source Control Checklist in Appendix 8, review the following procedure to specify Source Control BMPs for your site:

1. ***Identify Pollutant Sources*:** Review Column 1 in the Pollutant Sources/Source Control Checklist. Check off the potential sources of Pollutants that apply to your site.

2. ***Note Locations on Project-Specific WQMP Exhibit*:** Note the corresponding requirements listed in Column 2 of the Pollutant Sources/Source Control Checklist. Show the location of each Pollutant source and each permanent Source Control BMP in your Project-Specific WQMP Exhibit located in Appendix 1.

3. ***Prepare a Table and Narrative*:** Check off the corresponding requirements listed in Column 3 in the Pollutant Sources/Source Control Checklist. In the left column of Table G.1 below, list each potential source of runoff Pollutants on your site (from those that you checked in the Pollutant Sources/Source Control Checklist). In the middle column, list the corresponding permanent, Structural Source Control BMPs (from Columns 2 and 3 of the Pollutant Sources/Source Control Checklist) used to prevent Pollutants from entering runoff. **Add additional narrative** in this column that explains any special features, materials or methods of construction that will be used to implement these permanent, Structural Source Control BMPs.

4. ***Identify Operational Source Control BMPs:*** To complete your table, refer once again to the Pollutant Sources/Source Control Checklist. List in the right column of your table the Operational BMPs that should be implemented as long as the anticipated activities continue at the site. Copermittee stormwater ordinances require that applicable Source Control BMPs be implemented; the same BMPs may also be required as a condition of a use permit or other revocable Discretionary Approval for use of the site.

Table F.1 Permanent and Operational Source Control Measures

Potential Sources of Runoff pollutants	Permanent Structural Source Control BMPs	Operational Source Control BMPs
Onsite storm drains inlets	• Mark all inlet with the words "only rain down storm drain" or similar. Catch basin markers may be available from the Riverside County Flood Control and Water Conservation District, call 951.55.1200 to verify	• Maintain and periodically repaint or replace inlet markings • Provide Stormwater pollution prevention information to new site owners, lessees, or operators. • See applicable optional BMPs in Fact Sheet SC-44, "Drainage System Maintenance," in the CASQA Stormwater Quality Handbooks at www. cabmphandbooks.com • Include the following in lease agreements: "Tenant shall not allow anyone to discharge anything to storm drains or to store or deposit materials so as to create a potential discharge to storm drains."
Landscape/Outdoor Pesticide Us	State that final landscape plans will accomplish all of the following. • Preserve existing native trees, shrubs, and ground cover to the maximum extent possible. • Design landscaping to minimize irrigation and runoff, to promote surface infiltration where appropriate, and to minimize the use of fertilizers and pesticides that can contribute to stormwater pollution. • Where landscaped areas are used to retain or detain stormwater, specify plants that are tolerant to saturated soil conditions. • Consider using pest-resistant plants, especially adjacent to hardscape. To insure successful establishment, select plants appropriate to site soils, slopes, climate, sun, wind, rain, land use, air movement	• Maintain landscaping using minimum or no pesticides. • See applicable operational BMPs in "What you should know for…. Landscape and Gardening" at http://rcflood.org/stormwater/. • Provide IPM information to new owners, lessees and operators
Roofing, gutters and trim	• Avoid roofing, gutters, and trim made of copper or other unprotected metals that may leach into runoff.	• See applicable operational BMPs in "Guidelines for Maintaining Your Swimming Pool, Jacuzzi and Garden Fountain" at http://rcflood.org/stormwater
Sidewalks and Parking Lots	N/A	Maintain landscaping to keep parking spots and sidewalks as clean as possible.

Section G: Construction Plan Checklist

Populate Table H.1 below to assist the plan checker in an expeditious review of your project. The first two columns will contain information that was prepared in previous steps, while the last column will be populated with the corresponding plan sheets. This table is to be completed with the submittal of your final Project-Specific WQMP.

Table G.1 Construction Plan Cross-reference

BMP No. or ID	BMP Identifier and Description	Corresponding Plan Sheet(s)	BMP Location (Lat/Long)
BIORET BASIN	Bioretention Basin	Conceptual grade plan sheet 3	33°56'53"N 117°17'38"W
DMA B	Bioretention Trench	Conceptual Grade plan sheet 2	33°56'48"N 117°17'38"W
DMA C	Bioretention Trench	Conceptual Grade plan sheet 2	33°56'48"N 117°17'36"W
DMA D	Bioretention Trench	Conceptual Grade plan sheet 5	33°56'48"N 117°17'34"W

Note that the updated table — or Construction Plan WQMP Checklist — is **only a reference tool** to facilitate an easy comparison of the construction plans to your Project-Specific WQMP. Co-Permittee staff can advise you regarding the process required to propose changes to the approved Project-Specific WQMP.

Section H: Operation, Maintenance and Funding

The Copermittee will periodically verify that Stormwater BMPs on your site are maintained and continue to operate as designed. To make this possible, your Copermittee will require that you include in Appendix 9 of this Project-Specific WQMP:

1. A means to finance and implement facility maintenance in perpetuity, including replacement cost.
2. Acceptance of responsibility for maintenance from the time the BMPs are constructed until responsibility for operation and maintenance is legally transferred. A warranty covering a period following construction may also be required.
3. An outline of general maintenance requirements for the Stormwater BMPs you have selected.
4. Figures delineating and designating pervious and impervious areas, location, and type of Stormwater BMP, and tables of pervious and impervious areas served by each facility. Geo-locating the BMPs using a coordinate system of latitude and longitude is recommended to help facilitate a future statewide database system.
5. A separate list and location of self-retaining areas or areas addressed by LID Principles that do not require specialized O&M or inspections but will require typical landscape maintenance as noted in Chapter 5, pages 85-86, in the WQMP Guidance. Include a brief description of typical landscape maintenance for these areas.

Your local Co-Permittee will also require that you prepare and submit a detailed Stormwater BMP Operation and Maintenance Plan that sets forth a maintenance schedule for each of the Stormwater BMPs built on your site. An agreement assigning responsibility for maintenance and providing for inspections and certification may also be required.

Details of these requirements and instructions for preparing a Stormwater BMP Operation and Maintenance Plan are in Chapter 5 of the WQMP Guidance Document.

Maintenance Mechanism: Home Owner Association

Will the proposed BMPs be maintained by a Home Owners' Association (HOA) or Property Owners Association (POA)?

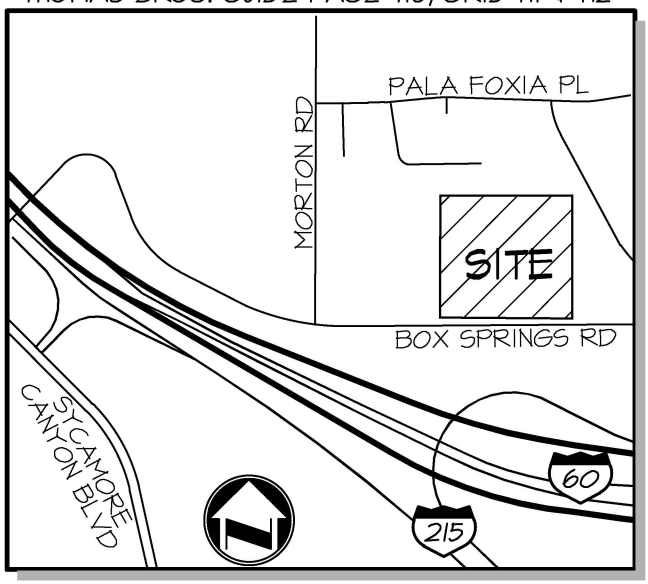
☒ Y ☐ N

Include your Operation and Maintenance Plan and Maintenance Mechanism in Appendix 9. Additionally, include all pertinent forms of educational materials for those personnel that will be maintaining the proposed BMPs within this Project-Specific WQMP in Appendix 10.

Appendix 1: Maps and Site Plans

Location Map, WQMP Site Plan and Receiving Waters Map

THOMAS BROS. GUIDE PAGE 716, GRID H1 & H2



VICINITY MAP

N.T.S

T2SR4W SEC 34 SW

R 07 W | R 06 W | R 05 W | R 04 W | R 03 W | R 02 W | R 01 W | R 01 E | R 02 E | R 03 E | R 04 E | R 05 E

T 01 S
T 02 S
T 03 S
T 04 S
T 05 S
T 06 S
T 07 S
T 08 S

PROJECT SITE = 0.64

0.85 MiraLoma
RiversideNorth
0.68 PigeonPass
0.54 RiversideSouth
0.66 MorenoEast
0.85 Beaumont
0.88 PradoDam
0.51 Woodcrest
0.50 LakeMathews
0.68 PerrisReservoir
0.87 VistaGrandeGS
0.70 SanJacintoNWS
1.18 Idyllwild
0.58 SunCity
0.68 Winchester
0.70 ElsinoreNWS
1.11 ElCarisoStation
0.90 HurkeyCreek
0.77 WildomarLaCresta
0.52 SkinnerLake
0.65 Anza
0.77 SantaRosaPlateau
1.00 TemeculaNWS
0.64 AguangaValley

Santa Ana River Watershed
Santa Margarita Watershed

EASTVALE | NORCO | CORONA | RIVERSIDE | MORENO VALLEY | CALIMESA | BEAUMONT | SAN JACINTO | PERRIS | CANYON LAKE | LAKE ELSINORE | WILDOMAR | MENIFEE | HEMET | MURRIETA | TEMECULA

06	05	04	03	02	01
07	08	09	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

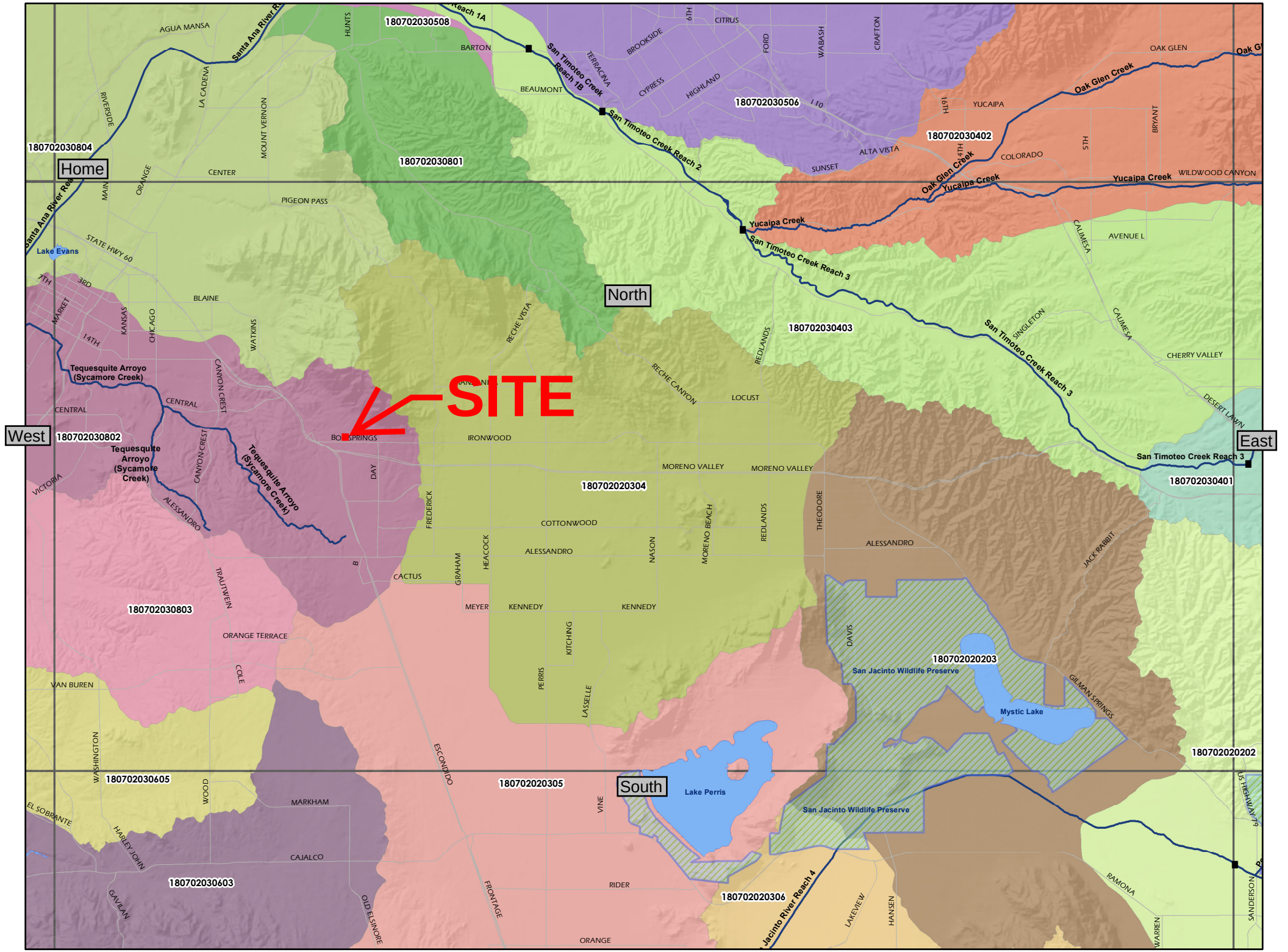
N

Rain Gage Locations

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

Isohyetal Map for the 85th Percentile 24 hour Storm Event

July 2011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West
East
South
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180702030605
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180702030603
180702020306
Santa Ana River Reach 1A
San Timoteo Creek Reach 1B
San Timoteo Creek Reach 2
San Timoteo Creek Reach 3
Oak Glen Creek
Yucaipa Creek
Tequesquite Arroyo (Sycamore Creek)
San Jacinto River Reach 4
San Jacinto Wildlife Preserve
Mystic Lake
Lake Perris
Lake Evans
BARTON
BEAUMONT
YUCAIPA
OAK GLEN
CHERRY VALLEY
BLAINE
IRONWOOD
MORENO VALLEY
COTTONWOOD
ALESSANDRO
CACTUS
MEYER
KENNEDY
ORANGE TERRACE
MARKHAM
CAJALCO
RIDER
ORANGE
LOCUST
ALTA VISTA
SUNSET
COLORADO
WILDWOOD CANYON
PIGEON PASS
CENTER
IRONWOOD
AGUA MANSA
LA CADENA
MOUNT VERNON
RIVERSIDE
ORANGE
MAIN
STATE HWY 60
MARKET
KANSAS
CHICAGO
WATKINS
RECHE VISTA
RECHE CANYON
REDLANDS
SINGLETON
CALIMESA
AVENUE L
DESERT LAWN
CANYON CREST
CENTRAL
VICTORIA
ALESSANDRO
DAY
FREDERICK
HEACOCK
GRAHAM
NASON
MORENO BEACH
THEODORE
JACK RABBIT
TRAUTWEIN
COLE
VAN BUREN
WASHINGTON
WOOD
EL SOBRANTE
HARLEY JOHN
GAVILAN
OLD ELSINORE
ESCONDIDO
FRONTAGE
VINE
PERRIS
KITCHING
LASSELLE
DAVIS
GILMAN SPRINGS
LAKEVIEW
HANSEN
RAMONA
WARREN
SANDERSON
US HIGHWAY 79
CITRUS
CRAFTON
WABASH
FORD
HIGHLAND
CYPRESS
TERRACINA
BROOKSIDE
HUNTS
5TH
4TH
BRYANT
CALIMESA
SINGLETON
CHERRY VALLEY
MORENO VALLEY
ALESSANDRO
COTTONWOOD
IRONWOOD
LOCUST
RECHE CANYON
RECHE VISTA
REDLANDS
CANYON CREST
CENTRAL
TRAUTWEIN
COLE
WASHINGTON
WOOD
HARLEY JOHN
GAVILAN
OLD ELSINORE
ESCONDIDO
FRONTAGE
VINE
PERRIS
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LASSELLE
DAVIS
GILMAN SPRINGS
LAKEVIEW
HANSEN
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WARREN
SANDERSON
US HIGHWAY 79
CHICAGO
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LA CADENA
MOUNT VERNON
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DESERT LAWN
CHERRY VALLEY
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ALTA VISTA
SUNSET
COLORADO
YUCAIPA
OAK GLEN
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CITRUS
CRAFTON
WABASH
FORD
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CYPRESS
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IRONWOOD
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COTTONWOOD
ALESSANDRO
CACTUS
MEYER
KENNEDY
ORANGE TERRACE
MARKHAM
CAJALCO
RIDER
ORANGE
LOCUST
RECHE CANYON
RECHE VISTA
REDLANDS
SINGLETON
CALIMESA
AVENUE L
DESERT LAWN
CHERRY VALLEY
WILDWOOD CANYON
ALTA VISTA
SUNSET
COLORADO
YUCAIPA
OAK GLEN
BARTON
BEAUMONT
CITRUS
CRAFTON
WABASH
FORD
HIGHLAND
CYPRESS
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CENTER
BLAINE
IRONWOOD
MORENO VALLEY
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CACTUS
MEYER
KENNEDY
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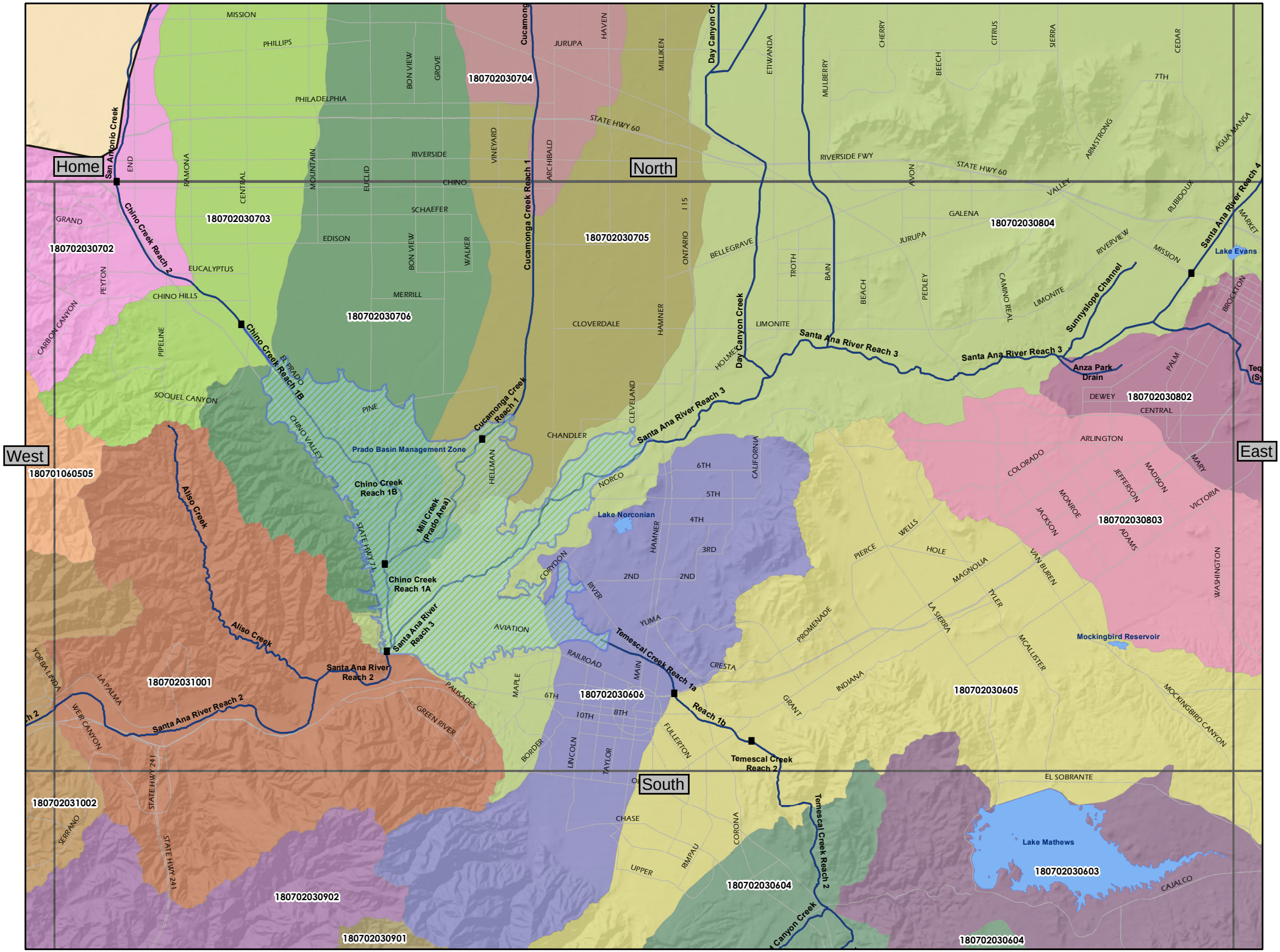
MARKHAM
CAJALCO
RIDER
ORANGE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West
East
South
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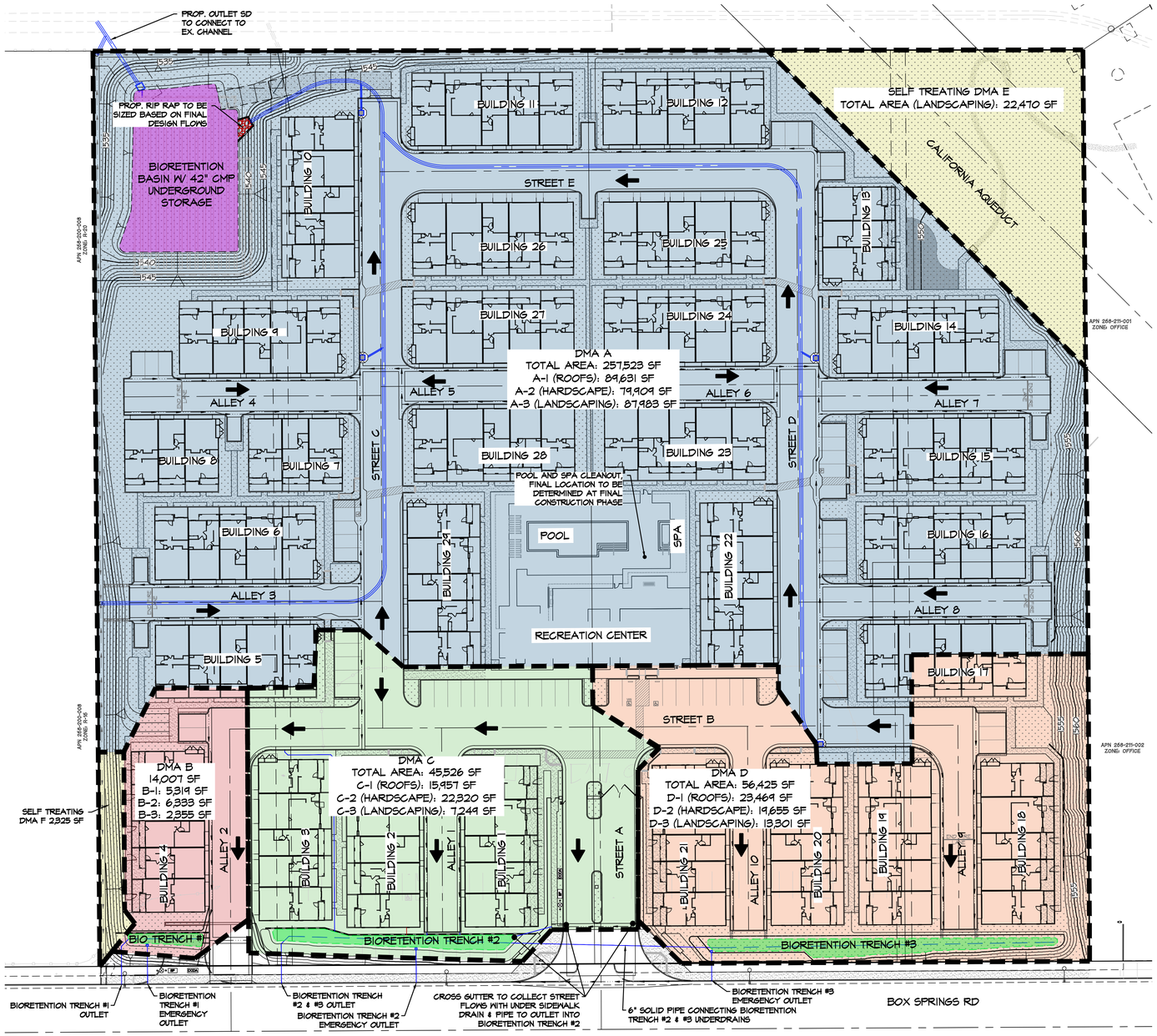
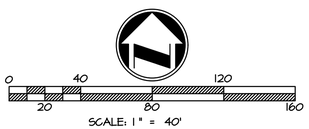
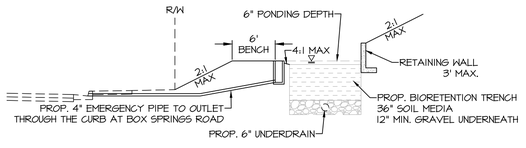
180702030902
180702030901
180702030604
180702030603
Santa Ana River Reach 4
Santa Ana River Reach 3
Santa Ana River Reach 2
Chino Creek Reach 2
Chino Creek Reach 1B
Chino Creek Reach 1A
Cucamonga Creek Reach 1
Day Canyon Creek
Sunnyslope Channel
Anza Park Drain
Aliso Creek
Mill Creek (Prado Area)
Temescal Creek Reach 1a
Reach 1b
Temescal Creek Reach 2
Prado Basin Management Zone
Lake Norconian
Lake Evans
Mockingbird Reservoir
Lake Mathews
San Antonio Creek
MISSION
PHILLIPS
PHILADELPHIA
RIVERSIDE
CHINO
SCHAEFER
EDISON
MERRILL
CHINO HILLS
EUCALYPTUS
SOQUEL CANYON
CARBON CANYON
GRAND
PEYTON
PIPELINE
END
RAMONA
CENTRAL
MOUNTAIN
EUCLID
BON VIEW
GROVE
VINEYARD
ARCHIBALD
JURUPA
HAVEN
MILLIKEN
ONTARIO
115
HAMNER
CLOVERDALE
CHANDLER
CLEVELAND
PINE
CHINO VALLEY
EL PRADO
HELLMAN
CALIFORNIA
NORCO
6TH
5TH
4TH
3RD
2ND
CORDON
RIVER
YUMA
AVIATION
RAILROAD
MAIN
MAPLE
CRESTA
PROMENADE
LA SIERRA
MCALLISTER
INDIANA
GRANT
FULLERTON
BORDER
LINCOLN
TAYLOR
CHASE
CORONA
RIMPAU
UPPER
PALISADES
GREEN RIVER
WEIR CANYON
LA PALMA
YORBA LINDA
STATE HWY 241
SERRANO
STATE HWY 71
STATE HWY 60
RIVERSIDE FWY
ETIWANDA
MULBERRY
CHERRY
BEECH
CITRUS
SIERRA
CEDAR
7TH
ARMSTRONG
AGUA MANSA
AVON
VALLEY
GALENA
JURUPA
BELLEGRAVE
TROTH
BAIN
BEACH
PEDLEY
CAMINO REAL
LIMONITE
RIVERVIEW
MISSION
RUBIDOUX
MARKET
BROCKTON
PALM
DEWEY
CENTRAL
ARLINGTON
COLORADO
JEFFERSON
MADISON
MARY
VICTORIA
MONROE
JACKSON
ADAMS
WASHINGTON
WELLS
PIERCE
HOLE
MAGNOLIA
VAN BUREN
TYLER
MOCKINGBIRD CANYON
EL SOBRANTE
CAJALCO

IN THE CITY OF MORENO VALLEY, COUNTY OF RIVERSIDE, STATE OF CALIFORNIA

TENTATIVE TRACT 38955
BMP MAP

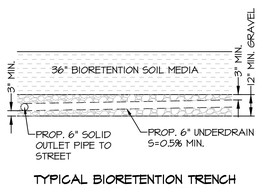






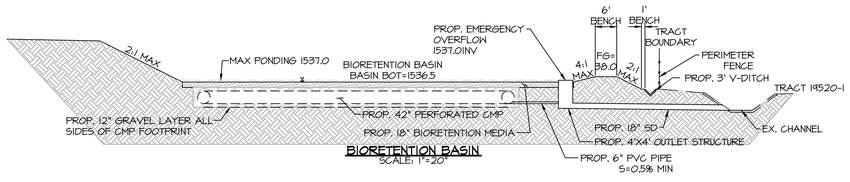
TYPICAL BIORETENTION TRENCH CROSS SECTION

NTS



TYPICAL BIORETENTION TRENCH LONGITUDINAL SECTION

NTS



BIORETENTION BASIN

SCALE: 1"=20'

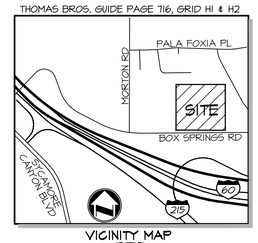
ENGINEER
ADKAN ENGINEERS
6879 AIRPORT DRIVE
RIVERSIDE, CA 92504
TELEPHONE: (951) 688-0241
MBRENDECKE@ADKAN.COM

OWNER
RIVERSIDE COUNTY FARM BUREAU, INC.
21160 BOX SPRINGS RD, SUITE 102
MORENO VALLEY, CA 92557

ASSESSORS PARCEL NUMBERS
256-200-002, 256-200-003, &
256-200-004

APPLICANT
FOREMOST PACIFIC GROUP
21211 LAS RAMBLAS, SUITE 100
MISSION VIEJO, CA 92691
949-748-6714

THOMAS BROS. GUIDE PAGE 716, GRID H1 & H2



VICINITY MAP

T2SR4W SEC 34 SW

LEGEND

- DRAINAGE FLOWS
- DMA BOUNDARY
- PROP. MAJOR CONTOUR
- PROP. MAJOR CONTOUR
- PROP. MINOR CONTOUR
- PROP. STORM DRAIN
- PROP. WATER
- PROP. SEWER
- PROP. CATCH BASIN
- DMA A
- DMA B
- LANDSCAPING
- DMA C
- DMA D
- CONCRETE
- DMA E & DMA F - SELF TREATING
- BIORETENTION TRENCH
- BIORETENTION BASIN

AC	ACRES
CB	CATCH BASIN
CFS	CUBIC FEET PER SECOND
DA	DRAINAGE AREA
DMA	DRAINAGE MANAGEMENT AREA
EX.	EXISTING
PROP.	PROPOSED
SF	SQUARE FEET

DRAINAGE AREA	DMA A	DMA B	DMA C	DMA D	DMA E (SELF-TREATING)	DMA F (SELF-TREATING)	TOTAL AREA BY SURFACE (SF)
ROOFS (SF)	257,523	5,319	15,957	23,469	0	0	302,268
HARDSCAPE (SF)	79,909	6,333	24,621	19,655	0	0	130,518
LANDSCAPE (SF)	87,983	2,355	7,249	13,301	22,470	2,325	133,358
TOTAL AREA (SF)	425,415	14,007	47,827	56,425	22,470	2,325	

SOURCE CONTROL MEASURES

- ONSITE STORM DRAIN
  - MARK ALL DRAINS WITH THE WORDS, "ONLY RAIN DOWN THE STORM DRAIN" OR SIMILAR.
- ONSITE LANDSCAPING
  - DESIGN LANDSCAPING TO MINIMIZE IRRIGATION AND RUNOFF, TO PROMOTE SURFACE INFILTRATION WHERE APPROPRIATE, AND TO MINIMIZE THE USE OF FERTILIZERS OR PESTICIDES THAT CONTRIBUTE TO STORMWATER POLLUTION.
  - CONSIDER USING PEST-RESISTANT PLANTS, ESPECIALLY ADJACENT TO HARDSCAPE.
  - SELECT PLANTS APPROPRIATE TO SITE SOILS, SLOPES, CLIMATE, SUN, WIND, RAIN, LAND USE, AIR MOVEMENT, ECOLOGICAL CONSISTENCY, AND PLANT INTERACTIONS.
- TRASH RECEPTACLES-REFUSE AREAS
  - ALL UNITS TO HAVE INDIVIDUAL REFUSE BINS, TO BE STORED IN GARAGES AND KEPT IN GOOD CONDITION
  - RECREATION CENTER TO HAVE INDIVIDUAL REFUSE BINS STORED IN PROTECTED AREA, REGULARLY MAINTAINED AND CLEANED.
- FIRE SPRINKLER TESTING
  - BUILDING PLANS TO PROVIDE A MEANS FOR FIRE SPRINKLER TESTING AND DRAINAGE AS NEEDED, PER PLUMBING PLANS.
- ROOF GUTTERS
  - AVOID ROOFING, GUTTERS, AND TRIM MADE OF COPPER OR OTHER UNPROTECTED METALS THAT MAY LEACH INTO RUNOFF.
- VEHICLE EQUIPMENT REPAIR
  - NO VEHICLE REPAIR IS PERMITTED ONSITE, TO BE RESTRICTED PER CC&RS. DISPOSAL OF HAZARDOUS FLUIDS IS NOT PERMITTED, NO OPEN CONTAINERS OR DRIP PARTS TO BE LEFT UNATTENDED.
- PLAZAS, SIDEWALKS, & PARKING LOTS
  - SWEEP PLAZAS, SIDEWALKS, AND PARKING LOTS REGULARLY TO PREVENT ACCUMULATION OF LITTER AND DEBRIS. COLLECT DEBRIS FROM PRESSURE WASHING TO PREVENT ENTRY INTO THE STORM DRAIN SYSTEM. COLLECT WASHWATER CONTAINING ANY CLEANING AGENT OR DEGREASER AND DISCHARGE TO THE SANITARY SEWER NOT TO A STORM DRAIN.

BMP MAP
LWQ24-0026
PREPARATION DATE: NOVEMBER 2024

PLANS PREPARED BY:
adkan ENGINEERS
Civil Engineering • Surveying • Planning
6879 Airport Drive, Riverside, CA 92504
Tel:(951) 688-0241 • Fax:(951) 688-0599

Appendix 2: Construction Plans

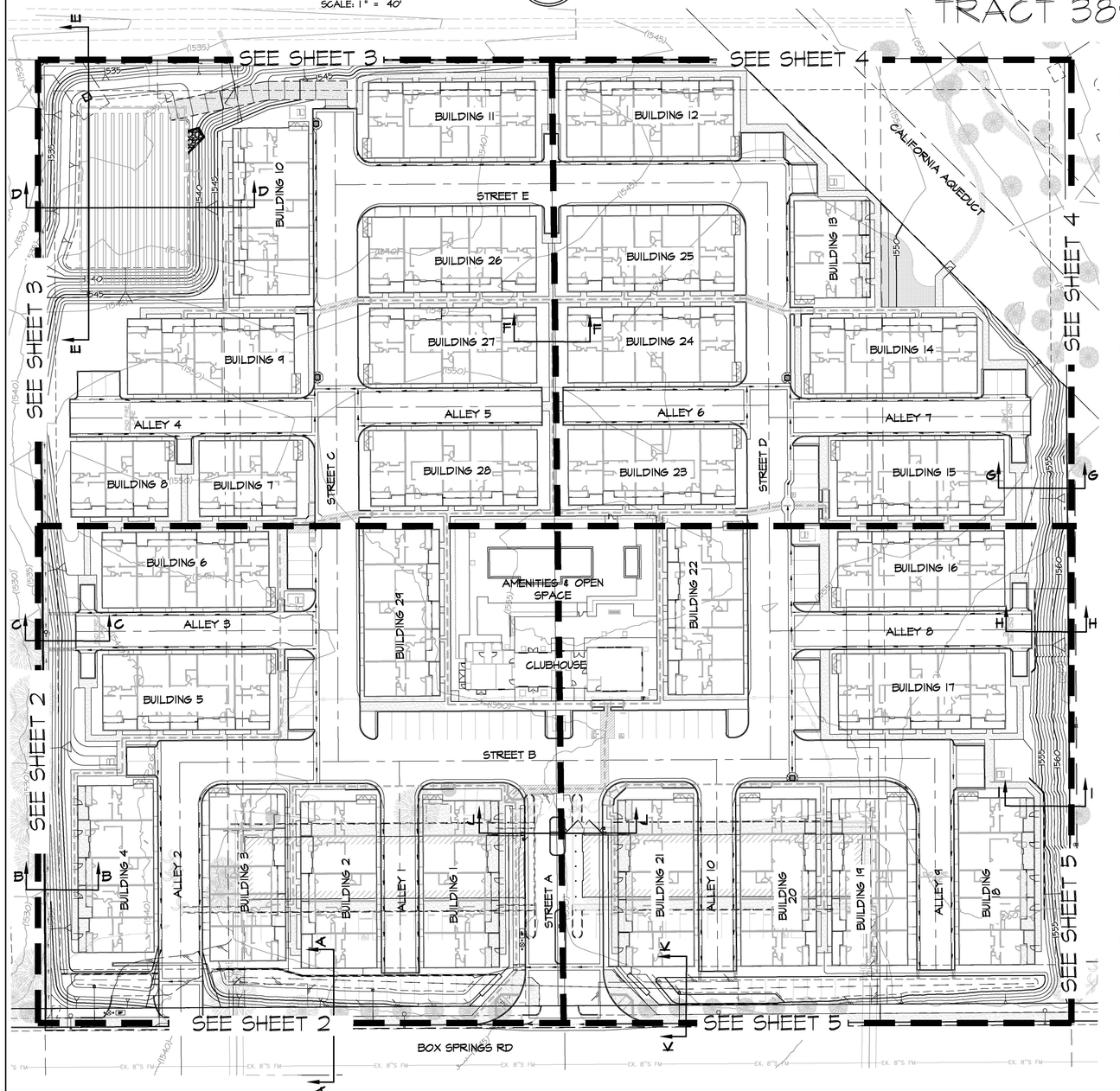
Grading and Drainage Plans

IN THE CITY OF MORENO VALLEY, COUNTY OF RIVERSIDE, STATE OF CALIFORNIA

CONCEPTUAL GRADING PLAN
TRACT 38955

0 20 40 80 120 240

SCALE: 1" = 40'



APPLICANT
FOREMOST PACIFIC GROUP
27271 LAS RAMBLAS, SUITE 100
MISSION VIEJO, CA 92691
949-748-8114

OWNER
RIVERSIDE COUNTY FARM BUREAU, INC.
21160 BOX SPRINGS RD, SUITE 102
MORENO VALLEY, CA 92557

ENGINEER
adkan ENGINEERS
6879 AIRPORT DRIVE
RIVERSIDE, CA. 92504
951-688-0241

ASSESSORS PARCEL NUMBERS
256-200-002, 256-200-003, & 256-200-004

TOPOGRAPHY SOURCE
FIELD SURVEY CONDUCTED BY ADKAN ENGINEERS ON SEPTEMBER 14, 2023

UTILITY PURVEYORS
SEWER: EASTERN MUNICIPAL WATER DISTRICT
WATER: EASTERN MUNICIPAL WATER DISTRICT
ELECTRIC: SOUTHERN CALIFORNIA EDISON
PHONE/CABLE: CHARTER COMMUNICATIONS
GAS: SOUTHERN CALIFORNIA GAS COMPANY
SCHOOL DISTRICT: MORENO VALLEY UNIFIFED

BENCHMARK
D 1144 (DX2741)
BRASS DISK STAMPED "D 1144 1961" IN SET VERTICALLY IN THE SW FACE OF A ROCK, 3.5 MILES NW FROM MARCH FIELD, 3.5 MILES NW ALONG THE A.T.S.F. RAILWAY FROM THE STATION AT MARCH FIELD, 76 FEET SE OF MILEPOST 6, 7 FEET NE OF NE RAIL, 1.9 FEET ABOVE THE GROUND, 5DN 1 FOOT HIGHER THAN THE TRACK.
1988 NAVD ELEVATION: 1554.4 FEET

EARTHWORK QUANTITIES
CUT: 23,409 CY FILL: 26,774 CY NET: 3,365 CY IMPORT

THE QUANTITY SHOWN ABOVE IS FOR DISCUSSION PURPOSES ONLY. SHRINKAGE, SUBSIDENCE AND SURFACE LOSS FACTORS ARE NOT INCLUDED. EARTHWORK WILL BE BALANCED ON SITE DURING FINAL ENGINEERING.

BASIS OF BEARINGS
THE CENTERLINE OF BOX SPRINGS ROAD BEING NORTH 84°41'51" EAST PER TRACT MAP NO. 11520, FILED IN BOOK 164 OF MAPS, AT PAGES 58 THROUGH 63, INCLUSIVE, RECORDS OF RIVERSIDE COUNTY, WAS HELD AS THE BASIS OF BEARINGS FOR THIS MAP

NOTE:
ALL DETAIL CROSS SECTIONS ARE LOCATED ON THE SHEETS THEY ARE SHOWN ON PER THE ABOVE, FOR TYPICAL ALLEY AND PASEO SECTIONS, SEE SHEET 4

LEGAL DESCRIPTION
THE LEGAL DESCRIPTION, EXCEPTIONS AND EXCLUSIONS ARE REFERENCED TO A PRELIMINARY REPORT PREPARED BY FIRST AMERICAN TITLE COMPANY, ORDER NO. NHSC-6484655 (RA), DATED MAY 10, 2023.

LEGAL DESCRIPTION:
REAL PROPERTY IN THE CITY OF MORENO VALLEY, COUNTY OF RIVERSIDE, STATE OF CALIFORNIA, DESCRIBED AS FOLLOWS:

PARCEL 1: (APN: 256-200-002)

THE WEST ONE-HALF OF THE SOUTHEAST ONE-QUARTER OF THE SOUTHWEST ONE-QUARTER OF THE SOUTHWEST ONE-QUARTER OF SECTION 34, TOWNSHIP 2 SOUTH, RANGE 4 WEST, SAN BERNARDINO BASE AND MERIDIAN AS SHOWN BY UNITED STATES GOVERNMENT SURVEY.

EXCEPTING THEREFROM THAT PORTION CONVEYED TO THE COUNTY OF RIVERSIDE, BY DEED RECORDED DECEMBER 6, 1966 AS INSTRUMENT NO. 117186, OFFICIAL RECORDS OF RIVERSIDE COUNTY, CALIFORNIA.

PARCEL 2: (APN: 256-200-003)

THE EAST ONE-HALF OF THE SOUTHEAST ONE-QUARTER OF THE SOUTHWEST ONE-QUARTER OF THE SOUTHWEST ONE-QUARTER OF SECTION 34, TOWNSHIP 2 SOUTH, RANGE 4 WEST, SAN BERNARDINO BASE AND MERIDIAN AS SHOWN BY UNITED STATES GOVERNMENT SURVEY.

EXCEPTING THEREFROM THAT PORTION OF LAND CONVEYED TO FEDERAL LAND BANK ASSOCIATION OF RIVERSIDE, BY DEED RECORDED MAY 23, 1966 AS INSTRUMENT NO. 53423, OFFICIAL RECORDS, MORE PARTICULARLY DESCRIBED AS FOLLOWS:

BEGINNING AT A POINT ON THE EAST LINE OF SAID SOUTHEAST ONE-QUARTER, 30 FEET NORTH OF THE SOUTHEAST CORNER THEREOF;
THENCE NORTH ALONG SAID EAST LINE, 282.00 FEET;
THENCE WEST, PARALLEL TO THE SOUTH LINE OF SAID SOUTHEAST ONE-QUARTER, 143.50 FEET;
THENCE SOUTH, PARALLEL TO SAID EAST LINE, 102.00 FEET;
THENCE EAST, PARALLEL TO SAID SOUTH LINE, 20.00 FEET;
THENCE SOUTH, PARALLEL TO SAID EAST LINE, 180.00 FEET;
THENCE EAST, PARALLEL TO SAID SOUTH LINE, 123.50 FEET TO THE POINT OF BEGINNING.

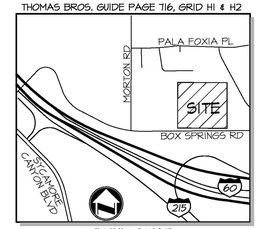
ALSO EXCEPTING THEREFROM THAT PORTION CONVEYED TO THE COUNTY OF RIVERSIDE, BY DEED RECORDED DECEMBER 6, 1966 AS INSTRUMENT NO. 117186, OFFICIAL RECORDS OF RIVERSIDE COUNTY, CALIFORNIA.

PARCEL 3: (APN: 256-200-004)

THAT PORTION OF THE SOUTHEAST ONE-QUARTER OF THE SOUTHWEST ONE-QUARTER OF THE SOUTHWEST ONE-QUARTER OF SECTION 34, TOWNSHIP 2 SOUTH, RANGE 4 WEST, SAN BERNARDINO MERIDIAN, AS SHOWN BY UNITED STATES GOVERNMENT SURVEY, DESCRIBED AS FOLLOWS:

BEGINNING AT A POINT ON THE EAST LINE OF SAID SOUTHEAST ONE-QUARTER, 30 FEET NORTH OF THE SOUTHEAST CORNER THEREOF;
THENCE NORTH ALONG SAID EAST LINE, 282.00 FEET;
THENCE WEST, PARALLEL TO THE SOUTH LINE OF SAID SOUTHEAST ONE-QUARTER, 143.50 FEET;
THENCE SOUTH, PARALLEL TO SAID EAST LINE, 102.00 FEET;
THENCE EAST, PARALLEL TO SAID SOUTH LINE, 20.00 FEET;
THENCE SOUTH, PARALLEL TO SAID EAST LINE, 180.00 FEET;
THENCE EAST, PARALLEL TO SAID SOUTH LINE, 123.50 FEET TO THE POINT OF BEGINNING.

THOMAS BROS. GUIDE PAGE 716, GRID H1 & H2



VICINITY MAP
(N.T.S.)

PROJECT DATA

TOTAL GROSS AREA:	9.33 AC
TOTAL NET AREA:	9.33 AC
PARCEL 1:	4.67 AC
PARCEL 2:	3.85 AC
PARCEL 3:	0.81 AC
EXISTING ZONING:	R-15, MULTI-FAMILY
PROPOSED ZONING:	R-15, MULTI-FAMILY
EXISTING LAND USE:	HDR, HIGH DENSITY RESIDENTIAL
PROPOSED LAND USE:	HDR, HIGH DENSITY RESIDENTIAL
EXISTING SURROUNDING LAND USE:	SINGLE FAMILY RESIDENTIAL
EXISTING SURROUNDING ZONING:	SINGLE FAMILY RESIDENTIAL
TOTAL UNITS:	134
DENSITY:	14.9 DUA

CONDOMINIUM DATA:
REQUIRED SETBACKS:
FRONT: 25 FT
SIDES: 10 FT
REAR: 20 FT

REQUIRED PRIVATE OPEN SPACE: 150 SF PER UNIT

REQUIRED PARKING:
2 BR: 2.0 SPACES x 80 UNITS= 160 SPACES
3 BR: 2.5 SPACES x 60 UNITS= 150 SPACES
TOTAL PARKING REQUIRED: 310

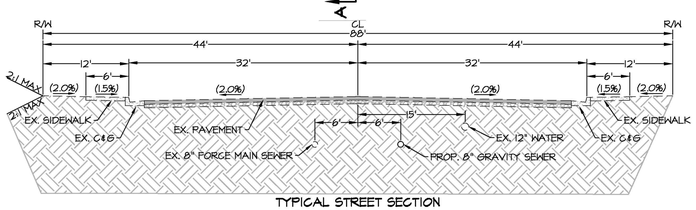
REQUIRED ADA PARKING STALLS:
2% OF PARKING STALLS — 2 ADA STALLS REQUIRED
1 / 8 VAN REQUIREMENT — 1 VAN STALL REQUIRED
PROVIDED PARKING:
GARAGE PARKING SPACES: 250
STANDARD STALLS: 65
ACCESSIBLE STALLS: 4
TOTAL PARKING PROVIDED: 319

PLAN	SQ. FT.	1ST FLOOR	2ND FLOOR	LAYOUT	GARAGE	PRIVATE OPEN SPACE	# OF UNITS
1	1,071	423	648	2 BR	1 CAR	151 SF	24
2	1,207	395	812	2 BR	2 CAR	179 SF	26
3	1,335	445	840	3 BR	2 CAR	167 SF	58
4	1,439	942	497	2 BR	2 CAR	171 SF	26
						TOTAL UNITS	134

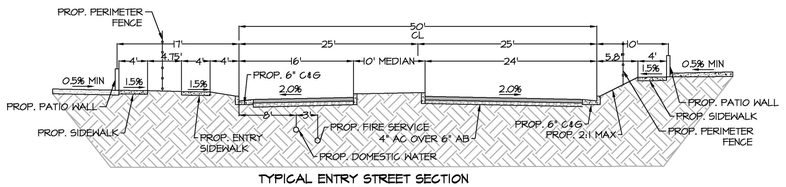
LEGEND

PROP.	PROPOSED
EX.	EXISTING
CL	CENTERLINE
PL	PROPERTY LINE
R/W	RIGHT OF WAY
S/W	SIDEWALK
C&G	CURB AND GUTTER
TE	TRASH ENCLOSURE
TYP.	TYPICAL
RET. WALL	RETAINING WALL
EXP. HT	EXPOSED HEIGHT
SD	STORM DRAIN
SWR	SEWER
WTR	WATER
POC	POINT OF CONNECTION
FS	FIRE SERVICE
INV	INVERT

PROP. DOMESTIC WATER
PROP. FIRE SERVICE
PROP. SEWER
PROP. SD
PROP. C&G
PROP. RET. WALL
PROP. MAJOR CONTOUR
PROP. MINOR CONTOUR
ADA PATH OF TRAVEL
CENTERLINE
RIGHT OF WAY
BOUNDARY
PROPERTY LINE
EASEMENT
EX. SEWER FORCE MAIN
EX. DOMESTIC WATER
EX. SD
EX. MAJOR CONTOUR
EX. MINOR CONTOUR
EX. C&G



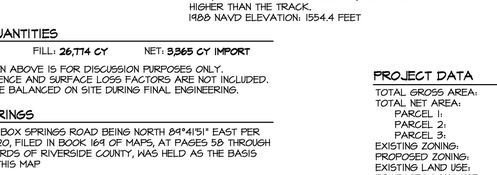
TYPICAL STREET SECTION
BOX SPRINGS ROAD
MINOR ARTERIAL: MVSI-105A-2
SCALE: 1"=10'



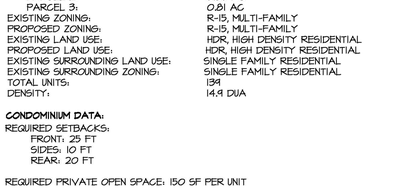
TYPICAL ENTRY STREET SECTION
STREET A
SCALE: 1"=10'



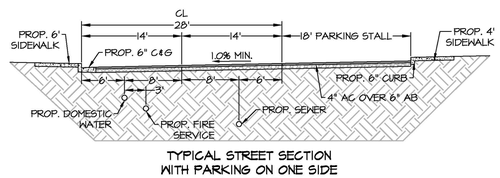
TYPICAL STREET SECTION
STREETS C & D
SCALE: 1"=10'



TYPICAL STREET SECTION
WITH PARKING ON ONE SIDE
STREETS C & D
SCALE: 1"=10'



STREET E SECTION
SCALE: 1"=10'



TYPICAL STREET SECTION
WITH PARKING ON ONE SIDE
STREET B
SCALE: 1"=10'

CONCEPTUAL GRADING PLAN
TTM 38955: PEN24-0058
SITE PLAN: PEN24-0054
PREPARATION DATE: OCTOBER 2024

PLANS PREPARED BY:
adkan ENGINEERS
Civil Engineering • Surveying • Planning
6879 Airport Drive, Riverside, CA 92504
Tel:(951) 688-0241 • Fax:(951) 688-0599

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PLOT DATE: 11/15/2024 3:30 PM

MATCHLINE SEE SHEET 3

MATCHLINE SEE SHEET 3

MATCHLINE SEE SHEET 5

MATCHLINE SEE SHEET 5

PROPERTY LINE

BUILDING SETBACK

APN: 256-200-008
ZONE: R-15

BUILDING 6
FF=1550.07
PE=1549.4

BUILDING 5
FF=1550.07
PE=1549.4

BUILDING 4
FF=1546.51
PE=1545.51

BUILDING 3
FF=1547.17
PE=1546.5

BUILDING 2
FF=1548.8
PE=1548.0

BUILDING 1
FF=1549.47
PE=1548.8

BUILDING 29
FF=1550.67
PE=1550.0

CLUBHOUSE
FF=1551.97
PE=1551.3

AMENITIES & OPEN SPACE

ACCESSIBLE UNIT

ALLEY 1

ALLEY 2

ALLEY 3

STREET A

STREET B

BOX SPRINGS RD

PROP. 4' S/W

PROP. 6.5' S/W

PROP. 6" CURB

PROP. 1' CURB CUT FOR FLOWS

PROP. 6" CURB & GUTTER

PROP. 6" WEDGE C&G

PROP. SD

PROP. SWR

PROP. FIRE

PROP. DW

PROP. TUBULAR STEEL FENCE

PROP. MAILBOX

PROP. PIPE FOR FLOWS

PROP. 6" UNDERDRAIN

PROP. 6" PIPE

PROP. 3' V-DITCH

PROP. PATIO WALL

PROP. PERIMETER FENCE

PROP. RET. WALL 6.0' MAX EXPOSED

PROP. SIDEWALK

PROP. ENTRY SIDEWALKS

PROP. 6' C&G

4" AC OVER 6" AB

PROP. BIORETENTION TRENCH, 36" MEDIA W/ 12" MIN. GRAVEL

PROP. 8" UNDERDRAIN

RETAINING WALL 3' MAX.

RETAINING CURB 18" MAX.

RETAINING WALL 6.0' MAX HT.

RETAINING WALL 3.0' MAX HT.

RETAINING WALL 3.0' MAX HT.

ROLLING GATE

PROP. 6" UNDERDRAIN.

SCE EASEMENT TO BE VACATED

EXIST. BLDG AND PARKING LOT TO BE DEMOLISHED

EX. POWER POLE & LINES TO BE REMOVED

CURB CORE AT LP FOR PIPE INLET

ACCESSIBLE UNIT

BUILDING SETBACK

BUILDING SETBACK

BIO TRENCH - 352 SF
36" MEDIA; ELEV=1541.5

BENCH=1542.0

1537.75 INV

BIORETENTION TRENCH - 1300 SF
36" MEDIA; ELEV=1545.5

BENCH=1546.0

1541.75 INV

EMERGENCY OUTLET 42.0TG

EMERGENCY OUTLET 46.0TG

OUTLET (1537.04)INV UNDER SIDEWALK DRAIN

OUTLET (1537.84)INV

OUTLET (1540.84)INV

OUTLET (1542.94)INV

OUTLET (1547.1

SECONDARY EMERGENCY VEHICLE ACCESS 28' RESIDENTIAL DRIVEWAY APPROACH PER STD. MVSI-111B

PROP. 766'± OFFSITE 8" SWR TO CONNECT AT MORTON ROAD INTERSECTION

PRIMARY ENTRANCE

MONUMENT WALL

(45.85) FL

EXIST. R/W

EX. 12" WTR

DW POC #1

DW POC #2

(3.6%)

SECTION A-A
SCALE: 1"=10'

SECTION B-B
SCALE: 1"=10'

SECTION C-C
SCALE: 1"=10'

SECTION J-J
SCALE: 1"=10'

SCALE: 1" = 20'

PAGE 2 OF 5
CONCEPTUAL GRADING PLAN
TTM 38455: PEN24-0058
SITE PLAN: PEN24-0059
PREPARATION DATE: OCTOBER 2024

PLANS PREPARED BY:
adkan ENGINEERS
Civil Engineering · Surveying · Planning
6879 Airport Drive, Riverside, CA 92504
Tel:(951) 688-0241 · Fax:(951) 688-0599

PLOT DATE: 12/5/2024 8:03 AM
U:\PROJECTS\FOREMOST COMMUNITIES\0540-FARM BUREAU\ENTITLEMENTS\GCONCEPTUAL GRADE\0540_ CG_02.DWG

APN 256-182-048
COMMON OPEN SPACE AREA

1528.6 INV

PROP. DRAINAGE AND MAINTENANCE EASEMENT

EX. CHANNEL

TERMS AND PROVISIONS PER GRANT OF EASEMENT RECORDED JANUARY 2, 1986 INSTR. NO. 789

14' DRIVE APPROACH

3' V-DITCH

RETAINING WALL 6.0' MAX HT.

1532.6 FS

BENCH=1538.0

4x4 OUTLET STRUCTURE 1497.0 TB

RETAINING WALL 3.0' MAX HT.

BIORETENTION BASIN
7,728 SF
BOT=1536.5
18" MEDIA
W 42" CMP UNDERGROUND STORAGE

APN 268-200-008
ZONE: R-20

3' V-DITCH

PROP. 4' S/W

BUILDING SETBACK

BUILDING 11
FF=1548.17
PE=1547.5

PROP. 6" C&G

PROP. 6" WEDGE C&G

PROP. SWR

STREET E

PROP. SD

PROP. FIRE

PROP. 6" WEDGE CURB ONLY

PROP. DW

BUILDING 10
FF=1547.67
PE=1547.0

ACCESSIBLE UNIT

BUILDING 26
FF=1548.97
PE=1548.3

PROP. DW

PROP. FIRE

PROP. SWR

PROP. 4' S/W

SCE EASEMENT TO BE VACATED

BUILDING 27
FF=1549.37
PE=1548.7

SEE SHEET 4

PROP. 6" CURB

BUILDING 9
FF=1548.97
PE=1548.3

PROP. 6" C&G

PROP. 6" CURB

PROP. 6" WEDGE C&G

ALLEY 4

ALLEY 5

END FIRE LANE

9' TYP.

20'

BUILDING 8
FF=1549.77
PE=1549.1

BUILDING 7
FF=1549.37
PE=1548.7

BUILDING 28
FF=1549.17
PE=1548.5

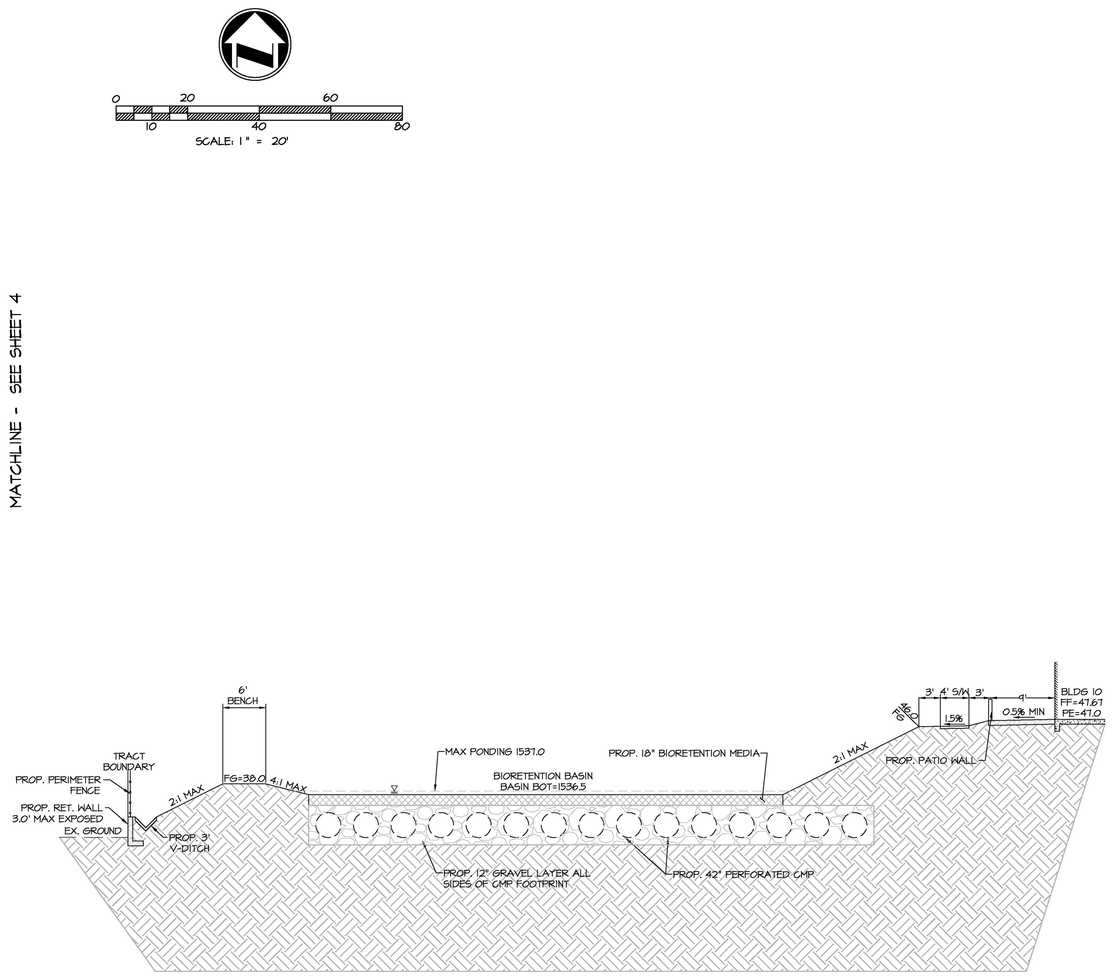
STREET C

BUILDING SETBACK

MATCHLINE - SEE SHEET 4

MATCHLINE - SEE SHEET 2

0 20 60
10 40 80
SCALE: 1" = 20'



SECTION D-D
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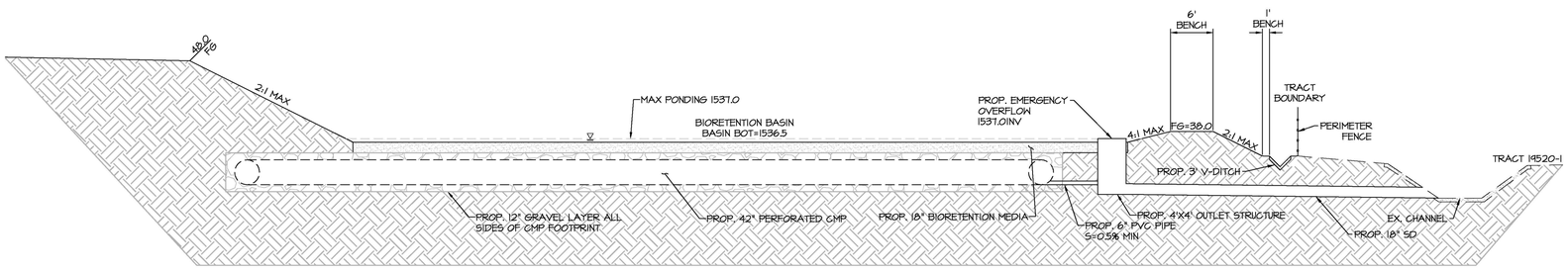

SECTION E-E
SCALE: 1"=10'

PAGE 3 OF 5
CONCEPTUAL GRADING PLAN
TTM 38455: PEN24-0058
SITE PLAN: PEN24-0054
PREPARATION DATE: OCTOBER 2024

PLANS PREPARED BY:
adkan ENGINEERS
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6879 Airport Drive, Riverside, CA 92504
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PLOT DATE: 11/5/2024 3:31 PM

APN 258-182-048
COMMON OPEN SPACE AREA

PROPERTY LINE

RETAINING WALL 6.0' MAX HT.

3' V-DITCH

BUILDING SETBACK

BUILDING 12
FF=1548.67
PE=1548.0

STREET E

BUILDING 25
FF=1549.37
PE=1548.7

BUILDING 24
FF=1551.67
PE=1551.0

BUILDING 23
FF=1551.87
PE=1551.2

STREET D

ALLEY 6

ALLEY 7

BUILDING 13
FF=1550.17
PE=1549.5

BUILDING 14
FF=1551.77
PE=1551.1

BUILDING 15
FF=1551.87
PE=1551.2

CALIFORNIA AQUEDUCT

SCE EASEMENT TO BE VACATED

HOA MAINTAINED OPEN SPACE

HOA MAINT. OPEN SPACE

PROPERTY LINE

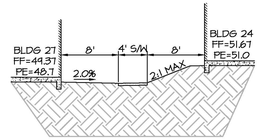
100' DWR EASEMENT

LEWISIA AVENUE

APN 258-211-001
ZONE: OFFICE

MATCHLINE
SEE SHEET 3

MATCHLINE
SEE SHEET 5



SECTION F-F
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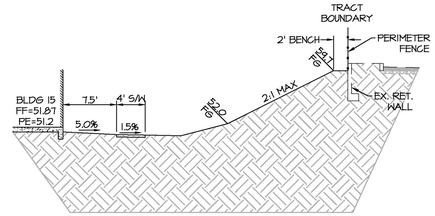
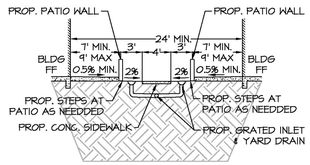
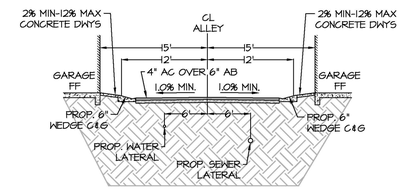


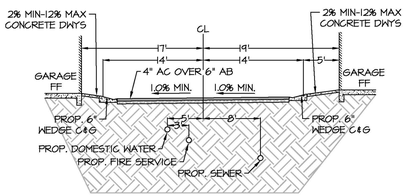
SECTION G-G
SCALE: 1"=10'



TYPICAL PASEO SECTION
SCALE: 1"=10'



TYPICAL ALLEY SECTION
*EXCLUDING ALLEY 2
SCALE: 1"=10'



ALLEY 2 (EVA) SECTION
SCALE: 1"=10'



SCALE: 1" = 20'

PAGE 4 OF 5
CONCEPTUAL GRADING PLAN
TTM 38955: PEN24-0058
SITE PLAN: PEN24-0054
PREPARATION DATE: OCTOBER 2024

PLANS PREPARED BY:
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PLOT DATE: 11/15/2024 3:32 PM

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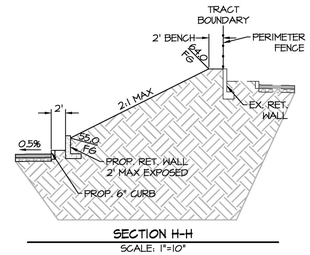
MATCHLINE
SEE SHEET 4

MATCHLINE
SEE SHEET 2

APN 256-211-002
ZONE: OFFICE

AMENITIES & OPEN SPACE
CLUBHOUSE
FF=1551.47
PE=1551.3
BUILDING 22
FF=1553.27
PE=1552.6
BUILDING 16
FF=1553.57
PE=1552.9
BUILDING 17
FF=1553.57
PE=1552.9
BUILDING 21
FF=1551.27
PE=1550.6
BUILDING 20
FF=1551.27
PE=1550.6
BUILDING 19
FF=1551.17
PE=1551.1
BUILDING 18
FF=1552.07
PE=1551.4
ALLEY 8
ALLEY 10
ALLEY 9
STREET A
BOX SPRINGS RD
PROP. TUBULAR STEEL FENCE
PROP. 4' S/W
PROP. 6' WEDGE CURB ONLY
PROP. 6' CURB
PROP. 6.5' S/W
PROP. 6' WEDGE C&G
PROP. S/W
PROP. MAILBOX
PROP. DW
PROP. FIRE
PROP. SD
PROP. 1' CURB CUT FOR FLOWS
ACCESSIBLE UNIT
SCE EASEMENT TO BE VACATED
EX. POWER POLE # LINES TO BE REMOVED
EXIST. BLDG AND PARKING LOT TO BE DEMOLISHED
RETAINING WALL 2.0' MAX HT.
RETAINING WALL 4.0' MAX HT.
BUILDING SETBACK
PROPERTY LINE
BIORETENTION TRENCH - 2,020 SF
36" MEDIA; ELEV=1549.5
PROP. 6" PERFORATED PIPE
PROP. 6" PIPE
BENCH=1550.0
EXIST. R/W
EMERGENCY OUTLET 50.01'G
PRIMARY ENTRANCE
OUTLET (1547.83)INV
RETAINING WALL 1.5' MAX HT.
MONUMENT WALL
(45.85) FL
544.63 INV
545.75 INV
DW POC #2
EX. 8" FM
EX. 12"W
EX. 8"S FM
OHE



SECTION H-H
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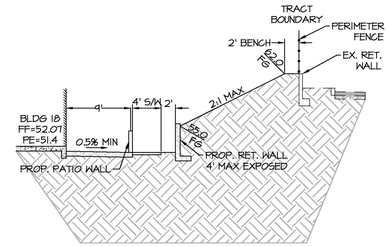
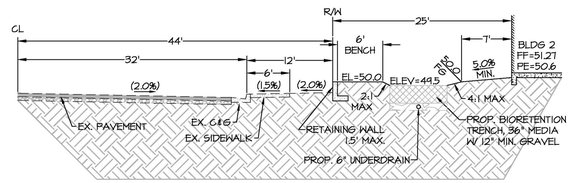
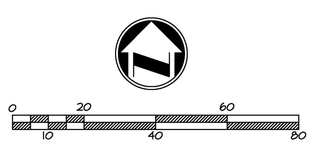


SECTION I-I
SCALE: 1"=10'



SECTION K-K
SCALE: 1"=10'



SCALE: 1" = 20'

PAGE 5 OF 5
CONCEPTUAL GRADING PLAN
TTM 38455: PEN24-0058
SITE PLAN: PEN24-0054
PREPARATION DATE: OCTOBER 2024

PLANS PREPARED BY:
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PLOT DATE: 11/15/2024 3:33 PM

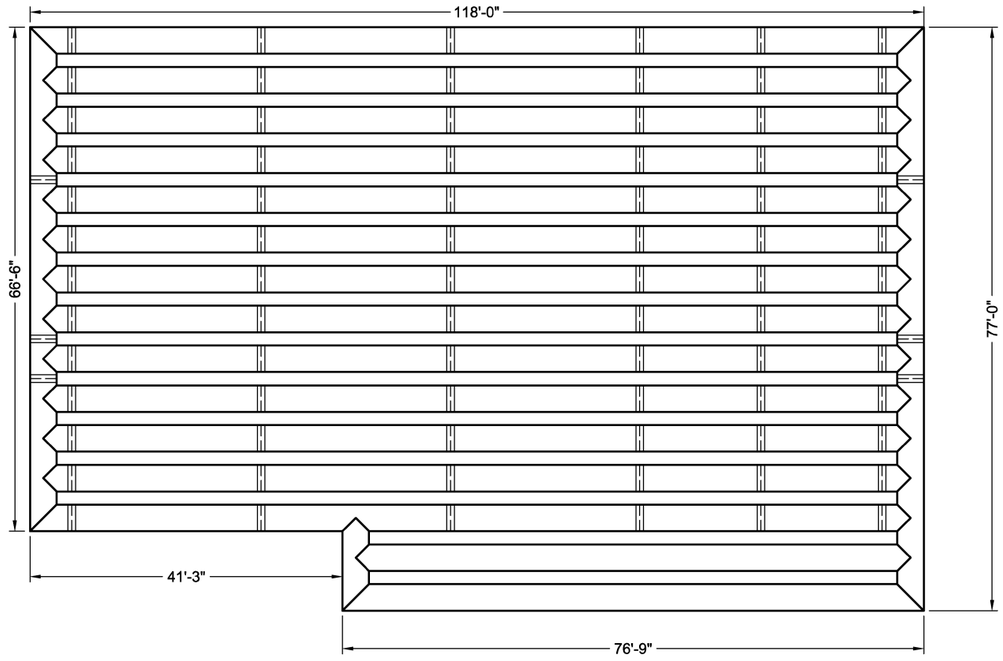
PROJECT SUMMARY

CALCULATION DETAILS
- LOADING = HS20/HS25
- APPROX. LINEAR FOOTAGE = 1,737 LF

STORAGE SUMMARY
- STORAGE VOLUME REQUIRED = N/A
- PIPE STORAGE VOLUME = 16,707 CF
- BACKFILL STORAGE VOLUME = 13,224 CF
- TOTAL STORAGE PROVIDED = 29,931 CF
- STONE VOID = 40%

PIPE DETAILS
- DIAMETER = 42"
- CORRUGATION = 2 2/3x1/2
- GAGE = 16
- COATING = ALT2
- WALL TYPE = PERFORATED
- BARREL SPACING = 21"

BACKFILL DETAILS
- WIDTH AT ENDS = 12"
- ABOVE PIPE = 12"
- WIDTH AT SIDES = 12"
- BELOW PIPE = 12"



ASSEMBLY
SCALE: 1" = 20'

NOTES

- ALL RISER AND STUB DIMENSIONS ARE TO CENTERLINE. ALL ELEVATIONS, DIMENSIONS, AND LOCATIONS OF RISERS AND INLETS, SHALL BE VERIFIED BY THE ENGINEER OF RECORD PRIOR TO RELEASING FOR FABRICATION.
- ALL FITTINGS AND REINFORCEMENT COMPLY WITH ASTM A998.
- ALL RISERS AND STUBS ARE 2⅔" x ½" CORRUGATION AND 16 GAGE UNLESS OTHERWISE NOTED.
- RISERS TO BE FIELD TRIMMED TO GRADE.
- QUANTITY OF PIPE SHOWN DOES NOT PROVIDE EXTRA PIPE FOR CONNECTING THE SYSTEM TO EXISTING PIPE OR DRAINAGE STRUCTURES. OUR SYSTEM AS DETAILED PROVIDES NOMINAL INLET AND/OR OUTLET PIPE STUB FOR CONNECTION TO EXISTING DRAINAGE FACILITIES. IF ADDITIONAL PIPE IS NEEDED IT IS THE RESPONSIBILITY OF THE CONTRACTOR.
- BAND TYPE TO BE DETERMINED UPON FINAL DESIGN.
- THE PROJECT SUMMARY IS REFLECTIVE OF THE DYODS DESIGN, QUANTITIES ARE APPROX. AND SHOULD BE VERIFIED UPON FINAL DESIGN AND APPROVAL. FOR EXAMPLE, TOTAL EXCAVATION DOES NOT CONSIDER ALL VARIABLES SUCH AS SHORING AND ONLY ACCOUNTS FOR MATERIAL WITHIN THE ESTIMATED EXCAVATION FOOTPRINT.
- THESE DRAWINGS ARE FOR CONCEPTUAL PURPOSES AND DO NOT REFLECT ANY LOCAL PREFERENCES OR REGULATIONS. PLEASE CONTACT YOUR LOCAL CONTECH REP FOR MODIFICATIONS.

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www.ContechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

CONTECH® CMP DETENTION SYSTEMS
CONTECH DYODS DRAWING

DYO49120 Farm Bureau
North 42"
Moreno Valley, CA
DETENTION SYSTEM

PROJECT No.:	SEQ. No.:	DATE:
28212	49120	10/11/2024
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.: 1		

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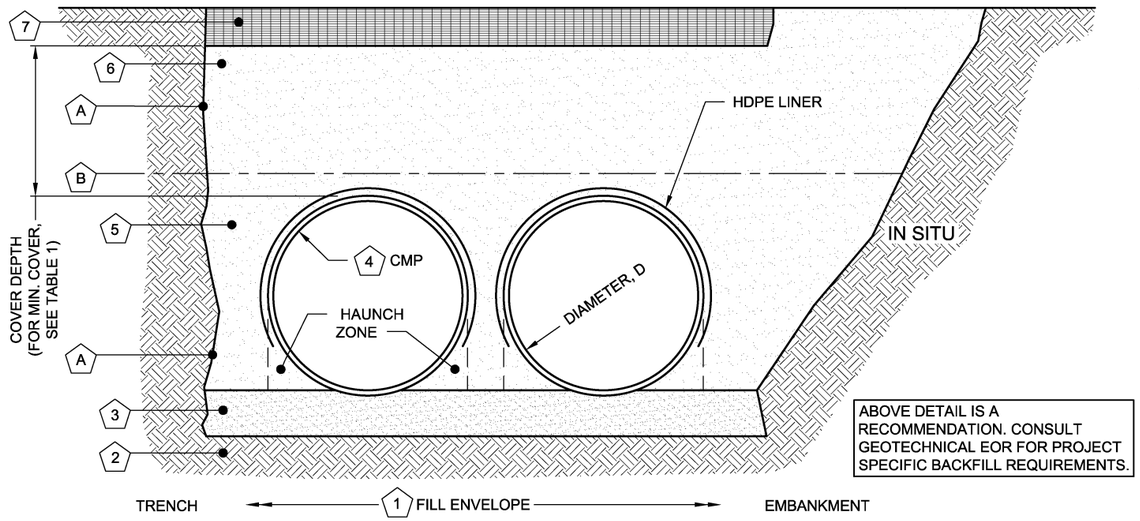
TABLE 1:

DIAMETER, D	MIN. COVER	CORR. PROFILE
6"-10"	12"	1 1/2" x 1/4"
12"-48"	12"	2 2/3" x 1/2"
>48"-96"	12"	3" x 1", 5" x 1"
>96"	D/8	3" x 1", 5" x 1"

- STRUCTURAL BACKFILL MUST EXTEND TO LIMITS OF THE TABLE
- TOTAL HEIGHT OF COMPACTED COVER FOR CONVENTIONAL HIGHWAY LOADS IS MEASURED FROM TOP OF PIPE TO BOTTOM OF FLEXIBLE PAVEMENT OR TOP OF RIGID PAVEMENT.



ABOVE DETAIL IS A RECOMMENDATION. CONSULT GEOTECHNICAL EOR FOR PROJECT SPECIFIC BACKFILL REQUIREMENTS.

MINIMUM WIDTH DEPENDS ON SITE CONDITIONS AND ENGINEERING JUDGEMENT

INSTALLATION NOTES

1. WHEN PLACING THE FIRST LIFTS OF BACKFILL IT IS IMPORTANT TO MAKE SURE THAT THE BACKFILL IS PROPERLY COMPACTED UNDER AND AROUND THE PIPE HAUNCHES.
2. OTHER ALTERNATE BACKFILL MATERIAL MAY BE ALLOWED DEPENDING ON SITE SPECIFIC CONDITIONS, AS APPROVED BY SITE ENGINEER.
3. AN HDPE MEMBRANE LINER WILL BE PLACED ON THE CROWN OF EACH PIPE TO PROVIDE AN IMPERMEABLE BARRIER AGAINST ENVIRONMENTAL CHANGES THAT MAY ADVERSELY AFFECT THE SYSTEM OVER TIME. PLEASE REFER TO THE CORRUGATED METAL PIPE DETENTION DESIGN GUIDE FOR ADDITIONAL TECHNICAL DETAILS.

TABLE 2:

CMP RETENTION STANDARD BACKFILL SPECIFICATIONS

	MATERIAL LOCATION	MATERIAL SPECIFICATION	DESCRIPTION	
1	FILL ENVELOPE WIDTH	PER ENGINEER OF RECORD	MINIMUM TRENCH WIDTH MUST ALLOW ROOM FOR PROPER COMPACTION OF HAUNCH MATERIALS UNDER THE PIPE. THE SUGGESTED MINIMUM TRENCH WIDTH, OR EOR RECOMMENDATION: PIPE ≤ 12": D + 16" PIPE > 12": 1.5D + 12"	MINIMUM EMBANKMENT WIDTH (IN FEET) FOR INITIAL FILL ENVELOPE: PIPE < 24": 3.0D PIPE 24" - 144": D + 4'0" PIPE > 144": D + 10'0"
2	FOUNDATION	**AASHTO 26.5.2** - PER ENGINEER OF RECORD	PRIOR TO PLACING THE BEDDING, THE FOUNDATION MUST BE CONSTRUCTED TO A UNIFORM AND STABLE GRADE. IN THE EVENT THAT UNSUITABLE FOUNDATION MATERIALS ARE ENCOUNTERED DURING EXCAVATION, THEY SHALL BE REMOVED AND FOUNDATION BROUGHT BACK TO GRADE WITH A FILL MATERIAL APPROVED BY THE ENGINEER OF RECORD.	
3	BEDDING	**AASHTO M 43: 3, 357, 4, 467, 5, 56, 57**	ENGINEER OF RECORD TO DETERMINE IF BEDDING IS REQUIRED. PIPE MAY BE PLACED ON THE TRENCH BOTTOM OF A RELATIVELY LOOSE, NATIVE SUITABLE WELL GRADED GRANULAR MATERIAL THAT IS ROUGHLY SHAPED TO FIT THE BOTTOM OF THE PIPE, 2" MIN DEPTH. THE BEDDING MATERIAL MAY BE SUITABLE OPEN GRADED GRANULAR BEDDING CONFORMING TO AASHTO SOIL CLASSIFICATIONS A1, A2, OR A3 WITH MAXIMUM PARTICLE SIZE OF 3" PER AASHTO 26.3.8.1	
4	CORRUGATED METAL PIPE			
5	BACKFILL	FREE-DRAINING, ANGULAR, NATURALLY OCCURRING WASHED-STONE PER **AASHTO M 43: 3, 357, 4, 467, 5, 56, 57** OR APPROVED EQUAL *	HAUNCH ZONE MATERIAL SHALL BE HAND SHOVELED OR SHOVEL SLICED INTO PLACE TO ALLOW FOR PROPER COMPACTION WITHOUT SOFT SPOTS. BACKFILL SHALL BE PLACED IN 8" +/- LOOSE LIFTS AND COMPACTED TO 90% STANDARD PROCTOR PER AASHTO T 99. BACKFILL SHALL BE PLACED SUCH THAT THERE IS NO MORE THAN A TWO LIFT (16") DIFFERENTIAL BETWEEN ANY OF THE PIPES AT ANY TIME DURING THE BACKFILL PROCESS. THE BACKFILL SHOULD BE ADVANCED ALONG THE LENGTH OF THE SYSTEM TO AVOID DIFFERENTIAL LOADING. WHERE CONVENTIONAL COMPACTION TESTING IS NOT PRACTICAL, THE MATERIAL SHALL BE MECHANICALLY COMPACTED UNTIL NO FURTHER YIELDING OF MATERIAL IS OBSERVED UNDER THE COMPACTOR. **IN AREAS WITH HIGH WATER TABLE FLUCTUATIONS THAT INTERACT WITH THE PIPE ZONE, CONSIDER INSTALLING A GEOTEXTILE SEPARATION LAYER TO PREVENT SOIL MIGRATION.	
6	COVER MATERIAL	UP TO MIN. COVER - **AASHTO M 145: A-1, A-2, A-3** ABOVE MIN. COVER - PER ENGINEER OF RECORD	COVER MATERIAL MAY INCLUDE NON-BITUMINOUS, GRANULAR ROADBASE MATERIAL WITHIN MIN COVER LIMITS	
7	RIGID OR FLEXIBLE PAVEMENT (IF APPLICABLE)	PER ENGINEER OF RECORD	FLEXIBLE PAVEMENT SHOULD NOT BE COUNTED AS PART OF THE FILL HEIGHT OVER THE CMP. FINAL BACKFILL MATERIAL SELECTION AND COMPACTION REQUIREMENTS SHALL FOLLOW THE PROJECT PLANS AND SPECIFICATIONS PER THE ENGINEER OF RECORD.	
A	OPTIONAL SIDE GEOTEXTILE	NONE	GEOTEXTILE LAYER IS RECOMMENDED ON SIDES OF EXCAVATION TO PREVENT SOIL MIGRATION.	
B	GEOTEXTILE BETWEEN LAYERS	NONE	IF SOIL TYPES DIFFER AT ANY POINT ABOVE PIPE INVERT, A GEOTEXTILE LAYER IS RECOMMENDED TO BE PLACED BETWEEN THE LAYERS TO PREVENT SOIL MIGRATION.	

NOTES:
- FOR MULTIPLE BARREL INSTALLATIONS, THE RECOMMENDED STANDARD SPACING BETWEEN PARALLEL PIPE RUNS SHALL BE THE PIPE DIAMETER /2 BUT NO LESS THAN 12" FOR DIAMETERS <72". FOR 72" AND LARGER DIAMETERS, THE MINIMUM SPACING IS 36". CONTACT YOUR CONTECH REPRESENTATIVE FOR NONSTANDARD SPACING.

* APPROVED REGIONAL EQUIVALENTS FOR SECTION 5 INCLUDE CA-7, MIDOT 6AA, 6A, OR 5G, PROVIDED THEY MEET THE PARTICLE SIZES INDICATED.

MANUFACTURER RECOMMENDED BACKFILL

NOT TO SCALE

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CONTECH® CMP DETENTION SYSTEMS
CONTECH DYODS DRAWING

DYO49120 Farm Bureau
North 42"
Moreno Valley, CA
DETENTION SYSTEM

PROJECT No.:	SEQ. No.:	DATE:
28212	49120	10/11/2024
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.: 1		

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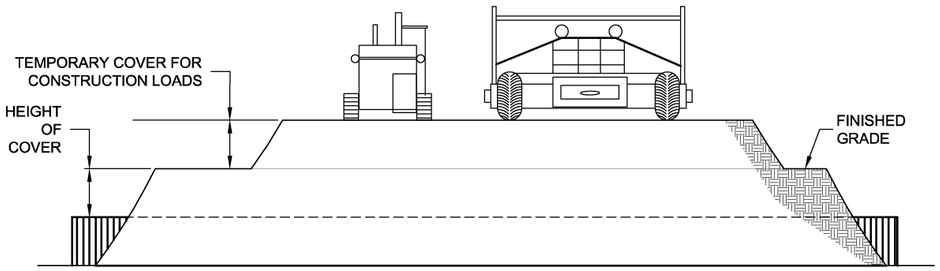


CONSTRUCTION LOADS

FOR TEMPORARY CONSTRUCTION VEHICLE LOADS, AN EXTRA AMOUNT OF COMPACTED COVER MAY BE REQUIRED OVER THE TOP OF THE PIPE. THE HEIGHT-OF-COVER SHALL MEET THE MINIMUM REQUIREMENTS SHOWN IN THE TABLE BELOW. THE USE OF HEAVY CONSTRUCTION EQUIPMENT NECESSITATES GREATER PROTECTION FOR THE PIPE THAN FINISHED GRADE COVER MINIMUMS FOR NORMAL HIGHWAY TRAFFIC.

PIPE SPAN, INCHES	AXLE LOADS (kips)			
	18-50	50-75	75-110	110-150
	MINIMUM COVER (FT)			
12-42	2.0	2.5	3.0	3.0
48-72	3.0	3.0	3.5	4.0
78-120	3.0	3.5	4.0	4.0
126-144	3.5	4.0	4.5	4.5

*MINIMUM COVER MAY VARY, DEPENDING ON LOCAL CONDITIONS. THE CONTRACTOR MUST PROVIDE THE ADDITIONAL COVER REQUIRED TO AVOID DAMAGE TO THE PIPE. MINIMUM COVER IS MEASURED FROM THE TOP OF THE PIPE TO THE TOP OF THE MAINTAINED CONSTRUCTION ROADWAY SURFACE.

CONSTRUCTION LOADING DIAGRAM

SCALE: N.T.S.

SPECIFICATION FOR DESIGNED DETENTION SYSTEM:

SCOPE
THIS SPECIFICATION COVERS THE MANUFACTURE AND INSTALLATION OF THE DESIGNED DETENTION SYSTEM DETAILED IN THE PROJECT PLANS.

MATERIAL
THE MATERIAL SHALL CONFORM TO THE APPLICABLE REQUIREMENTS LISTED BELOW:

ALUMINIZED TYPE 2 STEEL COILS SHALL CONFORM TO THE APPLICABLE REQUIREMENTS OF AASHTO M-274 OR ASTM A-92.

THE GALVANIZED STEEL COILS SHALL CONFORM TO THE APPLICABLE REQUIREMENTS OF AASHTO M-218 OR ASTM A-929.

THE POLYMER COATED STEEL COILS SHALL CONFORM TO THE APPLICABLE REQUIREMENTS OF AASHTO M-246 OR ASTM A-742.

THE ALUMINUM COILS SHALL CONFORM TO THE APPLICABLE REQUIREMENTS OF AASHTO M-197 OR ASTM B-744.

CONSTRUCTION LOADS
CONSTRUCTION LOADS MAY BE HIGHER THAN FINAL LOADS. FOLLOW THE MANUFACTURER'S OR NCSPA GUIDELINES.

NOTE:
THESE DRAWINGS ARE FOR CONCEPTUAL PURPOSES AND DO NOT REFLECT ANY LOCAL PREFERENCES OR REGULATIONS. PLEASE CONTACT YOUR LOCAL CONTECH REP FOR MODIFICATIONS.

PIPE
THE PIPE SHALL BE MANUFACTURED IN ACCORDANCE TO THE APPLICABLE REQUIREMENTS LISTED BELOW:

ALUMINIZED TYPE 2: AASHTO M-36 OR ASTM A-760

GALVANIZED: AASHTO M-36 OR ASTM A-760

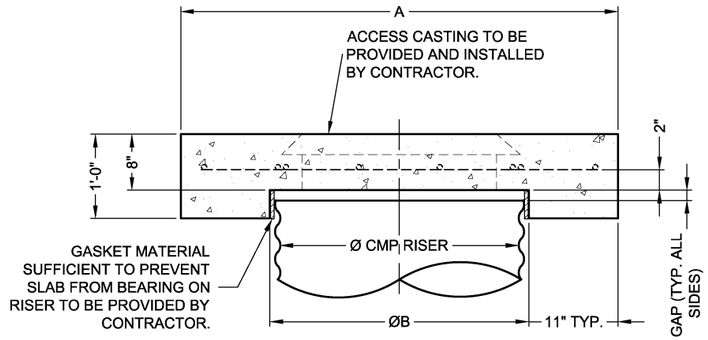
POLYMER COATED: AASHTO M-245 OR ASTM A-762

ALUMINUM: AASHTO M-196 OR ASTM B-745

HANDLING AND ASSEMBLY
SHALL BE IN ACCORDANCE WITH NCSP'S (NATIONAL CORRUGATED STEEL PIPE ASSOCIATION) FOR ALUMINIZED TYPE 2, GALVANIZED OR POLYMER COATED STEEL. SHALL BE IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS FOR ALUMINUM PIPE.

INSTALLATION
SHALL BE IN ACCORDANCE WITH AASHTO STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES, SECTION 26, DIVISION II DIVISION II OR ASTM A-798 (FOR ALUMINIZED TYPE 2, GALVANIZED OR POLYMER COATED STEEL) OR ASTM B-788 (FOR ALUMINUM PIPE) AND IN CONFORMANCE WITH THE PROJECT PLANS AND SPECIFICATIONS. IF THERE ARE ANY INCONSISTENCIES OR CONFLICTS THE CONTRACTOR SHOULD DISCUSS AND RESOLVE WITH THE SITE ENGINEER.

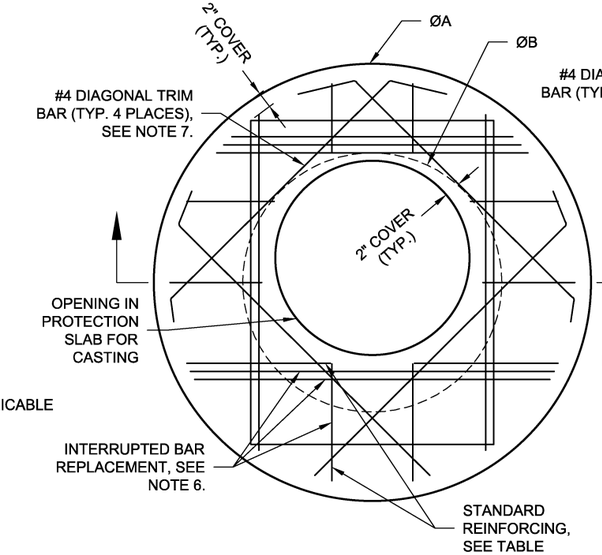
IT IS ALWAYS THE RESPONSIBILITY OF THE CONTRACTOR TO FOLLOW OSHA GUIDELINES FOR SAFE PRACTICES.



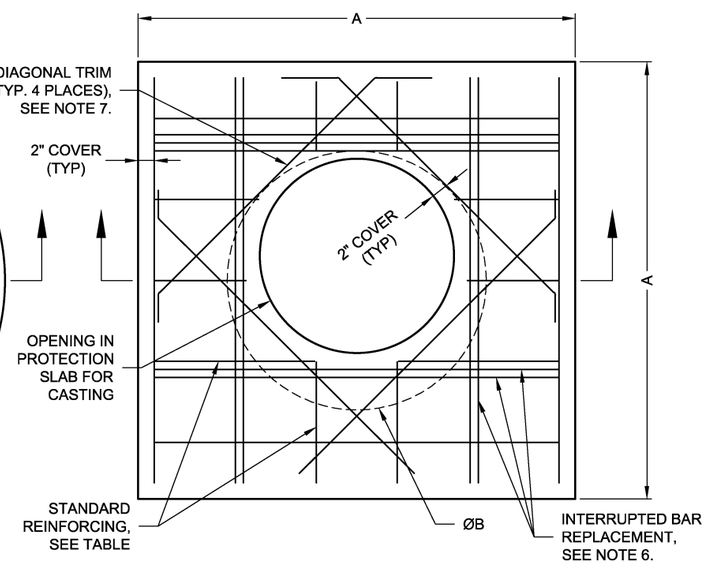
SECTION VIEW

REINFORCING TABLE				
Ø CMP RISER	A	Ø B	REINFORCING	**BEARING PRESSURE (PSF)
24"	Ø 4' 4'X4'	26"	#5 @ 12" OCEW #5 @ 12" OCEW	2,410 1,780
30"	Ø 4'-6" 4'-6" X 4'-6"	32"	#5 @ 12" OCEW #5 @ 12" OCEW	2,120 1,530
36"	Ø 5' 5' X 5'	38"	#5 @ 10" OCEW #5 @ 10" OCEW	1,890 1,350
42"	Ø 5'-6" 5'-6" X 5'-6"	44"	#5 @ 10" OCEW #5 @ 9" OCEW	1,720 1,210
48"	Ø 6' 6' X 6'	50"	#5 @ 9" OCEW #5 @ 8" OCEW	1,600 1,100

** ASSUMED SOIL BEARING CAPACITY



ROUND OPTION PLAN VIEW



SQUARE OPTION PLAN VIEW

NOTES:

1. DESIGN IN ACCORDANCE WITH AASHTO, 17th EDITION.
2. DESIGN LOAD HS25.
3. EARTH COVER = 1' MAX.
4. CONCRETE STRENGTH = 3,500 psi
5. REINFORCING STEEL = ASTM A615, GRADE 60.
6. PROVIDE ADDITIONAL REINFORCING AROUND OPENINGS EQUAL TO THE BARS INTERRUPTED, HALF EACH SIDE. ADDITIONAL BARS TO BE IN THE SAME PLANE.
7. TRIM OPENING WITH DIAGONAL #4 BARS, EXTEND BARS A MINIMUM OF 12" BEYOND OPENING, BEND BARS AS REQUIRED TO MAINTAIN BAR COVER.
8. PROTECTION SLAB AND ALL MATERIALS TO BE PROVIDED AND INSTALLED BY CONTRACTOR.
9. DETAIL DESIGN BY DELTA ENGINEERING, BINGHAMTON, NY.

MANHOLE CAP DETAIL

SCALE: N.T.S.

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CONTECH® CMP DETENTION SYSTEMS
CONTECH DYODS DRAWING

DYO49120 Farm Bureau
North 42"
Moreno Valley, CA
DETENTION SYSTEM

PROJECT No.:	SEQ. No.:	DATE:
28212	49120	10/11/2024
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.: 1		

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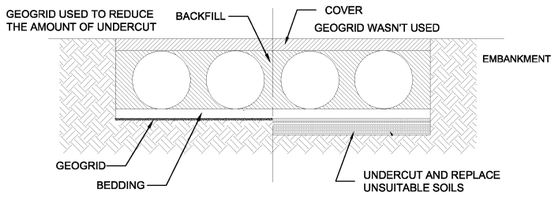
CMP DETENTION INSTALLATION GUIDE

PROPER INSTALLATION OF A FLEXIBLE UNDERGROUND DETENTION SYSTEM WILL ENSURE LONG-TERM PERFORMANCE. THE CONFIGURATION OF THESE SYSTEMS OFTEN REQUIRES SPECIAL CONSTRUCTION PRACTICES THAT DIFFER FROM CONVENTIONAL FLEXIBLE PIPE CONSTRUCTION. CONTECH ENGINEERED SOLUTIONS STRONGLY SUGGESTS SCHEDULING A PRE-CONSTRUCTION MEETING WITH YOUR LOCAL SALES ENGINEER TO DETERMINE IF ADDITIONAL MEASURES, NOT COVERED IN THIS GUIDE, ARE APPROPRIATE FOR YOUR SITE.

FOUNDATION

CONSTRUCT A FOUNDATION THAT CAN SUPPORT THE DESIGN LOADING APPLIED BY THE PIPE AND ADJACENT BACKFILL WEIGHT AS WELL AS MAINTAIN ITS INTEGRITY DURING CONSTRUCTION.

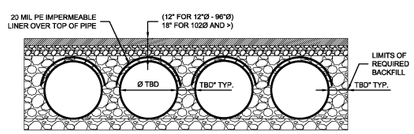
IF SOFT OR UNSUITABLE SOILS ARE ENCOUNTERED, REMOVE THE POOR SOILS DOWN TO A SUITABLE DEPTH AND THEN BUILD UP TO THE APPROPRIATE ELEVATION WITH A COMPETENT BACKFILL MATERIAL. THE STRUCTURAL FILL MATERIAL GRADATION SHOULD NOT ALLOW THE MIGRATION OF FINES, WHICH CAN CAUSE SETTLEMENT OF THE DETENTION SYSTEM OR PAVEMENT ABOVE. IF THE STRUCTURAL FILL MATERIAL IS NOT COMPATIBLE WITH THE UNDERLYING SOILS AN ENGINEERING FABRIC SHOULD BE USED AS A SEPARATOR. IN SOME CASES, USING A STIFF REINFORCING GEOGRID REDUCES OVER EXCAVATION AND REPLACEMENT FILL QUANTITIES.



GRADE THE FOUNDATION SUBGRADE TO A UNIFORM OR SLIGHTLY SLOPING GRADE. IF THE SUBGRADE IS CLAY OR RELATIVELY NON-POROUS AND THE CONSTRUCTION SEQUENCE WILL LAST FOR AN EXTENDED PERIOD OF TIME, IT IS BEST TO SLOPE THE GRADE TO ONE END OF THE SYSTEM. THIS WILL ALLOW EXCESS WATER TO DRAIN QUICKLY, PREVENTING SATURATION OF THE SUBGRADE.

GEOMEMBRANE BARRIER

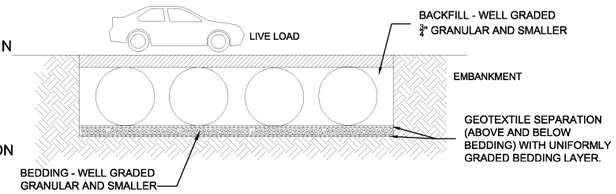
THE RESISTIVITY OF A PROJECT SITE MAY CHANGE OVER TIME DUE TO THE USE OF VARIOUS SALTING, DE-ICING, AND AGRICULTURAL AGENTS APPLIED ON OR NEAR THE AREA. TO MITIGATE THE POTENTIAL IMPACT OF THESE AGENTS, AN HDPE MEMBRANE LINER WILL BE INSTALLED ON THE CROWN OF EACH PIPE, CREATING AN IMPERMEABLE BARRIER. THIS MEASURE IS DESIGNED TO PROTECT THE SYSTEM FROM ENVIRONMENTAL CHANGES THAT COULD LEAD TO PREMATURE CORROSION AND REDUCE THE OVERALL SERVICE LIFE.



IN-SITU TRENCH WALL

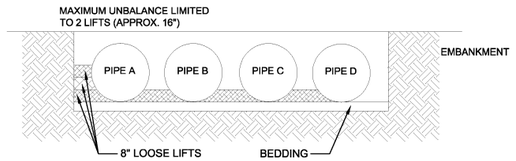
IF EXCAVATION IS REQUIRED, THE TRENCH WALL NEEDS TO BE CAPABLE OF SUPPORTING THE LOAD THAT THE PIPE SHEDS AS THE SYSTEM IS LOADED. IF SOILS ARE NOT CAPABLE OF SUPPORTING THESE LOADS, THE PIPE CAN DEFLECT. PERFORM A SIMPLE SOIL PRESSURE CHECK USING THE APPLIED LOADS TO DETERMINE THE LIMITS OF EXCAVATION BEYOND THE SPRING LINE OF THE OUTER MOST PIPES.

IN MOST CASES THE REQUIREMENTS FOR A SAFE WORK ENVIRONMENT AND PROPER BACKFILL PLACEMENT AND COMPACTION TAKE CARE OF THIS CONCERN.



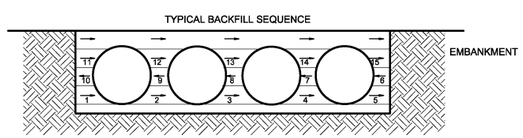
BACKFILL PLACEMENT

MATERIAL SHALL BE WORKED INTO THE PIPE HAUNCHES BY MEANS OF SHOVEL-SLICING, RODDING, AIR TAMPER, VIBRATORY ROD, OR OTHER EFFECTIVE METHODS.

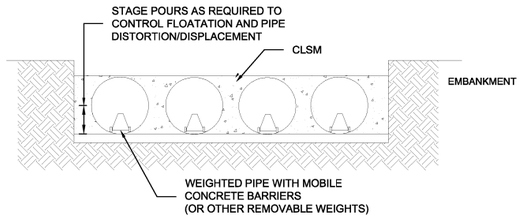


IF AASHTO T99 PROCEDURES ARE DETERMINED INFEASIBLE BY THE GEOTECHNICAL ENGINEER OF RECORD, COMPACTION IS CONSIDERED ADEQUATE WHEN NO FURTHER YIELDING OF THE MATERIAL IS OBSERVED UNDER THE COMPACTOR, OR UNDER FOOT, AND THE GEOTECHNICAL ENGINEER OF RECORD (OR REPRESENTATIVE THEREOF) IS SATISFIED WITH THE LEVEL OF COMPACTION.

FOR LARGE SYSTEMS, CONVEYOR SYSTEMS, BACKHOES WITH LONG REACHES OR DRAGLINES WITH STONE BUCKETS MAY BE USED TO PLACE BACKFILL. ONCE MINIMUM COVER FOR CONSTRUCTION LOADING ACROSS THE ENTIRE WIDTH OF THE SYSTEM IS REACHED, ADVANCE THE EQUIPMENT TO THE END OF THE RECENTLY PLACED FILL, AND BEGIN THE SEQUENCE AGAIN UNTIL THE SYSTEM IS COMPLETELY BACKFILLED. THIS TYPE OF CONSTRUCTION SEQUENCE PROVIDES ROOM FOR STOCKPILED BACKFILL DIRECTLY BEHIND THE BACKHOE, AS WELL AS THE MOVEMENT OF CONSTRUCTION TRAFFIC. MATERIAL STOCKPILES ON TOP OF THE BACKFILLED DETENTION SYSTEM SHOULD BE LIMITED TO 8- TO 10-FEET HIGH AND MUST PROVIDE BALANCED LOADING ACROSS ALL BARRELS. TO DETERMINE THE PROPER COVER OVER THE PIPES TO ALLOW THE MOVEMENT OF CONSTRUCTION EQUIPMENT SEE TABLE 1, OR CONTACT YOUR LOCAL CONTECH SALES ENGINEER.



WHEN FLOWABLE FILL IS USED, YOU MUST PREVENT PIPE FLOATATION. TYPICALLY, SMALL LIFTS ARE PLACED BETWEEN THE PIPES AND THEN ALLOWED TO SET-UP PRIOR TO THE PLACEMENT OF THE NEXT LIFT. THE ALLOWABLE THICKNESS OF THE CLSM LIFT IS A FUNCTION OF A PROPER BALANCE BETWEEN THE UPLIFT FORCE OF THE CLSM, THE OPPOSING WEIGHT OF THE PIPE, AND THE EFFECT OF OTHER RESTRAINING MEASURES. THE PIPE CAN CARRY LIMITED FLUID PRESSURE WITHOUT PIPE DISTORTION OR DISPLACEMENT, WHICH ALSO AFFECTS THE CLSM LIFT THICKNESS. YOUR LOCAL CONTECH SALES ENGINEER CAN HELP DETERMINE THE PROPER LIFT THICKNESS.

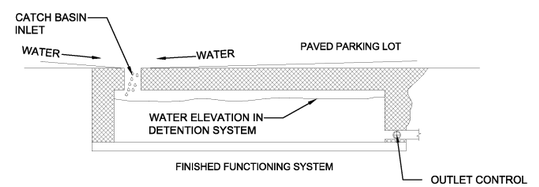


CONSTRUCTION LOADING

TYPICALLY, THE MINIMUM COVER SPECIFIED FOR A PROJECT ASSUMES H-20 LIVE LOAD. BECAUSE CONSTRUCTION LOADS OFTEN EXCEED DESIGN LIVE LOADS, INCREASED TEMPORARY MINIMUM COVER REQUIREMENTS ARE NECESSARY. SINCE CONSTRUCTION EQUIPMENT VARIES FROM JOB TO JOB, IT IS BEST TO ADDRESS EQUIPMENT SPECIFIC MINIMUM COVER REQUIREMENTS WITH YOUR LOCAL CONTECH SALES ENGINEER DURING YOUR PRE-CONSTRUCTION MEETING.

ADDITIONAL CONSIDERATIONS

BECAUSE MOST SYSTEMS ARE CONSTRUCTED BELOW-GRADE, RAINFALL CAN RAPIDLY FILL THE EXCAVATION; POTENTIALLY CAUSING FLOATATION AND MOVEMENT OF THE PREVIOUSLY PLACED PIPES. TO HELP MITIGATE POTENTIAL PROBLEMS, IT IS BEST TO START THE INSTALLATION AT THE DOWNSTREAM END WITH THE OUTLET ALREADY CONSTRUCTED TO ALLOW A ROUTE FOR THE WATER TO ESCAPE. TEMPORARY DIVERSION MEASURES MAY BE REQUIRED FOR HIGH FLOWS DUE TO THE RESTRICTED NATURE OF THE OUTLET PIPE.



CMP DETENTION SYSTEM INSPECTION AND MAINTENANCE

UNDERGROUND STORMWATER DETENTION AND INFILTRATION SYSTEMS MUST BE INSPECTED AND MAINTAINED AT REGULAR INTERVALS FOR PURPOSES OF PERFORMANCE AND LONGEVITY.

INSPECTION

INSPECTION IS THE KEY TO EFFECTIVE MAINTENANCE OF CMP DETENTION SYSTEMS AND IS EASILY PERFORMED. CONTECH RECOMMENDS ONGOING, ANNUAL INSPECTIONS. SITES WITH HIGH TRASH LOAD OR SMALL OUTLET CONTROL ORIFICES MAY NEED MORE FREQUENT INSPECTIONS. THE RATE AT WHICH THE SYSTEM COLLECTS POLLUTANTS WILL DEPEND MORE ON SITE SPECIFIC ACTIVITIES RATHER THAN THE SIZE OR CONFIGURATION OF THE SYSTEM.

INSPECTIONS SHOULD BE PERFORMED MORE OFTEN IN EQUIPMENT WASHDOWN AREAS, IN CLIMATES WHERE SANDING AND/OR SALTING OPERATIONS TAKE PLACE, AND IN OTHER VARIOUS INSTANCES IN WHICH ONE WOULD EXPECT HIGHER ACCUMULATIONS OF SEDIMENT OR ABRASIVE/ CORROSIVE CONDITIONS. A RECORD OF EACH INSPECTION IS TO BE MAINTAINED FOR THE LIFE OF THE SYSTEM

MAINTENANCE

CMP DETENTION SYSTEMS SHOULD BE CLEANED WHEN AN INSPECTION REVEALS ACCUMULATED SEDIMENT OR TRASH IS CLOGGING THE DISCHARGE ORIFICE.

ACCUMULATED SEDIMENT AND TRASH CAN TYPICALLY BE EVACUATED THROUGH THE MANHOLE OVER THE OUTLET ORIFICE. IF MAINTENANCE IS NOT PERFORMED AS RECOMMENDED, SEDIMENT AND TRASH MAY ACCUMULATE IN FRONT OF THE OUTLET ORIFICE. MANHOLE COVERS SHOULD BE SECURELY SEATED FOLLOWING CLEANING ACTIVITIES. CONTECH SUGGESTS THAT ALL SYSTEMS BE DESIGNED WITH AN ACCESS/INSPECTION MANHOLE SITUATED AT OR NEAR THE INLET AND THE OUTLET ORIFICE. SHOULD IT BE NECESSARY TO GET INSIDE THE SYSTEM TO PERFORM MAINTENANCE ACTIVITIES, ALL APPROPRIATE PRECAUTIONS REGARDING CONFINED SPACE ENTRY AND OSHA REGULATIONS SHOULD BE FOLLOWED.

ANNUAL INSPECTIONS ARE BEST PRACTICE FOR ALL UNDERGROUND SYSTEMS. DURING THIS INSPECTION, IF EVIDENCE OF SALTING/DE-ICING AGENTS IS OBSERVED WITHIN THE SYSTEM, IT IS BEST PRACTICE FOR THE SYSTEM TO BE RINSED, INCLUDING ABOVE THE SPRING LINE SOON AFTER THE SPRING THAW AS PART OF THE MAINTENANCE PROGRAM FOR THE SYSTEM.

MAINTAINING AN UNDERGROUND DETENTION OR INFILTRATION SYSTEM IS EASIEST WHEN THERE IS NO FLOW ENTERING THE SYSTEM. FOR THIS REASON, IT IS A GOOD IDEA TO SCHEDULE THE CLEANOUT DURING DRY WEATHER.

THE FOREGOING INSPECTION AND MAINTENANCE EFFORTS HELP ENSURE UNDERGROUND PIPE SYSTEMS USED FOR STORMWATER STORAGE CONTINUE TO FUNCTION AS INTENDED BY IDENTIFYING RECOMMENDED REGULAR INSPECTION AND MAINTENANCE PRACTICES. INSPECTION AND MAINTENANCE RELATED TO THE STRUCTURAL INTEGRITY OF THE PIPE OR THE SOUNDNESS OF PIPE JOINT CONNECTIONS IS BEYOND THE SCOPE OF THIS GUIDE.

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DYO49120 Farm Bureau
North 42"
Moreno Valley, CA
DETENTION SYSTEM

PROJECT No.:	SEQ. No.:	DATE:
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DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.: 1		

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Appendix 3: Soils Information

Geotechnical Study and Other Infiltration Testing Data

DUE DILIGENCE GEOTECHNICAL EVALUATION
AND INFILTRATION FEASIBILITY TESTING
PROPOSED MULTI-FAMILY RESIDENTIAL DEVELOPMENT
(FARM BUREAU PROJECT), 9.32-ACRES
21150 AND 21160 BOX SPRINGS ROAD
CITY OF MORENO VALLEY
RIVERSIDE COUNTY, CALIFORNIA
(APNS 256-200-002, -003, AND -004)

FOR

FOREMOST PACIFIC GROUP, LLC
27271 LAS RAMBLES, SUITE 100
MISSION VIEJO, CALIFORNIA 92691

W.O. 8676-A-SC NOVEMBER 9, 2023

GeoSoils, Inc.

Geotechnical • Geologic • Coastal • Environmental

18451 Collier Avenue, Suite A • Lake Elsinore, California 92530 • (951) 471-0700 • FAX (951) 471-0702 • www.geosoilsinc.com

November 9, 2023

W.O. 8676-A-SC

Foremost Pacific Group, LLC
27271 Las Rambles, Suite 100
Mission Viejo, California 92691

Attention: Mr. Bryan Bergeron

Subject: Due Diligence Geotechnical Evaluation and Infiltration Feasibility Testing, Proposed Multi-Family Residential Development (Farm Bureau Project), 9.32-Acres, 21150 and 21160 Box Springs Road, City of Moreno Valley, Riverside County, California (APNs 256-200-002, -003, and -004)

Dear Mr. Bergeron:

In accordance with your request and authorization, GeoSoils, Inc. (GSI) is presenting the results of our due diligence geotechnical evaluation and infiltration feasibility testing for the proposed Farm Bureau project located at 21150 and 21160 Box Springs Road in the City of Moreno Valley, Riverside County, California. The primary purpose of this study was to evaluate the onsite soils and geologic conditions and their effects on the proposed multi-family residential development, from a geotechnical point of view. A secondary purpose of this study was to provide infiltration feasibility testing for the proposed stormwater BMP basin, a limited offsite pavement section thickness evaluation of bounding exterior roadways, preparation of general earthwork and grading guidelines, and development criteria in light of proposed multi-family residential development and site geologic conditions.

EXECUTIVE SUMMARY

Based on our review of readily available data, our recent subsurface investigation, associated laboratory testing, and geologic and engineering analyses, the proposed development of the project site appears suitable for its intended multi-family residential use from a geotechnical viewpoint, provided the recommendations presented in the text of this report are properly implemented. The primary developmental considerations are summarized below:

- The proposed 9.32-acre Farm Bureau project is located at 21150 and 21160 Box Springs Road in the City of Moreno Valley, Riverside County, California. Based on our recent subsurface investigation, and published geologic mapping by Morton and Cox (2001), the site is mantled by a thin layer of early-Pleistocene-age very old alluvial fan deposits (Qvof), underlain by unnamed late-Cenozoic

sedimentary bedrock (Qts). During our subsurface investigation, Cretaceous-age granitic bedrock, of a tonalite composition (Kt) was also encountered, and is mapped just north of the project boundary (Morton and Cox, 2001).

- Our review indicates no known active faults are crossing the site, and the site is not located within an Alquist-Priolo Earthquake Fault Zone (California Department of Conservation, California Geological Survey [CGS], 2018). In addition, the site is not located within a County of Riverside fault zone. Based on our review of the Riverside County Information Technology website (RCIT, 2023), the site is located within a zone of "low" to "very low" liquefaction potential, and is characterized as being potentially susceptible to subsidence (RCIT, 2023). Further discussions of the potentials for liquefaction and subsidence are provided within following sections of this report.

- As encountered during our recent field work, the site is mantled by up to 2½ to 20 feet of very old alluvial fan deposits, underlain by sedimentary and granitic bedrock materials at depth. Due to the relatively low density and lack of uniformity, all near-surface weathered deposits (upper 3 to 7 feet) of alluvial and bedrock materials (sedimentary and granitic), are considered unsuitable for the support of settlement-sensitive improvements or additional engineered fill. Based on the available subsurface data obtained, the thickness of these potentially compressible earth materials is anticipated to be approximately 3 to 7 feet, with an average of approximately 5 feet across the site, with the potential for localized deeper removals.

- Seeps, springs, mottled soils, or other indications of a high regional groundwater level were not noted at the subject site during the time of our field investigation Based on our review of the California Department of Water Resources Water Data Library (CDWR; 2023), nearby well measurements reviewed appear to be regional groundwater measurements at depths of 56.4 and 83.6 feet (Station No. 339387N1172448W001, and No. 339480N1172444W001, respectively) at sites with similar ground surface elevations. As such, the regional groundwater table, at depth, is not anticipated to significantly affect the planned improvements, provided the conclusions and recommendations presented herein are properly incorporated into the design and construction of the project.

- An evaluation of storm water infiltration feasibility within the current BMP locations (selected by the Client) indicates a relatively low infiltration potential at the two specific locations tested. Further discussions of the test procedures used, onsite USDA soil groups, general infiltration siting requirements and limitations, along with the converted infiltration rates obtained are presented herein.

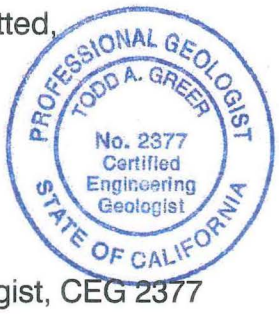
- Adverse geologic features that would preclude project feasibility (e.g., landslides, shallow regional groundwater, subsidence, active faulting, etc.) were not encountered.

- The recommendations presented in this report should be incorporated into preliminary planning, design, and construction considerations of the project.

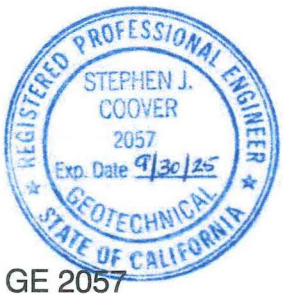
The opportunity to be of service is sincerely appreciated. If you should have any questions, please do not hesitate to contact our office.

Respectfully submitted,

GeoSoils, Inc.



Todd A. Greer
Engineering Geologist, CEG 2377



Stephen J. Coover
Geotechnical Engineer, GE 2057

MAM/TAG/JPF/SJC/sh

Distribution: (1) Addressee (PDF via email)

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DUE DILIGENCE GEOTECHNICAL EVALUATION
AND INFILTRATION FEASIBILITY TESTING
PROPOSED MULTI-FAMILY RESIDENTIAL DEVELOPMENT
(FARM BUREAU PROJECT), 9.32-ACRES
21150 AND 21160 BOX SPRINGS ROAD
CITY OF MORENO VALLEY
RIVERSIDE COUNTY, CALIFORNIA
(APNS 256-200-002, -003, and -004)

SCOPE OF SERVICES

The scope of our services has included the following:

1. Review of online and in-house geologic maps and literature for the site, review of the conceptual site plan provided and development assessment report by AEI CASC Engineering (ACE, undated), including aerial photographs provided by Google Earth Pro (GEP, 2023) and the United States Department of Agricultural (USDA, 1980, see Appendix A).

2. Geologic site reconnaissance and geologic mapping of significant earth materials units and sedimentary structures.

3. The advancement of five (5) exploratory borings across the site for geotechnical logging and soil sample collection, and to evaluate subsurface conditions onsite. In addition, two (2) relatively shallow borings were advanced within the locations of the stormwater BMPs for infiltration feasibility testing.

4. The advancement of two (2) asphaltic concrete (AC) cores via core-drilled samples on the bounding exterior roadway using a subcontractor. After the advancement of the cores through the AC of the roadways structural section, the crushed aggregate base was removed by hand methods, at each coring location, and the AC and aggregate base sections were measured and logged (Appendix B). The final cap consisted of black-dyed Portland Cement Concrete (PCC).

5. General areal seismicity and liquefaction evaluation (Appendix C).

6. Pertinent laboratory testing of representative soil samples collected during our subsurface exploration program. Testing included in-situ moisture and density, maximum density testing, expansion index, and sulfate/corrosion testing of the materials encountered during our field study. Results of our laboratory testing are provided in Appendix D.

7. Appropriate engineering and geologic analyses of data collected and preparation of this report and accompaniments.

SITE LOCATION

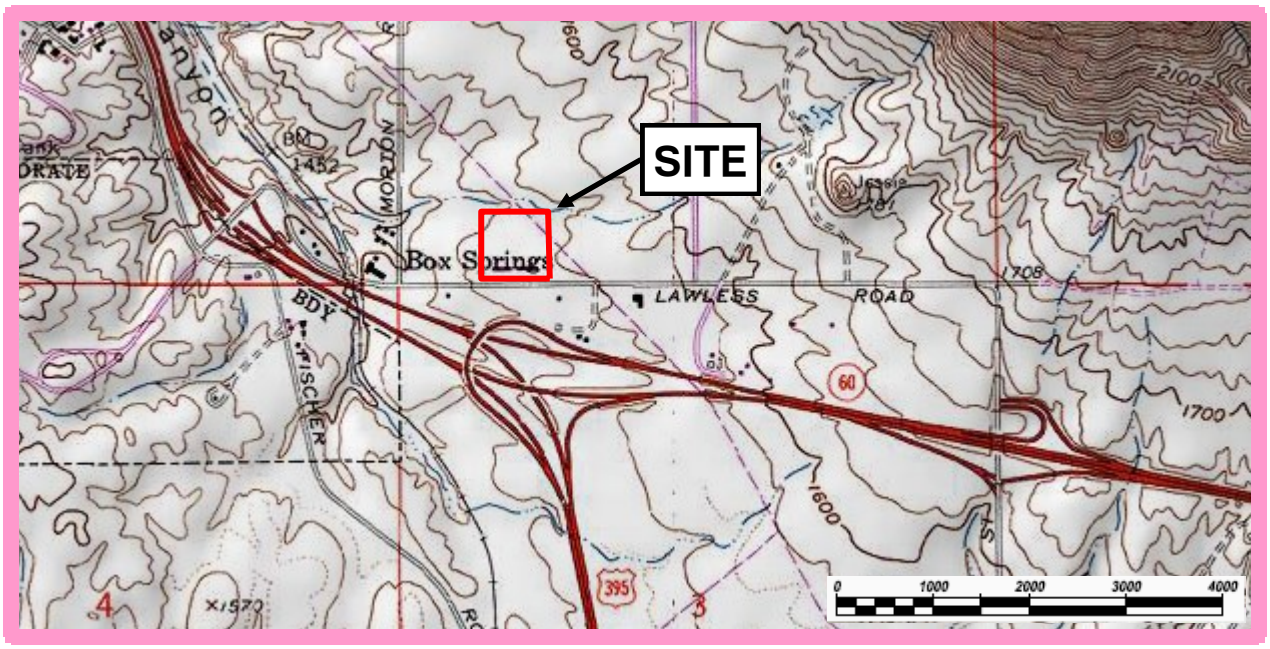
The subject 9.32-acre site is located at 21150 and 21160 Box Springs Road in the City of Moreno Valley, Riverside County, California (see Figure 1, Site Location Map). Based on our review, a majority of the site is currently vacant and undeveloped; however, two (2) commercial buildings occupy the southern side of the site, at the above addresses fronting Box Springs Road. Topographically, the property consists of gently-sloping terrain that varies in elevation from approximately 1,533 feet MSL (Mean Sea Level) near the northwest corner of the site to approximately 1,565 feet MSL near the northeast corner of the property. Therefore, overall relief is on the order of approximately 32 feet. A State aqueduct pipeline easement is located in the northeast corner of the property, however no improvements nor grading are proposed in the easement. Based on our field investigation and review of geologic mapping by Morton and Cox (2001), the site is mantled by a relatively thin layer of early-Pleistocene-age very old alluvial fan deposits (Qvof), underlain by unnamed late-Cenozoic sedimentary bedrock (Qts). During our subsurface investigation Cretaceous-age granitic bedrock, of a tonalite composition (Kt) was also encountered, and is mapped just north of the project boundary (Morton and Cox, 2001). As discussed previously, the site is located within in an area designated as having a "low" to "very low" potential for liquefaction during a seismic event, and the site is characterized as being potentially susceptible to subsidence (RCIT, 2023).

PROPOSED DEVELOPMENT

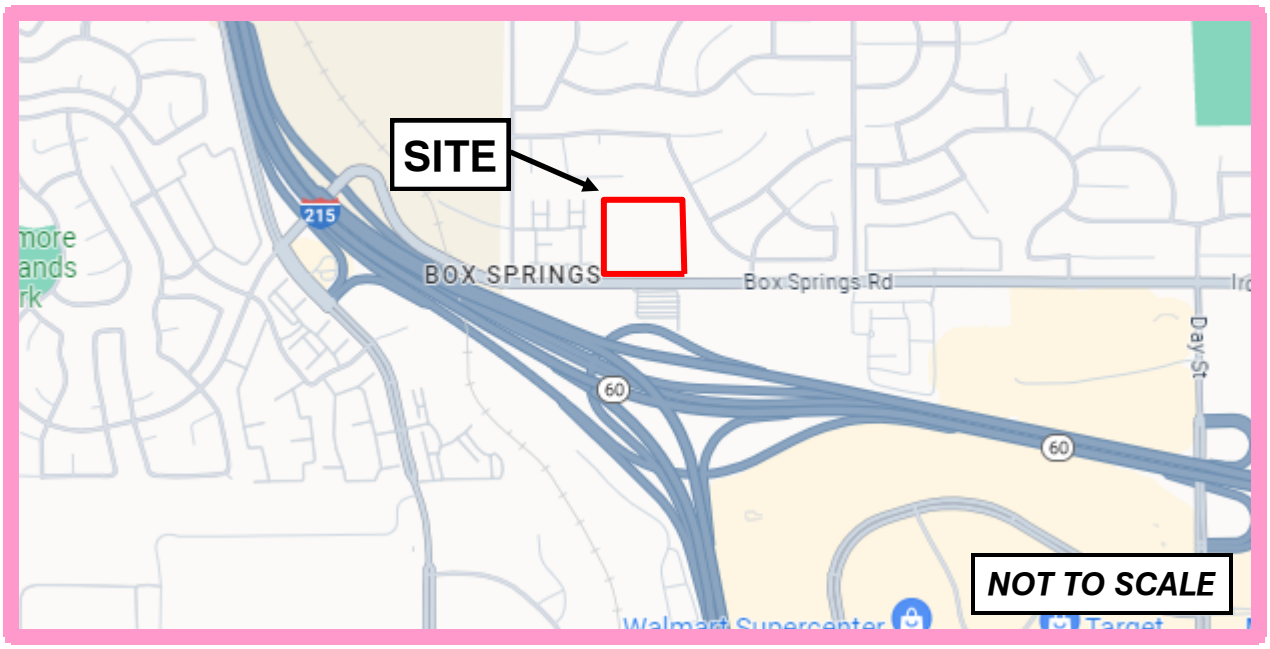
GSI understands that the proposed improvements for the Farm Bureau project would include the development of a residential townhome complex, a recreation facility, water quality stormwater BMPs, associated underground utilities and roadway/parking infrastructure improvements, including perimeter block and retaining wall improvements. Typical cut and fill grading techniques would be necessary to achieve the design grades. We further understand that the multi-family residences are proposed as one or two-story structures, with slab-on-grade/continuous footings using typical wood-frame and stucco type construction. Building loads are assumed to be typical for these types of relatively light structures. Sewage disposal is to be accommodated by tying into the regional system.

FIELD STUDIES

As indicated above, field studies conducted during our evaluation of the property for this investigation consisted of geologic reconnaissance mapping, the advancement of a total of seven (7) exploratory borings across the property for evaluation of near-surface soil and geologic conditions, sample collection, and infiltration feasibility testing. Field exploration was performed on September 18, 2023, with associated infiltration testing conducted on September 19, 2023. The borings were advanced using a hollow-stem drill rig. The



Base Map: TOPO! Copyright 2003 National Geographic, USGS Riverside East Quadrangle, California -- Riverside Co., 7.5 Minute, dated 1967.



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8676-A-SC

SITE LOCATION MAP

Figure 1

borings were observed and logged by a geologist from our firm who also collected representative soil samples for appropriate laboratory testing. The logs of the borings are presented in Appendix B. The approximate locations of the exploratory borings and infiltration test borings advanced for this study are presented on Figure 2 (Geotechnical Map) which uses the undated site plan provided as a base map.

GEOLOGY

Regional Geologic Setting

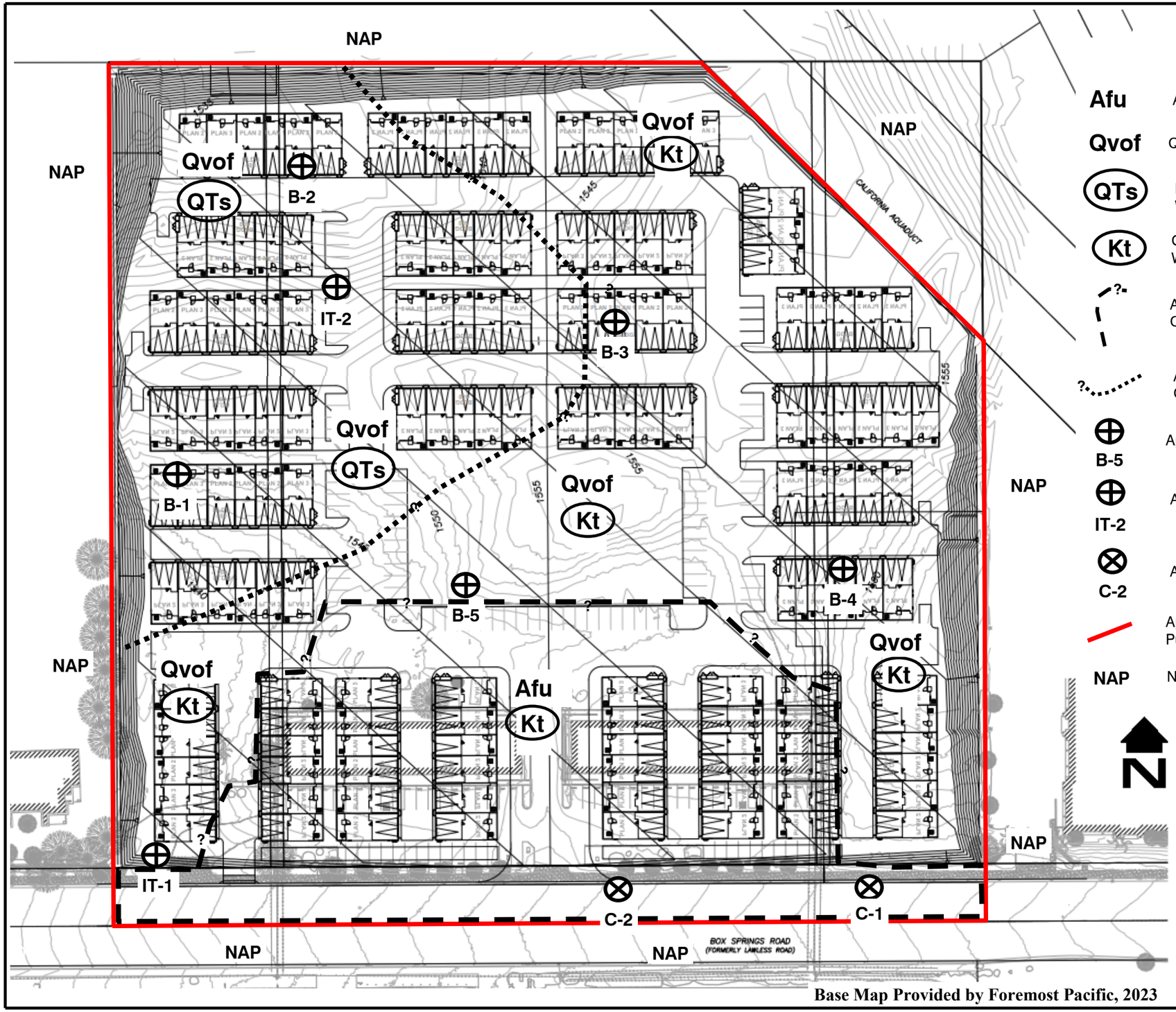
The property lies within the Perris Block, a relatively stable area located between the Elsinore and San Jacinto fault zones, in a prominent natural geomorphic province in southwestern California known as the Peninsular Ranges. The Peninsular Ranges are characterized by steep, elongated ranges and valleys that trend northwesterly. This province is typified by plutonic and metamorphic rocks (bedrock) which comprise the majority of the mountain masses, with relatively thin volcanic and sedimentary deposits discontinuously overlying the bedrock, and with Plio/Pleistocene-age to older Quaternary-age alluvial fan deposits filling in the valleys and younger alluvium filling in the incised drainages. The alluvial deposits are derived from the water borne deposition of the products of weathering and erosion of the bedrock.

Site Geology

Based on our recent subsurface investigation, and published geologic mapping by Morton and Cox (2001), the site is mantled by a relatively thin layer of early-Pleistocene-age very old alluvial fan deposits (Qvof), underlain by unnamed late-Cenozoic sedimentary bedrock (Qts). During our subsurface investigation Cretaceous-age granitic bedrock, of a tonalite composition (Kt) was also encountered, and is mapped just north of the project boundary (Morton and Cox, 2001). Based on our subsurface investigation and geologic reconnaissance mapping, the near-surface very old alluvial fan deposits have been recently tilled (disturbed) for weed abatement purposes.

Site Earth Materials

As discussed above, the earth materials encountered during our subsurface investigation included early-Pleistocene-age very old alluvial fan deposits, unnamed late-Cenozoic sedimentary rocks, and undifferentiated Cretaceous tonalite (Morton and Cox, 2001). Mappable geologic units are shown on Figure 2 (Geotechnical Map), and these units are described as follows, from youngest to oldest:



GSI LEGEND

Afu	Artificial Fill - Undocumented
Qvof	Quaternary - Very Old Alluvial Fan Deposits.
QTs	Late-Cenozoic - Sedimentary Rocks (Circled Where Buried).
Kt	Cretaceous Tonalite, Undifferentiated (Circled Where Buried).
?-	Approximate Location of Geologic Contact, Queried where Uncertain.
?.....	Approximate Location of Concealed Geologic Contact, Queried where Uncertain.
B-5	Approximate Location of Exploratory Boring.
IT-2	Approximate Location of Infiltration Test Boring.
C-2	Approximate Location of Asphalt Core.
	Approximate Boundary of Property Under the Purview of this Report.
NAP	Not A Part of this Study.

ALL LOCATIONS ARE APPROXIMATE

This document or e-file is not part of the Construction Documents and should not be relied upon as being an accurate depiction of design.

Base Map Provided by Foremost Pacific, 2023

GeoSoils, Inc.

Figure 2

GEOTECHNICAL MAP

W.O. 8676-A-SC	DATE: 11/23	SCALE: 1’=100’

Quaternary - Very Old Alluvial Fan Deposits (Map Symbol - Qvof)

As encountered during our recent field work, the site is mantled by up to 2½ to 20 feet of very old alluvial fan deposits, underlain by sedimentary and granitic bedrock materials at depth. These materials were observed to consist primarily of brown to reddish brown silty sands and sandy silts. The very old alluvial fan deposits were generally dry to moist, with a loose consistency near the surface, likely due to previous tilling for weed abatement purposes. At depth, these alluvial materials were generally moist to saturated, with a medium stiff to hard consistency, where silty. Expansion index (E.I.) testing performed on a representative sample of the fan deposits indicates a very low expansive soil condition (E.I. 0-20), on a preliminary basis. However, at the conclusion of site grading, low expansive soils (E.I. 21-50) may not be precluded from occurring. The near-surface weathered old alluvial fan deposits (upper 3 to 7 feet) are considered unsuitable for the support of settlement-sensitive improvements (i.e., building foundations, concrete slab-on-grade floors, site walls, pavements, exterior hardscape, etc.) and will require surficial removal and recompaction during rough grading. The very old alluvial fan deposits may be reused for compacted fills, provided that they have been cleansed of deleterious materials (i.e., weeds, grasses, and concentrations of organic matter), prior to placement onsite as engineered fill.

Unnamed Late-Cenozoic Sedimentary Rocks (Map Symbol - QTs)

As encountered onsite, late-Cenozoic sedimentary rocks were logged underlying the alluvial fan deposits on the northwestern portion of the site. Upon drilling, the sedimentary bedrock deposits generally consisted of grayish brown to dark gray silty sands. The sedimentary rock deposits were generally damp, and were dense to very dense with depth; however, they were penetrated with the hollow stem auger drill rig, with moderate production, to depths ranging from 16½ to 26½ feet below the existing ground surface. If encountered during anticipated remedial removals or planned cuts, any weathered late-Cenozoic sedimentary rock deposits (upper 1 to 2 feet) may also need to be removed and recompacted during rough grading. These sedimentary bedrock deposits may be reused for compacted fills, provided that they have been cleansed of deleterious materials, prior to placement onsite as engineered fill.

Cretaceous-age - Tonalite - Undifferentiated (Map Symbol - Kt)

As encountered onsite, Cretaceous-age granitic rocks, of a tonalite composition (Morton and Cox, 2001) were logged underlying the very old alluvial fan deposits onsite. The Cretaceous-age granitic bedrock was encountered at depths ranging from 2½ feet (hillside areas) to as much as 20 feet below existing grades (low-lying areas). The granitic bedrock materials observed were typically composed of biotite-hornblende tonalite that were grayish brown, dark gray, to yellow in color, and predominately damp in moisture content. The near-surface granitic bedrock appears to be somewhat weathered to moderately weathered, becoming very dense with depth. The granitic bedrock materials

were penetrated with the hollow stem auger drill rig, with slow production, to a depth of 5½ to 10½ feet, where explored. While no bedrock outcrops exist onsite, the possibility of localized areas of non-rippable and non-trenchable bedrock materials may exist onsite in the form of slightly weathered to unweathered bedrock materials at depth. The soils derived from these granitic rocks commonly have a very low expansion potential. However, weathered, near-surface residual soils may have a low expansion potential. These granitic bedrock materials may be reused for compacted fills, provided that they have been cleansed of deleterious materials, and any oversized rock (greater than 12 inches) prior to placement onsite as engineered fill.

GROUNDWATER

Seeps, springs, mottled soils, perched groundwater, or other indications of a high regional groundwater level were not noted at the subject site during the time of our field investigation. Based on our review of the California Department of Water Resources Water Data Library (CDWR; 2023), nearby well measurements reviewed appear to be regional groundwater measurements at depths of 56.4 and 83.6 feet (Station No. 339387N1172448W001, and No. 339480N1172444W001, respectively) at sites with similar ground surface elevations. As such, the regional groundwater table, at depth, is not anticipated to significantly affect the planned improvements, provided the conclusions and recommendations presented herein are properly incorporated into the design and construction of the project. In general, perched groundwater and seepage may occur along fill-alluvial and fill-bedrock contacts, or along discontinuities (sand lenses, bedding planes, joints, and fractures) due to migration from adjacent drainage areas and development during or after periods of above normal or heavy precipitation or irrigation.

FAULTING AND REGIONAL SEISMICITY

Local and Regional Faults

Our review indicates that there are no known active faults crossing this site, and the site is not within an Alquist-Priolo Earthquake Fault Zone (California Geological Survey [CGS], 2018). However, the site is situated in a region subject to strong earthquakes occurring along active faults. These faults include, but are not limited to, the Claremont fault, the Rialto-Colton fault, and others within the San Jacinto fault zone; and the San Andreas Fault system.

According to Blake (2000a), the closest known active faults to the site are the San Bernardino and San Jacinto Valley-Casa Loma segments of the San Jacinto fault zone, and are both located approximately 6.1 miles (9.8 km) north-northeast of the site. Both segments of the San Jacinto fault zone have demonstrated movement in the Holocene Epoch (i.e., last 11,700 years), and therefore, are considered active and are located within

Alquist-Priolo Earthquake Fault Zones (CGS, 2018). Cao, et al. (2003) indicates that the San Bernardino and San Jacinto Valley/Casa Loma segments of the San Jacinto fault zone are both "A" faults and are capable of producing a maximum magnitude (M_w) 6.7 and 6.9 earthquake, respectively. The possibility of ground acceleration, or shaking at the site, may be considered as approximately similar to the Southern California region as a whole.

Seismicity

The acceleration-attenuation relations of Bozorgnia, Campbell, and Niazi (1999), have been incorporated into EQFAULT (Blake, 2000a). For this study, peak horizontal ground accelerations anticipated at the site were determined based on the mean plus 1 - sigma attenuation curves developed by those authors. The EQFAULT computer program performs deterministic seismic hazard analyses using digitized California faults as earthquake sources. The program estimates the closest distance between each fault and a given site. If a fault is found to be within a user-selected radius, the program estimates peak horizontal ground acceleration that may occur at the site from an upper bound ("maximum credible") earthquake on that fault. Site acceleration (g) is computed by user-selected acceleration-attenuation relations that are contained in EQFAULT. Based on the EQFAULT program, peak horizontal ground accelerations (deterministic acceleration values) from an upper bound event at the site may be on the order of 0.5013g.

Historical Site Acceleration

Historical site seismicity was evaluated with the acceleration-attenuation relations of Bozorgnia, Campbell, and Niazi (1999) and the computer program EQSEARCH (Blake, 2000b). This program was used to perform a search of historical earthquake records for magnitude 5.0 to 9.0 seismic events within a 100 km radius, between the years 1800 to May 8, 2021. Based on the selected acceleration-attenuation relation, a peak horizontal ground acceleration has been estimated, which may have affected the site during the specific seismic events in the past. Based on the available data and attenuation relationship used, the estimated maximum (peak) site acceleration during the period 1800 to May 8, 2021, was 0.447g. In addition, a seismic recurrence curve is also estimated/generated from the historical data (see Appendix C).

Seismic Design Parameters

Based on the site conditions, the following table summarizes the site-specific design criteria obtained from the 2022 CBC (CBSC, 2022), Chapter 16 Structural Design, Section 1613, Earthquake Loads. The computer program "Seismic Design Maps," provided by the California Office of Statewide Health Planning and Development (OSHPD, 2023) was used for design (https://seismicmaps.org/). The short spectral response uses a period of 0.2 seconds.

2022 CBC SEISMIC DESIGN PARAMETERS		
PARAMETER	**VALUE**	**2022 CBC OR REFERENCE**
Risk Category	I, II, or III	Table 1604.5
Site Class	C	Section 1613.2.2/Chap. 20 ASCE 7-16 (p. 203-204)
Spectral Response - (0.2 sec), S_s	1.5g	Section 1613.2.1 Figure 1613.2.1(1)
Spectral Response - (1 sec), S_1	0.6g	Section 1613.2.1 Figure 1613.2.1(2)
Site Coefficient, F_a	1.2	Table 1613.2.3(1)
Site Coefficient, F_v	1.4	Table 1613.2.3(2)
Maximum Considered Earthquake Spectral Response Acceleration (0.2 sec), S_{MS}	1.8g	Section 1613.2.3 (Eqn 16-36)
Maximum Considered Earthquake Spectral Response Acceleration (1 sec), S_{M1}	0.84g	Section 1613.2.3 (Eqn 16-37)
5% Damped Design Spectral Response Acceleration (0.2 sec), S_{DS}	1.2g	Section 1613.2.4 (Eqn 16-38)
5% Damped Design Spectral Response Acceleration (1 sec), S_{D1}	0.56g	Section 1613.2.4 (Eqn 16-39)
PGA_M - Probabilistic Vertical Ground Acceleration may be assumed as about 50% of these values.	0.747g	ASCE 7-16 (Eqn 11.8.1)
Seismic Design Category	D	Section 1613.2.5/ASCE 7-16 (p. 85: Table 11.6-1 or 11.6-2)

GENERAL SEISMIC PARAMETERS	
PARAMETER	**VALUE**
Distance to Seismic Source (A fault)[1]	6.1 mi (9.8 km)[2]
Upper Bound Earthquake San Jacinto (San Jacinto Valley/Casa Loma) Segment	$M_w = 6.9$ [1]
[1] - Cao, et al. (2003) [2] - USGS (2021)	

Conformance to the criteria above for seismic design does not constitute any kind of guarantee or assurance that significant structural damage or ground failure will not occur in the event of a large earthquake. The primary goal of seismic design is to protect life, not to eliminate all damage, since such design may be economically prohibitive. Cumulative effects of seismic events are not addressed in the 2022 CBC (CBSC, 2022) and regular maintenance and repair following locally significant seismic events (i.e., M_w5.5) will likely be necessary, as is the case in all of Southern California.

In the event of a maximum probable or credible earthquake occurring on any of the nearby major faults, strong ground shaking would occur in the subject site's general area. Potential damage to any structure(s) would likely be greatest from the vibrations and impelling force caused by the inertia of a structure's mass. This potential would be no greater than that for other existing structures and improvements in the immediate vicinity.

SECONDARY SEISMIC HAZARDS

The following list includes other geologic/seismic related hazards that have been considered during our evaluation of the site. The hazards listed are considered negligible or mitigated as a result of site location, soil characteristics, recommended remedial site grading, and typical site development procedures:

- Liquefaction
- Lateral Spreading
- Subsidence
- Ground Lurching or Shallow Ground Rupture
- Tsunami
- Seiche

A review of the Riverside County Information Technology (RCIT, 2023), or "Map My County" website indicates that the site is not located within a County of Riverside fault zone. However, based on our review, the site is located within a zone of "low" to "very low" liquefaction potential, and is characterized as being potentially susceptible to subsidence (RCIT, 2023). Our general liquefaction screening evaluation (pursuant to Special Publication 117 [CGS, 2008 SP117]) indicates that the potential for liquefaction and associated adverse effects within the site is considered low, based on the dense/medium stiff to very dense/hard very old alluvial fan deposits which underlie the site at shallow depths, the very dense/hard bedrock materials (sedimentary and granitic) at depth, and the anticipated removal and recompaction of near-surface potentially compressible soils during site grading activities.

The effects of areal subsidence generally occur at the transition or boundaries between low-lying areas and adjacent hillside terrain, where materials of substantially different engineering properties (i.e., thick alluvium vs. bedrock) are present, or in areas of overdraft owing to groundwater withdrawal, usually where bounded by Neogene faults. Our review of available data, as well as stereoscopic aerial photographs (USDA, 1980), showed no features generally associated with areal subsidence (i.e., radially-directed drainages flowing into a depression(s), linearity of depressions associated with mountain fronts, etc.), directly on the project site. In view of the nature of the underlying very old alluvial fan deposits, the shallow bedrock materials, and lack of onsite faulting, the potential for this phenomena to affect the site is considered very low.

In addition, ground fissures are generally associated with excessive groundwater withdrawal and associated subsidence, or active faulting. Our review did not reveal any information that active faulting or excessive groundwater withdrawal, or ground fissures, or hydroconsolidation in the specific site location, is occurring at this time. Therefore, the potential for ground fissures is also considered very low.

MASS WASTING/LANDSLIDE SUSCEPTIBILITY

Mass wasting refers to the various processes by which earth materials are moved down slope in response to the force of gravity. Examples of these processes include slope creep, surficial failures, and deep-seated landslides. Creep is the slowest form of mass wasting and generally involves the outer 5 to 10 feet of a slope surface. During heavy rains, such as those in El Niño years, creep-affected materials may become saturated, resulting in a more rapid form of downslope movement (i.e., landslides or surficial failures). For this relatively low relief (gently-sloping) site, geomorphic expressions indicative of past mass wasting events (i.e., scarps and hummocky terrain) were not observed on the property during our field studies, nor in our review of regional geologic mapping. Further, no adverse geologic structures were encountered during our subsurface exploration. Regional geologic maps do not indicate the presence of landslides on the property. However, based on the granular nature of the onsite earth materials, the onsite soils are considered erosive. Therefore, slopes composed of these materials may be subject to rilling, gullying, sloughing, depending on rainfall severity and surface drainage practices. Such risks can be minimized through properly designed, and regularly and periodically maintained surface drainage.

LABORATORY TESTING

Classification

Soils were classified visually according to the Unified Soils Classification System. The soil classifications are shown on the Boring Logs presented in Appendix B. The Laboratory Test Results are presented in Appendix D.

Moisture-Density

The field moisture contents and dry unit weights were determined for undisturbed ring samples for the soils encountered in the exploratory borings. The dry unit weight was determined in pounds per cubic foot (pcf) and the field moisture content was determined as a percentage of the dry unit weight. The results of these tests are shown on the Boring Logs (Appendix B).

Laboratory Standard

The maximum dry density and optimum moisture content was determined for the major soil type encountered within the exploratory borings. The laboratory standard used was ASTM D 1557. The moisture-density relationships obtained are shown below:

SOIL TYPE	BORING AND DEPTH (ft.)	MAXIMUM DRY DENSITY (pcf)	OPTIMUM MOISTURE CONTENT (%)
Silty Sand, Brown (Rock Corrected)	B-3 @ 0-5	137.5	6.2
Silty Sand, Brown (Uncorrected)	B-3 @ 0-5	134.6	6.9

Expansion Potential

Expansion index (E.I.) testing was performed on a representative sample of site earth materials. E.I. test results are presented in the following Table. Additional E.I. testing should be conducted at the conclusion of site grading to further evaluate the preliminary test results obtained.

SOIL TYPE	LOCATION & DEPTH (FT)	EXPANSION INDEX (E.I.)	EXPANSION POTENTIAL
Brown, Silty SAND	B-3 @ 0-5	<5	Very Low

Soluble Sulfates/Corrosion

A representative sample of site soil was analyzed for soluble sulfates, chloride, pH, and resistivity. The soluble sulfate and corrosion potential results are presented in the following Table. Additional sulfate/corrosion testing should be conducted at the conclusion of site grading to further evaluate the preliminary test results obtained.

LOCATION AND DEPTH (FT.)	SOLUBLE SULFATES (PERCENTAGE BY WEIGHT)	CHLORIDE (PPM)	pH	RESISTIVITY (OHMS-CM)
B-3 @ 0-5	<0.003	43	7.5	8,800

For preliminary planning purposes, and based upon the soluble sulfate test results and the latest edition of the 2022 CBC (CBSC, 2022), the soluble sulfate content is considered Class “S0” per the ACI 318-14 (0.00 to 0.10 soil percentage by weight is considered Class “S0”). As such, sulfate-resistant concrete is currently not anticipated. Based on the results of the resistivity and pH testing, the onsite soils are generally considered slightly alkaline (a pH of 7.4 to 7.8 is considered slightly alkaline), and are considered moderately corrosive to ferrous metals in a saturated state (2,000 to 10,000 ohm-cm is considered moderately corrosive). Chlorides are generally low.

Although the site soils are categorized as being moderately corrosive toward ferrous metals, it is our understanding that ferrous metals embedded in properly poured and formed concrete with the proper mix should be adequately protected from these conditions. Based upon the laboratory test results obtained, a consulting corrosion engineer may be retained to provide specific recommendations for foundations, utility piping, etc, as warranted.

Direct Shear Testing

Direct shear testing was performed on a remolded sample of site earth materials collected from the borings in general accordance with ASTM D 3080. The shear testing results are provided in the following table, and in Appendix D.

SAMPLE LOCATION AND DEPTH (FT)	PRIMARY		RESIDUAL	
	COHESION (PSF)	FRICTION ANGLE (DEGREES)	COHESION (PSF)	FRICTION ANGLE (DEGREES)
B-3 @ 0-5	210	38	110	37

PERCOLATION/INFILTRATION TESTING

In general accordance with guidelines of the Riverside County Flood Control (RCFC, 2011) Design Handbook for Low Impact Development Best Management Practices, and following errata (RCFC, 2016), two (2) percolation tests were conducted at the locations provided by the client (see Geotechnical Map, Figure 2). The percolation testing was conducted within the proposed areas of the BMP systems, at a depth of 5 feet. The percolation/infiltration testing was performed to further evaluate site conditions with respect to the proposed water quality BMP systems that will retain and filter onsite storm water. The percolation testing was performed in general conformance with the RCFC (2011 and 2016) and CASQA (2003) design handbooks for such testing. The field percolation testing and geologic logging were performed by a staff geologist from our firm. Logs of the borings advanced for this study are included in Appendix B. The field percolation data sheets are presented in Appendix E. Procedures for testing are outlined briefly below:

Percolation Test Procedures

Test Borings:

1. Diameter - 8 inches.
2. After the removal of loose materials, 2 inches of gravel was placed on the bottom of each test cup.
3. A perforated pipe was then installed within each test location to facilitate accurate field measurements and prevent caving during the pre-soak period and next day testing.

Pre-Soaking: After the installation of the perforated pipes, the boring was filled with clear water several times. The pre-soak period for percolation tests continued overnight, as all the water did not seep away while the tester was present.

Sandy Soil Test: During the sandy soil test period, two (2) consecutive measurements were conducted at each test location at intervals of approximately 25 minutes. Less than 6 inches of water seeped away during each of the two (2) test measurements within the percolation test locations, therefore a 30 minute test period was selected for standard (percolation) testing.

Testing: After required pre-soak period and sandy soil test periods, percolation testing measurements were made. A column of clear water was re-established within each of the test locations. The drop in water level was measured from a fixed reference point, refilling after each test measurement. For each test, a series of test measurements were taken for a minimum of six (6) hours, at time intervals of 30 minutes.

Accuracy: All test measurements were read to the nearest ¼-inch.

Test Results: Calculations from our field testing indicate percolation rates of 10 minutes/inch in both locations. Per the RCFC (2011) guidelines, the percolation rates obtained were then converted to infiltration rates utilizing the "Porchet Method," to be used by the design engineer for appropriate sizing of the BMP systems (RCFC, 2011). The converted infiltration rates obtained varied between 0.56 and 0.42 inches/hour, with an average of 0.49 inches/hour. Typically, the lowest infiltration rate obtained is applied to the design; therefore, an unfactored (i.e., no factor of safety) design infiltration rate (DIR) of 0.42 inches/hour may used by the design engineer. The converted infiltration rates, along with the formulas used are presented in Figure 3 (Percolation Rate to Infiltration Rate Conversion).

USDA Site Soil Groups, Soil Units, Ksat Values

Our review of the United States Department of Agriculture (USDA, 2023) Web Soil Survey (https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm), indicates four (4) major soil units underlie the site. These include the Fallbrook fine sandy loam, the Hanford coarse sandy loam, the Monserate sandy loam, and the Monserate sandy loam, shallow. The Fallbrook fine sandy loam (FkD2) and the Monserate sandy loam (MmC2) are the two soil units that generally underlie the areas of the proposed stormwater basins, with FkD2 comprising the majority of the northwestern section of the site and FkD2 and MmC2 both appearing in the southwest. Based on our review, the soils onsite belong to Hydrologic

Percolation Rate to Infiltration Rate Conversion

* Infiltration Rate (I_t) = $\dfrac{\Delta H\ \pi r^2\ 60}{\Delta t(\pi r^2 + 2\pi r H_{avg})} = \dfrac{\Delta H\ 60\ r}{\Delta t(r+2H_{avg})}$

Where:
- I_t = tested infiltration rate, inches/hour
- ΔH = change in head over the time interval, inches
- Δt = time interval, minutes
- r = effective radius of test hole
- H_{avg} = average head over the time interval, inches

		Δt	Init Level	Fnl Level	ΔH	H_{avg}	I_t	
Infiltration Test Numbers	IT-1 @ 5 ft.	30	21	18	3	19 1/2	0.56	
	IT-2 @ 5 ft.	30	28	25	3	26 1/2	0.42	
								Low = 0.42
								Average = 0.49
								**DIR= 0.42

* Conversion per the "Porchet Method" (RCFWCD, 2011)

** DIR = Design Infiltration Rate

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Figure 3

Soil Groups “A,” “C,” and “D,” with the capacity of the most limiting soil layer to transmit water classified as “very low” to “high”. The “K_{sat}” value (i.e., hydraulic conductivity or infiltration rate) for the soil type onsite was evaluated to be within the range of 0.00 (very low) to 5.95 (high) inches per hour. The results of site specific infiltration testing (this study) generally appear consistent with the findings presented in the USDA data set.

Infiltration Basin Siting Requirements

Our review of the general infiltration basin siting requirements and limitations (CASQA, 2003), indicates sites characterized as belonging to Hydrologic Soil Group “A,” “B,” and “C” may be suitable for infiltration, requiring a minimum soil infiltration rate of 0.5 inches/hour (CASQA, 2003). Based on our review of historic regional groundwater levels and recent onsite subsurface investigation, and provided a relatively shallow BMP systems are constructed, a minimum 10-foot vertical separation from the bottom of the BMP systems to the top of historic high groundwater levels will be maintained.

The design engineer will need to review basin siting requirements by CASQA (2003) and the converted rates obtained during this study with respect to the proposed water quality BMP systems. An appropriate factor of safety (FOS), per the RCFC (2011) BMP design handbook, should also be applied by the design engineer.

Onsite Storm Water Quality Best Management Practice (BMP) Systems

It is our understanding that onsite infiltration-runoff retention systems (OIRRS) are planned for Best Management Practices (BMPs) or Low Impact Development (LID) principles for the project, certain guidelines must be followed in the planning, design, and construction of such systems. Such systems, if improperly designed or implemented without consideration of the geotechnical aspects of site conditions, can contribute to flooding, saturation of bearing materials beneath site improvements, slope instability, and possible concentration and contribution of pollutants into the groundwater or storm drain or utility trench systems.

A key factor in these systems is the infiltration rate (often referred to as the percolation rate) which can be ascribed to, or determined for, the earth materials within which these systems are installed. Additionally, the infiltration rate of the designed system (which may include gravel, sand, mulch/topsoil, or other amendments, etc.) will need to be considered. The project infiltration testing is very site specific, any changes to the location of the proposed OIRRS or estimated size of the OIRRS, may require additional infiltration testing. Locally, relatively impermeable formations include: clayey surficial soils, igneous and metamorphic bedrock, as well as future fine grained fill soils.

Some of the methods which are used for onsite infiltration include percolation basins, dry wells, bio-swale/bio-retention, permeable pavers/pavement, infiltration trenches, filter boxes and subsurface infiltration galleries/chambers. Some of these systems are constructed using native and import soils, perforated piping, and filter fabrics while others

employ structural components such as stormwater infiltration chambers and filters/separators. Every site will have characteristics which should lend themselves to one or more of these methods, but not every site is suitable for OIRRS. In practice, OIRRS are usually initially designed by the project design civil engineer. Selection of methods should include (but should not be limited to) review by licensed professionals including the geotechnical engineer, hydrogeologist, engineering geologist, project civil engineer, landscape architect, environmental professional, and industrial hygienist. Applicable governing agency requirements should be reviewed and included in design considerations.

The following geotechnical guidelines should be considered when designing onsite infiltration-runoff retention systems:

- It is not good engineering practice to allow water to saturate soils, especially near slopes or improvements; however, the controlling agency/authority is now requiring this for OIRRS purposes on many projects.

- Wherever possible, infiltration systems should not be installed within 50 feet of the tops of slopes steeper than 15 percent or within H/3 from the tops of slopes (where "H" equals the height of slope).

- Impermeable liners used in conjunction with basins should consist of a 30-mil polyvinyl chloride (PVC) membrane that is covered by a minimum of 12 inches of clean soil, free from rocks and debris, at a maximum inclination of 4:1 (h:v), and meets the following minimum specifications:

  Specific Gravity (ASTM D792): 1.2 (g/cc [min.]); Tensile (ASTM D882): 73 (lb/in-width [min.]); Elongation at Break (ASTM D882): 380 (% [min.]); Modulus (ASTM D882): 30 (lb/in-width [min.]); and Tear Strength (ASTM D1004): 8 (lbs [min.]); Seam Shear Strength (ASTM D882) 58.4 (lb/in [min.]); Seam Peel Strength (ASTM D882) 15 (lb/in [min]).

- Wherever possible, infiltrations systems should not be placed within a distance of H/2 from the toes of slopes (where H equals the height of slope).

- The landscape architect should be notified of the location of the proposed OIRRS. If landscaping is proposed within the OIRRS, consideration should be given to the type of vegetation chosen and their potential effect upon subsurface improvements (i.e., some trees/shrubs will have an effect on subsurface improvements with their extensive root systems). Over-watering landscape areas above, or adjacent to, the proposed OIRRS could adversely affect performance of the system.

- Areas adjacent to, or within, the OIRRS that are subject to inundation should be properly protected against scouring, undermining, and erosion, in accordance with the recommendations of the design engineer.

- Infiltrations systems should not be installed within 8 feet of building foundations utility trenches, and walls, or a 1:1 (horizontal to vertical [h:v]) slope (down and away) from the bottom elements of these improvements. Alternatively, deepened foundations or pile/pier supported improvements may be used.

- Infiltrations systems should not be installed adjacent to pavement or hardscape improvements. Alternatively, deepened/thickened edges and curbs or impermeable liners may be used in areas adjoining the OIRRS.

- As with any OIRRS, localized ponding and groundwater seepage should be anticipated. The potential for seepage or perched groundwater to occur after site development should be disclosed to all interested/affected parties.

- Installation of infiltrations systems should avoid expansive soils (Expansion Index [E.I.] $\geq$51) or soils with a relatively high plasticity index (P.I. > 20).

- Infiltration systems should not be installed where the vertical separation of the groundwater level is less than 10 feet from the base of the system.

- Where permeable pavements are planned as part of the system, the site Traffic Index (T.I.) Should be less than 25,000 Average Daily Traffic (ADT), as recommended in Allen, et al. (2011).

- Infiltration systems should be designed using a suitable factor of safety (FOS) to account for uncertainties in the known infiltration rates (as generally required by the controlling authorities), and reduction in performance over time.

- As with any OIRRS, proper care will need to provided. Best management practices should be followed at all times, especially during inclement weather. Provisions for the management of any siltation, debris within the OIRRS, or overgrown vegetation (including root systems) should be considered. An appropriate inspection schedule will need to adopted and provided to all interested/affected parties.

- Any designed system will require regular and periodic maintenance, which may include rehabilitation or complete replacement of the filter media (e.g., sand, gravel, filter fabrics, topsoils, mulch, etc.) or other components used in construction, so that the design life exceeds 15 years. Due to the potential for piping and adverse seepage conditions, a burrowing rodent control program should also be implemented onsite.

- Newly established vegetation/landscaping (including phreatophytes) may have root systems that will influence the performance of the OIRRS or nearby LID systems.

- The potential for surface flooding, in the case of system blockage, should be evaluated by the design engineer.

- Any proposed utility backfill materials (i.e., inlet/outlet piping or other subsurface utilities) located within or near the proposed area of the OIRRS may become saturated. This is due to the potential for piping, water migration, or seepage along the utility trench line backfill. If utility trenches cross or are proposed near the OIRRS, cut-off walls or other water barriers will need to be installed to mitigate the potential for piping and excess water entering the utility backfill materials. Planned or existing utilities may also be subject to piping of fines into open-graded gravel backfill layers unless separated from overlying or adjoining OIRRS by geotextiles or slurry backfill.

- The use of OIRRS above existing utilities that might degrade/corrode with the introduction of water/seepage should be avoided.

PRELIMINARY CONCLUSIONS AND RECOMMENDATIONS

Based on our field exploration, laboratory testing, and geotechnical engineering analysis, it is our opinion that the subject site is suitable for the proposed multi-family residential development from a geotechnical engineering and geologic viewpoint, provided that the recommendations presented in the following sections are incorporated into the design and construction phases of site development. The primary geotechnical concerns with respect to the proposed development and improvements are:

- Earth materials characteristics and depth to competent bearing material.
- On-going expansion and corrosion potential of site soils.
- Erosiveness of site earth materials.
- Potential for perched water during and following site development.
- Regional seismic activity.

The recommendations presented herein consider these as well as other aspects of the site. The engineering analyses performed concerning site preparation and the recommendations presented herein have been completed using the information provided and obtained during our field work. In the event that any significant changes are made to proposed site development, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and the recommendations of this report verified or modified in writing by this office. Foundation design parameters are considered preliminary until the foundation design, layout, and structural loads are provided to this office for review.

EARTHWORK CONSTRUCTION RECOMMENDATIONS

General

All earthwork should conform to the guidelines presented in the 2022 CBC (CBSC, 2022), the requirements of the City of Moreno Valley and County of Riverside, and the General

Earthwork and Grading Guidelines presented in Appendix F, except where specifically superceded in the text of this report. Prior to earthwork, a GSI representative should be present at the preconstruction meeting to provide additional earthwork guidelines, if needed, and review the rough grading and earthwork schedule.

During earthwork construction, all site preparation and the general grading procedures of the contractor should be observed and the fill selectively tested by a representative(s) of GSI. If unusual or unexpected conditions are exposed in the field, they should be reviewed by this office and, if warranted, modified or additional recommendations will be offered. All applicable requirements of local and national construction and general industry safety orders, the Occupational Safety and Health Act (OSHA, 2011), and the Construction Safety Act should be met. It is the onsite general contractor's and individual subcontractors' responsibility to provide a safe working environment for our field staff who are onsite. GSI does not consult in the area of safety engineering.

1. Soils engineering and compaction testing services should be provided during grading operations to assist the contractor in removing unsuitable soils and in his effort to compact the fill.

2. Geologic observations should be performed during grading to document or further evaluate geologic conditions. Although unlikely, if adverse geologic structures are encountered, supplemental recommendations and earthwork may be warranted.

3. In general, and based upon the available data to date, regional groundwater will not be a factor in site development or underground utility installation. However, seepage may be encountered along fill contacts or throughout the site along with seasonal perched water. Seepage and a transient perched water table can also develop along, or near, the contact between near surface fills and the underlying native soil, most likely after heavy rains, or due to irrigation practices or other factors not evident at the time of our review. This may occur after development. As such, the need for localized subdrainage systems for the control of seepage and perched water should be anticipated.

4. Based upon the proposed development plan and our field exploration, the very old alluvial fan deposits, and bedrock materials (sedimentary and granitic) throughout the site should be readily rippable with conventional earthwork equipment, in good working order.

5. Due to the non-cohesive nature of some of the onsite materials, some caving and sloughing should be anticipated in all subsurface excavations and trenching. Therefore, current local and state/federal safety ordinances for subsurface trenching should be enforced.

6. General earthwork, grading guidelines, and preliminary criteria are provided at the end of this report as Appendix F. Specific recommendations are provided below.

Demolition/Grubbing

1. Any existing surficial/subsurface structures (i.e., foundations, septic systems, etc.), tress and major vegetation, bushes, and any miscellaneous debris should be removed from the areas of proposed grading.

2. The project geotechnical consultant should be notified of any previous foundation, irrigation or drain lines, septic systems, or other subsurface structures that are uncovered during the recommended removals, so that appropriate remedial recommendations can be provided.

3. Cavities or loose soils remaining after demolition and site clearance should be cleaned out, observed by the soils engineer, processed, and replaced with fill that has been moisture conditioned to at least optimum moisture content and compacted to at least 90 percent of the laboratory standard (ASTM D 1557), if not removed by proposed cuts.

Treatment of Existing Ground

1. All near-surface weathered very old alluvial fan deposits and bedrock materials (sedimentary and granitic) should be removed to either competent very old alluvial fan deposits or bedrock materials (i.e., greater than or equal to 85 percent compaction, or greater than or equal to 105 pcf for in-place native materials). For preliminary planning purposes, removal depths are estimated to be approximately 3 to 7 feet, with an average of approximately 5 feet across the site, with the potential for localized deeper removals. However, a minimum of 2 feet of compacted fill should underlie proposed building foundations. Actual depths of removals will be evaluated in the field during grading by the geotechnical consultant.

2. After the above removals, the upper 6 inches of the exposed subsoils should be scarified, brought to at least optimum moisture content, and recompacted to a minimum relative compaction of 90 percent of the laboratory standard.

3. The existing site soils and earth materials may be reused as compacted fill provided that any significant concentrations of vegetation and miscellaneous trash/debris are removed prior to or during fill placement.

4. Localized deeper removal may be necessary due to buried drainage channel meanders or dry porous materials. The project geotechnical consultant/geologist should observe all removal areas during the grading.

Fill Placement

1. Fill materials should be cleansed of significant vegetation and debris prior to fill placement.

2. Fill materials should be brought to at least optimum moisture, placed in thin 6- to 8-inch lifts and mechanically compacted to obtain a minimum relative compaction of 90 percent of the laboratory standard (ASTM D 1557).

3. While appreciable amounts of oversized rock are currently not anticipated during site grading, several oversized boulders and oversized rocks are located in the northwest corner of the property, and appear associated with grading of the adjoining property to the west. Any oversized rock materials greater than 12 inches in diameter should not be placed within 10 feet of finish grade. General guidelines for rock placement are provided in Appendix F.

4. Any import materials should be observed and determined suitable by the soils engineer prior to placement on the site. Foundation designs may be altered if import materials have a greater sulfate or expansion values than the onsite materials encountered during our preliminary investigation.

Transition and Overexcavation Areas

In order to reduce the potential for differential settlements between cut and fill materials or materials of differing engineering properties, the entire cut portion of cut/fill transitions should be overexcavated to a minimum depth of 3 feet below finish grade, or a maximum ratio of fill thickness of 3:1 (maximum to minimum), and replaced with compacted fill. In addition, building pads located entirely in cut areas, if any, should be overexcavated and capped with at least 3 feet of fill or 2 feet below the bottom of proposed footings, whichever is greater.

Fill Quality

Surficial onsite soils (very old alluvial fan and bedrock materials) generally consist of admixtures of silty sand, sand, clayey sand, and localized silt. Rippable zones of weathered bedrock (sedimentary and granitic) will likely generate good quality fill consisting of silty sand to sand and brittle rock fragments within the near surface, while oversized materials (floaters 12-inch plus) may not be precluded at depth, or locally near the surface. As discussed previously, several oversized boulders and oversized rocks are located in the northwest corner of the property. Per Code, the placement of oversized materials (i.e., 12-inch and larger) should be no closer than 10 feet from finish grade. Hold down depths of oversized material should also consider other site improvements, such as swimming pools and spas, as well as disclosure issues. General guidelines for rock placement are provided in Appendix F.

Preliminary Earthwork Factors

Preliminary earthwork factors (shrinkage and bulking) for the subject property have been estimated based upon our field and laboratory testing, visual site observations, and experience in the site area. It is apparent that shrinkage would vary with depth and with areal extent over the site based on previous site use. Variables include vegetation, weed control, discing, and previous filling or exploring. However, all these factors are difficult to define in a three-dimensional fashion.

Therefore, the information presented below represents average shrinkage/bulking values:

Very Old Alluvial Fan Deposits . . . . . 5% to 10% shrinkage
Cenozoic Sedimentary Rock Deposits (weathered - upper 5') 3% to 5% shrinkage
Cenozoic Sedimentary Rock Deposits (unweathered) . . . . . 2% to 3% bulking
Cretaceous Granitic Bedrock Deposits (weathered- upper 3').1% to 2% shrinkage
Cretaceous Granitic Bedrock Deposits (unweathered) . . . . . 3% to 7% bulking

An additional shrinkage factor item would include the removal of root systems of individual large plants or trees. These plants and trees vary in size, but when pulled, may result in a loss of ½ to 1 cubic yard, to locally greater than 1 cubic yard of volume, respectively. The above facts indicate that earthwork balance for the site may be difficult to define and flexibility in design is essential to achieve a balanced end product. Subsidence due to equipment loadings (dynamic compaction) may be on the order of up to 0.10 feet, but will depend on haul routes, etc.

Subdrains

The possibility that local seepage may be encountered at the subject site is considered low. However, the need for subdrainage systems for the control of localized groundwater seepage cannot be precluded. If required, subdrainage for slopes and embankments should adhere to the specifications in Appendix F, which should be incorporated into the project plans and construction documents.

Slope Considerations and Slope Design

A detailed evaluation of slope stability is beyond the scope of this current preliminary report, and generally not required for slopes less than 30 feet in vertical height, at gradients of 2:1 (h:v), or flatter. However, a general discussion of slope stability is included herein. Based on our experience on adjacent projects, proposed fill and cut slopes constructed onsite, to the heights proposed, should be grossly and surficially stable provided the recommendations contained herein are implemented during site development.

All slopes should be designed and constructed in accordance with the minimum requirements of the City of Moreno Valley and County of Riverside, the recommendations

in the General Earthwork and Grading Guidelines section of this report (Appendix F), and the following:

1. Fill slopes should be designed and constructed at a 2:1 (h:v) gradient or flatter and should not exceed about 30 feet in height. Fill slopes should be properly built and compacted to a minimum relative compaction of 90 percent throughout, including the slope surfaces.

2. Cut slopes should be designed at gradients of 2:1 (h:v) or flatter and should not exceed about 30 feet in height. While stabilization of such slopes is not anticipated, locally adverse geologic conditions (i.e., daylighted joints/fractures, severely weathered bedrock deposits may be encountered which may require remedial grading, stabilization, or laying back of the slope to an angle flatter than the adverse geologic condition. All slope configurations should minimally conform to City/County guidelines. General guidelines for slope construction are presented in Appendix F.

3. Local areas of highly to severely weathered bedrock or non-cohesive materials may be present. Should these materials be exposed in cut slopes, the potential for long term maintenance or possible slope failure exists. Evaluation of cut slopes during grading would be necessary in order to identify any areas of severely weathered rock or non-cohesive materials. Should any of these materials be exposed during construction, the soils engineer/geologist, would assess the magnitude and extent of the materials and their potential affect on long-term maintenance or possible slope failures. Where loose materials are exposed on the cut slopes, the project's engineering geologist would require that the slope be cleaned prior to making their final inspection. Final approval of the cut slope can only be made after the slope being fully cut and cleaned.

4. Loose rock debris and fines remaining on the face of the cut slopes should be removed during grading. This can be accomplished by the use of a slope-board, as warranted. Cut slopes should be mapped by the project engineering geologist during grading to allow amendments to the recommendations should exposed conditions warrant alternation of the design or stabilization.

5. Irrigation of natural (ungraded) slope areas is not recommended. Site drainage should be directed away from the top and bottom (toe) of natural slope areas, and such slopes will also require regular and periodic maintenance.

PRELIMINARY RECOMMENDATIONS - FOUNDATIONS

General

Preliminary recommendations for foundation design and construction are provided in the following sections. These preliminary recommendations have been developed from our

understanding of the currently planned site development, site observations, subsurface exploration, laboratory testing, and engineering analyses. Foundation design should be re-evaluated at the conclusion of site grading/remedial earthwork for the as-graded soil conditions. Although not anticipated, revisions to these recommendations may be necessary. In the event that the information concerning the proposed development plan is not correct, or any changes in the design, location or loading conditions of the proposed additions are made, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and conclusions of this report are modified or approved in writing by this office.

The information and recommendations presented in this section are not meant to supercede design by the project structural engineer or civil engineer specializing in structural design. Upon request, GSI could provide additional input/consultation regarding soil parameters, as related to foundation design.

Expansive/Corrosive Soils

The laboratory testing conducted for this study indicates that the majority of onsite soils do not meet the criteria of detrimentally expansive soils as defined in Section 1803.5.3 of the 2022 CBC. However, some site soils are considered expansive. With recommended site grading, the overall expansive character of site soils is anticipated to be non-detrimentally expansive. Should site grading result in areas underlain with expansive soils, foundation systems constructed within the influence of detrimentally expansive soils (i.e., E.I. > 20 and P.I. $\geq$ 15) will require specific design to resist expansive soil effects per Sections 1808.6.1 or 1808.6.2 of the 2022 CBC, and should be reviewed by the project structural engineer.

Preliminary testing indicates that site soils present a negligible sulfate exposure (exposure Class “S0” (per Table 19.3.2.1 of ACI 318R-14) to concrete. However, reinforced concrete mix design for foundations, slab-on-grade floors, and pavements should also conform to Exposure Classes “S0”, “W0”, and “C1” in Table 19.3.1.1 of ACI 318R-14, as concrete would likely be exposed to moisture.

Preliminary Foundation Design

The following preliminary foundation design recommendations are presented as a minimum criteria from a soils engineering viewpoint.

1. The foundation systems should be designed and constructed in accordance with guidelines presented in the 2022 CBC.

2. An allowable bearing value of 2,000 pounds per square foot (psf) may be used for the design of footings that maintain a minimum width of 12 inches and a minimum depth of 12 inches (below the lowest adjacent grade) and are founded entirely into

properly compacted, engineered fill or suitable formation. This value may be increased by 20 percent for each additional 12 inches in footing depth to a maximum value of 2,500 psf. These values may be increased by one-third when considering short duration seismic or wind loads. Foundation embedment depth excludes concrete slabs-on-grade, or slab underlayment. Foundations should not simultaneously bear on formation and engineered fill.

3. For foundations deriving passive resistance from engineered fill, a passive earth pressure may be computed as an equivalent fluid having a density of 250 pcf, with a maximum earth pressure of 2,500 psf.

4. The upper 6 inches of passive pressure should be neglected if not confined by slabs or pavement.

5. For lateral sliding resistance, a 0.35 coefficient of friction may be used for a concrete to soil contact when multiplied by the dead load.

6. When combining passive pressure and frictional resistance, the passive pressure component should be reduced by one-third.

7. All footing setbacks from slopes should comply with Figure 1808.7.1 of the 2022 CBC. GSI recommends a minimum horizontal setback distance of 7 feet as measured from the bottom, outboard edge of the footing to the slope face.

8. Footings for structures adjacent to retaining walls should be deepened so as to extend below a 1:1 projection from the heel of the wall. Alternatively, walls may be designed to accommodate structural loads from buildings or appurtenances as described in the “Retaining Wall” section of this report.

9. Provided that the earthwork and foundation recommendations in this reported are adhered, foundations bearing on engineered fill should be minimally designed to accommodate a differential settlement of 1 inch over a 40-foot horizontal span (angular distortion = 1/480).

Preliminary Foundation Construction Recommendations

Current laboratory testing indicates that the majority of onsite soils do not meet the criteria of detrimentally expansive soils as defined in Section 1803.5.3 of the 2022 CBC. The following foundation construction recommendations are presented as a minimum criteria from a soils engineering viewpoint. These recommendations are intended to support planned improvements underlain by at least 7 feet of non-detrimentally expansive soils (i.e., E.I.< 21 and P.I. < 15). Expansive soils may not be precluded from occurring locally. Should foundations be underlain by expansive soils at depths of less than 7 feet, they will require specific design modifications to mitigate expansive soil effects as required in Sections 1808.6.1 or 1808.6.2 of the 2022 CBC (CBSC, 2022).

1. Exterior and interior footings should be founded into engineered fill, or suitable formation, at minimum depths of 12 inches, 18 inches, or 24 inches below the lowest adjacent grade, for planned one-, two-, or three-story floor loads, respectively, with footing width per Code. Isolated, exterior column and panel pads, or wall footings, should be at least 24 inches square, and founded at a minimum depth of 18 inches into properly engineered fill or suitable formation. All footings should be reinforced with four No. 4 reinforcing bars, two placed near the top and two placed near the bottom of the footing. Reinforcement of pad footings should be provided by the projects structural engineer.

2. All exterior column footings, and perimeter wall footings, should be tied together via grade beams in at least one direction for very low expansive soils, and two directions for low expansive soils, if encountered. The grade beam should be at least 12 inches square in cross section, and should be provided with a minimum of one No. 4 reinforcing bar at the top, and one No. 4 reinforcing bar at the bottom of the grade beam. The base of the reinforced grade beam should be at the same elevation as the adjoining footings.

3. A grade beam, reinforced as previously recommended, and at least 12 inches square, should be provided across large (garage) entrances. The base of the reinforced grade beam should be at the same elevation as the adjoining footings.

4. Based on the very low to potentially low expansive soils that underlie the subject lots, the slab thickness, reinforcement, and concrete used should comply with all applicable codes, and in accordance with the foundation designers' recommendations. At minimum, concrete slabs should be reinforced with No. 3 reinforcement bars placed at 18-inch on center, in two horizontally perpendicular directions (i.e., long axis and short axis). For slab underlayment, please refer to the “Soil Moisture Transmission” section of this report.

5. All slab reinforcement should be supported to ensure proper mid-slab height positioning during placement of the concrete. "Hooking" of reinforcement is not an acceptable method of positioning.

6. The slab subgrade should be pre-soaked to at least the soils “optimum moisture content,” to a depth of at least 12 inches, prior to the placement of underlayment sand and vapor retarder. Slab subgrade pre-soaking should be evaluated by the geotechnical consultant within 72 hours of the placement of the underlayment sand and vapor retarder.

7. Reinforced concrete mix design should conform to Exposure Classes “S0", “W0", and “C1” in Table 19.3.2.1 of ACI 318R-14.

Post-Tension Foundation Systems

Post-tension foundation systems may be used to mitigate the damaging effects of seismic activity or shrink/swell effects of expansive soil conditions, if encountered, on the proposed building foundations and slab-on-grade floors. The post-tension foundation designer may elect to exceed the minimal recommendations, provided herein, to increase slab stiffness performance. Post-tension (PT) design may be either ribbed or mat-type. The latter is also referred to as uniform thickness foundation (UTF). The use of a UTF is an alternative to the traditional ribbed-type. The UTF offers a reduction in grade beams. That is to say a UTF typically uses a single perimeter grade beam and "shovel" footings, but has a thicker slab than the ribbed-type. UTF perimeter footings may use an allowable vertical bearing value of 1,500 psf, if founded into approved engineered fill overlying dense unweathered sedimentary bedrock.

The information and recommendations presented in this section are not meant to supercede design by a registered structural engineer or civil engineer qualified to perform post-tensioned design. Post-tension foundations should be designed using sound engineering practice and be in accordance with local and 2022 CBC requirements and Post Tensioning Institute (PTI) methodologies (PTI; 2004, 2008, 2012, 2013, and 2014). Upon request, GSI can provide additional data/consultation regarding soil parameters as related to post-tension foundation design.

From a soil expansion/shrinkage standpoint, a common contributing factor to distress of structures using post-tensioned slabs is a "dishing" or "arching" of the slabs. This is caused by the fluctuation of moisture content in the soils below the perimeter of the slab primarily due to onsite and offsite irrigation practices, climatic and seasonal changes, and the presence of expansive soils. When the soil environment surrounding the exterior of the slab has a higher moisture content than the area beneath the slab, moisture tends to migrate inward, underneath the slab edges to a distance beyond the slab edges referred to as the moisture variation distance. When this migration of water occurs, the volume of the soils beneath the slab edges expands and causes the slab edges to lift in response. This is referred to as an edge-lift condition. Conversely, when the outside soil environment is drier, the moisture transmission regime is reversed and the soils underneath the slab edges lose their moisture and shrink. This process leads to dropping of the slab at the edges, which leads to what is commonly referred to as the center lift condition. A well-designed, post-tensioned slab having sufficient stiffness and rigidity provides a resistance to excessive bending that results from non-uniform swelling and shrinking slab subgrade soils, particularly within the moisture variation distance, near the slab edges. Other mitigation techniques typically used in conjunction with post-tensioned slabs consist of a combination of specific soil pre-saturation and the construction of a perimeter "cut-off" wall grade beam. Soil pre-saturation consists of moisture conditioning the slab subgrade soils prior to the post-tension slab construction. This effectively reduces soil moisture migration from the area located outside the building toward the soils underlying the post-tension slab. Perimeter cut-off walls are thickened edges of the concrete slab that impedes both outward and inward soil moisture migration.

Slab Subgrade Pre-Soaking

Pre-moistening of the slab subgrade soil is recommended. The moisture content of the subgrade soils should be equal to or greater than optimum moisture to a depth equivalent to the perimeter grade beam or cut-off wall depth in the slab areas (typically 12, or 18, inches for very low to low expansive soil conditions, respectively).

Pre-moistening or pre-soaking should be evaluated by the soils engineer 72 hours prior to vapor retarder placement. In summary:

EXPANSION POTENTIAL	PAD SOIL MOISTURE	CONSTRUCTION METHOD	SOIL MOISTURE RETENTION
Very Low (E.I. = 0-20)	Upper 12 inches of pad at or above soil optimum moisture	Wetting or reprocessing	Periodically wet or cover with plastic after trenching. Evaluation 72 hours prior to placement of concrete.
Low (E.I. = 21-50)	Upper 12 inches of pad soil moisture 2 percent over optimum (or 1.2 times)	Wetting or reprocessing	Periodically wet or cover with plastic after trenching. Evaluation 72 hours prior to placement of concrete.

Perimeter Cut-Off Walls

Perimeter cut-off walls should be at least 12, or 18 inches deep for very low to low expansive soil conditions, respectively. The cut-off walls may be integrated into the slab design or independent of the slab. The cut-off walls should be a minimum of 6 inches thick (wide). The bottom of the perimeter cut-off wall should be designed to resist tension, using cable or reinforcement per the structural engineer.

Post-Tension Foundation Design

The following recommendations for design of post-tensioned slabs have been prepared in general compliance with the requirements of the recent Post Tensioning Institute's (PTI's) publication titled "Standard Requirements for Design and Analysis of Shallow Post-tensioned Concrete Foundations on Expansive Soils" (PTI, 2012), together with its following errata (PTI, 2013 and 2014).

Post-Tension Foundation Soil Support Parameters

The recommendations for soil support parameters have been provided based on the typical soil index properties for soils that are very low to low in expansion potential. The soil index properties are typically the upper bound values based on our experience and practice in the southern California area. Additional testing is recommended either during or following grading, and prior to foundation construction to further evaluate the soil

conditions within the upper 7 to 15 feet of pad grade. The following table presents suggested minimum coefficients to be used in the Post-Tensioning Institute design method:

Thornthwaite Moisture Index	-20 inches/year
Correction Factor for Irrigation	20 inches/year
Depth to Constant Soil Suction	7 feet or overexcavation depth, whichever is greater
Constant soil Suction (pf)	3.6
Moisture Velocity	0.7 inches/month
Plasticity Index (P.I.)*	15-45
* - The effective plasticity index should be evaluated for the upper 7 to 15 feet of earth materials.	

Based on the above, the recommended post-tension soil support parameters are tabulated below:

TABLE 1 - POST-TENSION FOUNDATION DESIGN

DESIGN PARAMETER[4]	VERY LOW TO LOW EXPANSION[5] (E.I. = 0-50)
e_m center lift	9.0 feet
e_m edge lift	5.2 feet
y_m center lift	0.4 inches
y_m edge lift	0.7 inch
Bearing Value [1]	1,500 psf [1]
Lateral Pressure	250 psf
Subgrade Modulus (k)	100 pci/inch
Minimum Perimeter Footing Embedment [2]	12 inches

[1] Internal bearing values within the perimeter of the post-tension slab for very low to low expansive soil conditions may be increased to 2,000 psf for a minimum embedment of 12 inches, then by 20 percent for each additional foot of embedment to a maximum of 2,500 psf.
[2] For medium to very high expansive soil conditions, internal bearing values within the perimeter of the post-tension slab may be increased to 1,500 psf for a minimum embedment of 12 inches, then by 20 percent for each additional foot of embedment to a maximum of 2,000 psf.
[3] As measured below the lowest adjacent compacted subgrade surface (not including slab underlayment layer thickness).
[4] Post-tension slab design should also be evaluated with respect to the potential differential settlements provided in this report.
[5] Category Criteria:
Category I Expansion Index < 50 (very low to low), or Max fill less than 25 feet thick, or fill differential less than 10 feet.

The parameters are considered minimums and may not be adequate to represent all expansive soils and site conditions such as adverse drainage or improper landscaping and maintenance. The above parameters are applicable provided the structure has positive drainage that is maintained away from the structure. In addition, no trees with significant

root systems are to be planted within 15 feet of the perimeter of foundations. Therefore, it is important that information regarding drainage, site maintenance, trees, settlements, and effects of expansive soils be passed on to future all interested/affected parties. The values tabulated above may not be appropriate to account for possible differential settlement of the slab due to other factors, such as excessive settlements. If a stiffer slab is desired, alternative Post-Tensioning Institute ([PTI] third edition) parameters may be recommended. All exterior columns not supported by the post-tensioned foundation should be supported by 24 square inch isolated footings extending at least 18 inches into approved engineered fill. Exterior column footings should be tied to the post-tensioned foundation with 12 square inch, reinforced grade beams in at least one direction for very low expansive soils and two directions for low expansive soils.

Mat Foundations

In lieu of using a post-tensioned foundation to resist differential settlement or expansive soil effects, the Client may consider a mat foundation which uses steel bar reinforcement instead of post-tensioned cables. The structural engineer may supercede the following recommendations based on the planned building loads and use. Wire Reinforcement Institute (WRI, 2016) methodologies for design may be used.

Mat Foundation Design

The design of mat foundations should incorporate the vertical modulus of subgrade reaction. This value is a unit value for a 1-foot square footing and should be reduced in accordance with the following equation when used with the design of larger foundations. This assumes that the bearing soils will consist of engineered fills with an average relative compaction of 90 percent of the laboratory (ASTM D 1557).

$$K_R = K_S \left[\frac{B+1}{2B} \right]^2$$

where: K_S = unit subgrade modulus
K_R = reduced subgrade modulus
B = foundation width (in feet)

The modulus of subgrade reaction (K_S) and effective plasticity index (PI) to be used in mat foundation design for various expansive soil conditions are presented in the following table:

VERY LOW TO LOW EXPANSION (E.I. = 0-50)
K_S = 100 pci/inch, PI < 15

Reinforcement bar sizing and spacing for mat slab foundations should be provided by the structural engineer. Mat slabs may be uniform thickness foundations (UTF) or may incorporate the use of edge footings for moisture cut-off barriers as recommended herein for post-tension foundations. Edge footings should be a minimum of 6 inches thick. The bottom of the edge footing should be designed to resist tension, using reinforcement per the structural engineer. The need and arrangement of interior grade beams (stiffening beams) will be in accordance with the structural consultant's recommendations. The recommendations for a mat type of foundation assume that the soils below the slab are compacted fill. The parameters herein are to mitigate the effects of expansive soils and should be modified to mitigate the effects of the total and differential settlements reported in the "Foundation and Improvement Settlements" section of this report.

Specific pre-moistening/pre-soaking and moisture testing of the slab subgrade are recommended, as previously provided in this report. Slab subgrade moisture conditioning/pre-soaking should conform to the recommendations previously provided for post-tension foundation systems.

Confirmation Testing for Final Foundation Design

Following the completion of site grading, the expansion index, subgrade modulus, and corrosion potential of soils exposed near finish pad grades should be re-evaluated. Although not anticipated, the results of the recommended testing may require amendments to these preliminary recommendations.

PRELIMINARY FOUNDATION AND IMPROVEMENT SETTLEMENTS

In addition to designing slab systems (post-tension or other) for the soil conditions described herein, the estimated settlement and angular distortion values that an individual structure could be subjected to should be evaluated by a structural engineer. The levels of angular distortion were evaluated on a 40-foot length assumed as minimum dimension of buildings; if, from a structural standpoint, a decreased or increased length over which the tilt is assumed to occur is justified, this change should be incorporated into the design. The structures should be evaluated and designed for the combination of the soil parameters presented above, and the estimated total settlement, differential settlement and angular distortions provided herein.

The footings or slabs should be designed to accommodate a total static settlement of up to 2 inches and a static differential settlement of 1 inch, i.e., at least 1 inch in a 40-foot span. The structural engineer should consider these settlements and the performance of the foundation as well as the overlying structure. In addition to the above, the structural engineer should also consider estimated settlements due to short duration seismic loading and applicable load combinations, as required by the controlling authorities or the 2022 CBC. Post-construction settlement of the fill should generally be mitigated by

appropriate foundation design currently recommended, provided the design parameters presented herein are properly used in design of foundation systems.

These settlement estimates indicated above have been based on City of Moreno Valley and Riverside County overexcavation requirements, and do not preclude top of slope deformation (within Code setback zones) and settlement due to fills that have been saturated from utility leaks, pool leaks, prevailing climatic conditions, or excessive landscape irrigation.

SOIL MOISTURE TRANSMISSION CONSIDERATIONS

GSI has evaluated the potential for vapor or water transmission through the concrete floor slab, in light of typical floor coverings and improvements. Please note that slab moisture emission rates range from about 2 to 27 lbs/24 hours/1,000 square feet from a typical slab (Kanare, 2005), while floor covering manufacturers generally recommend about 3 lbs/24 hours as an upper limit. The recommendations in this section are not intended to preclude the transmission of water or vapor through the foundation or slabs. Foundation systems and slabs shall not allow water or water vapor to enter into the structure so as to cause damage to another building component or to limit the installation of the type of flooring materials typically used for the particular application (State of California, 2023). These recommendations may be exceeded or supplemented by a water "proofing" specialist, project architect, or structural consultant. Thus, the client will need to evaluate the following in light of a cost versus benefit analysis (owner expectations and repairs/replacement), along with disclosure to all interested/affected parties.

Vapor transmission will occur in new slab-on-grade floors as a result of chemical reactions taking place within the curing concrete. Vapor transmission through concrete floor slabs as a result of concrete curing has the potential to adversely affect sensitive floor coverings depending on the thickness of the concrete floor slab and the duration of time between the placement of concrete and the floor covering. It is possible that a slab moisture sealant may be needed prior to the placement of sensitive floor coverings if a thick slab-on-grade floor is used and the time frame between concrete and floor covering placement is relatively short.

Considering the E.I. test results presented herein, and known soil conditions in the region, the anticipated typical water vapor transmission rates, floor coverings, and improvements (to be chosen by the Client or project architect) that can tolerate vapor transmission rates without significant distress, the following alternatives are provided:

- Concrete slab-on-grade floors (including garage slabs) should be thicker.

- Concrete slab underlayment should consist of a 15-mil vapor retarder, or equivalent, with all laps sealed per the 2019 CBC and the manufacturer's recommendation.

The vapor retarder should comply with the ASTM E 1745 - Class A criteria, and be installed in accordance with ACI 302.1R-04 and ASTM E 1643.

- The 15-mil vapor retarder (ASTM E 1745 - Class A) should be installed per the recommendations of the manufacturer, including all penetrations (i.e., pipe, ducting, rebar, etc.).

- Concrete slabs, including garages, should be underlain by 2 inches of clean sand (S.E. $\geq$ 30) above a 15-mil vapor retarder (ASTM E 1745 - Class A, per Engineering Bulletin 119 [Kanare, 2005]). The vapor retarder shall in-turn, be underlain by 2 inches of sand (S.E. $\geq$ 30) placed directly on the prepared, moisture conditioned, subgrade. The vapor retarder should be sealed to provide a continuous retarder under the entire slab and should be installed per the recommendations of the manufacturer, including all penetrations (i.e., pipe, ducting, rebar, etc.). The manufacturer shall provide instructions for lap sealing, including minimum width of lap, method of sealing, and either supply or specify suitable products for lap sealing (ASTM E 1745), and per Code.

  ACI 302.1R-04 (2004) states "If a cushion or sand layer is desired between the vapor retarder and the slab, care must be taken to protect the sand layer from taking on additional water from a source such as rain, curing, cutting, or cleaning. Wet cushion or sand layer has been directly linked in the past to significant lengthening of time required for a slab to reach an acceptable level of dryness for floor covering applications." Therefore, additional observation or testing will be necessary for the cushion or sand layer for moisture content, and relatively uniform thicknesses, prior to the placement of concrete.

- Additional concrete mix design recommendations should be provided by the structural consultant or waterproofing specialist. Concrete finishing and workability should be addressed by the structural consultant and a waterproofing specialist.

- Where concrete admixtures are used, the structural consultant should also make changes to the concrete in the grade beams and footings in kind, so that the concrete used in the foundation and slabs are designed or treated for more uniform moisture protection.

- The owner(s) should be specifically advised which areas are suitable for tile flooring, vinyl flooring, or other types of water/vapor-sensitive flooring and which are not suitable. In all planned floor areas, flooring shall be installed per the manufacturer's recommendations.

- Additional recommendations regarding water or vapor transmission should be provided by the architect/structural engineer/slab or foundation designer and should be consistent with the specified floor coverings indicated by the architect.

Regardless of the mitigation, some limited moisture/moisture vapor transmission through the slab should be anticipated. Construction crews may require special training for installation of certain product(s), as well as concrete finishing techniques. The use of specialized product(s) should be approved by the slab designer and water-proofing consultant. A technical representative of the flooring contractor should review the slab and moisture retarder plans and provide comment prior to the construction of the foundations or improvements. The vapor retarder contractor should have representatives onsite during the initial installation.

PRELIMINARY WALL DESIGN PARAMETERS

General

Recommendations for the design and construction of conventional masonry retaining walls are provided below. Recommendations for specialty walls (i.e., crib, earthstone, mechanically stabilized earth [MSE], gravity, etc.) can be provided upon request, and would be based on site specific conditions.

Conventional Retaining Walls

The design parameters provided below assume that either very low expansive soils (typically Class 2 permeable filter material or Class 3 aggregate base) or native onsite materials with an expansion index up to 50 are used to backfill any retaining wall. The type of backfill (i.e., select or native), should be specified by the wall designer, and clearly shown on the plans. Building walls, below grade, should be water-proofed. Waterproofing should also be provided for site retaining walls in order to reduce the potential for efflorescence staining.

Preliminary Retaining Wall Foundation Design

Preliminary foundation design for retaining walls should incorporate the following recommendations:

Minimum Footing Embedment - 18 inches below the lowest adjacent grade (excluding landscape layer [upper 6 inches]).

Minimum Footing Width - 24 inches

Allowable Bearing Pressure - An allowable bearing pressure of 2,500 pcf may be used in the preliminary design of retaining wall foundations provided that the footing maintains a minimum width of 24 inches and extends at least 18 inches into approved engineered fill overlying dense formational materials. This pressure may be increased by one-third for short-term wind or seismic loads.

Passive Earth Pressure - A passive earth pressure of 250 pcf with a maximum earth pressure of 2,500 psf may be used in the preliminary design of retaining wall foundations provided the foundation is embedded into properly compacted silty to clayey sand fill.

Lateral Sliding Resistance - A 0.35 coefficient of friction may be used for a concrete to soil contact when multiplied by the dead load. When combining passive pressure and frictional resistance, the passive pressure component should be reduced by one-third.

Backfill Soil Density - Soil densities ranging between 125 pcf and 135 pcf may be used in the design of retaining wall foundations. This assumes an average engineered fill compaction of at least 90 percent of the laboratory standard (ASTM D 1557).

Any retaining wall footings near the perimeter of the site will likely need to be deepened into unweathered native deposits for adequate vertical and lateral bearing support. All retaining wall footing setbacks from slopes should comply with Figure 1808.7.1 of the 2022 CBC. GSI recommends a minimum horizontal setback distance of 7 feet as measured from the bottom, outboard edge of the footing to the slope face.

Restrained Walls

Any retaining walls that will be restrained prior to placing and compacting backfill material or that have re-entrant or male corners, should be designed for an at-rest equivalent fluid pressure (EFP) of 55 pcf and 65 pcf for select and very low expansive native backfill, respectively. The design should include any applicable surcharge loading. For areas of male or re-entrant corners, the restrained wall design should extend a minimum distance of twice the height of the wall (2H) laterally from the corner.

Cantilevered Walls

The recommendations presented below are for cantilevered retaining walls up to 10 feet high. Design parameters for walls less than 3 feet in height may be superceded by City of Moreno Valley standard design. Active earth pressure may be used for retaining wall design, provided the top of the wall is not restrained from minor deflections. An equivalent fluid pressure approach may be used to compute the horizontal pressure against the wall. Appropriate fluid unit weights are given below for specific slope gradients of the retained material. These do not include other superimposed loading conditions due to traffic, structures, seismic events or adverse geologic conditions. When wall configurations are finalized, the appropriate loading conditions for superimposed loads can be provided upon request.

For preliminary planning purposes, the structural consultant/wall designer should incorporate the surcharge of traffic on the back of retaining walls where vehicular traffic could occur within horizontal distance “H” from the back of the retaining wall (where “H” equals the wall height). The traffic surcharge may be taken as 100 psf/ft in the upper 5 feet of backfill for light truck and cars traffic. This does not include the surcharge of parked vehicles which should be evaluated at a higher surcharge to account for the effects of seismic loading. Equivalent fluid pressures for the design of cantilevered retaining walls are provided in the following table:

SURFACE SLOPE OF RETAINED MATERIAL (HORIZONTAL:VERTICAL)	EQUIVALENT FLUID WEIGHT P.C.F. (SELECT BACKFILL)[2]	EQUIVALENT FLUID WEIGHT P.C.F. (NATIVE BACKFILL)[3]
Level[1]	38	50
2 to 1	55	65

[1] Level backfill behind a retaining wall is defined as compacted earth materials, properly drained, without a slope for a distance of 2H behind the wall, where H is the height of the wall.
[2] SE > 30, P.I. < 15, E.I. < 21, and < 10% passing No. 200 sieve.
[3] E.I. = 0 to 50, SE > 30, P.I. < 15, E.I. < 21, and < 15% passing No. 200 sieve.

Seismic Surcharge

For engineered retaining walls with more than 6 feet of retained materials, as measured vertically from the bottom of the wall footing at the heel to daylight , GSI recommends that the walls be evaluated for a seismic surcharge (in general accordance with 2022 CBC requirements). The site walls in this category should maintain an overturning factor-of-safety (FOS) of approximately 1.25 when the seismic surcharge (increment), is applied. For restrained walls, the seismic surcharge should be applied as a uniform surcharge load from the bottom of the footing (excluding shear keys) to the top of the backfill at the heel of the wall footing. This seismic surcharge pressure (seismic increment) may be taken as 18H where "H" for retained walls is the dimension previously noted as the height of the backfill to the bottom of the footing. The resultant force should be applied at a distance 0.6 H up from the bottom of the footing. For the evaluation of the seismic surcharge, the bearing pressure may exceed the static value by one-third, considering the transient nature of this surcharge. For cantilevered walls, the pressure should be applied as an inverted triangular distribution using 18H. For restrained walls, the pressure should be applied as a rectangular distribution. Please note this is for local wall stability only.

The 18H is derived from a Mononobe-Okabe solution for both restrained cantilever walls. This accounts for the increased lateral pressure due to shakedown or movement of the sand fill soil in the zone of influence from the wall or roughly a 45° - ϕ/2 plane away from the back of the wall. The 18H seismic surcharge is derived from the formula:

$P_h = ⅜ \bullet a_h \bullet \gamma_t H$

Where:
- P_h = Seismic increment.
- a_h = Probabilistic horizontal site acceleration with a percentage of "g."
- γ_t = total unit weight (125 to 135 pcf for site soils @ 90 percent relative compaction).
- H = Height of the wall from the bottom of the footing or point of pile fixity.

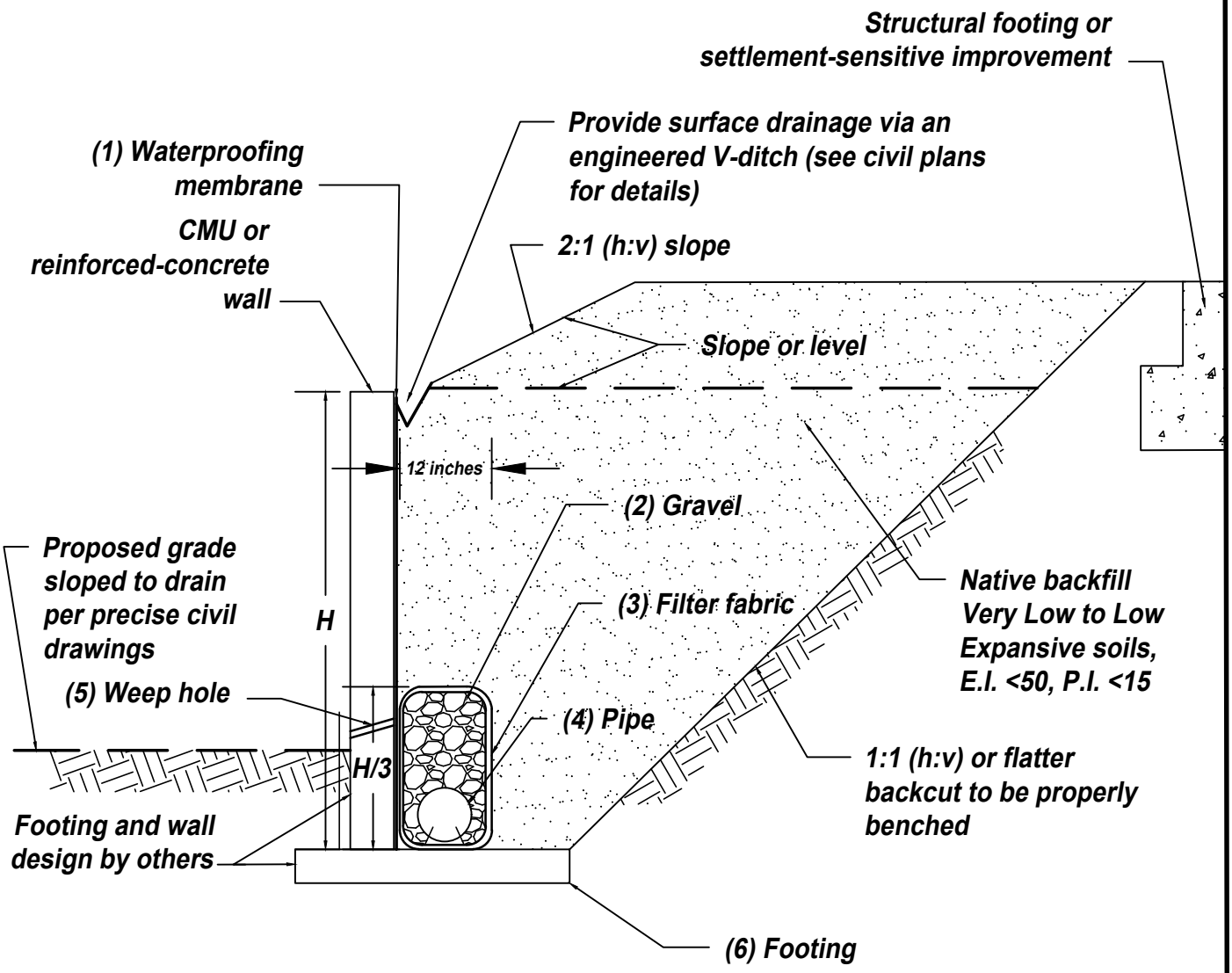
Retaining Wall Backfill and Drainage

Positive drainage must be provided behind all retaining walls in the form of gravel wrapped in geofabric and outlets. A backdrain system is considered necessary for retaining walls that are 2 feet or greater in height. Details 1, 2, and 3, present the backdrainage options discussed below. Backdrains should consist of a 4-inch diameter perforated PVC or ABS pipe encased in either Class 2 permeable filter material or ¾-inch to 1½-inch gravel wrapped in approved filter fabric (Mirafi 140 or equivalent). For select backfill, the filter material should extend a minimum of 1 horizontal foot behind the base of the walls and upward at least 1 foot. For native backfill that has up to E.I. = 20, continuous Class 2 permeable drain materials should be used behind the wall. This material should be continuous (i.e., full length) behind the wall, and it should be constructed in accordance with the enclosed Detail 1 (Typical Retaining Wall Backfill and Drainage Detail). For limited access and confined areas, (panel) drainage behind the wall may be constructed in accordance with Detail 2 (Retaining Wall Backfill and Subdrain Detail Geotextile Drain). Materials with an expansion index (E.I.) potential of greater than 20 should not be used as backfill for retaining walls. Retaining wall backfill materials should be moisture conditioned and mixed to achieve the soil's optimum moisture content, placed in relatively thin lifts (6 to 10 inches), and compacted to at least 90 percent relative compaction. For more onerous expansive situations, backfill and drainage behind the retaining wall should conform with Detail 3 (Retaining Wall And Subdrain Detail Clean Sand Backfill).

Outlets should consist of a 4-inch diameter solid PVC or ABS pipe spaced no greater than 100 feet apart, with a minimum of two outlets, one on each end. The use of weep holes, only, in walls higher than 2 feet, is not recommended. The surface of the backfill should be sealed by pavement or the top 18 inches compacted with native soil (E.I. $\leq$ 50). Proper surface drainage should also be provided. For additional mitigation, consideration should be given to applying a water-proof membrane to the back of all retaining structures. The use of a waterstop should be considered for all concrete and masonry joints.

Wall/Retaining Wall Footing Transitions

Site walls are anticipated to be founded on footings designed in accordance with the recommendations in this report. Should wall footings transition from cut to fill, the structural consultant/wall designer may specify either:



(1) Waterproofing membrane.

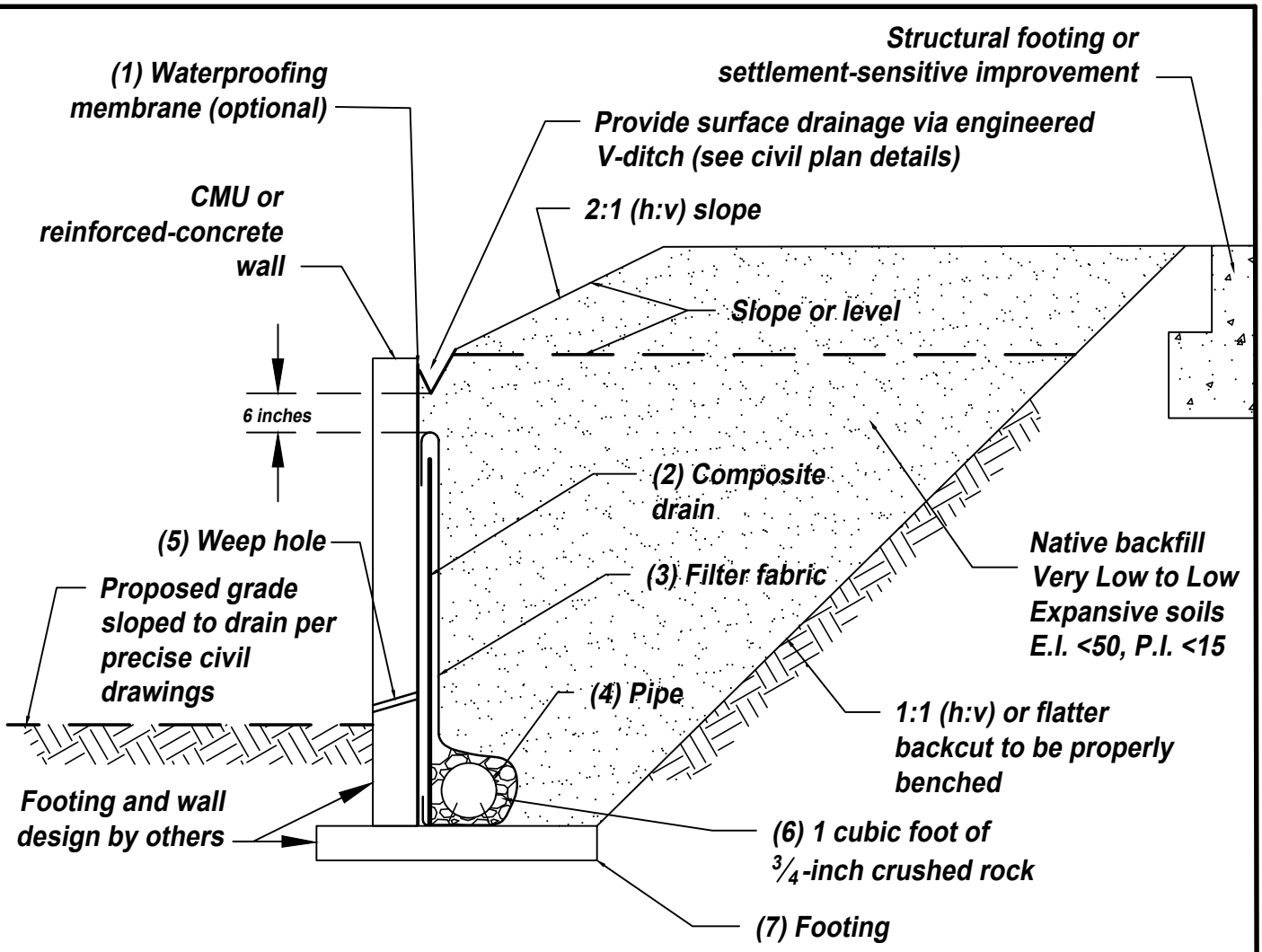
(2) Gravel: Clean, crushed, ¾ to 1½ inch.

(3) Filter fabric: Mirafi 140N or approved equivalent.

(4) Pipe: 4-inch-diameter perforated PVC, Schedule 40, or approved alternative with minimum of 1 percent gradient sloped to suitable, approved outlet point (perforations down).

(5) Weep holes: For CMU walls, Omit grout every other block, at or slightly above finished surface. For reinforced concrete walls, minimum 2-inch diameter weep holesspaced at 20 foot centers along the wall and placed 3 inches above finished surface. Design civil engineer to provide drainage at toe of wall. No weep holes for below-grade walls.

(6) Footing: If bench is created behind the footing greater than the footing width using level fill or cut natural earth materials, an additional "heel" drain will likely be required by geotechnical consultant.



(1) Waterproofing membrane (optional): Liquid boot or approved mastic equivalent.

(2) Drain: Miradrain 6000 or J-drain 200 or equivalent for non-waterproofed walls; Miradrain 6200 or J-drain 200 or equivalent for waterproofed walls (all perforations down).

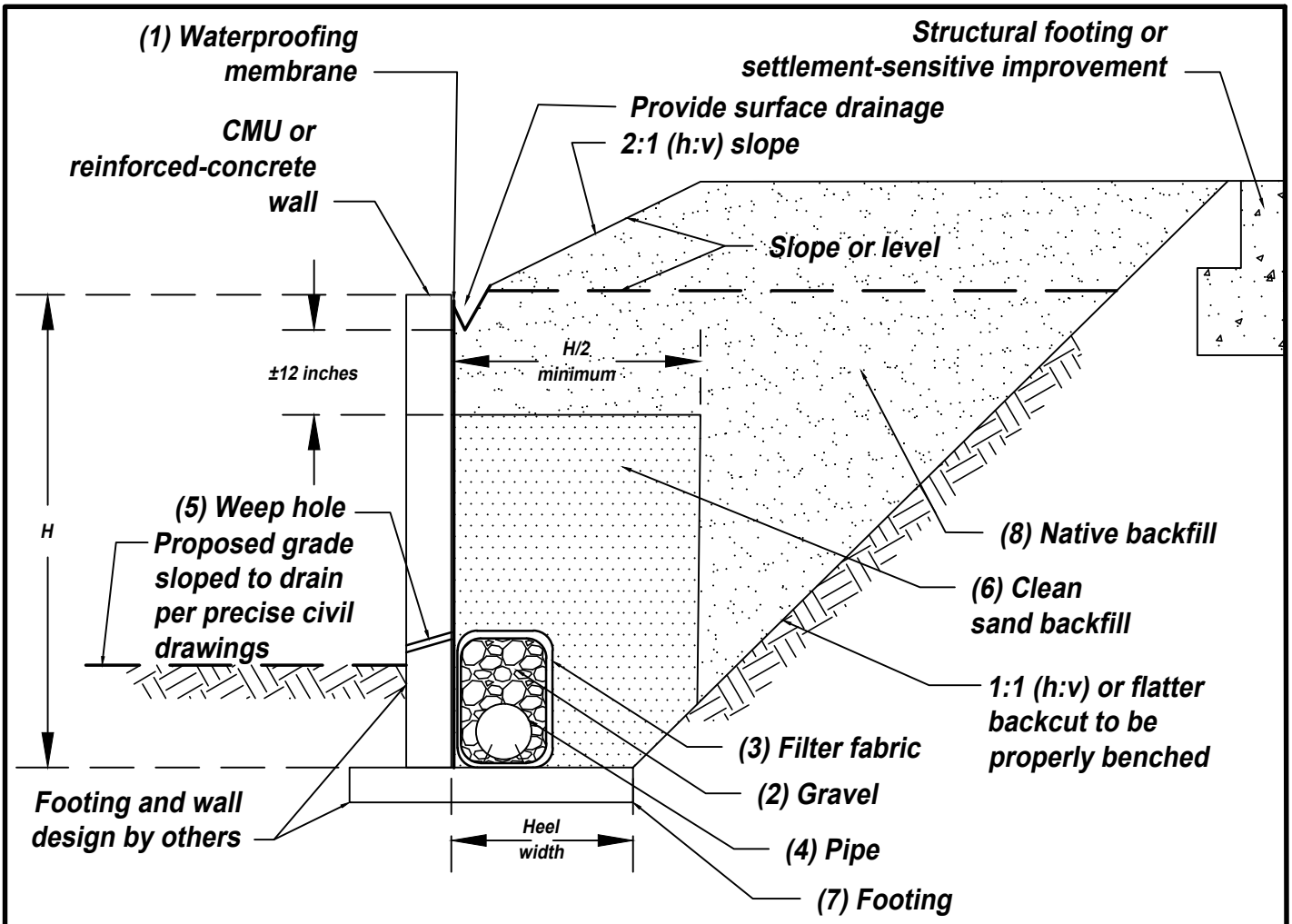
(3) Filter fabric: Mirafi 140N or approved equivalent; place fabric flap behind core.

(4) Pipe: 4-inch-diameter perforated PVC, Schedule 40, or approved alternative with minimum of 1 percent gradient to proper outlet point (perforations down).

(5) Weep holes: For CMU walls, Omit grout every other block, at or slightly above finished surface. For reinforced concrete walls, minimum 2-inch diameter weep holesspaced at 20 foot centers along the wall and placed 3 inches above finished surface. Design civil engineer to provide drainage at toe of wall. No weep holes for below-grade walls.

(6) Gravel: Clean, crushed, ¾ to 1½ inch.

(7) Footing: If bench is created behind the footing greater than the footing width using level fill or cut natural earth materials, an additional "heel" drain will likely be required by geotechnical consultant.



(1) Waterproofing membrane: Liquid boot or approved masticequivalent.

(2) Gravel: Clean, crushed, ¾ to 1½ inch.

(3) Filter fabric: Mirafi 140N or approved equivalent.

(4) Pipe: 4-inch-diameter perforated PVC, Schedule 40, or approved alternative with minimum of 1 percent gradient to proper outlet point (perforations down).

(5) Weep hole: For CMU walls, Omit grout every other block, at or slightly above finished surface. For reinforced concrete walls, minimum 2-inch diameter weep holesspaced at 20 foot centers along the wall and placed 3 inches above finished surface. Design civil engineer to provide drainage at toe of wall. No weep holes for below-grade walls.

(6) Clean sand backfill: Must have sand equivalent value (S.E.) of 35 or greater; can be densified by water jetting upon approval by geotechnical engineer.

(7) Footing: If bench is created behind the footing greater than the footing width using level fill or cut natural earth materials, an additional "heel" drain will likely be required by geotechnical consultant.

(8) Native backfill: If E.I. <21 and S.E. ≥35 then all sand requirements also may not be required and will be reviewed by the geotechnical consultant.

a) A minimum of a 2-foot overexcavation and recompaction of cut materials for a distance of 2H, from the point of transition.

b) Increase of the amount of reinforcing steel and wall detailing (i.e., expansion joints or crack control joints) such that a angular distortion of 1/360 for a distance of 2H on either side of the transition may be accommodated. Expansion joints should be placed no greater than 20 feet on-center, in accordance with the structural engineer's/wall designer's recommendations, regardless of whether or not transition conditions exist. Expansion joints should be sealed with a flexible, non-shrink grout.

c) Embed the footings entirely into native formational material (i.e., deepened footings).

If transitions from cut to fill transect the wall footing alignment at an angle of less than 45 degrees (plan view), then the designer should follow recommendation "a" (above) and until such transition is between 45 and 90 degrees to the wall alignment.

PRELIMINARY PAVEMENT DESIGN AND CONSTRUCTION

General

The governing agency may retain the authority to approve the final structural design sections after subgrade elevations and actual resistance values (R-values) have been obtained at the conclusion of earthwork. Based on a general review of pavement designs for other nearby projects, and for estimation and bidding purposes, the pavement sections provided herein should be considered for preliminary design. Typically, actual pavement sections will likely vary, therefore final pavement sections should be based on actual R-value testing performed during, or shortly after, roadway grading for any proposed street and driveway/parking area improvements.

Asphaltic Concrete (AC) Pavements

The preliminary design for Asphaltic Concrete (AC), and Portland Cement Concrete Pavement (PCCP) was evaluated based on an assumed R-value of 30, and the use of concrete shoulders (curb and gutter) at the edge of PCC pavement. GSI does not recommend the use of an ADTT value of less than 25 for any pavement section, unless the ADTT significantly less than 25 is certified by a civil engineer specializing in traffic engineering.

It is our understanding that the "minimum" pavement section required by the City of Moreno Valley for a local street, modified local street, or collector is 3.6 inches of AC on 6 inches of Crushed Aggregate Base (CAB) for a traffic index of 6.0 to 7.0 (Standard Plan No. MVSI-100A-2). Per the standard plan the City of Moreno Valley does not allow the use of Crushed Miscellaneous Base (CMB). Typically actual pavement sections will likely vary,

therefore final pavement sections should be based on actual Resistance Value (R-value) testing performed during, or shortly after, roadway grading for any proposed street and roadway area improvements. Applicable sections of City of Moreno Valley ordinances should be followed during design of public roads, fire access lanes, etc.

Preliminary Pavement Design

The preliminary pavement sections presented in the following table are based on the assumed R-value of 30, the general Traffic Indices (T.I.'s) used by the City of Moreno Valley (MVSI-100A-2) for a rural (street), local (street), collector (road), and an arterial (road), and the guidelines presented in the latest revision to the California Department of Transportation (Caltrans, 2020) "Highway Design Manual" seventh edition. It is our understanding that the minimum pavement section required by the City of Moreno Valley for a rural (road) and general local (road) is 3.6 inches of AC (asphaltic concrete) on 6.0 inches of Class 2 aggregate base for a T.I. of 5.0 to 6.0. Based on the assumed R-value of 50 obtained (i.e., R=50), the following preliminary pavement designs are presented. Applicable sections of City ordinances should be followed during design of public roads, fire access lanes, etc.

Asphaltic Concrete Pavement (ACP)

Preliminary asphaltic concrete (AC) pavement sections are presented in the following table:

STREET CLASSIFICATION	TRAFFIC INDEX (T.I.)[1]	STANDARD PAVEMENT DESIGNS		
		R-VALUE	AC INCHES	CLASS 2 BASE ROCK[2] INCHES
Local Street or Modified Local Street	6.0	30	3.6*	7.0
Collector (Road)	7.0	30	3.6*	10.0
Industrial Collector (Road)	10.0	30	6.0*	14.5

[1] T.I.s are based on City street design criteria (City of Moreno Valley, Standard Plan No. MVSI-100A-2).
[2] Denotes standard Caltrans Class 2 aggregate base rock ® $\geq$ 78, SE $\geq$ 25).
* Denotes City of Moreno Valley minimum asphaltic concrete or aggregate base.

The preliminary pavement sections provided above are intended as a minimum guideline. If thinner or highly variable pavement sections are constructed, increased maintenance and repair could be expected. If the ADT (average daily traffic) or ADTT (average daily truck traffic) increases beyond that intended, as reflected by the T.I. used for design, increased maintenance and repair could be required for the pavement section. Consideration should be given to the increased potential for distress from overuse of paved street areas by heavy equipment or construction related heavy traffic (e.g., concrete trucks, loaded supply trucks, etc.), particularly when the final section is not in place

(i.e., topcoat). Best management construction practices should be followed at all times, especially during inclement weather.

Limited Pavement Thickness Evaluation

As discussed previously, a secondary purpose of our study was to provide a limited offsite pavement section thickness evaluation of the exterior roadway. Our limited study included the advancement of two (2) exploratory AC cores via core-drilled samples on Box Springs Road using a subcontractor. After the advancement of the cores through the AC of the roadways structural section, the crushed aggregate base was removed by hand methods at each coring location, and the AC and aggregate base sections were measured and logged. The approximate locations of the AC cores advanced during our investigation are depicted on Figure 2 (Geotechnical Map).

Based on our site reconnaissance and field review localized areas of the offsite roadway, Box Springs Road, exhibits minimal distress (structural, surficial, and aesthetic). According to a map from the City of Moreno Valley Public Works Department, rehabilitation of the subject portion of Box Spring Road was proposed in November of 2022, and occurred some time after April 2023 (GEP, 2023) but before the date of our site investigation (September, 2023). While reports on the extent of these improvements are currently unavailable at this time, the following items were noted during our limited offsite pavement section thickness evaluation.

- It is our understanding that the recent rehabilitation of the subject portion of Box Spring Road has included a slurry-seal, and re-striping of the offsite roadway.

- The existing AC section in the subject portion of Box Springs Road was observed to be in good condition, with minor cracking within the middle lanes along construction lay-down seams.

- The offsite roadways AC section was generally design deficient at both coring locations, while the aggregate base was design compliant. A comparison of the existing roadway structural section measurements vs. the City minimum roadway structural sections for an “Arterial Roadway” (Standard Plan No. MVSI-100A-2) are presented on Table 1. A negative number within Table 1 indicates an AC or aggregate base section deficiency, while a positive number indicates an excess AC or aggregate base section.

TABLE 1										
EXISTING VS. RECOMMENDED MINIMUM ROADWAY SECTIONS*										
CORE	LOCATION	EXISTING AC (IN)	MINIMUM AC (IN)	Δ AC (IN)	% *OF DESIGN***	EXISTING BASE (IN)	MINIMUM BASE (IN)	Δ BASE (IN)	% *OF DESIGN***	COMMENT
C-1	Box Springs Rd. East	5.00	6.0	-1.00	-16.67	12.00	12.0	0.00	0.00	AC - Design Deficient. Base - Design Compliant
C-2	Box Springs Rd. West	4.75	6.0	-1.25	-20.83	12.00	12.0	0.00	0.00	AC - Design Deficient. Base - Design Compliant
* City of Murrieta Minimum Roadway Design Sections (Standard No.120) ** Positive numbers indicate exceeds design recommendations; negative numbers indicates design deficient.										

The roadways AC thickness was generally design deficient; while roadways base thickness was design compliant, per current City standards.

Portland Concrete Cement (PCC) Pavement

The preliminary design for Portland Cement Concrete Pavement (PCCP) was evaluated using an assumed subgrade R-value of 30, a modulus of rupture (MR) of 420 and 500 psi. GSI does not recommend the use of an ADTT value of less than 25 for any pavement section, unless the ADTT significantly less than 25 is certified by a civil engineer specializing in traffic engineering. The preliminary PCCP sections are provided in the following table:

PORTLAND CONCRETE CEMENT PAVEMENTS (PCCP)*					
TRAFFIC AREAS	CONCRETE TYPE	PCCP THICKNESS (INCHES)	TRAFFIC AREAS	CONCRETE TYPE	PCCP THICKNESS (INCHES)
Light Vehicles	520-C-2500	6.0	Dumpster Aprons (Trash Service)	520-C-2500	8.0
	560-C-3250	5.0		560-C-3250	7.0
NOTE: All PCCP is designed as un-reinforced and bearing directly on compacted subgrade. However, a 4-inch thick leveling course of compacted aggregate base, or crushed rock may be considered to improve performance. All PCCP should be properly detailed (jointing, etc.) per the industry standard. Pavements may be additionally reinforced with #4 reinforcing bars, placed 18 inches on center, each way, for improved performance. * To be re-evaluated based on exposed field conditions and R-values obtained following rough grading.					

The transition of the pavement from parking to traffic lanes should be made over a distance of 24 inches with crack control joints (weaken plane) or contact joints at the end of the transition. A minimum 4-inch layer of base rock in traffic and bus stop areas should be considered to improve traffic lane performance. Base rock may consist of either ¾-inch minus crushed rock or Caltrans Class 2 aggregate base. Crushed rock may be compacted by vibratory methods. Aggregate base should be compacted to a minimum relative compaction of 95 percent.

Weakened Plane Joints

Transverse and longitudinal weakened plane joints may be constructed per Greenbook Standard Specifications (2021), Section 302-6.5, or the structural/civil engineer.

Transverse weakened plane joints should be spaced no farther than 15 feet apart and no closer than 5 feet. Longitudinal weakened plane joints should be spaced no farther than 20 feet apart, but not less than 5 feet.

Expansion Joints and Contact Joints

Transverse expansion joints should be constructed at 120-foot spacings, or in accordance with City standards. Transverse and longitudinal contact joints should be constructed in accordance with the recommendations of the design engineer. Within large slab areas, joint spacings should be no greater than 20 feet.

Slab Reinforcement

The preliminary PCC Pavements for this project are designed as unreinforced and should perform adequately, assuming proper construction. If additional control of internal slab stresses (i.e., curing shrinkage, thermal expansion and contraction), and the effects of expansive soil subgrades is desired, then the use of No. 4 reinforcing bars, 18 inches on center each way, should be considered.

Subgrade should be compacted to a minimum relative compaction of 95 percent. Aggregate base compaction should be 95 percent of the maximum dry density (ASTM D 1557). If adverse conditions (i.e., saturated ground, etc.) are encountered during preparation of subgrade, special construction methods may need to be employed. These recommendations should be considered preliminary. R-value testing and pavement design analysis should be performed upon completion of grading for the project.

Concrete/Pervious Pavers

Concrete pavers should be underlain by a minimum of 8 inches of aggregate base, overlain by a leveling-course of sand, or per the manufacturers guidelines. Manufacturer's guidelines should be reviewed for concordance with the intent of the geotechnical report and the underlying soil conditions. Prior to aggregate base placement the subgrade soils should be compacted to a minimum relative compaction of 95 percent. Aggregate base compaction should also be 95 percent of the maximum dry density (ASTM D-1557), and follow the pavement grading recommendations provided below, as warranted.

PAVEMENT GRADING RECOMMENDATIONS

General

All section changes should be properly transitioned. If adverse conditions are encountered during the preparation of subgrade materials, special construction methods may need to be employed. A GSI representative should be present for the preparation of subgrade, aggregate base rock, and asphalt concrete.

Subgrade

Within access drives and parking areas, all surficial deposits of loose soil material should be removed and recompacted as recommended. After the loose soils are removed, the bottom is to be scarified to a depth of at least 6 inches, moisture conditioned as necessary and compacted to 95 percent of the maximum laboratory density or the City minimum, as evaluated by ASTM Test Method D 1557.

Deleterious material, excessively wet or dry pockets, concentrated zones of oversized rock fragments, and any other unsuitable materials encountered during grading should be removed. The compacted fill material should then be brought to the elevation of the proposed subgrade for the pavement. The subgrade should be proof-rolled in order to ensure a uniform firm and unyielding surface. All grading and fill placement should be observed by the project geotechnical consultant or his representative.

Aggregate Base Rock

Compaction tests are required for the recommended base section. Minimum relative compaction required will be 95 percent of the laboratory maximum density as evaluated by ASTM Test Designation D 1557. Base aggregate should be in accordance to the Caltrans Class 2 base rock (minimum R-value=78). The City of Moreno Valley does not accept crushed miscellaneous base (CMB) as acceptable materials for roadway base.

Drainage

Positive drainage should be provided for all surface water to drain towards the area swale, curb and gutter, catch basin, or to an approved drainage channel. Positive site drainage should be maintained at all times. Water should not be allowed to pond or seep into the ground. If planters or landscaping are adjacent to paved areas, measures should be taken to minimize the potential for water to enter the pavement section, such as thickened edges, enclosed planters, etc.

Additional Considerations

To mitigate perched groundwater, consideration should be given to installation of subgrade separators (cut-offs) between pavement subgrade and landscape areas (such as planting strips in parkways), although this is not a requirement from a geotechnical standpoint. Cut-offs, if used, should be 6 inches wide and at least 12 inches below the pavement/subgrade contact or 12 inches below the aggregate base rock, if used.

DRIVEWAYS, CONCRETE APRONS, FLATWORK, AND OTHER IMPROVEMENTS

The soil materials on site may be expansive. The effects of expansive soils are cumulative, and typically occur over the lifetime of any improvements. On relatively level areas, when

the soils are allowed to dry, the dessication and swelling process tends to cause heaving and distress to flatwork and other improvements. The resulting potential for distress to improvements may be reduced, but not totally eliminated. To that end, it is recommended that the developer should notify any owners or interested/affected parties of this long-term potential for distress. To reduce the likelihood of distress, the following recommendations are presented for all exterior flatwork:

1. The subgrade area for sidewalk slabs should be compacted to achieve a minimum 90 percent relative compaction, the subgrade area for access drive slabs and concrete aprons should be compacted to achieve a minimum 95 percent relative compaction, and then be presoaked to 2 to 3 percentage points above (or 125 percent of) the soils' optimum moisture content, to a depth of 18 inches below subgrade elevation. If very low expansive soils are present, only optimum moisture content, or greater, is required and specific presoaking is not warranted. The moisture content of the subgrade should be proof tested within 72 hours prior to concrete placement.

2. Exterior concrete slabs should be cast over a non-yielding surface, consisting of a 4-inch layer of Class 2 base, crushed rock, gravel, or clean sand (or City minimum, whichever is greater), that should be compacted and level prior to placement of concrete. If very low expansive soils are present, the base, rock, gravel, or sand may be deleted. The layer or subgrade should be wet-down completely prior to placement of concrete, to minimize loss of concrete moisture to the surrounding earth materials.

3. Exterior sidewalk slabs should be a minimum of 4 inches thick. Access drive slabs should be a minimum of 5 inches thick. Slabs and approaches should additionally have a thickened edge (12 inches) adjacent to all landscape areas, to help impede infiltration of landscape water under the slab. Trash disposal (dumpster) area aprons should be a minimum of 6 inches thick and meet minimum City standards, as necessary.

4. Curbs next to slopes should have a thickened edge similar to drives and approaches.

5. The use of transverse and longitudinal control joints are recommended to help control slab cracking due to concrete shrinkage or expansion. Two ways to mitigate such cracking are: a) add a sufficient amount of reinforcing steel, increasing tensile strength of the slab; and, b) provide an adequate amount of control or expansion joints to accommodate anticipated concrete shrinkage and expansion.

   In order to reduce the potential for unsightly cracks, slabs should be reinforced at mid-height with a minimum of No. 3 bars placed at 18 inches on center, in each

direction. If subgrade soils within the top 7 feet from finish grade are very low expansive soils (i.e., E.I. ≤20), then 6x6-W1.4xW1.4 welded-wire mesh may be substituted for the rebar, provided the reinforcement is placed on chairs, at slab mid-height. The exterior slabs should be scored or saw cut, ½ to ⅜ inches deep, often enough so that no section is greater than 10 feet by 10 feet. For sidewalks or narrow slabs, control joints should be provided at intervals of every 6 feet. The slabs should be separated from the foundations and sidewalks with expansion joint filler material. Presoaking, as indicated earlier, is recommended for slab subsoils.

6. No traffic should be allowed upon the newly placed concrete slabs until they have been properly cured to within 75 percent of design strength. Concrete compression strength should be a minimum of 2,500 psi.

7. Access drives, sidewalks, and patio/exterior slabs adjacent to the structure should be separated from the structure with thick expansion joint filler material. In areas directly adjacent to a continuous source of moisture (i.e., irrigation, planters, etc.), all joints should be additionally sealed with flexible mastic.

8. Planters and walls (sound walls or retaining walls) should not be tied to the structure.

9. Overhang structures should be supported on the slabs, or structurally designed with continuous footings tied in at least two directions. If very low expansion soils are present, footings need only be tied in one direction.

10. Any masonry landscape or sound walls that are to be constructed throughout the property should be grouted and articulated in segments no more than 20 feet long. These segments should be keyed or doweled together.

11. If settlement concerns or expansive soils are present, utilities may be enclosed within a closed utilidor (vault) or designed with flexible connections to accommodate differential settlement and expansive soil conditions.

12. Positive site drainage should be maintained at all times. Finish grade on the building pad should provide a minimum of 1 to 2 percent fall to the street, as indicated herein. It should be kept in mind that drainage reversals could occur, including post-construction settlement, if relatively flat drainage gradients are not periodically maintained by the owner or interested/affected parties.

13. Air conditioning (A/C) units should be supported by slabs that are incorporated into the building foundation or constructed on a rigid slab with flexible couplings for plumbing and electrical lines. A/C waste water lines should be drained to a suitable non-erosive outlet.

14. Shrinkage cracks could become excessive if proper finishing and curing practices are not followed. Finishing and curing practices should be performed per the Portland Cement Association (PCA) guidelines. Mix design should incorporate rate of curing for climate and time of year, sulfate content of soils, corrosion potential of soils, and fertilizers used on site.

DEVELOPMENT CRITERIA

Slope Deformation

Compacted fill slopes designed using customary factors of safety for gross or surficial stability and constructed in general accordance with the design specifications should be expected to undergo some differential vertical heave or settlement in combination with differential lateral movement in the out-of-slope direction, after grading. This post-construction movement occurs in two forms: slope creep, and lateral fill extension (LFE). Slope creep is caused by alternate wetting and drying of the fill soils which results in slow downslope movement. This type of movement is expected to occur throughout the life of the slope, and is anticipated to potentially affect improvements or structures (e.g., separation or cracking), placed near the top-of-slope, up to a maximum distance of approximately 15 feet from the top-of-slope, depending on the slope height. This movement generally results in rotation and differential settlement of improvements located within the creep zone. LFE occurs due to deep wetting from irrigation and rainfall on slopes comprised of expansive materials. Although some movement should be expected, long-term movement from this source may be minimized, but not eliminated, by placing the fill throughout the slope region, wet of the fill's optimum moisture content.

It is generally not practical to attempt to eliminate the effects of either slope creep or LFE. Suitable mitigative measures to reduce the potential of lateral deformation typically include: setback of improvements from the slope faces (per 2019 CBC), positive structural separations (i.e., joints) between improvements, and stiffening and deepening of foundations. Expansion joints in walls should be placed no greater than 20 feet on-center, and in accordance with the structural engineer's recommendations. All of these measures are recommended for design of structures and improvements. The ramifications of the above conditions, and recommendations for mitigation, should be provided to each homeowner or any homeowners association.

Slope Maintenance and Planting

Water has been shown to weaken the inherent strength of all earth materials. Slope stability is significantly reduced by overly wet conditions. Positive surface drainage away from slopes should be maintained and only the amount of irrigation necessary to sustain plant life should be provided for planted slopes. Over-watering should be avoided as it adversely affects site improvements, and causes perched groundwater conditions. Graded

slopes constructed utilizing onsite materials would be erosive. Eroded debris may be minimized and surficial slope stability enhanced by establishing and maintaining a suitable vegetation cover soon after construction. Compaction to the face of fill slopes would tend to minimize short-term erosion until vegetation is established. Plants selected for landscaping should be light weight, deep rooted types that require little water and are capable of surviving the prevailing climate. Jute-type matting or other fibrous covers may aid in allowing the establishment of a sparse plant cover. Utilizing plants other than those recommended above will increase the potential for perched water, staining, mold, etc., to develop. A rodent control program to prevent burrowing should be implemented. Irrigation of natural (ungraded) slope areas is generally not recommended. These recommendations regarding plant type, irrigation practices, and rodent control should be provided to each homeowner. Over-steepening of slopes should be avoided during building construction activities and landscaping.

Drainage

Adequate lot surface drainage is a very important factor in reducing the likelihood of adverse performance of foundations, hardscape, and slopes. Surface drainage should be sufficient to prevent ponding of water anywhere on a lot, and especially near structures and tops of slopes. Lot surface drainage should be carefully taken into consideration during fine grading, landscaping, and building construction. Therefore, care should be taken that future landscaping or construction activities do not create adverse drainage conditions. Positive site drainage within lots and common areas should be provided and maintained at all times. Drainage should not flow uncontrolled down any descending slope. Water should be directed away from foundations and not allowed to pond or seep into the ground. In general, the area within 5 feet around a structure should slope away from the structure. We recommend that unpaved lawn and landscape areas have a minimum gradient of 1 percent sloping away from structures, and whenever possible, should be above adjacent paved areas. Consideration should be given to avoiding construction of planters adjacent to structures (buildings, retaining walls, etc.). Pad drainage should be directed toward the street or other approved area(s). Downspouts, or drainage devices, should outlet a minimum of 5 feet from structures or into a subsurface drainage system. Areas of seepage may develop due to irrigation or heavy rainfall, and should be anticipated. Minimizing irrigation will lessen this potential. If areas of seepage develop, recommendations for minimizing this effect could be provided upon request.

Erosion Control

Cut and fill slopes will be subject to surficial erosion during and after grading. Onsite earth materials have a moderate to high erosion potential. Consideration should be given to providing hay bales and silt fences for the temporary control of surface water, from a geotechnical viewpoint.

Landscape Maintenance

Only the amount of irrigation necessary to sustain plant life should be provided. Over-watering the landscape areas will adversely affect proposed site improvements. We would recommend that any proposed open-bottom planters adjacent to proposed structures be eliminated for a minimum distance of 10 feet. As an alternative, closed-bottom type planters could be used. An outlet placed in the bottom of the planter, could be installed to direct drainage away from structures or any exterior concrete flatwork. If planters are constructed adjacent to structures, the sides and bottom of the planter should be provided with a moisture barrier to prevent penetration of irrigation water into the subgrade. Provisions should be made to drain the excess irrigation water from the planters without saturating the subgrade below or adjacent to the planters. Graded slope areas should be planted with drought resistant vegetation. Consideration should be given to the type of vegetation chosen and their potential effect upon surface improvements (i.e., some trees will have an effect on concrete flatwork with their extensive root systems). From a geotechnical standpoint leaching is not recommended for establishing landscaping. If the surface soils are processed for the purpose of adding amendments, they should be recompacted to 90 percent minimum relative compaction.

Subsurface and Surface Water

Subsurface and surface water are not anticipated to affect site development, provided that the recommendations contained in this report are incorporated into final design and construction and that prudent surface and subsurface drainage practices are incorporated into the construction plans. Perched groundwater conditions along zones of contrasting permeabilities may not be precluded from occurring in the future due to site irrigation, poor drainage conditions, or damaged utilities, and should be anticipated. Should perched groundwater conditions develop, this office could assess the affected area(s) and provide the appropriate recommendations to mitigate the observed groundwater conditions. Groundwater conditions may change with the introduction of irrigation, rainfall, or other factors.

Site Improvements

If any additional improvements (e.g., trash enclosures, walls, etc.) are planned for the site, recommendations concerning the geological or geotechnical aspects of design and construction of said improvements could be provided upon request. This office should be notified in advance of any fill placement, grading of the site, or trench backfilling after rough grading has been completed. This includes any grading, utility trench and retaining wall backfills, flatwork, etc.

Tile Flooring

Tile flooring can crack, reflecting cracks in the concrete slab below the tile, although small cracks in a conventional slab may not be significant. Therefore, the designer should

consider additional steel reinforcement for concrete slabs-on-grade where tile will be placed. The tile installer should consider installation methods that reduce possible cracking of the tile such as slipsheets. Slipsheets or a vinyl crack isolation membrane (approved by the Tile Council of America/Ceramic Tile Institute) are recommended between tile and concrete slabs on grade.

Additional Grading

This office should be notified in advance of any fill placement, supplemental regrading of the site, or trench backfilling after rough grading has been completed. This includes completion of grading in the street, driveway approaches, driveways, parking areas, and utility trench and retaining wall backfills.

Footing Trench Excavation

All footing excavations should be observed by a representative of this firm after trenching and prior to concrete form and reinforcement placement. The purpose of the observations is to evaluate that the excavations have been made into the recommended bearing material and to the minimum widths and depths recommended for construction. If loose or compressible materials are exposed within the footing excavation, a deeper footing or removal and recompaction of the subgrade materials would be recommended at that time. Footing trench spoil and any excess soils generated from utility trench excavations should be compacted to a minimum relative compaction of 90 percent, if not removed from the site.

Trenching/Temporary Construction Backcuts

Considering the nature of the onsite earth materials, it should be anticipated that caving or sloughing could be a factor in subsurface excavations and trenching. Shoring or excavating the trench walls/backcuts at the angle of repose (typically 25 to 45 degrees [except as specifically superceded within the text of this report]), should be anticipated. All excavations should be observed by an engineering geologist or soil engineer from GSI, prior to workers entering the excavation or trench, and minimally conform to CAL-OSHA, state, and local safety codes. Given the potentially erosive nature of the low expansive (low cohesive) soils, poor drainage or heavy rain events could destabilize trenches. Should adverse conditions exist, appropriate recommendations would be offered at that time. The above recommendations should be provided to any contractors or subcontractors, or homeowners, etc., that may perform such work.

Utility Trench Backfill

1. All interior utility trench backfill should be brought to at least 2 percent above optimum moisture content and then compacted to obtain a minimum relative compaction of 90 percent of the laboratory standard. As an alternative for shallow

(12-inch to 18-inch) under-slab trenches, sand having a sand equivalent value of 30 or greater may be used and jetted or flooded into place. Observation, probing and testing should be provided to evaluate the desired results.

2. Exterior trenches adjacent to, and within areas extending below a 1:1 plane projected from the outside bottom edge of the footing, and all trenches beneath hardscape features and in slopes, should be compacted to at least 90 percent of the laboratory standard. Sand backfill, unless excavated from the trench, should not be used in these backfill areas. Compaction testing and observations, along with probing, should be accomplished to evaluate the desired results.

3. All trench excavations should conform to CAL-OSHA, state, and local safety codes.

4. Utilities crossing grade beams, perimeter beams, or footings should either pass below the footing or grade beam utilizing a hardened collar or foam spacer, or pass through the footing or grade beam in accordance with the recommendations of the structural engineer.

SUMMARY OF RECOMMENDATIONS REGARDING GEOTECHNICAL OBSERVATION AND TESTING

We recommend that observation or testing be performed by GSI at each of the following construction stages:

- During grading/recertification.

- During excavation.

- During placement of subdrains, toe drains, or other subdrainage devices, prior to placing fill or backfill.

- After excavation of building footings, retaining wall footings, and free standing walls footings, prior to the placement of reinforcing steel or concrete.

- Prior to pouring any slabs or flatwork, after presoaking/presaturation of building pads and other flatwork subgrade, before the placement of concrete, reinforcing steel, capillary break (i.e., sand, pea-gravel, etc.), or vapor barriers (i.e., Stego Wrap, Husky Guard, etc.).

- During retaining wall subdrain installation, prior to backfill placement.

- During placement of backfill for area drain, interior plumbing, utility line trenches, and retaining wall backfill.

- During slope construction/repair.

- When any unusual soil conditions are encountered during any construction operations, after the issuance of this report.

- When any developer or homeowner improvements, such as flatwork, walls, etc., are constructed, prior to construction.

- A report of geotechnical observation and testing should be provided at the conclusion of each of the above stages, in order to provide concise and clear documentation of site work, or to comply with code requirements.

- GSI should review project sales documents to homeowners/homeowners associations for geotechnical aspects, including irrigation practices, the conditions outlined above, etc., prior to any sales. At that stage, GSI will provide homeowners maintenance guidelines which should be incorporated into such documents.

OTHER DESIGN PROFESSIONALS/CONSULTANTS

The design civil engineer, structural engineer, post-tension designer, architect, landscape architect, wall designer, etc., should review the recommendations provided herein, incorporate those recommendations into all their respective plans, and by explicit reference, make this report part of their project plans. This report presents minimum design criteria for the design of slabs, foundations and other elements possibly applicable to the project. These criteria should not be considered as substitutes for actual designs by the structural engineer/designer. Please note that the recommendations contained herein are not intended to preclude the transmission of water or vapor through the slab or foundation. The structural engineer/foundation or slab designer should provide recommendations to not allow water or vapor to enter into the structure so as to cause damage to another building component, or so as to limit the installation of the type of flooring materials typically used for the particular application.

The structural engineer/designer should analyze actual soil-structure interaction and consider, as needed, bearing, expansive soil influence, and strength, stiffness and deflections in the various slab, foundation, and other elements in order to develop appropriate, design-specific details. As conditions dictate, it is possible that other influences will also have to be considered. The structural engineer/designer should consider all applicable codes and authoritative sources where needed. If analyses by the structural engineer/designer result in less critical details than are provided herein as minimums, the minimums presented herein should be adopted. It is considered likely that some, more restrictive details will be required.

If the structural engineer/designer has any questions or requires further assistance, they should not hesitate to call or otherwise transmit their requests to GSI. In order to mitigate potential distress, the foundation or improvement's designer should confirm to GSI and the governing agency, in writing, that the proposed foundations or improvements can tolerate the amount of differential settlement or expansion characteristics and other design criteria specified herein.

PLAN REVIEW

Final project plans (grading, precise grading, foundation, retaining wall, landscaping, etc.), should be reviewed by this office prior to construction, so that construction is in accordance with the conclusions and recommendations of this report. Based on our review, supplemental recommendations or further geotechnical studies may be warranted.

LIMITATIONS

The materials encountered on the project site and used for our analysis are believed representative of the area; however, soil and bedrock materials vary in character between excavations and natural outcrops or conditions exposed during mass grading. Site conditions may vary due to seasonal changes or other factors.

The findings of this study are valid as of the present date. However, changes in the conditions of a property can occur with the passage of time, whether they be due to natural processes or the works of man on this or adjacent properties. In addition, changes in applicable or inappropriate standards may occur, whether they result from legislation or the broadening of knowledge. Accordingly, the findings of this study may be invalidated wholly or partially by changes outside our control. Therefore, this study and the recommendations contained herein are subject to review and should not be relied upon after a period of three years.

Inasmuch as our study is based upon our review and engineering analyses and laboratory data, the conclusions and recommendations are professional opinions. These opinions have been derived in accordance with current standards of practice, and no warranty, either expressed or implied, is given. Standards of practice are subject to change with time. GSI assumes no responsibility or liability for work or testing performed by others, or their inaction; or work performed when GSI is not requested to be onsite, to evaluate if our recommendations have been properly implemented. Use of this report constitutes an agreement and consent by the user to all the limitations outlined above, notwithstanding any other agreements that may be in place. In addition, this report may be subject to review by the controlling authorities. Thus, this report brings to completion our scope of services for this portion of the project. All samples will be disposed of after 30 days, unless specifically requested by the client, in writing.

APPENDIX A

REFERENCES

APPENDIX A

REFERENCES

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APPENDIX B

BORING LOGS

UNIFIED SOIL CLASSIFICATION SYSTEM

Major Divisions			Group Symbols	Typical Names
Coarse-Grained Soils More than 50% retained on No. 200 sieve	Gravels 50% or more of coarse fraction retained on No. 4 sieve	Clean Gravels	GW	Well-graded gravels and gravel-sand mixtures, little or no fines
			GP	Poorly graded gravels and gravel-sand mixtures, little or no fines
		Gravel with	GM	Silty gravels gravel-sand-silt mixtures
			GC	Clayey gravels, gravel-sand-clay mixtures
	Sands more than 50% of coarse fraction passes No. 4 sieve	Clean Sands	SW	Well-graded sands and gravelly sands, little or no fines
			SP	Poorly graded sands and gravelly sands, little or no fines
		Sands with Fines	SM	Silty sands, sand-silt mixtures
			SC	Clayey sands, sand-clay mixtures
Fine-Grained Soils 50% or more passes No. 200 sieve	Silts and Clays Liquid limit 50% or less		ML	Inorganic silts, very fine sands, rock flour, silty or clayey fine sands
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
			OL	Organic silts and organic silty clays of low plasticity
	Silts and Clays Liquid limit greater than 50%		MH	Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts
			CH	Inorganic clays of high plasticity, fat clays
			OH	Organic clays of medium to high plasticity
Highly Organic Soils			PT	Peat, mucic, and other highly organic soils

CONSISTENCY OR RELATIVE DENSITY

CRITERIA

Standard Penetration Test

Penetration Resistance N (blows/ft)	Relative Density
0 - 4	Very loose
4 - 10	Loose
10 - 30	Medium
30 - 50	Dense
> 50	Very dense

Standard Penetration Test

Penetration Resistance N (blows/ft)	Consistency	Unconfined Compressive Strength (tons/ft^2)
<2	Very Soft	<0.25
2 - 4	Soft	0.25 - .050
4 - 8	Medium	0.50 - 1.00
8 - 15	Stiff	1.00 - 2.00
15 - 30	Very Stiff	2.00 - 4.00
>30	Hard	>4.00

3" 3/4" #4 #10 #40 #200 U.S. Standard Sieve

Unified Soil Classification	Cobbles	Gravel		Sand			Silt or Clay
		coarse	fine	coarse	medium	fine	

MOISTURE CONDITIONS

Dry	Absence of moisture: dusty, dry to the touch
Slightly Moist	Below optimum moisture content for compaction
Moist	Near optimum moisture content
Very Moist	Above optimum moisture content
Wet	Visible free water; below water table

MATERIAL QUANTITY

trace	0 - 5 %
few	5 - 10 %
little	10 - 25 %
some	25 - 45 %

OTHER SYMBOLS

C Core Sample
S SPT Sample
B Bulk Sample
__ Groundwater
Qp Pocket Penetrometer

BASIC LOG FORMAT:
Group name, Group symbol, (grain size), color, moisture, consistency or relative density. Additional comments: odor, presence of roots, mica, gypsum, coarse grained particles, etc.

EXAMPLE:
Sand (SP), fine to medium grained, brown, moist, loose, trace silt, little fine gravel, few cobbles up to 4" in size, some hair roots and rootlets.

File:Mgr: c;\SoilClassif.wpd

PLATE B-1

GeoSoils, Inc.

BORING LOG

PROJECT: FPG FARM BUREAU, BOX SPRINGS, MORENO VALLEY

W.O. 8676-A-SC *BORING* B-1 *SHEET* 1 *OF* 1

DATE EXCAVATED 9-18-23 *LOGGED BY:* MAM *APPROX. ELEV.:* 1,544'MSL

SAMPLE METHOD: 8" HSA-140lb @30" Drop, Cal Sampler & SPT

Depth (ft.)	Sample: Bulk	Sample: Undisturbed	Sample: Blows/Ft.	USCS Symbol	Dry Unit Wt. (pcf)	Moisture (%)	Saturation (%)	Material Description
0			36	SM	130.8	7.5	75.3	**QUATERNARY VERY OLD ALLUVIAL FAN DEPOSITS (Qvof):** @ 0', SILTY SAND, brown, damp to moist, loose to medium dense; fine to coarse sand, organic debris at surface.
5			29/ 50-3"	SM	128.7	3.9	36.4	**BEDROCK LATE-CENOZOIC SEDIMENTARY ROCKS (QTs):** @ 5', Upon drilling breaks down to SILTY SAND, strong brown to dark gray to reddish yellow, damp, very dense; fine to coarse grained bedrock.
10			50-5"	SM		2.2		@ 10', As per 5', grayish brown.
15			50-2"	SM		1.7		@ 15', As per 5', dark gray.
20			50-6"	SM		2.6		@ 20', As per 15'.
25			50-2"	SM		4.5		@ 25', As per 15'.
30								Total Depth = 26.5'. Practical refusal. No caving or groundwater encountered. Backfilled 9-18-23.

Standard Penetration Test
Undisturbed, Ring Sample
Groundwater
Seepage

GeoSoils, Inc.

PLATE B-2

GeoSoils, Inc.

BORING LOG

PROJECT: FPG FARM BUREAU, BOX SPRINGS, MORENO VALLEY

W.O. 8676-A-SC *BORING* B-2 *SHEET* 1 *OF* 1

DATE EXCAVATED 9-18-23 *LOGGED BY:* MAM *APPROX. ELEV.:* 1,535'MSL

SAMPLE METHOD: 8" HSA-140lb @30" Drop, Cal Sampler & SPT

Depth (ft.)	Sample: Bulk	Sample: Undisturbed	Sample: Blows/Ft.	USCS Symbol	Dry Unit Wt. (pcf)	Moisture (%)	Saturation (%)	Material Description
0				SM				**QUATERNARY VERY OLD ALLUVIAL FAN DEPOSITS (Qvof):** @ 0', SILTY SAND, brown, damp to moist, medium dense; fine to coarse sand, organic debris at surface.
5		▼	18	ML		10.1		@ 5', SANDY SILT, reddish brown, moist to wet, stiff; fine to coarse sand.
				SM				**BEDROCK LATE CENOZOIC SEDIMENTARY ROCKS (QTs):** @ 7', Drill rig chatter; upon drilling breaks down to silty sand, grayish brown, damp, dense.
10		⌶	50-4"	SM	116.1	7.7	47.9	@ 10', SILTY SAND, gray to grayish brown, damp, very dense; fine to coarse grained bedrock, slightly weathered.
15		▼	50-4"	SM		3.7		@ 15', SILTY SAND, gray, dry, very dense; fine to coarse grained bedrock.
20								Total Depth = 16.5'. Practical refusal. No caving or groundwater encountered. Backfilled 9-18-23.
25								
30								

▼ *Standard Penetration Test*
⌶ *Undisturbed, Ring Sample*
▽ *Groundwater*
♀ *Seepage*

GeoSoils, Inc.

PLATE B-3

GeoSoils, Inc.

BORING LOG

PROJECT: FPG FARM BUREAU, BOX SPRINGS, MORENO VALLEY

W.O. 8676-A-SC *BORING* B-3 *SHEET* 1 *OF* 1

DATE EXCAVATED 9-18-23 *LOGGED BY:* MAM *APPROX. ELEV.:* 1,547'MSL

SAMPLE METHOD: 8" HSA-140lb @30" Drop, Cal Sampler & SPT

Depth (ft.)	Sample: Bulk	Sample: Undisturbed	Sample: Blows/Ft.	USCS Symbol	Dry Unit Wt. (pcf)	Moisture (%)	Saturation (%)	Material Description
0				SM				**QUATERNARY VERY OLD ALLUVIAL FAN DEPOSITS (Qvof):**
				ML				@ 0', SILTY SAND, brown, dry to moist, loose; fine to coarse sand; organic debris at surface.
								@ 2', SANDY SILT, brown to reddish brown, moist to wet, soft; fine to coarse sand.
5			6	ML	114.2	12.2	72.2	@ 5', As per 2', red brown, moist, medium stiff.
10			54	ML		10.6		@ 10', As per 2', hard.
15			81	ML	120.2	16.0	100	@ 15', As per 10', saturated; coarse grained.
								@ 18', Operator added water.
20			50-6"	SM		5.3		**BEDROCK CRETACEOUS TONALITE, UNDIFFERENTIATED (Kt):**
								@ 20', Upon drilling breaks down to SILTY SAND, gray to yellow, damp, very dense; fine to coarse grained bedrock, slightly weathered.
25			50-2"	SM		7.2		@ 25', As per 20'.
								Total Depth = 26.5'.
								Practical refusal.
								No caving or groundwater encountered.
								Backfilled 9-18-23.
30								

Standard Penetration Test

Undisturbed, Ring Sample

Groundwater

Seepage

GeoSoils, Inc.

PLATE B-4

GeoSoils, Inc.

BORING LOG

PROJECT: FPG FARM BUREAU, BOX SPRINGS, MORENO VALLEY

W.O. 8676-A-SC *BORING* B-4 *SHEET* 1 *OF* 1

DATE EXCAVATED 9-18-23 *LOGGED BY:* MAM *APPROX. ELEV.:* 1,563'MSL

SAMPLE METHOD: 8" HSA-140lb @30" Drop, Cal Sampler & SPT

Depth (ft.)	Sample: Bulk	Sample: Undisturbed	Sample: Blows/Ft.	USCS Symbol	Dry Unit Wt. (pcf)	Moisture (%)	Saturation (%)	Material Description
0				SM				**QUATERNARY VERY OLD ALLUVIAL FAN DEPOSITS (Qvof):** @ 0', SILTY SAND, pale brown to brown, dry to damp, loose to medium dense; fine to coarse sand, organic debris at surface.
				SM				**BEDROCK CRETACEOUS TONALITE, UNDIFFERENTIATED (Kt):**
5		▼	35/ 50-4"	SM		3.3		@ 5', Upon drilling breaks down to SILTY SAND, gray to yellow, damp, very dense; fine to coarse sand, slightly weathered.
10		⌶	50-4"	SM		2.6		@ 10', As per 5'.
								Total Depth = 11.5'. Practical refusal. No caving or groundwater encountered. Backfilled 9-18-23.
15								
20								
25								
30								

▼ *Standard Penetration Test*
⌶ *Undisturbed, Ring Sample*
▽ *Groundwater*
♀ *Seepage*

GeoSoils, Inc.

PLATE B-5

GeoSoils, Inc.

BORING LOG

PROJECT: FPG FARM BUREAU, BOX SPRINGS, MORENO VALLEY

W.O. 8676-A-SC *BORING* B-5 *SHEET* 1 *OF* 1

DATE EXCAVATED 9-18-23 *LOGGED BY:* MAM *APPROX. ELEV.:* 1,549'MSL

SAMPLE METHOD: 8" HSA-140lb @30" Drop, Cal Sampler & SPT

Depth (ft.)	Sample: Bulk	Sample: Undisturbed	Sample: Blows/Ft.	USCS Symbol	Dry Unit Wt. (pcf)	Moisture (%)	Saturation (%)	Material Description
0				SM				**QUATERNARY VERY OLD ALLUVIAL FAN DEPOSITS (Qvof):** @ 0', SILTY SAND, brown to pale brown, dry to damp, loose to dense; fine to coarse sand, organic debris at surface.
			50-5"	SM	118.4	3.3	22.1	**BEDROCK CRETACEOUS TONALITE, UNDIFFERENTIATED (Kt):** @ 2.5', Upon drilling breaks down to SILTY SAND, light gray to yellow, damp, very dense; fine to coarse grained, weathered.
5			50-5"	SM		3.4		@ 5', As per 2.5'; slightly weathered.
10								Total Depth = 6.5'. Practical refusal. No caving or groundwater encountered. Backfilled 9-18-23.
15								
20								
25								
30								

Standard Penetration Test
Undisturbed, Ring Sample
Groundwater
Seepage

GeoSoils, Inc.

PLATE B-6

GeoSoils, Inc.

BORING LOG

PROJECT: FPG FARM BUREAU, BOX SPRINGS, MORENO VALLEY

W.O. 8676-A-SC *BORING* IT-1 *SHEET* 1 *OF* 1

DATE EXCAVATED 9-18-23 *LOGGED BY:* MAM *APPROX. ELEV.:* 1,536'SL

SAMPLE METHOD: 8" HSA (No Sampling)

Depth (ft.)	Sample: Bulk	Sample: Undisturbed	Sample: Blows/Ft.	USCS Symbol	Dry Unit Wt. (pcf)	Moisture (%)	Saturation (%)	Material Description
0				SM				**QUATERNARY VERY OLD ALLUVIAL FAN DEPOSITS (Qvof):** @ 0', SILTY SAND, light brown, dry to damp, medium dense; fine to coarse sand.
5								Total Depth = 5'. Placed gravel and presoaked @ 10:03 am (no movement on water). Caved around testing pipe. No groundwater encountered. Backfilled 9-19-23.
10								
15								
20								
25								
30								

Standard Penetration Test

Undisturbed, Ring Sample

Groundwater

Seepage

GeoSoils, Inc.

PLATE B-7

GeoSoils, Inc.

BORING LOG

PROJECT: FPG FARM BUREAU, BOX SPRINGS, MORENO VALLEY

W.O. 8676-A-SC *BORING* IT-2 *SHEET* 1 *OF* 1

DATE EXCAVATED 9-18-23 *LOGGED BY:* MAM *APPROX. ELEV.:* 1,538'MSL

SAMPLE METHOD: 8" HSA (No Sampling)

Depth (ft.)	Sample: Bulk	Sample: Undisturbed	Sample: Blows/Ft.	USCS Symbol	Dry Unit Wt. (pcf)	Moisture (%)	Saturation (%)	Material Description
0				SM				**QUATERNARY VERY OLD ALLUVIAL FAN DEPOSITS (Qvof):** @ 0', SILTY SAND, strong brown, dry to damp, loose to dense; fine to coarse sand, organics at surface.
5								Total Depth = 5', Added gravel and presoaked @ 12:23 pm (no movement on water). No caving or groundwater encountered. Backfilled 9-19-23.
10								
15								
20								
25								
30								

▼ *Standard Penetration Test*
⌶ *Undisturbed, Ring Sample*
▽ *Groundwater*
♀ *Seepage*

APPENDIX C

SEISMIC DATA

```
**********************
*                    *
*    E Q F A U L T   *
*                    *
*    Version 3.00    *
*                    *
**********************
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DETERMINISTIC ESTIMATION OF
PEAK ACCELERATION FROM DIGITIZED FAULTS

JOB NUMBER: 8676

DATE: 10-16-2023

JOB NAME: FPG - Farm Bureau

CALCULATION NAME: Test Run Analysis

FAULT-DATA-FILE NAME: C:\Program Files\EQFAULT1\CGSFLTErev.DAT

SITE COORDINATES:
SITE LATITUDE: 33.9476
SITE LONGITUDE: 117.2932

SEARCH RADIUS: 62.14 mi

ATTENUATION RELATION: 12) Bozorgnia Campbell Niazi (1999) Hor.-Soft Rock-Cor.
UNCERTAINTY (M=Median, S=Sigma): S Number of Sigmas: 1.0
DISTANCE MEASURE: cdist
SCOND: 0
Basement Depth: 5.00 km Campbell SSR: 1 Campbell SHR: 0
COMPUTE PEAK HORIZONTAL ACCELERATION

FAULT-DATA FILE USED: C:\Program Files\EQFAULT1\CGSFLTErev.DAT

MINIMUM DEPTH VALUE (km): 3.0

EQFAULT SUMMARY

DETERMINISTIC SITE PARAMETERS

ABBREVIATED FAULT NAME	APPROXIMATE DISTANCE mi (km)	ESTIMATED MAX. EARTHQUAKE EVENT: MAXIMUM EARTHQUAKE MAG.(Mw)	PEAK SITE ACCEL. g	EST. SITE INTENSITY MOD.MERC.
SAN JACINTO-SAN BERNARDINO	6.1(9.8)	6.7	0.459	X
SAN JACINTO-SAN J.VLY-CASA LOMA	6.1(9.8)	6.9	0.501	X
SAN ANDREAS - San Bernardino M-1	14.5(23.3)	7.5	0.354	IX
SAN ANDREAS - SB-Coach. M-2b	14.5(23.3)	7.7	0.397	X
SAN ANDREAS - SB-Coach. M-1b-2	14.5(23.3)	7.7	0.397	X
SAN ANDREAS - Whole M-1a	14.5(23.3)	8.0	0.468	X
ELSINORE (GLEN IVY)	18.0(28.9)	6.8	0.186	VIII
CHINO-CENTRAL AVE. (Elsinore)	18.8(30.2)	6.7	0.235	IX
CUCAMONGA	20.1(32.4)	6.9	0.250	IX
WHITTIER	20.4(32.9)	6.8	0.163	VIII
ELSINORE (TEMECULA)	21.4(34.4)	6.8	0.156	VIII
NORTH FRONTAL FAULT ZONE (West)	21.8(35.1)	7.2	0.281	IX
CLEGHORN	22.7(36.6)	6.5	0.120	VII
SAN JACINTO-ANZA	26.0(41.8)	7.2	0.168	VIII
SAN JOSE	26.0(41.9)	6.4	0.138	VIII
SAN ANDREAS - 1857 Rupture M-2a	26.5(42.6)	7.8	0.248	IX
SAN ANDREAS - Cho-Moj M-1b-1	26.5(42.6)	7.8	0.248	IX
SAN ANDREAS - Mojave M-1c-3	26.5(42.6)	7.4	0.189	VIII
SIERRA MADRE	28.6(46.1)	7.2	0.214	VIII
PUENTE HILLS BLIND THRUST	33.1(53.2)	7.1	0.174	VIII
PINTO MOUNTAIN	33.7(54.3)	7.2	0.128	VIII
SAN JOAQUIN HILLS	34.1(54.9)	6.6	0.120	VII
NORTH FRONTAL FAULT ZONE (East)	34.4(55.4)	6.7	0.126	VIII
HELENDALE - S. LOCKHARDT	38.0(61.2)	7.3	0.122	VII
CLAMSHELL-SAWPIT	39.3(63.2)	6.5	0.096	VII
NEWPORT-INGLEWOOD (Offshore)	42.0(67.6)	7.1	0.095	VII
ELSINORE (JULIAN)	42.6(68.6)	7.1	0.094	VII
RAYMOND	42.9(69.1)	6.5	0.087	VII
NEWPORT-INGLEWOOD (L.A.Basin)	43.2(69.6)	7.1	0.093	VII
LENWOOD-LOCKHART-OLD WOMAN SPRGS	47.0(75.7)	7.5	0.113	VII
UPPER ELYSIAN PARK BLIND THRUST	47.0(75.7)	6.4	0.075	VII
SAN ANDREAS - Coachella M-1c-5	47.3(76.1)	7.2	0.090	VII
VERDUGO	49.5(79.7)	6.9	0.098	VII
BURNT MTN.	51.1(82.2)	6.5	0.052	VI
LANDERS	51.9(83.6)	7.3	0.088	VII
JOHNSON VALLEY (Northern)	52.6(84.6)	6.7	0.057	VI
EUREKA PEAK	52.9(85.2)	6.4	0.046	VI
PALOS VERDES	55.0(88.5)	7.3	0.083	VII
HOLLYWOOD	55.2(88.9)	6.4	0.063	VI
SAN JACINTO-COYOTE CREEK	56.4(90.7)	6.6	0.050	VI

DETERMINISTIC SITE PARAMETERS

ABBREVIATED FAULT NAME	APPROXIMATE DISTANCE mi (km)	ESTIMATED MAX. EARTHQUAKE EVENT: MAXIMUM EARTHQUAKE MAG.(Mw)	PEAK SITE ACCEL. g	EST. SITE INTENSITY MOD.MERC.
ROSE CANYON	57.5(92.6)	7.2	0.074	VII
EMERSON So. - COPPER MTN.	58.8(94.6)	7.0	0.063	VI
CORONADO BANK	59.4(95.6)	7.6	0.095	VII
SAN GABRIEL	62.1(100.0)	7.2	0.068	VI

****

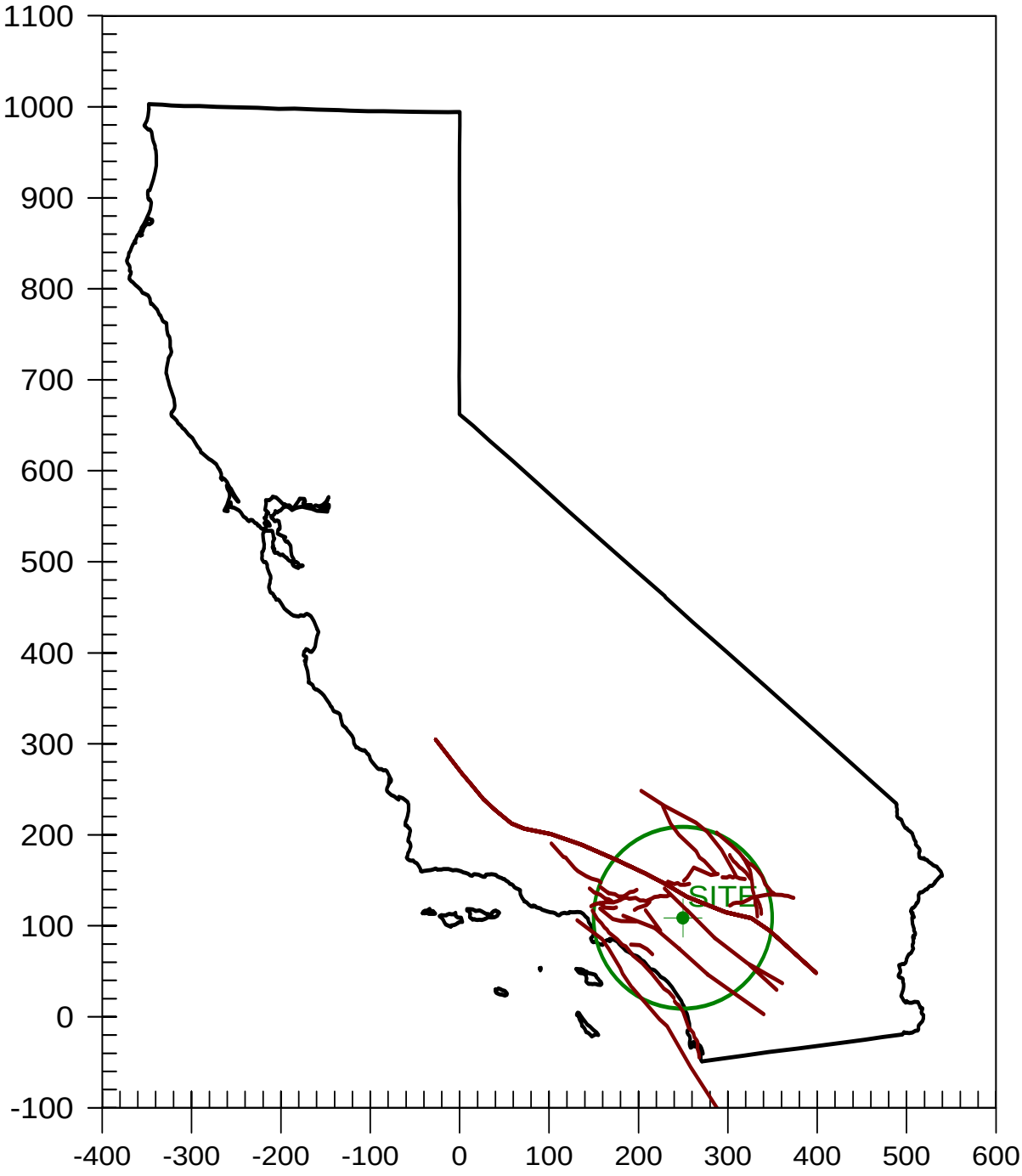
-END OF SEARCH- 44 FAULTS FOUND WITHIN THE SPECIFIED SEARCH RADIUS.

THE SAN JACINTO-SAN J.VLY-CASA LOMA FAULT IS CLOSEST TO THE SITE.
IT IS ABOUT 6.1 MILES (9.8 km) AWAY.

LARGEST MAXIMUM-EARTHQUAKE SITE ACCELERATION: 0.5013 g

CALIFORNIA FAULT MAP

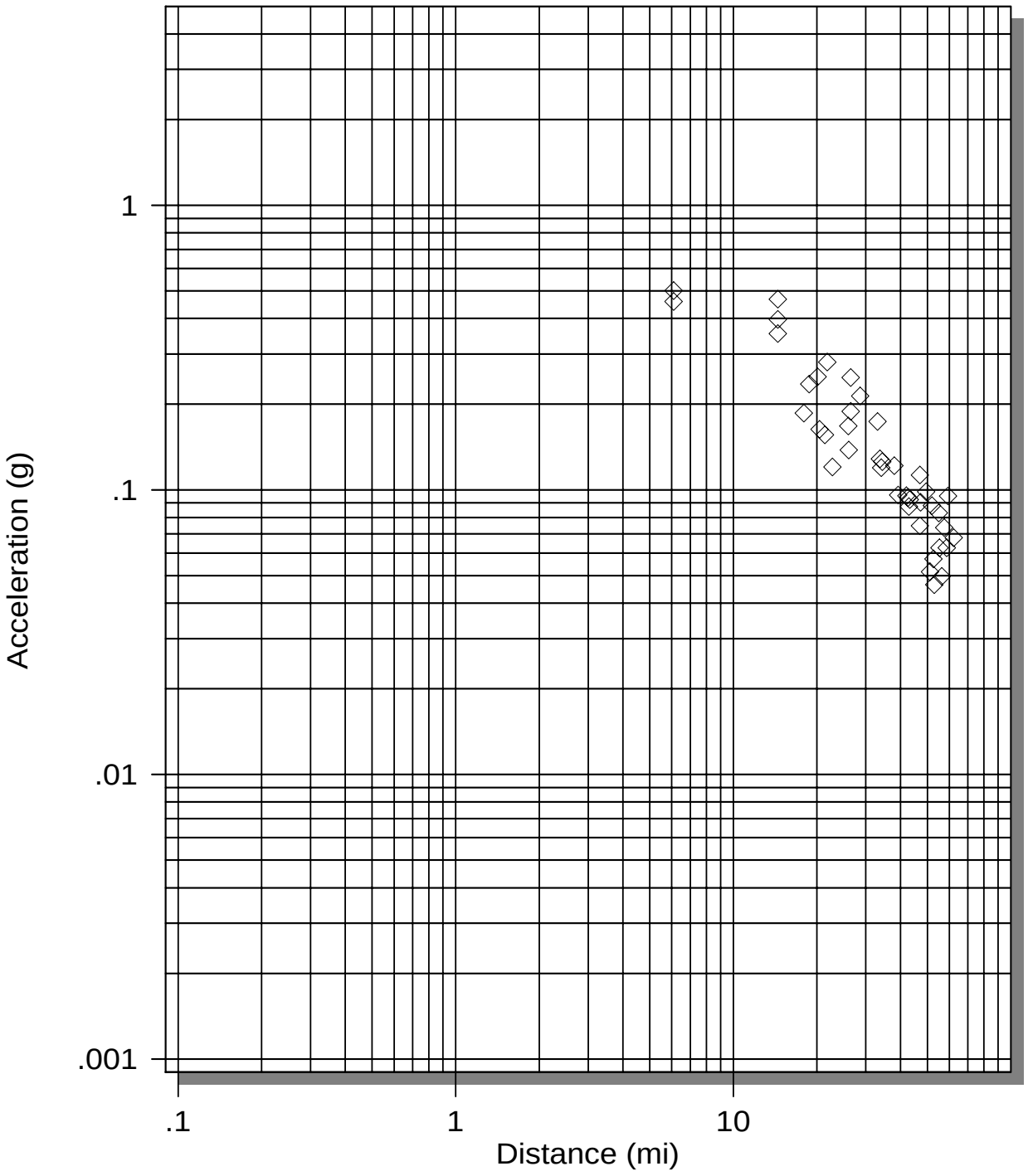
FPG Farm Bureau



W.O. 8676-A-SC
Plate C-3

MAXIMUM EARTHQUAKES

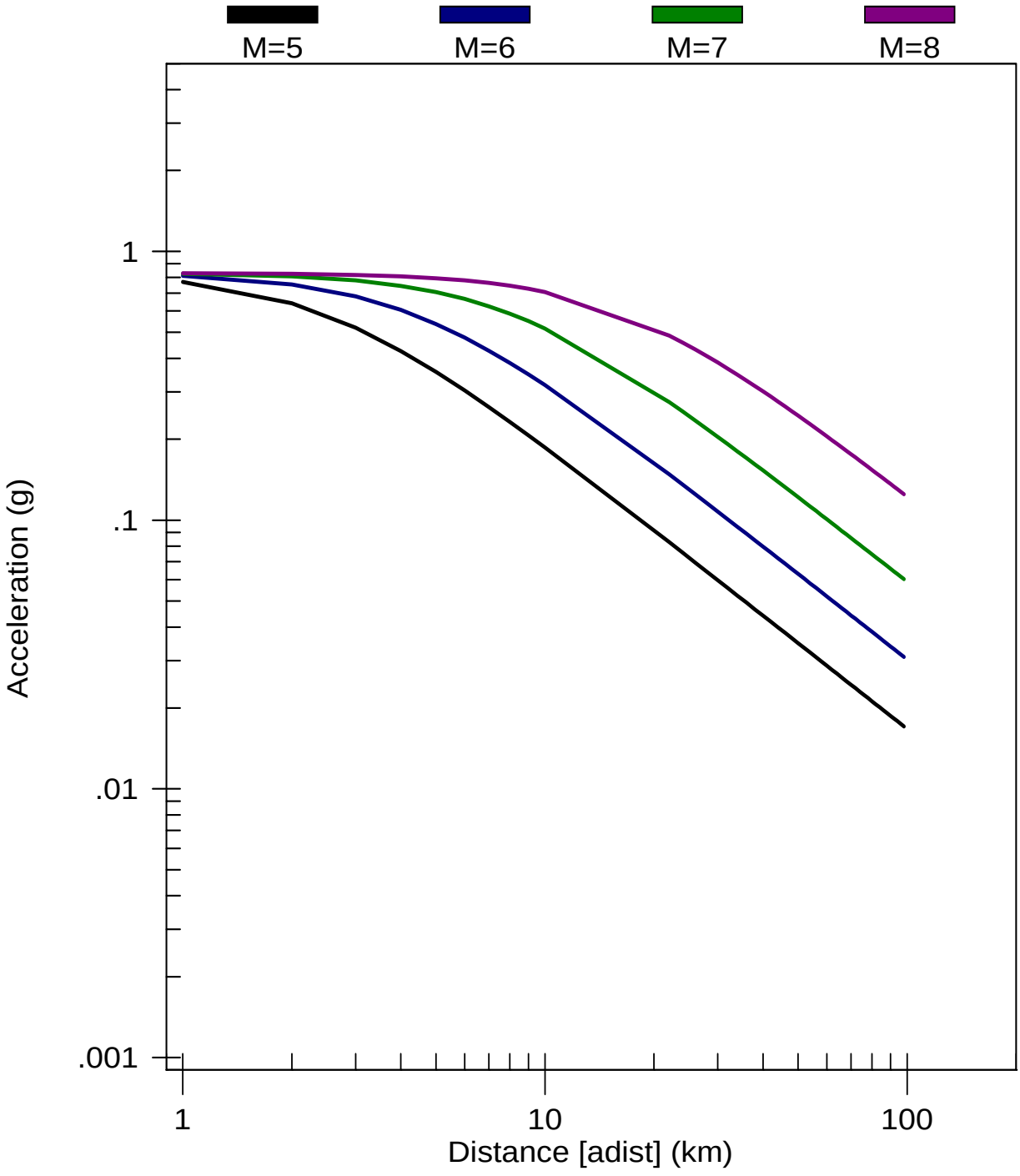
FPG Farm Bureau



W.O. 8676-A-SC
Plate C-4

STRIKE-SLIP FAULTS

12) Bozorgnia Campbell Niazi (1999) Hor.-Soft Rock-Cor.



W.O. 8676-A-SC
Plate C-5

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*                       *
*    E Q S E A R C H    *
*                       *
*     Version 3.00      *
*                       *
*************************

      ESTIMATION OF
   PEAK ACCELERATION FROM
CALIFORNIA EARTHQUAKE CATALOGS


JOB NUMBER: 8676
                                                DATE: 10-16-2023

JOB NAME: FPG - Farm Bureau

EARTHQUAKE-CATALOG-FILE NAME: ALLQUAKE.DAT


MAGNITUDE RANGE:
   MINIMUM MAGNITUDE:  5.00
   MAXIMUM MAGNITUDE:  9.00

SITE COORDINATES:
   SITE LATITUDE:  33.9476
   SITE LONGITUDE:  117.2932

SEARCH DATES:
           START DATE:   1800
           END DATE:   2021

SEARCH RADIUS:
           62.1 mi
           100.0 km

ATTENUATION RELATION:  12) Bozorgnia Campbell Niazi (1999) Hor.-Soft Rock-Cor.
   UNCERTAINTY (M=Median, S=Sigma): S       Number of Sigmas:  1.0
   ASSUMED SOURCE TYPE:  SS [SS=Strike-slip, DS=Reverse-slip, BT=Blind-thrust]
   SCOND:   1  Depth Source:  A
   Basement Depth:  5.00 km     Campbell SSR:  1     Campbell SHR:  0
   COMPUTE PEAK HORIZONTAL ACCELERATION

MINIMUM DEPTH VALUE (km):  3.0


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EARTHQUAKE SEARCH RESULTS
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FILE CODE	LAT. NORTH	LONG. WEST	DATE	TIME (UTC) H M Sec	DEPTH (km)	QUAKE MAG.	SITE ACC. g	SITE MM INT.	APPROX. DISTANCE mi [km]
DMG	34.0000	117.2500	07/23/1923	73026.0	0.0	6.25	0.447	X	4.4(7.0)
DMG	33.9000	117.2000	12/19/1880	0 0 0.0	0.0	6.00	0.300	IX	6.3(10.1)
MGI	34.1000	117.3000	07/15/1905	2041 0.0	0.0	5.30	0.120	VII	10.5(16.9)
MGI	34.0000	117.5000	12/16/1858	10 0 0.0	0.0	7.00	0.298	IX	12.4(19.9)
DMG	33.7000	117.4000	05/13/1910	620 0.0	0.0	5.00	0.060	VI	18.2(29.2)
DMG	33.7000	117.4000	05/15/1910	1547 0.0	0.0	6.00	0.110	VII	18.2(29.2)
DMG	33.7000	117.4000	04/11/1910	757 0.0	0.0	5.00	0.060	VI	18.2(29.2)
DMG	34.2000	117.4000	07/22/1899	046 0.0	0.0	5.50	0.079	VII	18.5(29.7)
DMG	33.8000	117.0000	12/25/1899	1225 0.0	0.0	6.40	0.131	VIII	19.7(31.6)
MGI	33.8000	117.6000	04/22/1918	2115 0.0	0.0	5.00	0.053	VI	20.3(32.7)
DMG	34.2000	117.1000	09/20/1907	154 0.0	0.0	6.00	0.096	VII	20.6(33.2)
DMG	33.6990	117.5110	05/31/1938	83455.4	10.0	5.50	0.068	VI	21.2(34.2)
DMG	33.7500	117.0000	06/06/1918	2232 0.0	0.0	5.00	0.050	VI	21.6(34.8)
DMG	33.7500	117.0000	04/21/1918	223225.0	0.0	6.80	0.154	VIII	21.6(34.8)
DMG	33.9500	116.8500	09/28/1946	719 9.0	0.0	5.00	0.042	VI	25.4(40.8)
DMG	34.2700	117.5400	09/12/1970	143053.0	8.0	5.40	0.052	VI	26.4(42.4)
DMG	34.1800	116.9200	01/16/1930	034 3.6	0.0	5.10	0.043	VI	26.7(43.0)
DMG	34.1800	116.9200	01/16/1930	02433.9	0.0	5.20	0.045	VI	26.7(43.0)
DMG	33.7100	116.9250	09/23/1963	144152.6	16.5	5.00	0.040	V	26.7(43.0)
GSG	33.9530	117.7610	07/29/2008	184215.7	14.0	5.30	0.048	VI	26.8(43.1)
GSP	34.1400	117.7000	02/28/1990	234336.6	5.0	5.20	0.045	VI	26.8(43.1)
DMG	34.3000	117.5000	07/22/1899	2032 0.0	0.0	6.50	0.100	VII	27.0(43.5)
DMG	34.2670	116.9670	08/29/1943	34513.0	0.0	5.50	0.050	VI	28.9(46.5)
GSP	34.1630	116.8550	06/28/1992	144321.0	6.0	5.30	0.044	VI	29.1(46.9)
DMG	34.3000	117.6000	07/30/1894	512 0.0	0.0	6.00	0.065	VI	30.0(48.3)
GSP	34.1950	116.8620	08/17/1992	204152.1	11.0	5.30	0.042	VI	30.0(48.3)
DMG	34.1000	116.8000	10/24/1935	1448 7.6	0.0	5.10	0.038	V	30.1(48.5)
GSP	34.2900	116.9460	02/10/2001	210505.8	9.0	5.10	0.037	V	30.9(49.7)
GSN	34.2030	116.8270	06/28/1992	150530.7	5.0	6.70	0.096	VII	32.0(51.4)
DMG	33.9760	116.7210	06/12/1944	104534.7	10.0	5.10	0.034	V	32.8(52.8)
GSP	34.2390	116.8370	07/09/1992	014357.6	0.0	5.30	0.039	V	32.9(53.0)
DMG	33.9940	116.7120	06/12/1944	111636.0	10.0	5.30	0.038	V	33.4(53.8)
GSP	34.3400	116.9000	11/27/1992	160057.5	1.0	5.30	0.036	V	35.2(56.6)
DMG	34.1000	116.7000	02/07/1889	520 0.0	0.0	5.30	0.036	V	35.5(57.2)
DMG	34.3700	117.6500	12/08/1812	15 0 0.0	0.0	7.00	0.106	VII	35.6(57.3)
GSP	33.9325	117.9158	03/29/2014	040942.2	5.1	5.10	0.032	V	35.7(57.4)
GSG	34.3100	116.8480	02/22/2003	121910.6	1.0	5.20	0.033	V	35.7(57.4)
GSP	34.3690	116.8970	12/04/1992	020857.5	3.0	5.30	0.034	V	36.9(59.3)
DMG	34.2000	117.9000	08/28/1889	215 0.0	0.0	5.50	0.037	V	38.8(62.5)
PAS	33.9980	116.6060	07/08/1986	92044.5	11.7	5.60	0.038	V	39.5(63.6)
MGI	34.0000	118.0000	12/25/1903	1745 0.0	0.0	5.00	0.026	V	40.6(65.4)
DMG	33.6170	117.9670	03/11/1933	154 7.8	0.0	6.30	0.052	VI	44.9(72.3)
PAS	34.0610	118.0790	10/01/1987	144220.0	9.5	5.90	0.039	V	45.6(73.5)
DMG	34.0170	116.5000	07/24/1947	221046.0	0.0	5.50	0.031	V	45.7(73.5)
DMG	34.0170	116.5000	07/25/1947	04631.0	0.0	5.00	0.023	IV	45.7(73.5)
DMG	34.0170	116.5000	07/25/1947	61949.0	0.0	5.20	0.026	V	45.7(73.5)
DMG	34.0170	116.5000	07/26/1947	24941.0	0.0	5.10	0.024	V	45.7(73.5)
GSP	34.2620	118.0020	06/28/1991	144354.5	11.0	5.40	0.029	V	46.0(74.0)
PAS	34.0730	118.0980	10/04/1987	105938.2	8.2	5.30	0.027	V	46.9(75.4)
DMG	33.6830	118.0500	03/11/1933	658 3.0	0.0	5.50	0.030	V	47.1(75.8)
DMG	33.5750	117.9830	03/11/1933	518 4.0	0.0	5.20	0.025	V	47.2(76.0)
DMG	33.7500	118.0830	03/11/1933	323 0.0	0.0	5.00	0.022	IV	47.3(76.1)
DMG	33.7500	118.0830	03/13/1933	131828.0	0.0	5.30	0.026	V	47.3(76.1)

EARTHQUAKE SEARCH RESULTS

FILE CODE	LAT. NORTH	LONG. WEST	DATE	TIME (UTC) H M Sec	DEPTH (km)	QUAKE MAG.	SITE ACC. g	SITE MM INT.	APPROX. DISTANCE mi [km]
DMG	33.7500	118.0830	03/11/1933	2 9 0.0	0.0	5.00	0.022	IV	47.3(76.1)
DMG	33.7500	118.0830	03/11/1933	910 0.0	0.0	5.10	0.024	IV	47.3(76.1)

DMG	33.7500	118.0830	03/11/1933	230 0.0	0.0	5.10	0.024	IV	47.3(76.1)
MGI	34.1000	118.1000	07/11/1855	415 0.0	0.0	6.30	0.049	VI	47.3(76.2)
DMG	33.6170	118.0170	03/14/1933	19 150.0	0.0	5.10	0.023	IV	47.4(76.3)
DMG	33.7000	118.0670	03/11/1933	51022.0	0.0	5.10	0.023	IV	47.6(76.5)
DMG	33.7000	118.0670	03/11/1933	85457.0	0.0	5.10	0.023	IV	47.6(76.5)
DMG	33.7830	118.1330	10/02/1933	91017.6	0.0	5.40	0.027	V	49.5(79.6)
GSP	33.5290	116.5720	06/12/2005	154146.5	14.0	5.20	0.023	IV	50.5(81.3)
GSP	34.1390	116.4310	06/28/1992	123640.6	10.0	5.10	0.022	IV	51.1(82.2)
GSP	34.3410	116.5290	06/28/1992	124053.5	6.0	5.20	0.023	IV	51.4(82.8)
GSN	34.2010	116.4360	06/28/1992	115734.1	1.0	7.60	0.109	VII	52.0(83.8)
GSP	34.1080	116.4040	06/29/1992	141338.8	9.0	5.40	0.025	V	52.1(83.8)
DMG	33.9330	116.3830	12/04/1948	234317.0	0.0	6.50	0.050	VI	52.1(83.9)
GSP	34.0640	116.3610	09/15/1992	084711.3	9.0	5.20	0.022	IV	54.0(86.8)
GSP	33.5080	116.5140	10/31/2001	075616.6	15.0	5.10	0.020	IV	54.1(87.0)
PAS	33.5010	116.5130	02/25/1980	104738.5	13.6	5.50	0.026	V	54.4(87.5)
GSP	34.3320	116.4620	07/01/1992	074029.9	9.0	5.40	0.024	V	54.4(87.6)
T-A	34.0000	118.2500	09/23/1827	0 0 0.0	0.0	5.00	0.019	IV	54.9(88.3)
T-A	34.0000	118.2500	01/10/1856	0 0 0.0	0.0	5.00	0.019	IV	54.9(88.3)
T-A	34.0000	118.2500	03/26/1860	0 0 0.0	0.0	5.00	0.019	IV	54.9(88.3)
DMG	33.5000	116.5000	09/30/1916	211 0.0	0.0	5.00	0.019	IV	55.0(88.6)
PAS	34.3270	116.4450	03/15/1979	21 716.5	2.5	5.20	0.021	IV	55.1(88.7)
GSP	34.2680	116.4020	06/16/1994	162427.5	3.0	5.00	0.019	IV	55.5(89.4)
DMG	34.0670	116.3330	05/18/1940	55120.2	0.0	5.20	0.021	IV	55.6(89.4)
DMG	34.0670	116.3330	05/18/1940	72132.7	0.0	5.00	0.019	IV	55.6(89.4)
GSP	33.9610	116.3180	04/23/1992	045023.0	12.0	6.10	0.036	V	55.9(89.9)
GSP	34.0290	116.3210	08/21/1993	014638.4	9.0	5.00	0.019	IV	55.9(90.0)
DMG	33.7830	118.2500	11/14/1941	84136.3	0.0	5.40	0.023	IV	56.0(90.1)
MGI	34.0800	118.2600	07/16/1920	18 8 0.0	0.0	5.00	0.019	IV	56.1(90.2)
DMG	33.8500	118.2670	03/11/1933	1425 0.0	0.0	5.00	0.019	IV	56.2(90.5)
DMG	34.0830	116.3000	05/18/1940	5 358.5	0.0	5.40	0.023	IV	57.6(92.7)
MGI	34.0000	118.3000	09/03/1905	540 0.0	0.0	5.30	0.021	IV	57.8(92.9)
GSP	33.9020	116.2840	07/24/1992	181436.2	9.0	5.00	0.018	IV	57.9(93.2)
GSG	33.4200	116.4890	07/07/2010	235333.5	14.0	5.50	0.024	IV	58.8(94.7)
GSP	33.8760	116.2670	06/29/1992	160142.8	1.0	5.20	0.020	IV	59.0(95.0)
PAS	34.5160	116.4950	06/01/1975	13849.2	4.5	5.20	0.019	IV	60.1(96.8)
GSP	33.4315	116.4427	06/10/2016	080438.7	12.3	5.19	0.019	IV	60.5(97.3)
DMG	33.2000	116.7000	01/01/1920	235 0.0	0.0	5.00	0.017	IV	61.9(99.6)

****

-END OF SEARCH- 92 EARTHQUAKES FOUND WITHIN THE SPECIFIED SEARCH AREA.

TIME PERIOD OF SEARCH: 1800 TO 2021

LENGTH OF SEARCH TIME: 222 years

THE EARTHQUAKE CLOSEST TO THE SITE IS ABOUT 4.4 MILES (7.0 km) AWAY.

LARGEST EARTHQUAKE MAGNITUDE FOUND IN THE SEARCH RADIUS: 7.6

LARGEST EARTHQUAKE SITE ACCELERATION FROM THIS SEARCH: 0.447 g

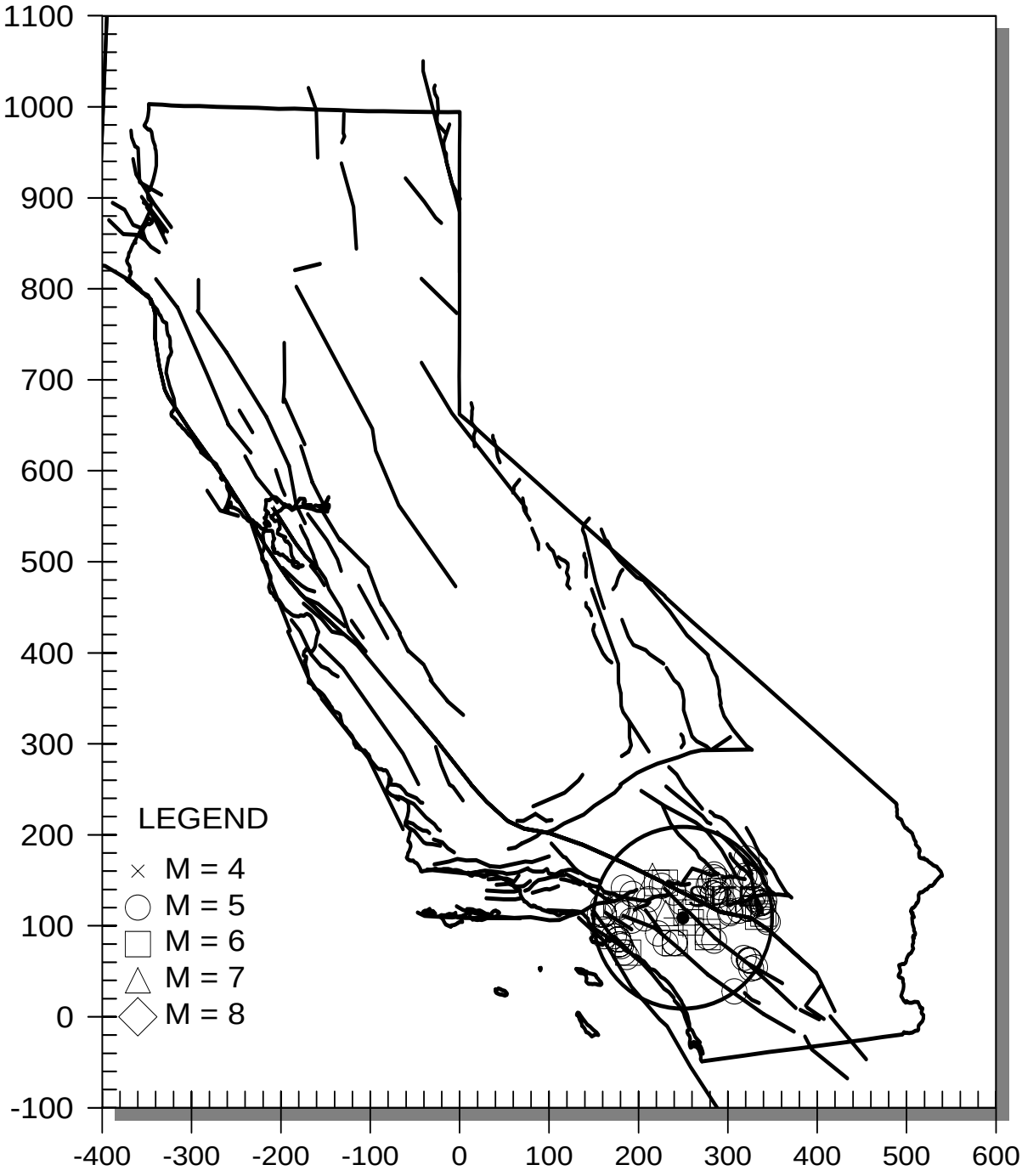
COEFFICIENTS FOR GUTENBERG & RICHTER RECURRENCE RELATION:
a-value= 1.424
b-value= 0.414
beta-value= 0.952

TABLE OF MAGNITUDES AND EXCEEDANCES:

Earthquake Magnitude	Number of Times Exceeded	Cumulative No. / Year
4.0	92	0.41441
4.5	92	0.41441
5.0	92	0.41441
5.5	26	0.11712
6.0	16	0.07207
6.5	7	0.03153
7.0	3	0.01351
7.5	1	0.00450

EARTHQUAKE EPICENTER MAP

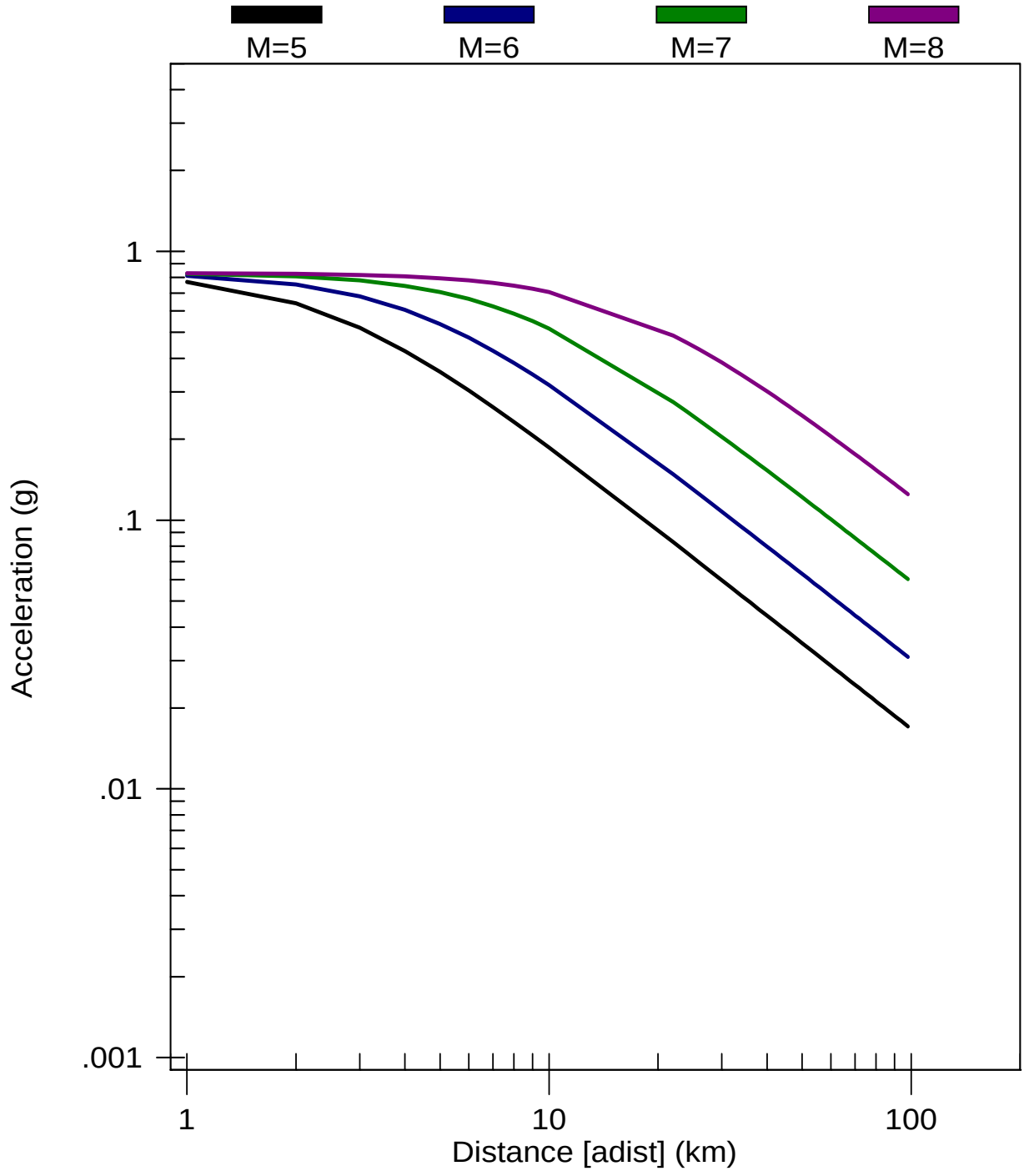
FPG - Farm Bureau



W.O. 8676-A-SC
Plate C-9

STRIKE-SLIP FAULTS

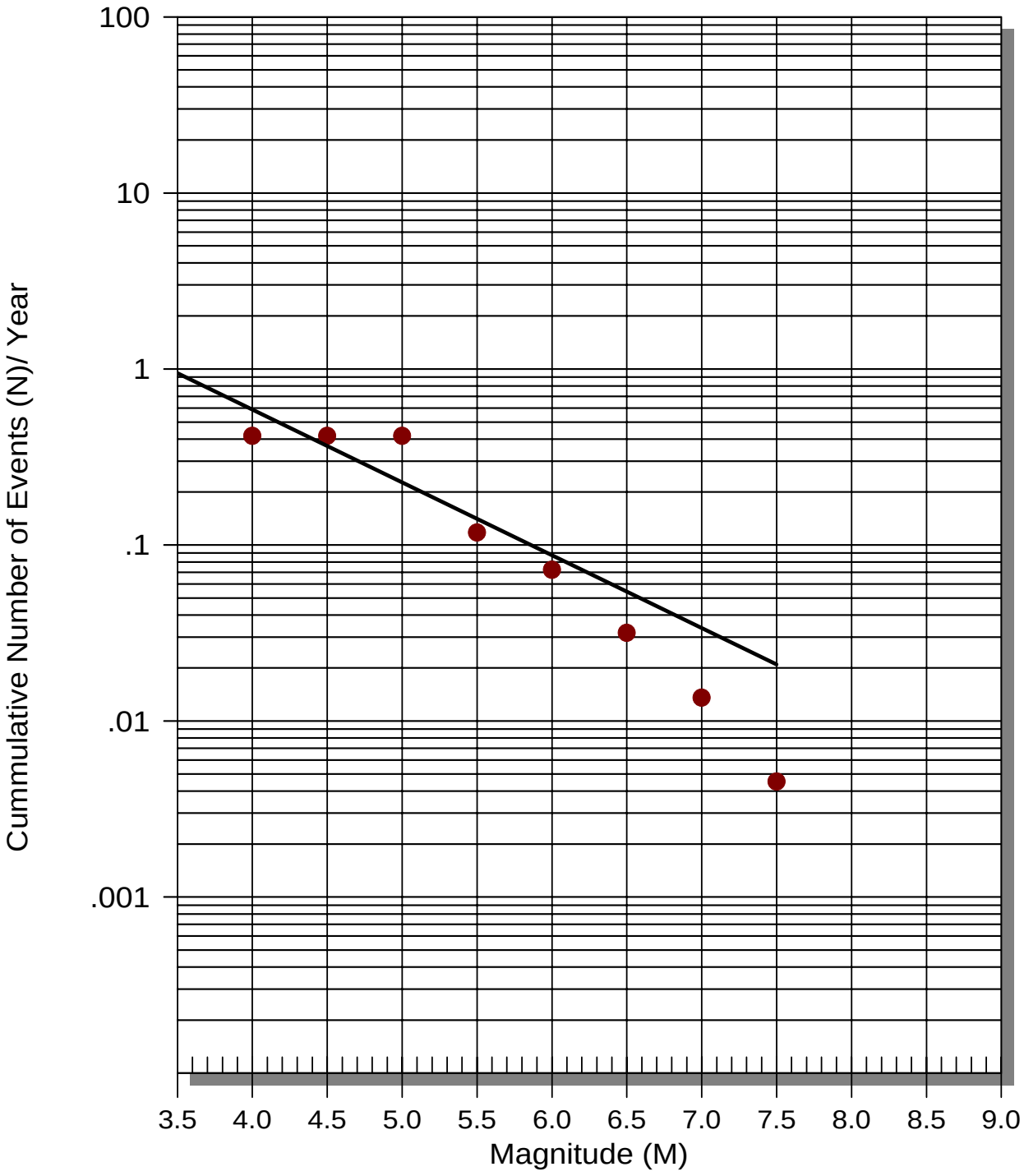
12) Bozorgnia Campbell Niazi (1999) Hor.-Soft Rock-Cor.



W.O. 8676-A-SC
Plate C-10

EARTHQUAKE RECURRENCE CURVE

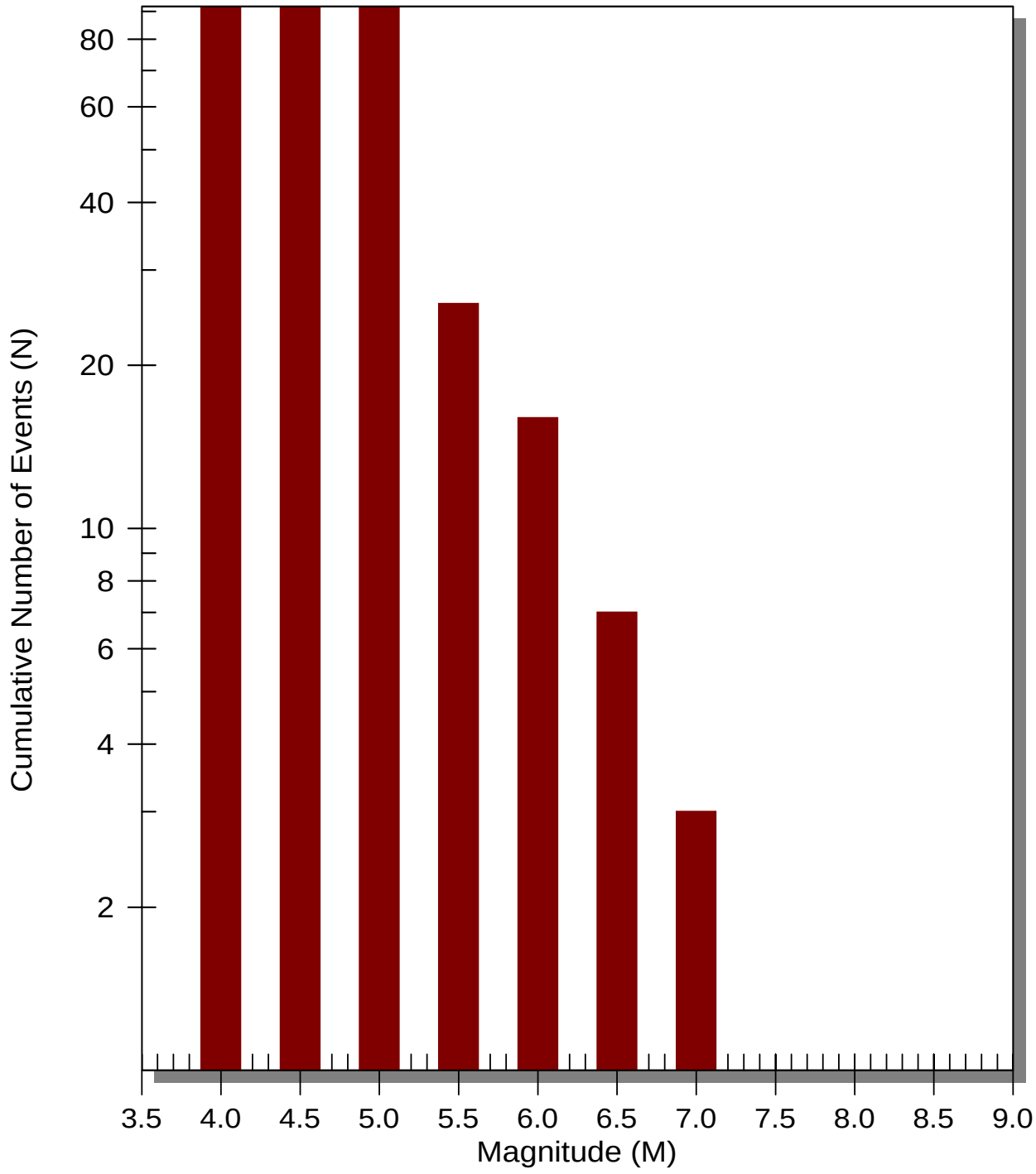
FPG - Farm Bureau



W.O. 8676-A-SC
Plate C-11

Number of Earthquakes (N) Above Magnitude (M)

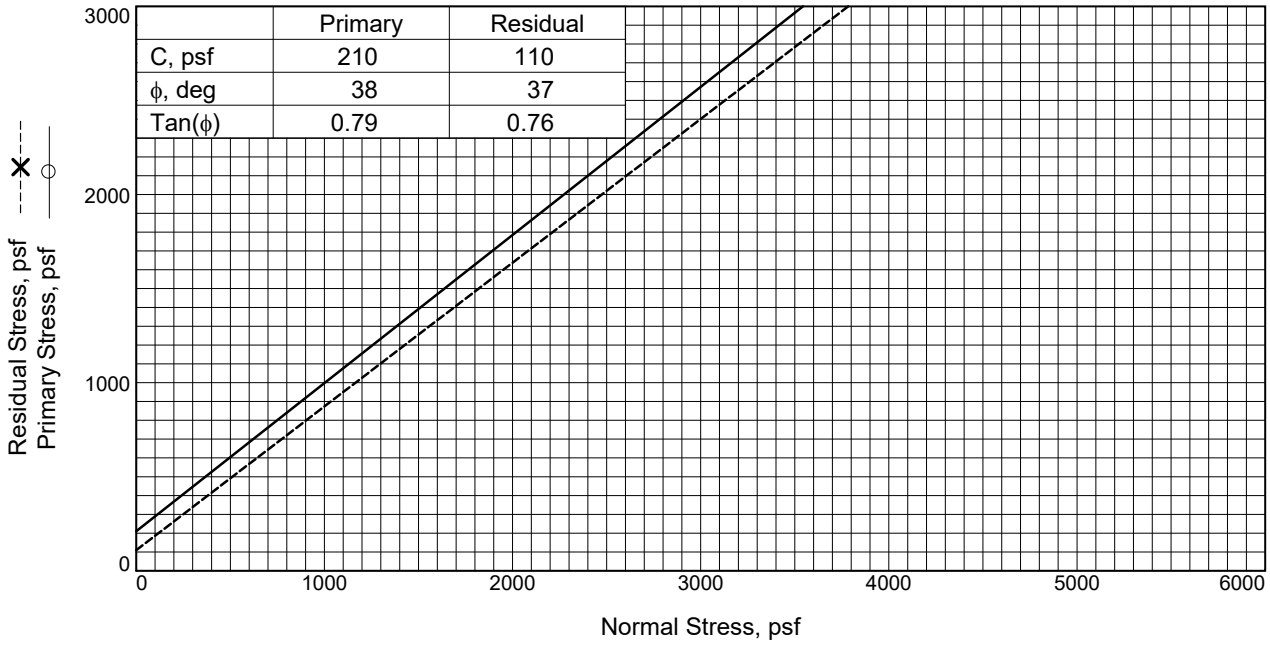
FPG - Farm Bureau

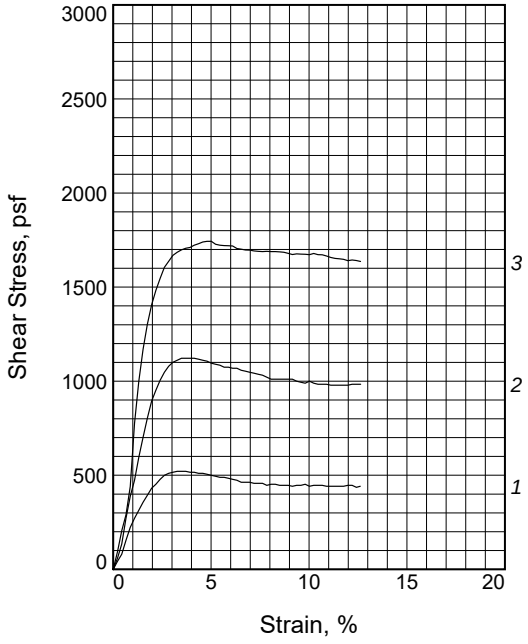


W.O. 8676-A-SC
Plate C-12

APPENDIX D

LABORATORY TEST RESULTS





Sample No.		1	2	3
Initial	Water Content, %	6.9	6.9	6.9
	Dry Density, pcf	121.9	121.9	121.7
	Saturation, %	51.2	51.2	50.9
	Void Ratio	0.3575	0.3575	0.3593
	Diameter, in.	2.38	2.38	2.38
	Height, in.	1.00	1.00	1.00
At Test	Water Content, %	13.1	12.9	12.6
	Dry Density, pcf	122.1	123.1	123.4
	Saturation, %	98.0	99.1	98.2
	Void Ratio	0.3548	0.3439	0.3402
	Diameter, in.	2.38	2.38	2.38
	Height, in.	1.00	0.99	0.99
Normal Stress, psf		500	1000	2000
Primary Stress, psf		521	1122	1743
Strain, %		3.5	3.7	5.0
Residual Stress, psf		441	994	1658
Strain, %		9.2	9.6	11.1
Strain rate, in./min.		0.004	0.004	0.004

Sample Type: Remolded
Description: Brown Silty Sand

Specific Gravity= 2.65
Remarks:

Figure _____

Client: Foremost Pacific Group

Project: Farm Bureau - Box Springs

Source of Sample: B-3 **Depth:** 0-5
Sample Number: B-3
Proj. No.: 8676-A-SC **Date Sampled:**

GeoSoils, Inc.

Tested By: TR **Checked By:** TR

W.O. 8676-A-SC
Plate D-1

GeoSoils, Inc.
5741 Palmer Way, Carlsbad CA 92010
Phone (760) 438-3155

CORROSION REPORT SUMMARY

Project No: **8676-A-SC**
Project Name: **Foremost Pacific Group**
Report Date: **September 28, 2023**

SAMPLE ID	pH (H+)	Minimum Resistivity (ohm/cm)	Sulfate Content (wt%)	Chloride Content (mg/kg)
B-3, 0-5ft	7.5	8800	<0.003	43

Sample testing in accordance with: pH - CTM 643, Resistivity - CTM 643
Sulfate - CTM 417, Chloride - CTM 422

Remarks: _____

APPENDIX E

FIELD PERCOLATION DATA SHEETS

Leach Line Percolation Data Sheet

Project: Foremost Pacific Group - Fran Bureau	W.O. Number: 8678-A-SC
Test Hole No.: P-1/8-7	Date Excavated: 9/18/2023
Depth of Test Hole: 5' (in pipe) 2'2" (outside)	Soil Classification: SM
Check for Sandy Soil Criteria Tested by: MAM	Date: 9/18/2023 Presoak: @ 12:23 PM MAM 9/18/23
Actual Percolation Tested by: MAM	Date: 9/19/2023

Sandy Soil Criteria Test

Trial No.	Time	Time Interval (Min.)	Initial Water Level (Inches)	Final Water Level (Inches)	Δ in Water Level (Inches)
1	8:57 9:22	25	21.5	16	5.5
2	9:23 9:48	25	22.5	19.5	3.0

Use: Normal Sandy (Circle One) Soil Criteria

	Time	Time Interval (min)	Total Elapsed Time (Min.)	Initial Water Level (Inches)	Final Water Level (Inches)	Δ in Water Level (Inches)	Percolation Rate (min/inch)
First Hour	9:49 10:19	30	30	22	16.5	5.5	5.45
	10:20 10:50	30	60	22.25	16.75	5.5	5.45
Second Hour	10:51 11:21	30	90	21	14.75	6.25	4.8
	11:23 11:53	30	120	22	15.75	6.25	4.8
Third Hour	11:53 12:23	30	150	21.5	16.25	5.25	5.71
	12:24 12:54	30	180	21.5	16.0	5.5	5.45
Fourth Hour	12:56 1:26	30	210	21.25	16	5.25	5.71
	1:28 1:58	30	240	21.25	15.5	5.75	5.22
Fifth Hour	2:00 2:30	30	270	21.5	16.25	5.25	5.71
	2:31 3:01	30	300	21.25	17.75	3.5	8.57
Sixth Hour	3:01 3:31	30	330	21.25	18.25	3	10
	3:33 4:03	30	360	21	18	3	10

Leach Line Percolation Data Sheet

Project: Fortenet Pacific Group - Farm Bureau		W.O. Number: 8676-A-SC	
Test Hole No.: P-2 / B-6		Date Excavated: 9/18/2023	
Depth of Test Hole: 5'1" (in pipe)		Soil Classification: SM	
Check for Sandy Soil Criteria Tested by: MM		Date: 9/19/2023	Presoak: @ 10:03 MM 9/18/23
Actual Percolation Tested by: MM		Date: 9/19/2023	

Sandy Soil Criteria Test

Trial No.	Time	Time Interval (Min.)	Initial Water Level (Inches)	Final Water Level (Inches)	Δ in Water Level (Inches)
1	9:08 9:33	25	35	30	5
2	9:36 10:01	25	33	30	3

Use: Normal Sandy (Circle One) Soil Criteria

	Time	Time Interval (min)	Total Elapsed Time (Min.)	Initial Water Level (Inches)	Final Water Level (Inches)	Δ in Water Level (Inches)	Percolation Rate (min/inch)
First Hour	10:02 10:32	30	30	30	28	2	15
	10:33 10:03	30	60	29	25.25	3.75	8
Second Hour	11:05 11:35	30	90	30.25	28	2.25	13.33
	11:36 12:06	30	120	30.75	28	2.75	10.91
Third Hour	12:07 12:37	30	150	29.25	26.5	2.75	10.91
	12:39 1:09	30	180	28	25	3	10
Fourth Hour	1:10 1:40	30	210	28	24	4	7.5
	1:41 2:11	30	240	28	24.25	3.75	8
Fifth Hour	2:13 2:43	30	270	27.5	23.5	4	7.5
	2:45 3:15	30	300	28	24.5	3.5	8.57
Sixth Hour	3:16 3:46	30	330	28	24.5	3.5	8.57
	3:48	30	360	28	25	3	10

APPENDIX F

GENERAL EARTHWORK AND GRADING GUIDELINES

GENERAL EARTHWORK AND GRADING GUIDELINES

General

These guidelines present general procedures and requirements for earthwork and grading as shown on the approved grading plans, including preparation of areas to be filled, placement of fill, installation of subdrains, excavations, and appurtenant structures or flatwork. The recommendations contained in the geotechnical report are part of these earthwork and grading guidelines and would supercede the provisions contained hereafter in the case of conflict. Evaluations performed by the consultant during the course of grading may result in new or revised recommendations which could supercede these guidelines or the recommendations contained in the geotechnical report. Generalized details follow this text.

The contractor is responsible for the satisfactory completion of all earthwork in accordance with provisions of the project plans and specifications and latest adopted Code. In the case of conflict, the most onerous provisions shall prevail. The project geotechnical engineer and engineering geologist (geotechnical consultant), or their representatives, should provide observation and testing services, and geotechnical consultation during the duration of the project.

EARTHWORK OBSERVATIONS AND TESTING

Geotechnical Consultant

Prior to the commencement of grading, a qualified geotechnical consultant (soil engineer and engineering geologist) should be employed for the purpose of observing earthwork procedures and testing the fills for general conformance with the recommendations of the geotechnical report(s), the approved grading plans, and applicable grading codes and ordinances.

The geotechnical consultant should provide testing and observation so that an evaluation may be made that the work is being accomplished as specified. It is the responsibility of the contractor to assist the consultants and keep them apprised of anticipated work schedules and changes, so that they may schedule their personnel accordingly.

All remedial removals, clean-outs, prepared ground to receive fill, key excavations, and subdrain installation should be observed and documented by the geotechnical consultant prior to placing any fill. It is the contractor's responsibility to notify the geotechnical consultant when such areas are ready for observation.

Laboratory and Field Tests

Maximum dry density tests to determine the degree of compaction should be performed in accordance with American Standard Testing Materials test method ASTM designation D-1557. Random or representative field compaction tests should be performed in

accordance with test methods ASTM designation D-1556, D-2937 or D-2922, and D-3017, at intervals of approximately 2 feet of fill height or approximately every 1,000 cubic yards placed. These criteria would vary depending on the soil conditions and the size of the project. The location and frequency of testing would be at the discretion of the geotechnical consultant.

Contractor's Responsibility

All clearing, site preparation, and earthwork performed on the project should be conducted by the contractor, with observation by a geotechnical consultant, and staged approval by the governing agencies, as applicable. It is the contractor's responsibility to prepare the ground surface to receive the fill, to the satisfaction of the geotechnical consultant, and to place, spread, moisture condition, mix, and compact the fill in accordance with the recommendations of the geotechnical consultant. The contractor should also remove all non-earth material considered unsatisfactory by the geotechnical consultant.

Notwithstanding the services provided by the geotechnical consultant, it is the sole responsibility of the contractor to provide adequate equipment and methods to accomplish the earthwork in strict accordance with applicable grading guidelines, latest adopted Code or agency ordinances, geotechnical report(s), and approved grading plans. Sufficient watering apparatus and compaction equipment should be provided by the contractor with due consideration for the fill material, rate of placement, and climatic conditions. If, in the opinion of the geotechnical consultant, unsatisfactory conditions such as questionable weather, excessive oversized rock or deleterious material, insufficient support equipment, etc., are resulting in a quality of work that is not acceptable, the consultant will inform the contractor, and the contractor is expected to rectify the conditions, and if necessary, stop work until conditions are satisfactory.

During construction, the contractor shall properly grade all surfaces to maintain good drainage and prevent ponding of water. The contractor shall take remedial measures to control surface water and to prevent erosion of graded areas until such time as permanent drainage and erosion control measures have been installed.

SITE PREPARATION

All major vegetation, including brush, trees, thick grasses, organic debris, and other deleterious material, should be removed and disposed of off-site. These removals must be concluded prior to placing fill. In-place existing alluvium or rock materials, as evaluated by the geotechnical consultant as being unsuitable, should be removed and recompacted prior to any fill placement. Depending upon the soil conditions, these materials may be reused as compacted fills. Any materials incorporated as part of the compacted fills should be approved by the geotechnical consultant.

Any underground structures such as cesspools, cisterns, mining shafts, tunnels, septic tanks, wells, pipelines, or other structures not located prior to grading, are to be removed

or treated in a manner recommended by the geotechnical consultant. Soft, dry, spongy, highly fractured, or otherwise unsuitable ground, extending to such a depth that surface processing cannot adequately improve the condition, should be overexcavated down to firm ground and approved by the geotechnical consultant before compaction and filling operations continue. Overexcavated and processed soils, which have been properly mixed and moisture conditioned, should be re-compacted to the minimum relative compaction as specified in these guidelines.

Existing ground, which is determined to be satisfactory for support of the fills, should be scarified (ripped) to a minimum depth of 6 to 8 inches, or as directed by the geotechnical consultant. After the scarified ground is brought to optimum moisture content, or greater and mixed, the materials should be compacted as specified herein. If the scarified zone is greater than 6 to 8 inches in depth, it may be necessary to remove the excess and place the material in lifts restricted to about 6 to 8 inches in compacted thickness. Scarification, disc harrowing, or other acceptable forms of mixing should continue until the soils are broken down and free of large lumps or clods, until the working surface is reasonably uniform and free from ruts, hollows, hummocks, mounds, or other uneven features, which would inhibit compaction as described previously.

Where fills are to be placed on ground with slopes steeper than 5:1 (horizontal to vertical [h:v]), the ground should be stepped or benched. The lowest bench, which will act as a key, should be a minimum of 15 feet wide and should be at least 2 feet deep into firm material, and approved by the geotechnical consultant. In fill-over-cut slope conditions, the recommended minimum width of the lowest bench or key is also 15 feet, with the key founded on firm material, as designated by the geotechnical consultant. As a general rule, unless specifically recommended otherwise by the geotechnical consultant, the minimum width of fill keys should be equal to ½ the height of the slope.

Standard benching is generally 4 feet (minimum) vertically, exposing firm, acceptable material. Benching may be used to remove unsuitable materials, although it is understood that the vertical height of the bench may exceed 4 feet. Pre-stripping may be considered for unsuitable materials in excess of 4 feet in thickness.

All areas to receive fill, including processed areas, removal areas, and the toes of fill benches, should be observed and approved by the geotechnical consultant prior to placement of fill. Fills may then be properly placed and compacted until design grades (elevations) are attained.

COMPACTED FILLS

Any earth materials imported or excavated on the property may be used in the fill provided that each material has been evaluated to be suitable by the geotechnical consultant. These materials should be free of roots, tree branches, other organic matter, or other deleterious materials. All unsuitable materials should be removed from the fill as directed by the geotechnical consultant. Soils of poor gradation, undesirable expansion potential,

or substandard strength characteristics may be designated by the consultant as unsuitable and may require blending with other soils to serve as a satisfactory fill material.

Fill materials derived from benching operations should be dispersed throughout the fill area and blended with other approved material. Benching operations should not result in the benched material being placed only within a single equipment width away from the fill/bedrock contact.

Oversized materials defined as rock, or other irreducible materials, with a maximum dimension greater than 12 inches, should not be buried or placed in fills unless the location of materials and disposal methods are specifically approved by the geotechnical consultant. Oversized material should be taken offsite, or placed in accordance with recommendations of the geotechnical consultant in areas designated as suitable for rock disposal. GSI anticipates that soils to be used as fill material for the subject project may contain some rock. Appropriately, the need for rock disposal may be necessary during grading operations on the site. From a geotechnical standpoint, the depth of any rocks, rock fills, or rock blankets, should be a sufficient distance from finish grade. This depth is generally the same as any overexcavation due to cut-fill transitions in hard rock areas, and generally facilitates the excavation of structural footings and substructures. Should deeper excavations be proposed (i.e., deepened footings, utility trenching, etc.), the developer may consider increasing the hold-down depth of any rocky fills to be placed, as appropriate. In addition, some agencies/jurisdictions mandate a specific hold-down depth for oversize materials placed in fills. The hold-down depth, and potential to encounter oversize rock, both within fills, and occurring in cut or natural areas, would need to be disclosed to all interested/affected parties. Once approved by the governing agency, the hold-down depth for oversized rock (i.e., greater than 12 inches) in fills on this project is provided as 10 feet, unless specified differently in the text of this report. The governing agency may require that these materials need to be deeper, crushed, or reduced to less than 12 inches in maximum dimension, at their discretion.

To facilitate future trenching, rock (or oversized material), should not be placed within the hold-down depth feet from finish grade, the range of foundation excavations, future utilities, or underground construction unless specifically approved by the governing agency, the geotechnical consultant, or the developer's representative.

If import material is required for grading, representative samples of the materials to be used as compacted fill should be analyzed in the laboratory by the geotechnical consultant to evaluate it's physical properties and suitability for use onsite. Such testing should be performed three (3) days prior to importation. If any material other than that previously tested is encountered during grading, an appropriate analysis of this material should be conducted by the geotechnical consultant as soon as possible.

Approved fill material should be placed in areas prepared to receive fill in near horizontal layers, that when compacted, should not exceed about 6 to 8 inches in thickness. The geotechnical consultant may approve thick lifts if testing indicates the grading procedures are such that adequate compaction is being achieved with lifts of greater thickness. Each

layer should be spread evenly and blended to attain uniformity of material and moisture suitable for compaction.

Fill layers at a moisture content less than optimum should be watered and mixed, and wet fill layers should be aerated by scarification, or should be blended with drier material. Moisture conditioning, blending, and mixing of the fill layer should continue until the fill materials have a uniform moisture content at, or above, optimum moisture.

After each layer has been evenly spread, moisture conditioned, and mixed, it should be uniformly compacted to a minimum of 90 percent of the maximum density as evaluated by ASTM test designation D-1557, or as otherwise recommended by the geotechnical consultant. Compaction equipment should be adequately sized and should be specifically designed for soil compaction, or of proven reliability to efficiently achieve the specified degree of compaction.

Where tests indicate that the density of any layer of fill, or portion thereof, is below the required relative compaction, or improper moisture is in evidence, the particular layer or portion shall be re-worked until the required density or moisture content has been attained. No additional fill shall be placed in an area until the last placed lift of fill has been tested and found to meet the density and moisture requirements, and is approved by the geotechnical consultant.

In general, per the latest adopted Code, fill slopes should be designed and constructed at a gradient of 2:1 (h:v), or flatter. Compaction of slopes should be accomplished by over-building a minimum of 3 feet horizontally, and then trimmed back to the design slope configuration. Testing shall be performed as the fill is elevated to evaluate compaction as the fill core is being developed. Special efforts may be necessary to attain the specified compaction in the fill slope zone. Final slope shaping should be performed by trimming and removing loose materials with appropriate equipment. A final evaluation of fill slope compaction should be based on observation or testing of the finished slope face. Where compacted fill slopes are designed steeper than 2:1 (h:v), prior approval from the governing agency, specific material types, a higher minimum relative compaction, special reinforcement, and special grading procedures will be recommended.

If an alternative to over-building and cutting back the compacted fill slopes is selected, then special effort should be made to achieve the required compaction in the outer 10 feet of each lift of fill by undertaking the following:

1. An extra piece of equipment consisting of a heavy, short-shanked sheepsfoot should be used to roll (horizontal) parallel to the slopes continuously as fill is placed. The sheepsfoot roller should also be used to roll perpendicular to the slopes, and extend out over the slope to provide adequate compaction to the face of the slope.

2. Loose fill should not be spilled out over the face of the slope as each lift is compacted. Any loose fill spilled over a previously completed slope face should be trimmed off or be subject to re-rolling.

3. Field compaction tests will be made in the outer (horizontal) 2 to 8 feet of the slope at appropriate vertical intervals, afer compaction operations.

4. After completion of the slope, the slope face should be shaped with a small tractor and then grid-rolled to achieve compaction to the slope face. Final testing should be used to evaluate compaction after grid-rolling.

5. Where testing indicates less than adequate compaction, the contractor will be responsible to rip, water, mix, and recompact the slope material as necessary to achieve compaction. Additional testing should be performed to evaluate compaction.

SUBDRAIN INSTALLATION

Subdrains should be installed in approved ground in accordance with the approximate alignment and details indicated by the geotechnical consultant. Subdrain locations or materials should not be changed or modified without approval of the geotechnical consultant. The geotechnical consultant may recommend and direct changes in subdrain line, grade, and drain material in the field, pending exposed conditions. The location of constructed subdrains, especially the outlets, should be recorded/surveyed by the project civil engineer. Drainage at the subdrain outlets should be provided by the project civil engineer.

EXCAVATIONS

Excavations and cut slopes should be examined during grading by the geotechnical consultant. If directed by the geotechnical consultant, further excavations or overexcavation and refilling of cut areas should be performed, or remedial grading of cut slopes should be performed. When fill-over-cut slopes are to be graded, unless otherwise approved, the cut portion of the slope should be observed by the geotechnical consultant prior to placement of materials for construction of the fill portion of the slope. The geotechnical consultant should observe all cut slopes, and should be notified by the contractor when excavation of cut slopes commence.

If, during the course of grading, unforeseen adverse or potentially adverse geologic conditions are encountered, the geotechnical consultant should investigate, evaluate, and make appropriate recommendations for mitigation of these conditions. The need for cut slope buttressing or stabilizing should be based on in-grading evaluation by the geotechnical consultant, whether anticipated or not.

Unless otherwise specified in geotechnical and geological report(s), no cut slopes should be excavated higher or steeper than that allowed by the ordinances of controlling governmental agencies. Additionally, short-term stability of temporary cut slopes is the contractor's responsibility.

Erosion control and drainage devices should be designed by the project civil engineer and should be constructed in compliance with the ordinances of the controlling governmental agencies, or in accordance with the recommendations of the geotechnical consultant.

COMPLETION

Observation, testing, and consultation by the geotechnical consultant should be conducted during the grading operations in order to state an opinion that all cut and fill areas are graded in accordance with the approved project specifications. After completion of grading, and after the geotechnical consultant has finished observations of the work, final reports should be submitted, and may be subject to review by the controlling governmental agencies. No further excavation or filling should be undertaken without prior notification of the geotechnical consultant or approved plans.

All finished cut and fill slopes should be protected from erosion or be planted in accordance with the project specifications or as recommended by a landscape architect. Such protection or planning should be undertaken as soon as practical after completion of grading.

JOB SAFETY

General

At GSI, getting the job done safely is of primary concern. The following is the company's safety considerations for use by all employees on multi-employer construction sites. On-ground personnel are at highest risk of injury, and possible fatality, on grading and construction projects. GSI recognizes that construction activities will vary on each site, and that site safety is the prime responsibility of the contractor; however, everyone must be safety conscious and responsible at all times. To achieve our goal of avoiding accidents, cooperation between the client, the contractor, and GSI personnel must be maintained. In an effort to minimize risks associated with geotechnical testing and observation, the following precautions are to be implemented for the safety of field personnel on grading and construction projects:

Safety Meetings: GSI field personnel are directed to attend contractor's regularly scheduled and documented safety meetings.

Safety Vests: Safety vests are provided for, and are to be worn by GSI personnel, at all times, when they are working in the field.

Safety Flags: Two safety flags are provided to GSI field technicians; one is to be affixed to the vehicle when on site, the other is to be placed atop the spoil pile on all test pits.

Flashing Lights: All vehicles stationary in the grading area shall use rotating or flashing amber beacons, or strobe lights, on the vehicle during all field testing. While operating a vehicle in the grading area, the emergency flasher on the vehicle shall be activated.

In the event that the contractor's representative observes any of our personnel not following the above, we request that it be brought to the attention of our office.

Test Pits Location, Orientation, and Clearance

The technician is responsible for selecting test pit locations. A primary concern should be the technician's safety. Efforts will be made to coordinate locations with the grading contractor's authorized representative, and to select locations following or behind the established traffic pattern, preferably outside of current traffic. The contractor's authorized representative (supervisor, grade checker, dump man, operator, etc.) should direct excavation of the pit and safety during the test period. Of paramount concern should be the soil technician's safety, and obtaining enough tests to represent the fill.

Test pits should be excavated so that the spoil pile is placed away from oncoming traffic, whenever possible. The technician's vehicle is to be placed next to the test pit, opposite the spoil pile. This necessitates the fill be maintained in a driveable condition. Alternatively, the contractor may wish to park a piece of equipment in front of the test holes, particularly in small fill areas or those with limited access.

A zone of non-encroachment should be established for all test pits. No grading equipment should enter this zone during the testing procedure. The zone should extend approximately 50 feet outward from the center of the test pit. This zone is established for safety and to avoid excessive ground vibration, which typically decreases test results.

When taking slope tests, the technician should park the vehicle directly above or below the test location. If this is not possible, a prominent flag should be placed at the top of the slope. The contractor's representative should effectively keep all equipment at a safe operational distance (e.g., 50 feet) away from the slope during this testing.

The technician is directed to withdraw from the active portion of the fill as soon as possible following testing. The technician's vehicle should be parked at the perimeter of the fill in a highly visible location, well away from the equipment traffic pattern. The contractor should inform our personnel of all changes to haul roads, cut and fill areas or other factors that may affect site access and site safety.

In the event that the technician's safety is jeopardized or compromised as a result of the contractor's failure to comply with any of the above, the technician is required, by company policy, to immediately withdraw and notify his/her supervisor. The grading contractor's representative will be contacted in an effort to affect a solution. However, in the interim, no further testing will be performed until the situation is rectified. Any fill placed can be considered unacceptable and subject to reprocessing, recompaction, or removal.

In the event that the soil technician does not comply with the above or other established safety guidelines, we request that the contractor bring this to the technician's attention and notify this office. Effective communication and coordination between the contractor's representative and the soil technician is strongly encouraged in order to implement the above safety plan.

Trench and Vertical Excavation

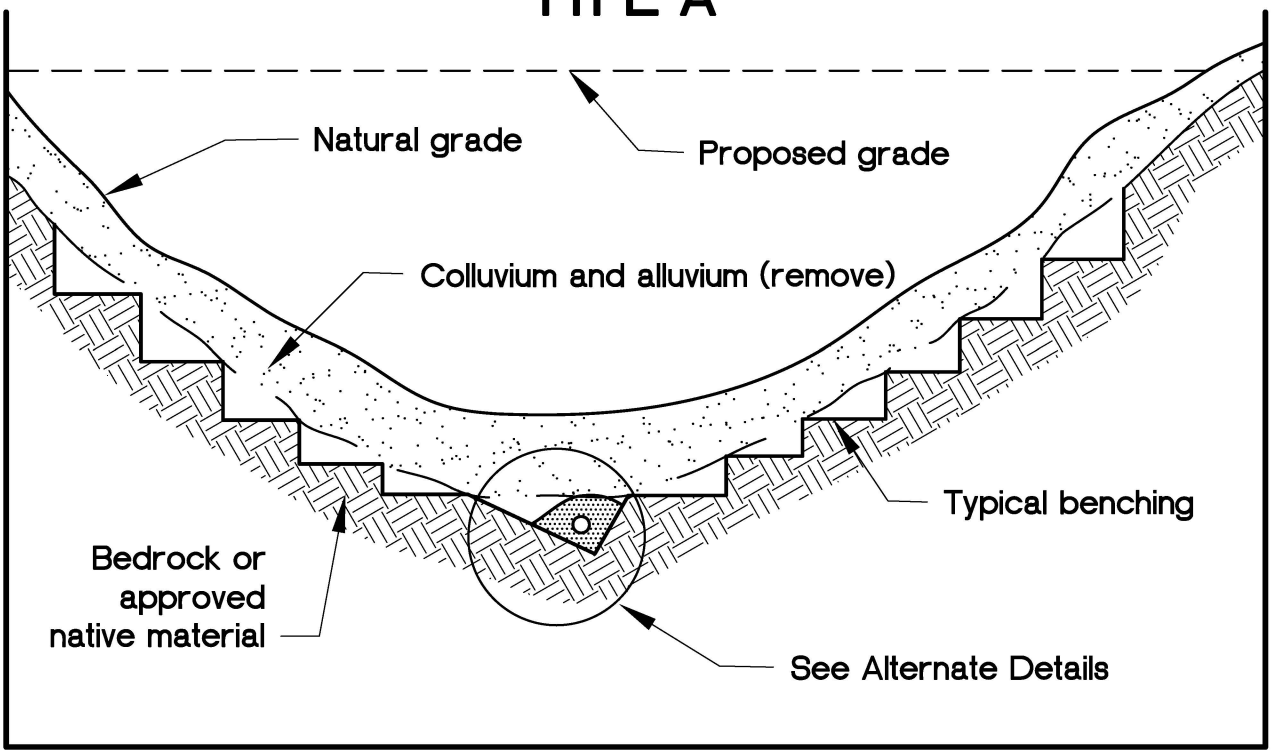
It is the contractor's responsibility to provide safe access into trenches where compaction testing is needed. Our personnel are directed not to enter any excavation or vertical cut which: 1) is 5 feet or deeper unless shored or laid back; 2) displays any evidence of instability, has any loose rock or other debris which could fall into the trench; or 3) displays any other evidence of any unsafe conditions regardless of depth.

All trench excavations or vertical cuts in excess of 5 feet deep, which any person enters, should be shored or laid back. Trench access should be provided in accordance with Cal/OSHA or state and local standards. Our personnel are directed not to enter any trench by being lowered or "riding down" on the equipment.

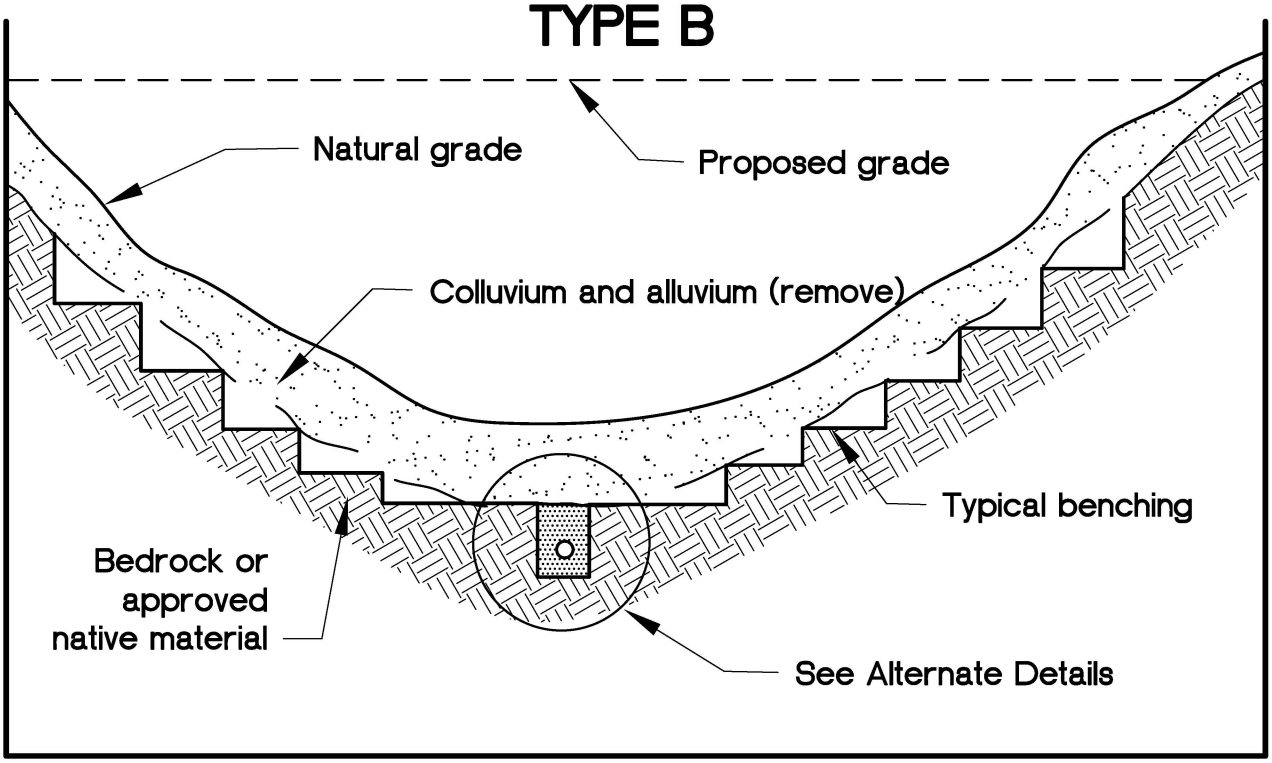
If the contractor fails to provide safe access to trenches for compaction testing, our company policy requires that the soil technician withdraw and notify his/her supervisor. The contractor's representative will be contacted in an effort to affect a solution. All backfill not tested due to safety concerns or other reasons could be subject to reprocessing or removal.

If GSI personnel become aware of anyone working beneath an unsafe trench wall or vertical excavation, we have a legal obligation to put the contractor and owner/developer on notice to immediately correct the situation. If corrective steps are not taken, GSI then has an obligation to notify Cal/OSHA or the proper controlling authorities.

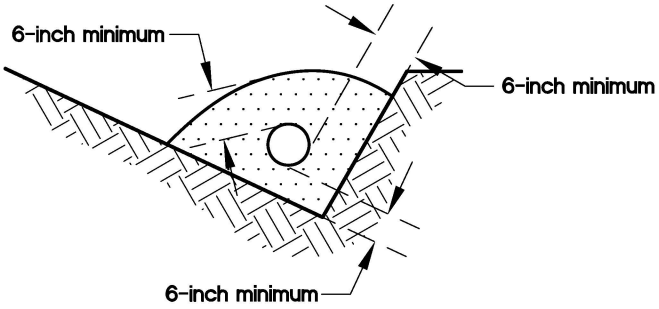
TYPE A



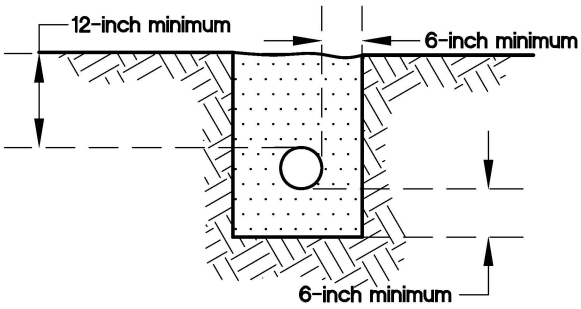
TYPE B



Selection of alternate subdrain details, location, and extent of subdrains should be evaluated by the geotechnical consultant during grading.



A-1



B-1

Filter material: Minimum volume of 9 cubic feet per lineal foot of pipe.

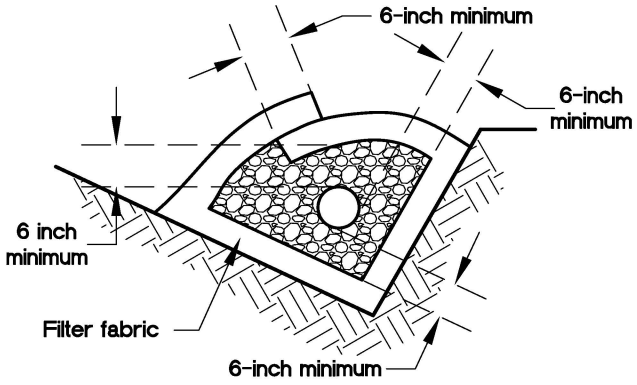
Perforated pipe: 6-inch-diameter ABS or PVC pipe or approved substitute with minimum 8 perforations (¼-inch diameter) per lineal foot in bottom half of pipe (ASTM D-2751, SDR-35, or ASTM D-1527, Schd. 40).

For continuous run in excess of 500 feet, use 8-inch-diameter pipe (ASTM D-3034, SDR-35, or ASTM D-1785, Schd. 40).

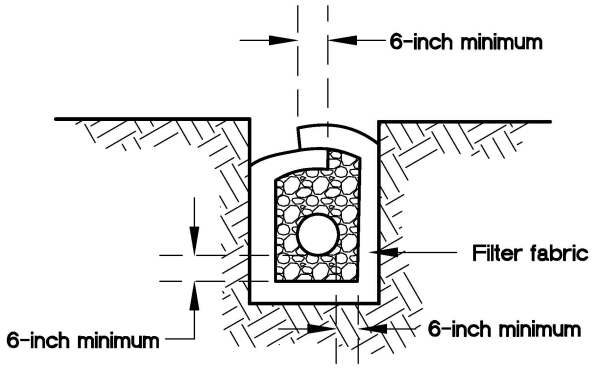
FILTER MATERIAL

Sieve Size	Percent Passing
1 inch	100
¾ inch	90-100
⅜ inch	40-100
No. 4	25-40
No. 8	18-33
No. 30	5-15
No. 50	0-7
No. 200	0-3

ALTERNATE 1: PERFORATED PIPE AND FILTER MATERIAL



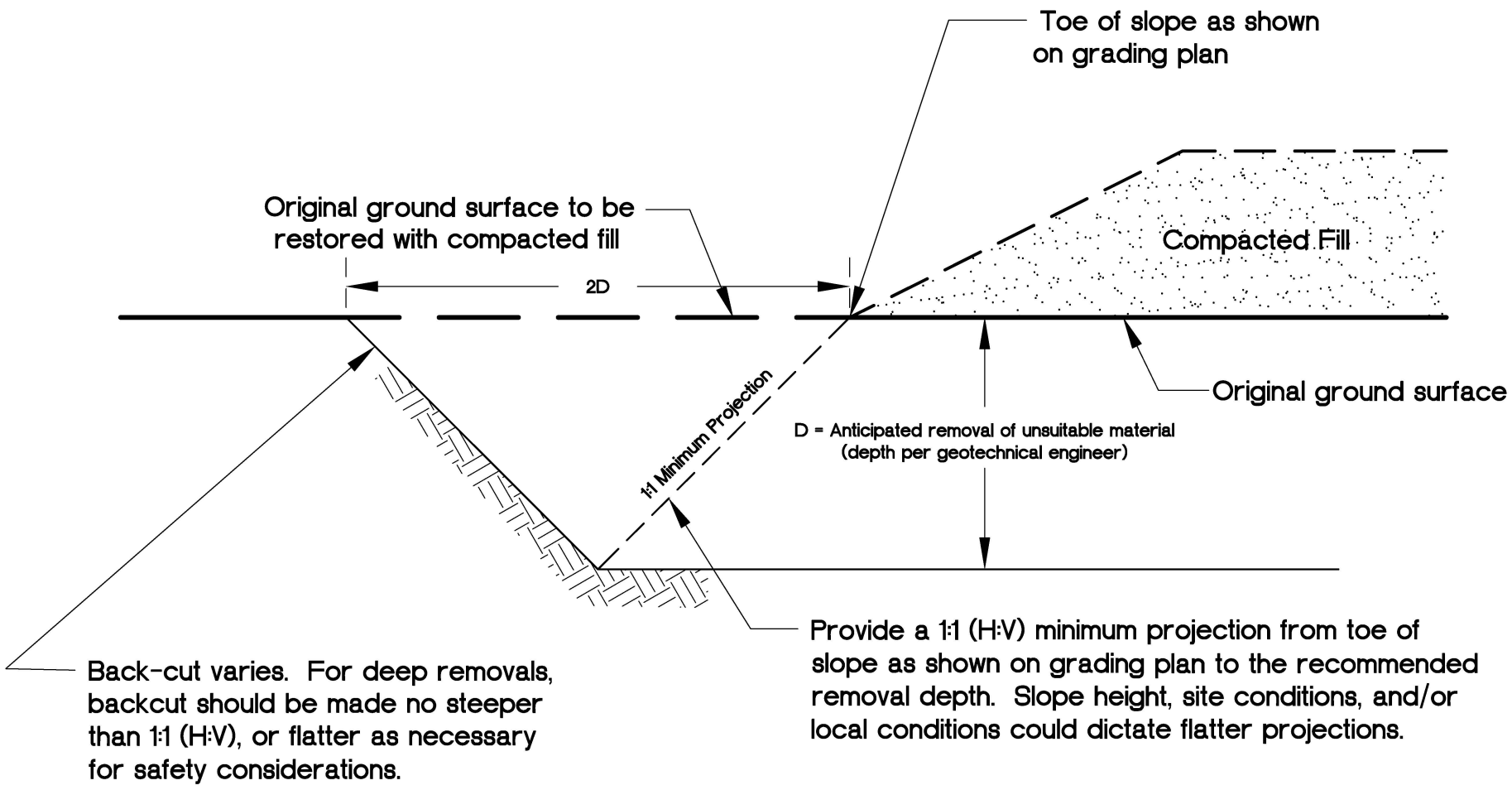
A-2



B-2

Gravel Material: 9 cubic feet per lineal foot.
Perforated Pipe: See Alternate 1
Gravel: Clean ¾-inch rock or approved substitute.
Filter Fabric: Mirafi 140 or approved substitute.

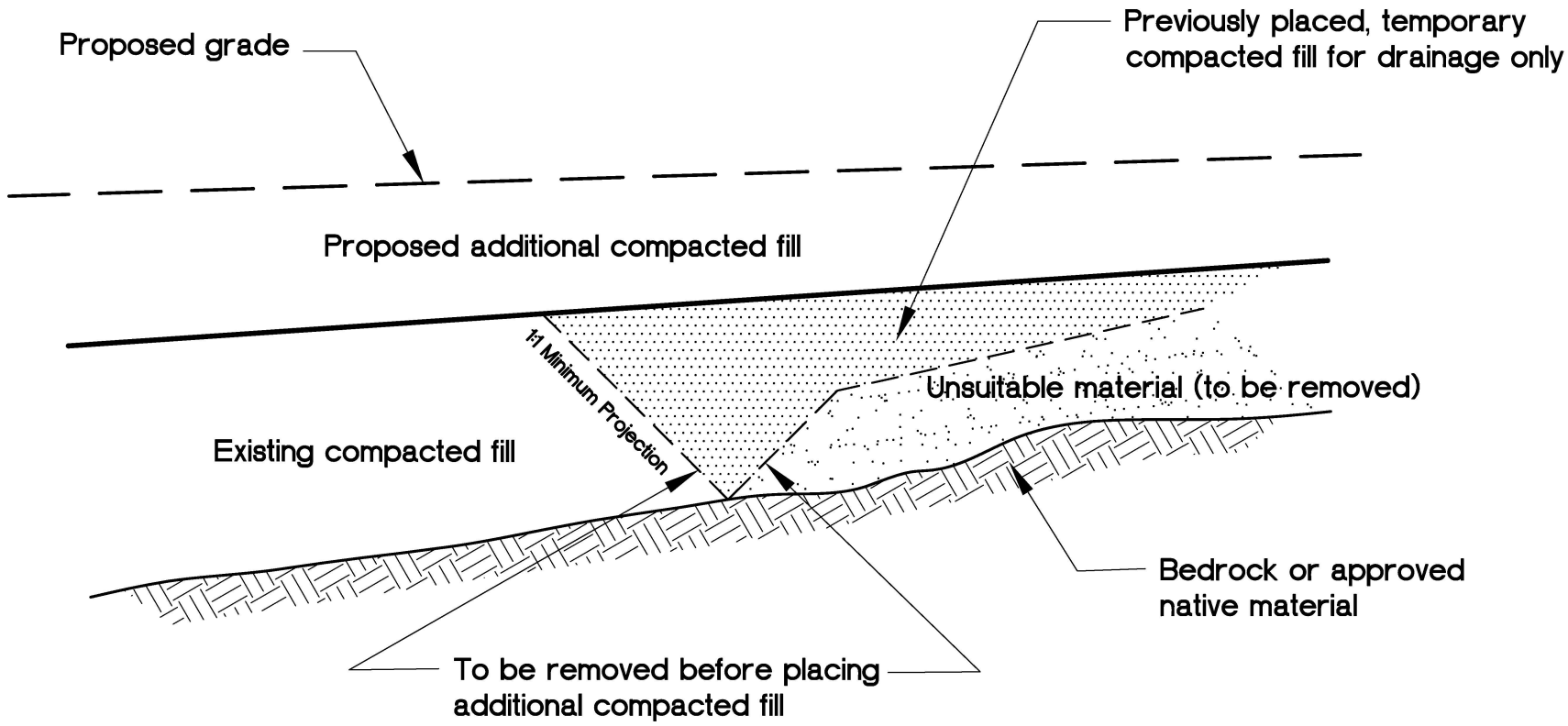
ALTERNATE 2: PERFORATED PIPE, GRAVEL, AND FILTER FABRIC



GeoSoils, Inc.

FILL SLOPE TOEING OUT ON FLAT ALLUVIATED CANYON DETAIL

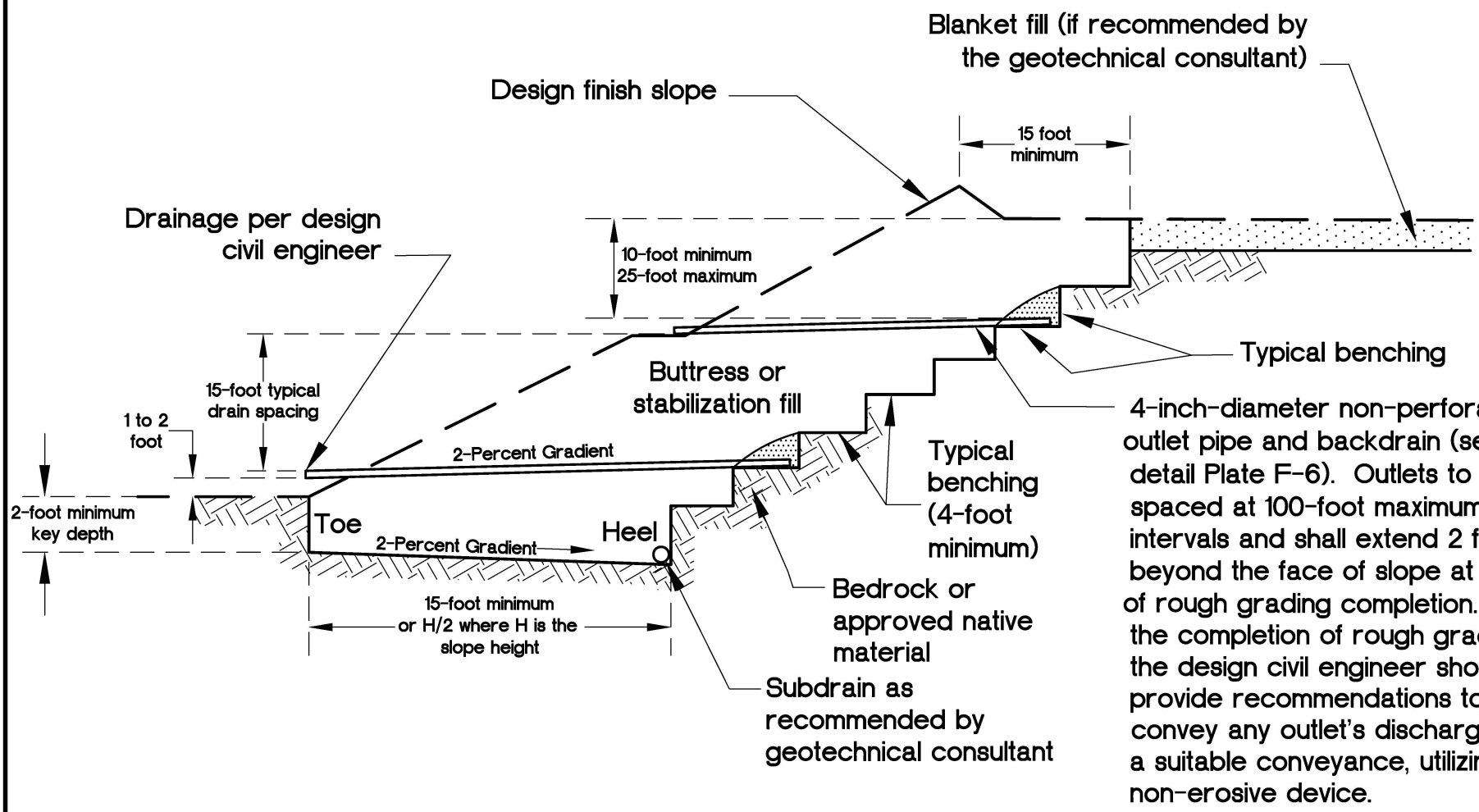
Plate F-3



GeoSoils, Inc.

REMOVAL ADJACENT TO EXISTING FILL ADJOINING CANYON FILL DETAIL

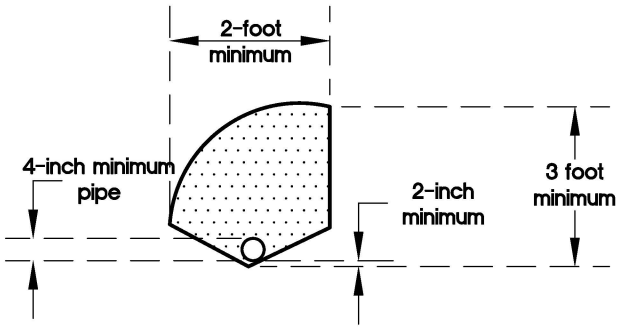
Plate F-4

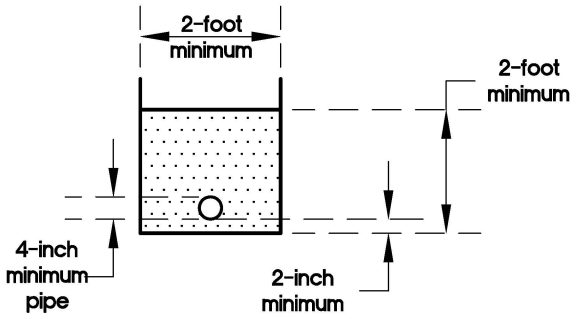


GeoSoils, Inc.

TYPICAL STABILIZATION / BUTTRESS FILL DETAIL

Plate F-5





Filter Material: Minimum of 5 cubic feet per lineal foot of pipe or 4 cubic feet per lineal feet of pipe when placed in square cut trench.

Alternative in Lieu of Filter Material: Gravel may be encased in approved filter fabric. Filter fabric shall be Mirafi 140 or equivalent. Filter fabric shall be lapped a minimum of 12 inches in all joints.

Minimum 4-Inch-Diameter Pipe: ABS-ASTM D-2751, SDR 35; or ASTM D-1527 Schedule 40, PVC-ASTM D-3034, SDR 35; or ASTM D-1785 Schedule 40 with a crushing strength of 1,000 pounds minimum, and a minimum of 8 uniformly-spaced perforations per foot of pipe. Must be installed with perforations down at bottom of pipe. Provide cap at upstream end of pipe. Slope at 2 percent to outlet pipe. Outlet pipe to be connected to subdrain pipe with tee or elbow.

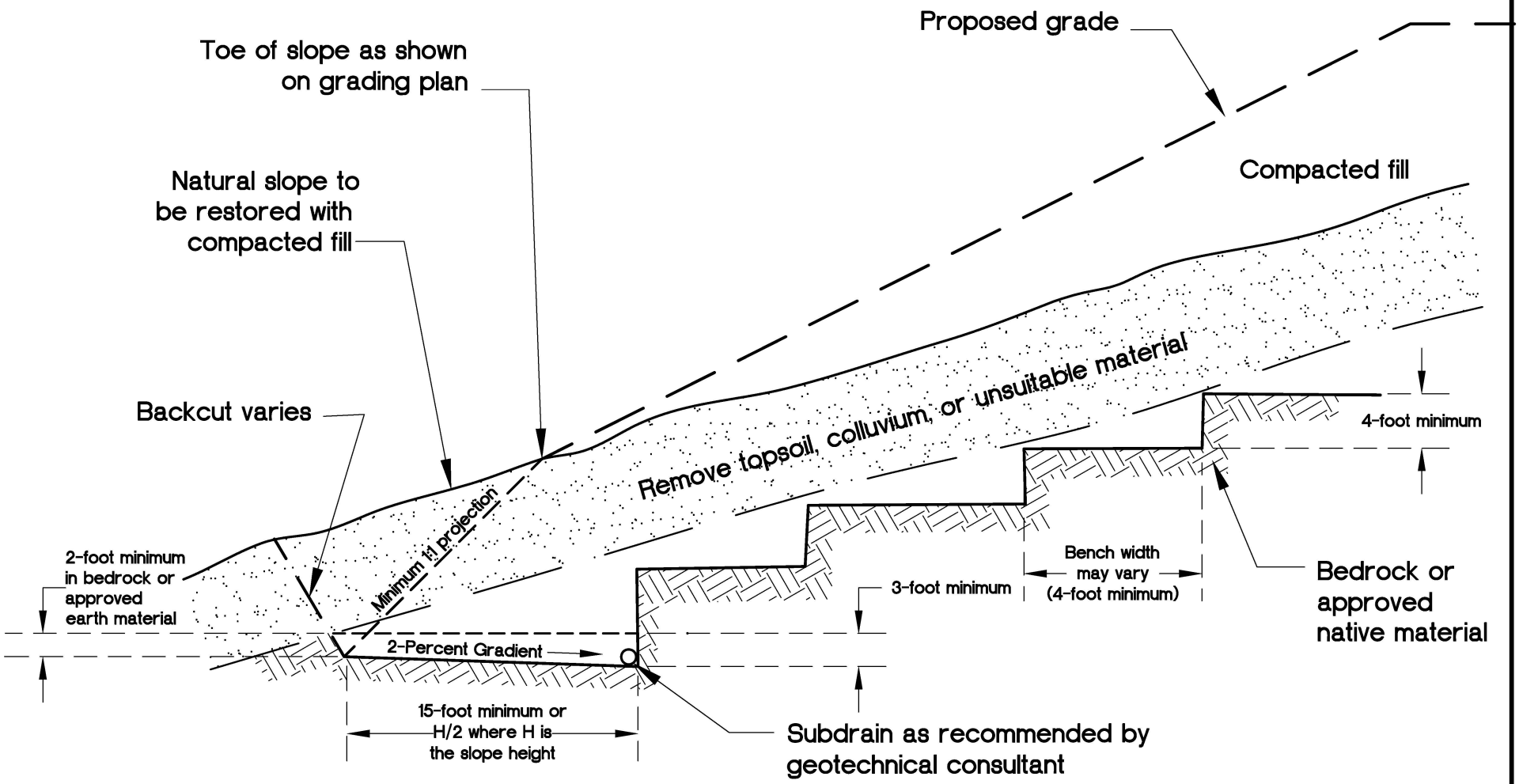
Notes:
1. Trench for outlet pipes to be backfilled and compacted with onsite soil.
2. Backdrains and lateral drains shall be located at elevation of every bench drain. First drain located at elevation just above lower lot grade. Additional drains may be required at the discretion of the geotechnical consultant.

Filter Material shall be of the following specification or an approved equivalent.

Sieve Size	Percent Passing
1 inch	100
¾ inch	90-100
⅜ inch	40-100
No. 4	25-40
No. 8	18-33
No. 30	5-15
No. 50	0-7
No. 200	0-3

Gravel shall be of the following specification or an approved equivalent.

Sieve Size	Percent Passing
1½ inch	100
No. 4	50
No. 200	8

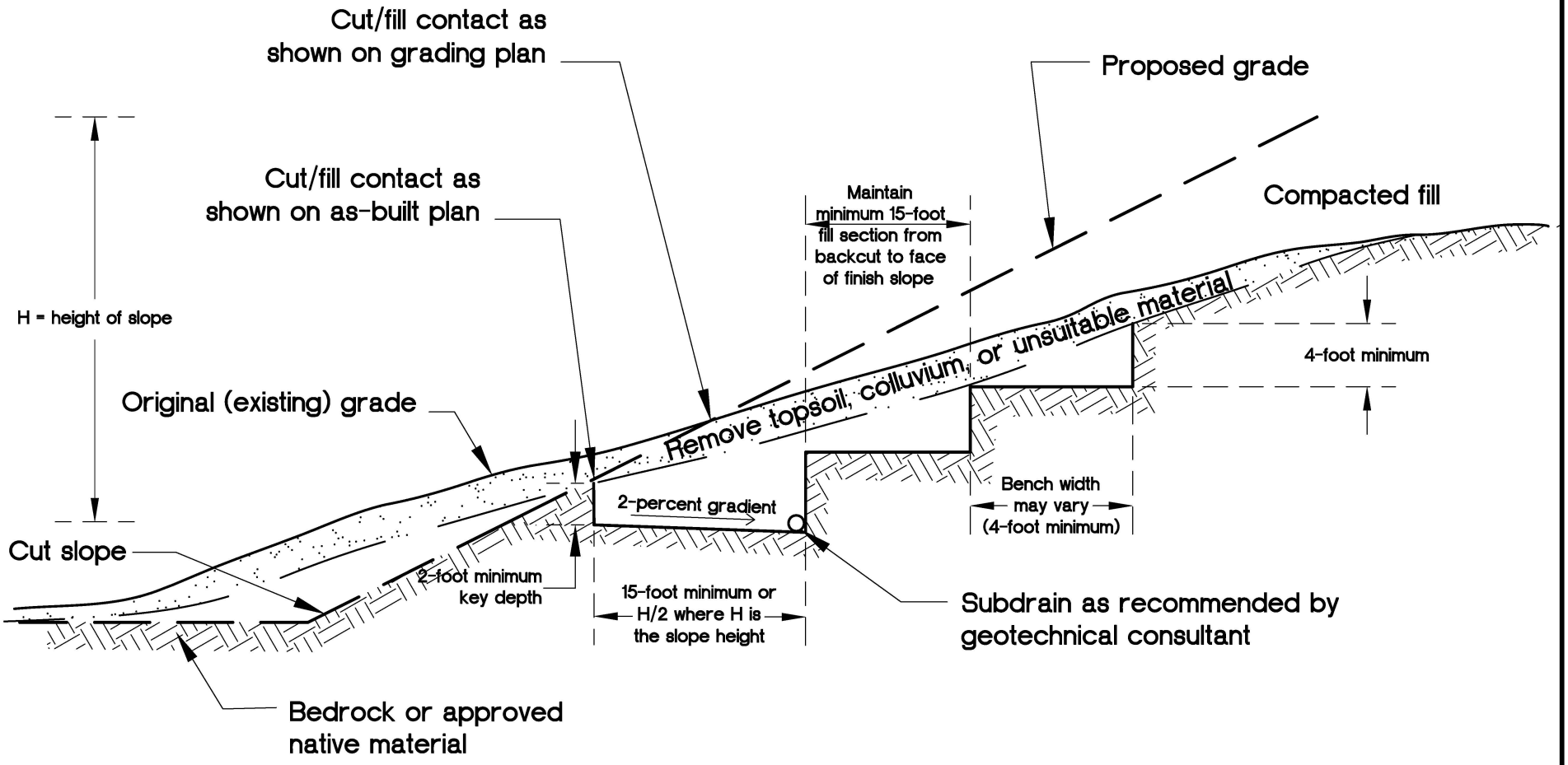


NOTES:

1. Where the natural slope approaches or exceeds the design slope ratio, special recommendations would be provided by the geotechnical consultant.

2. The need for and disposition of drains should be evaluated by the geotechnical consultant, based upon exposed conditions.

GeoSoils, Inc.	FILL OVER NATURAL (SIDEHILL FILL) DETAIL	Plate F-7

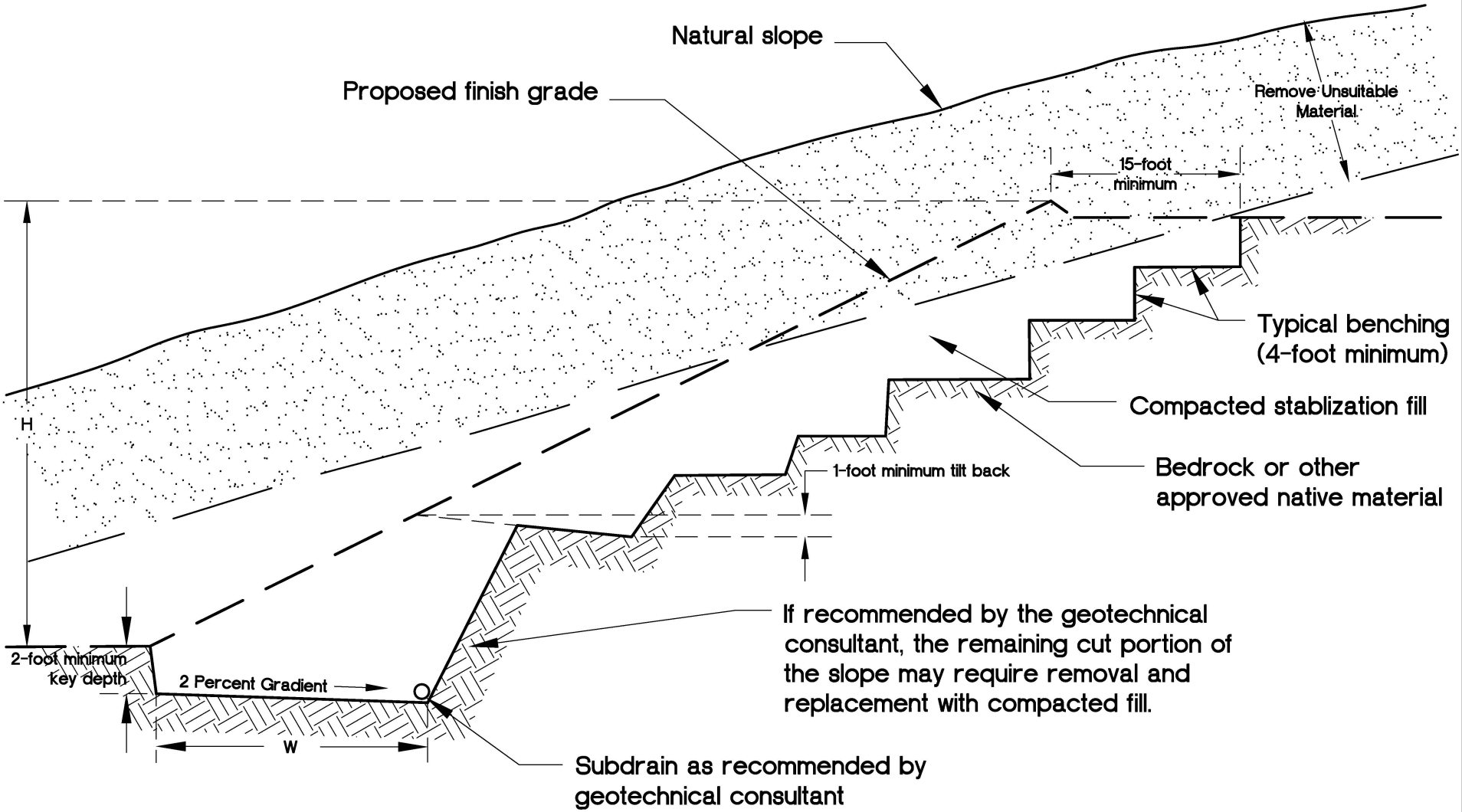


NOTE: The cut portion of the slope should be excavated and evaluated by the geotechnical consultant prior to construction of the fill portion.

GeoSoils, Inc.

FILL OVER CUT DETAIL

Plate F-8

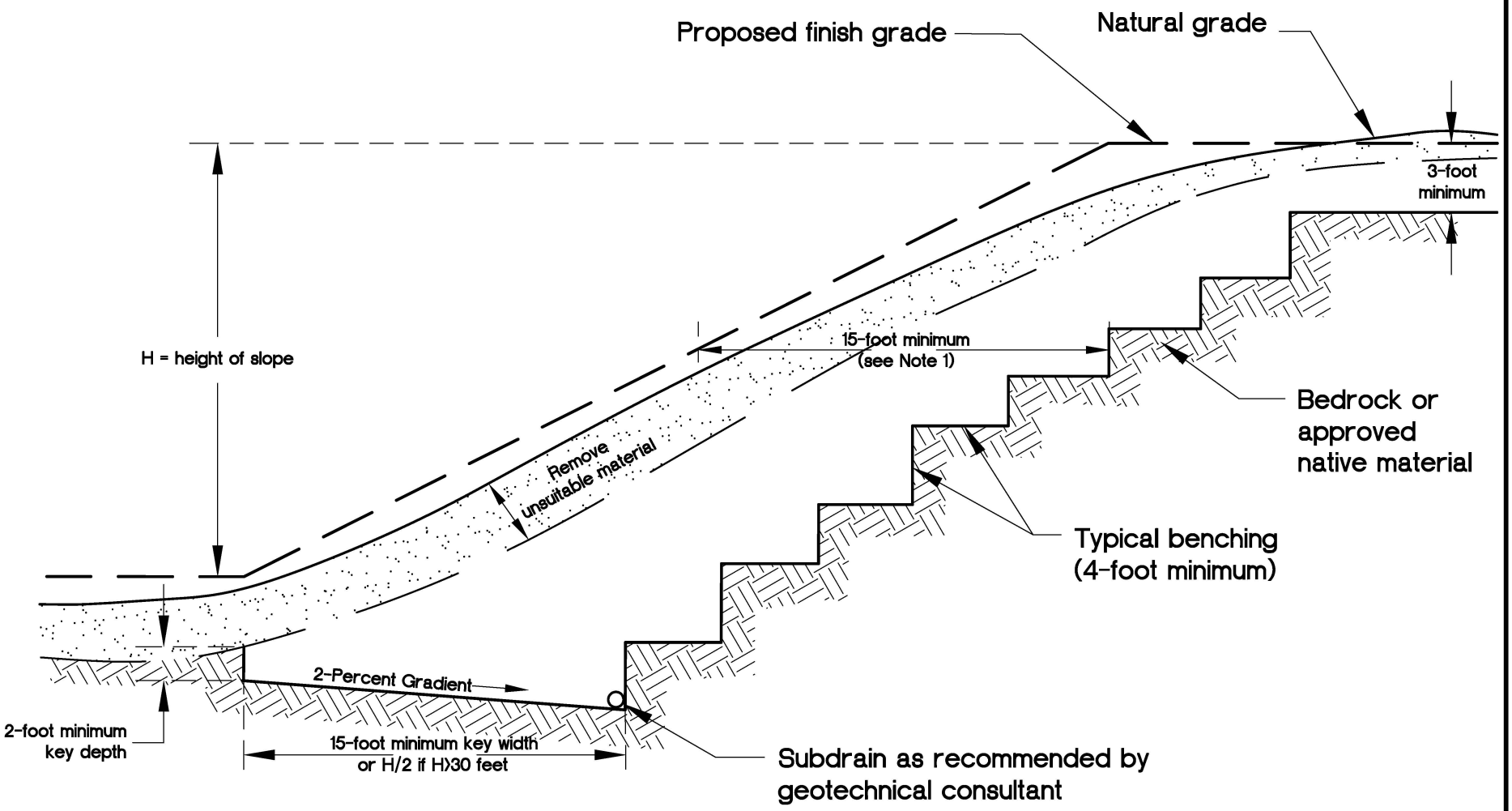


NOTES:

1. Subdrains may be required as specified by the geotechnical consultant.

2. W shall be equipment width (15 feet) for slope heights less than 25 feet. For slopes greater than 25 feet, W shall be evaluated by the geotechnical consultant. At no time, shall W be less than H/2, where H is the height of the slope.

GeoSoils, Inc.	STABLIZATION FILL FOR UNSTABLE MATERIAL EXPOSED IN CUT SLOPE DETAIL	Plate F-9



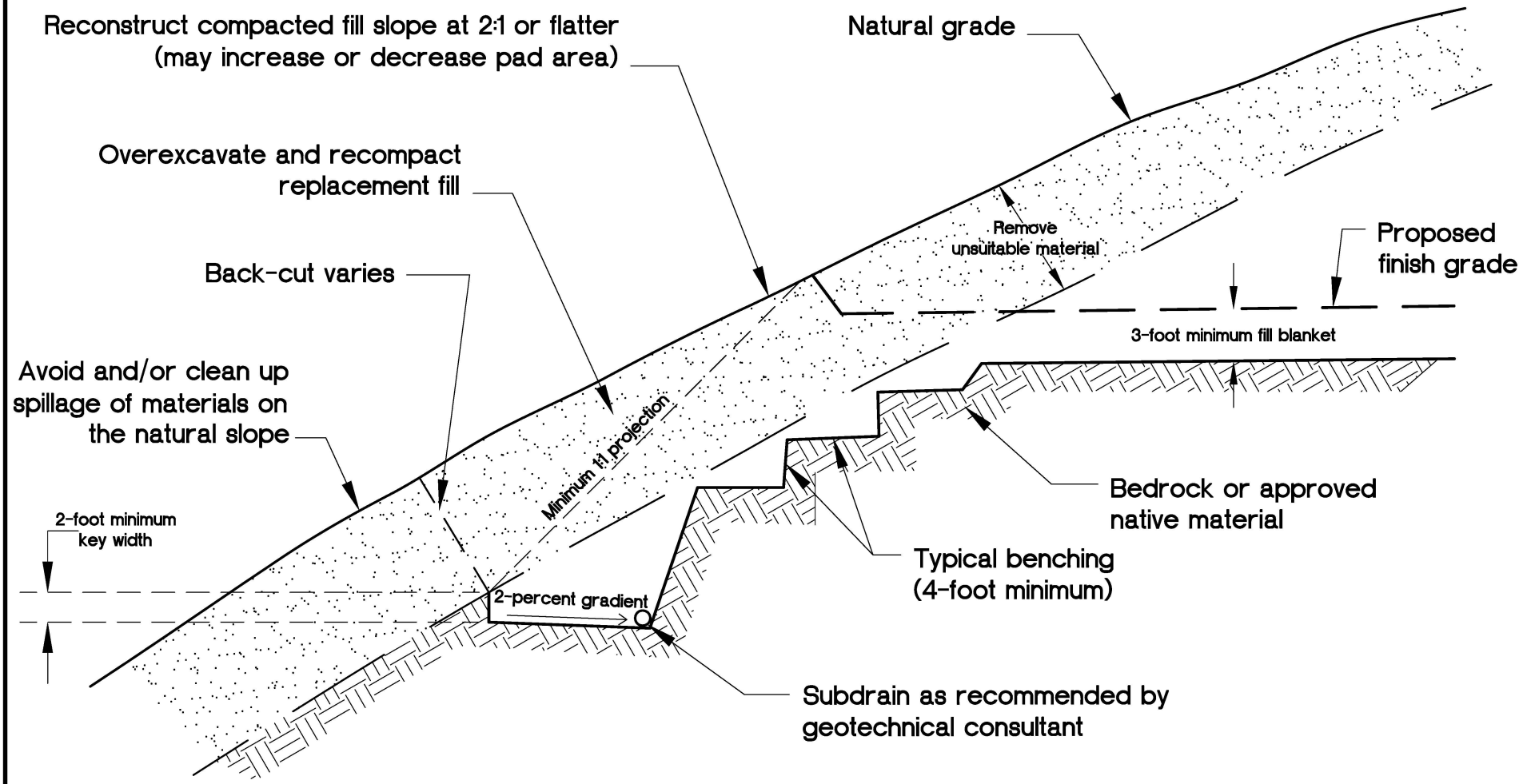
NOTES:

1. 15-foot minimum to be maintained from proposed finish slope face to backcut.
2. The need and disposition of drains will be evaluated by the geotechnical consultant based on field conditions.
3. Pad overexcavation and recompaction should be performed if evaluated to be necessary by the geotechnical consultant.

GeoSoils, Inc.

SKIN FILL OF NATURAL GROUND DETAIL

Plate F-10



NOTES:

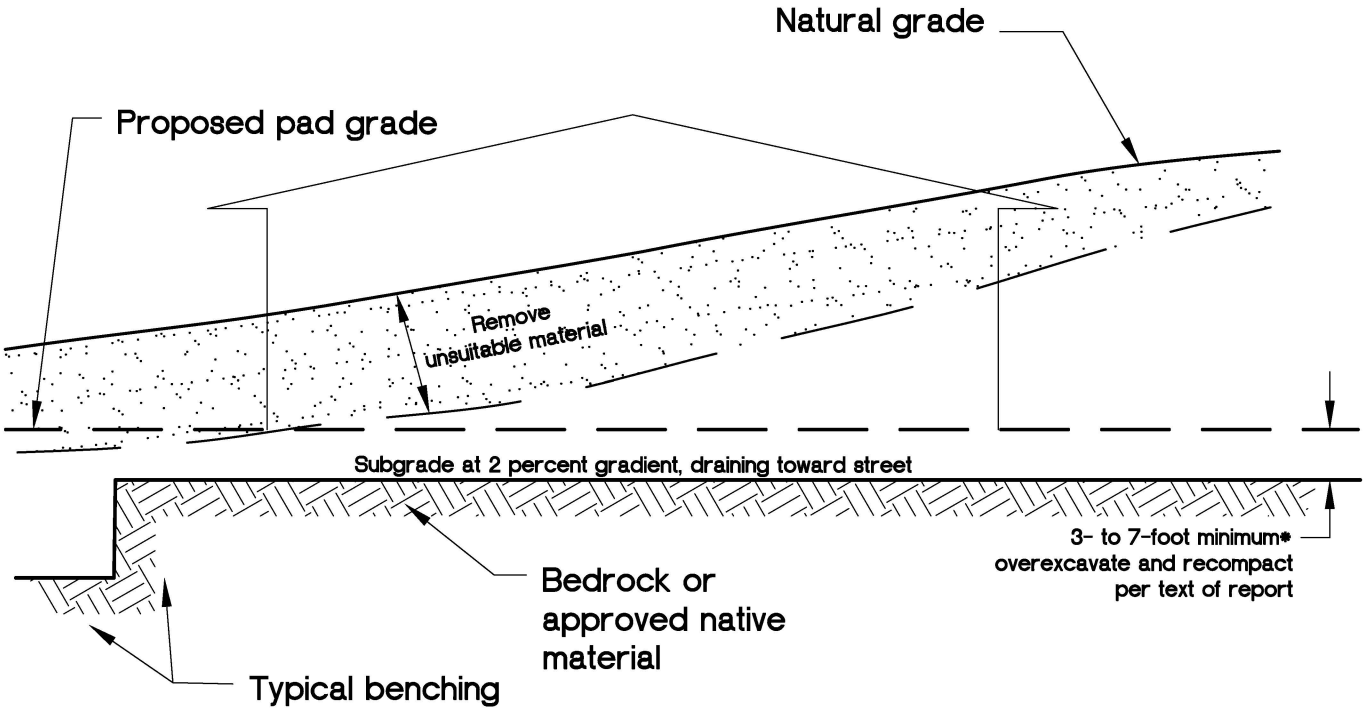
1. Subdrain and key width requirements will be evaluated based on exposed subsurface conditions and thickness of overburden.

2. Pad overexcavation and recompaction should be performed if evaluated necessary by the geotechnical consultant.

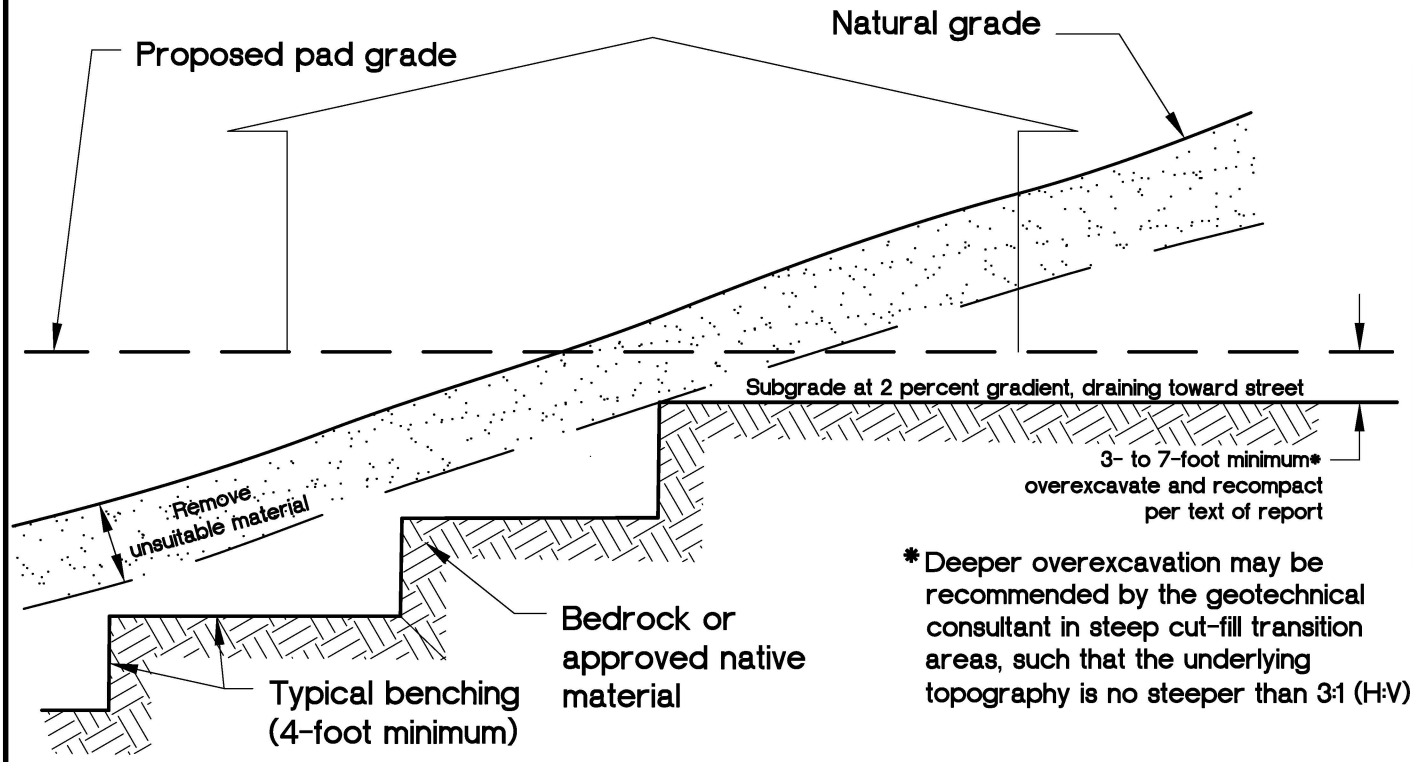
GeoSoils, Inc.

DAYLIGHT CUT LOT DETAIL

Plate F-11



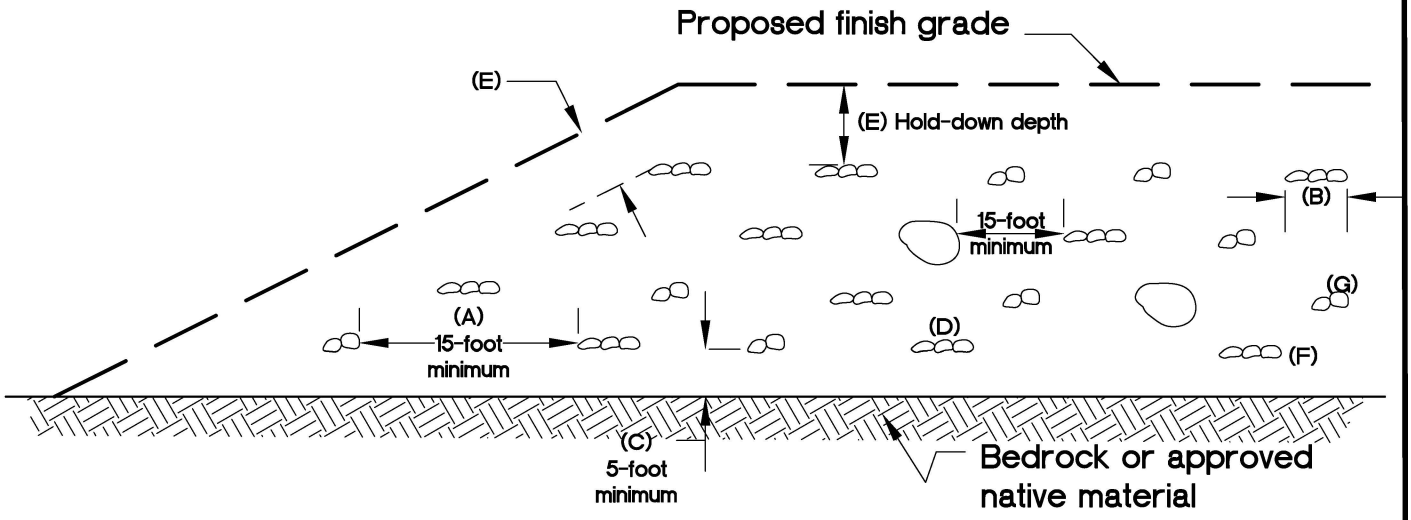
CUT LOT OR MATERIAL-TYPE TRANSITION



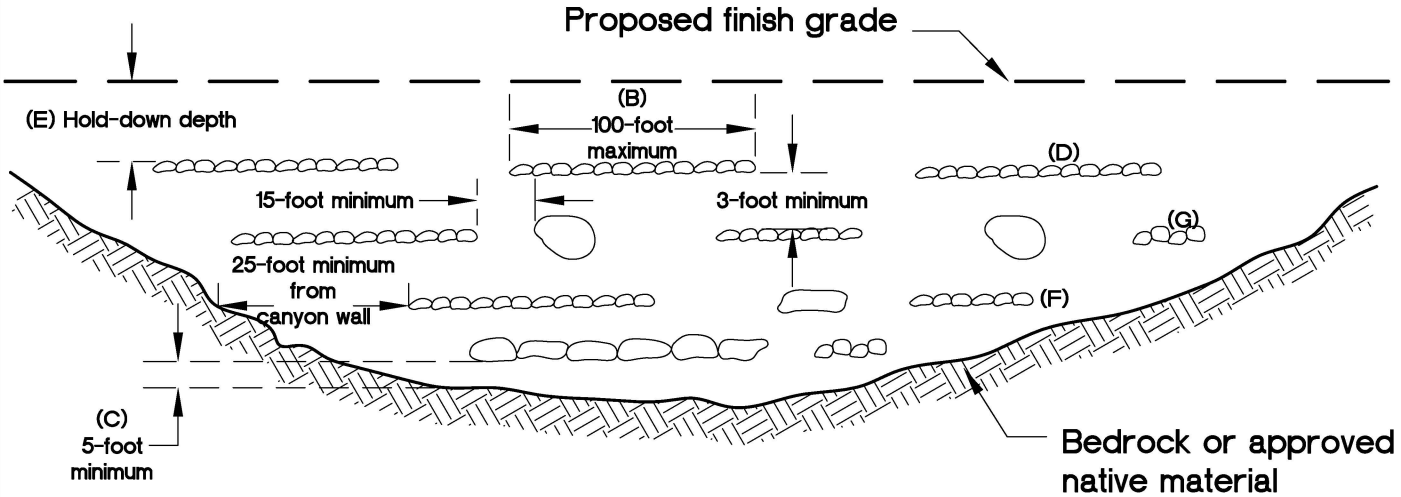
CUT-FILL LOT (DAYLIGHT TRANSITION)

GeoSoils, Inc.	TRANSITION LOT DETAILS	Plate F-12

VIEW NORMAL TO SLOPE FACE



VIEW PARALLEL TO SLOPE FACE



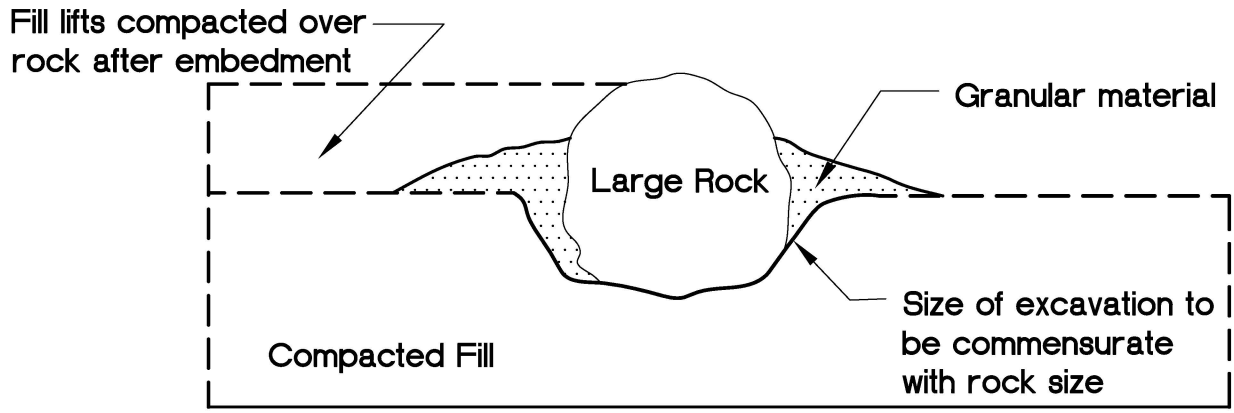
NOTES:

A. One equipment width or a minimum of 15 feet between rows (or windrows).
B. Height and width may vary depending on rock size and type of equipment. Length of windrow shall be no greater than 100 feet.
C. If approved by the geotechnical consultant, windrows may be placed direclty on competent material or bedrock, provided adequate space is available for compaction.
D. Orientation of windrows may vary but should be as recommended by the geotechnical engineer and/or engineering geologist. Staggering of windrows is not necessary unless recommended.
E. Clear area for utility trenches, foundations, and swimming pools: Hold-down depth as specified in text of report, subject to governing agency approval.
F. All fill over and around rock windrow shall be compacted to at least 90 percent relative compaction or as recommended.
G. After fill between windrows is placed and compacted, with the lift of fill covering windrow, windrow should be proof rolled with a D-9 dozer or equivalent.

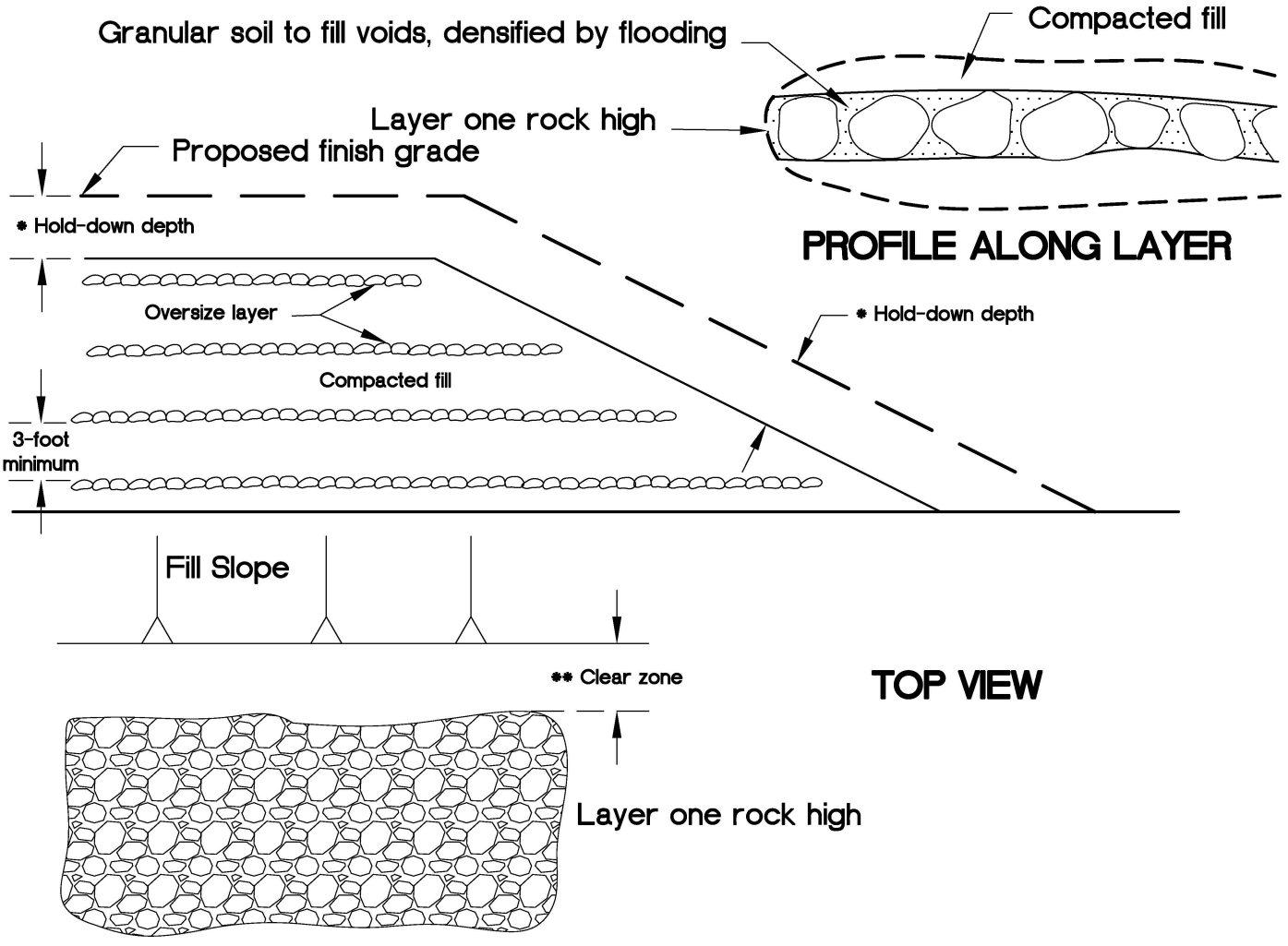
VIEWS ARE DIAGRAMMATIC ONLY AND MAY BE SUPERSEDED BY REPORT RECOMMENDATIONS OR CODE
ROCK SHOULD NOT TOUCH AND VOIDS SHOULD BE COMPLETELY FILLED

GeoSoils, Inc.	OVERSIZE ROCK DISPOSAL DETAIL	Plate F-13

ROCK DISPOSAL PITS



ROCK DISPOSAL LAYERS

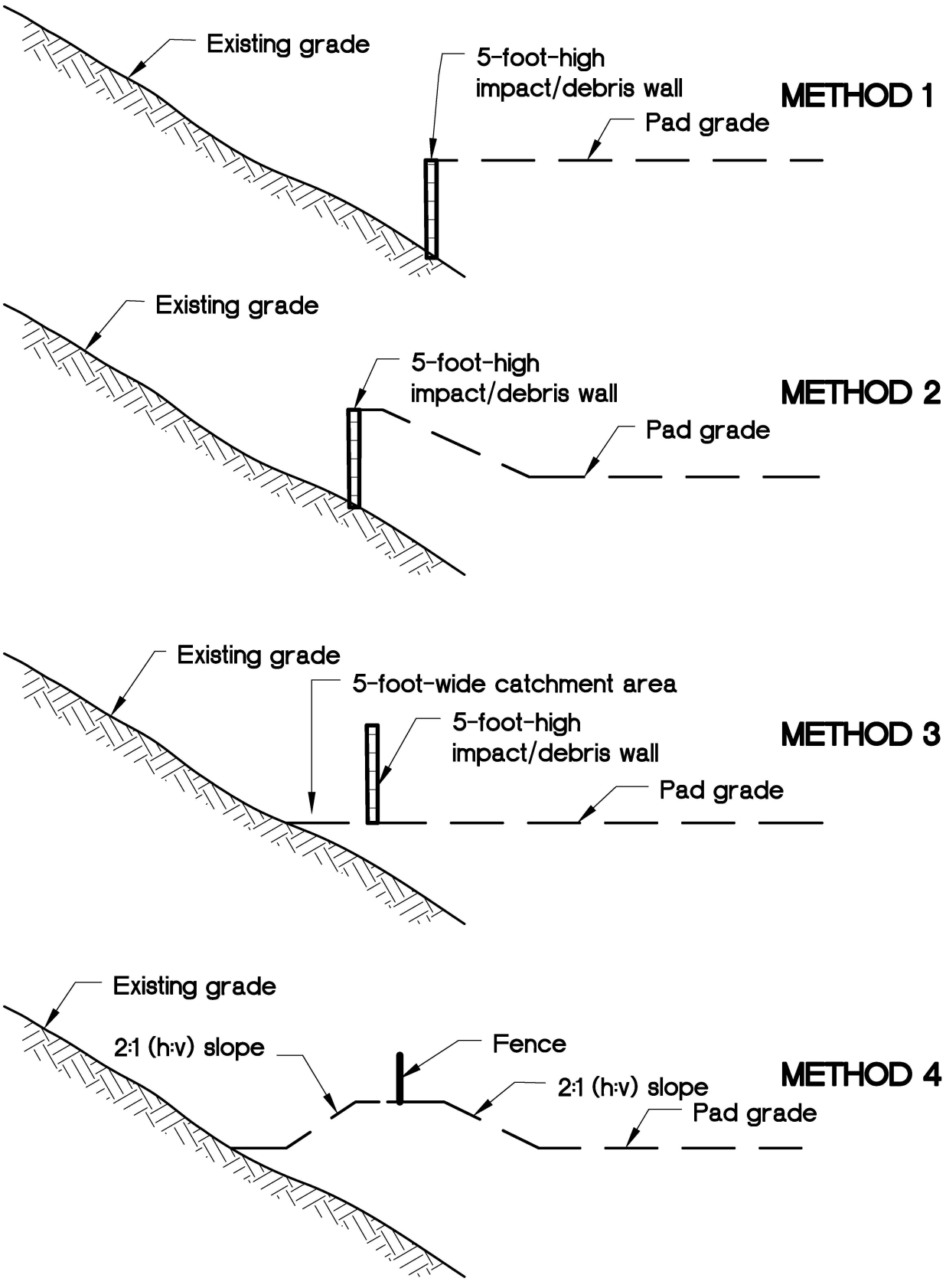


* Hold-down depth or below lowest utility as specified in text of report, subject to governing agency approval.

** Clear zone for utility trenches, foundations, and swimming pools, as specified in text of report.

VIEWS ARE DIAGRAMMATIC ONLY AND MAY BE SUPERSEDED BY REPORT RECOMMENDATIONS OR CODE ROCK SHOULD NOT TOUCH AND VOIDS SHOULD BE COMPLETELY FILLED IN

GeoSoils, Inc.	ROCK DISPOSAL DETAIL	Plate F-14

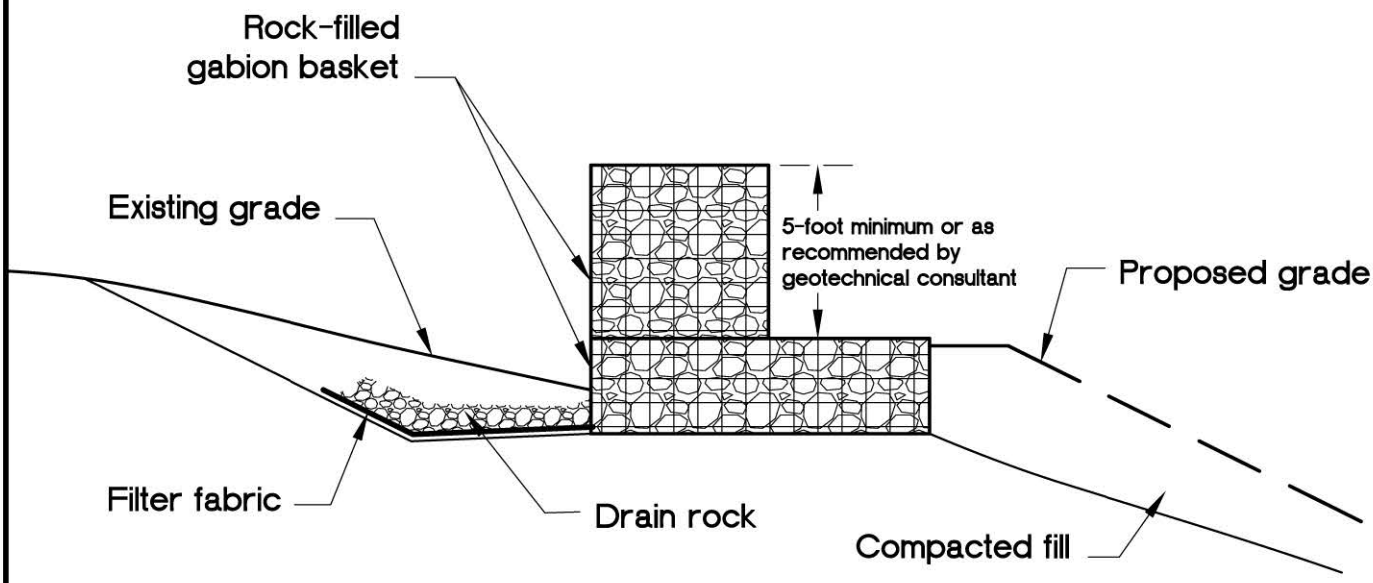


NOT TO SCALE

GeoSoils, Inc.

DEBRIS DEVICE CONTROL METHODS DETAIL

Plate F-15



Gabion impact or diversion wall should be constructed at the base of the ascending slope subject to rock fall. Walls need to be constructed with high segments that sustain impact and mitigate potential for overtopping, and low segment that provides channelization of sediments and debris to desired depositional area for subsequent clean-out. Additional subdrain may be recommended by geotechnical consultant.

From GSA, 1987

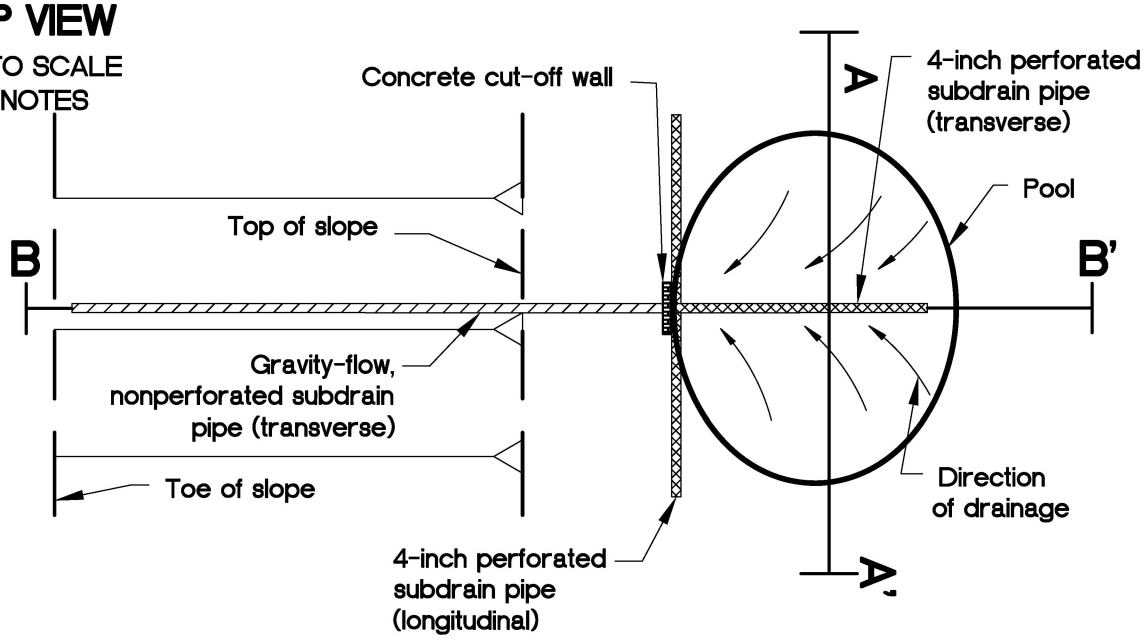
GeoSoils, Inc.

ROCK FALL MITIGATION DETAIL

Plate F-16

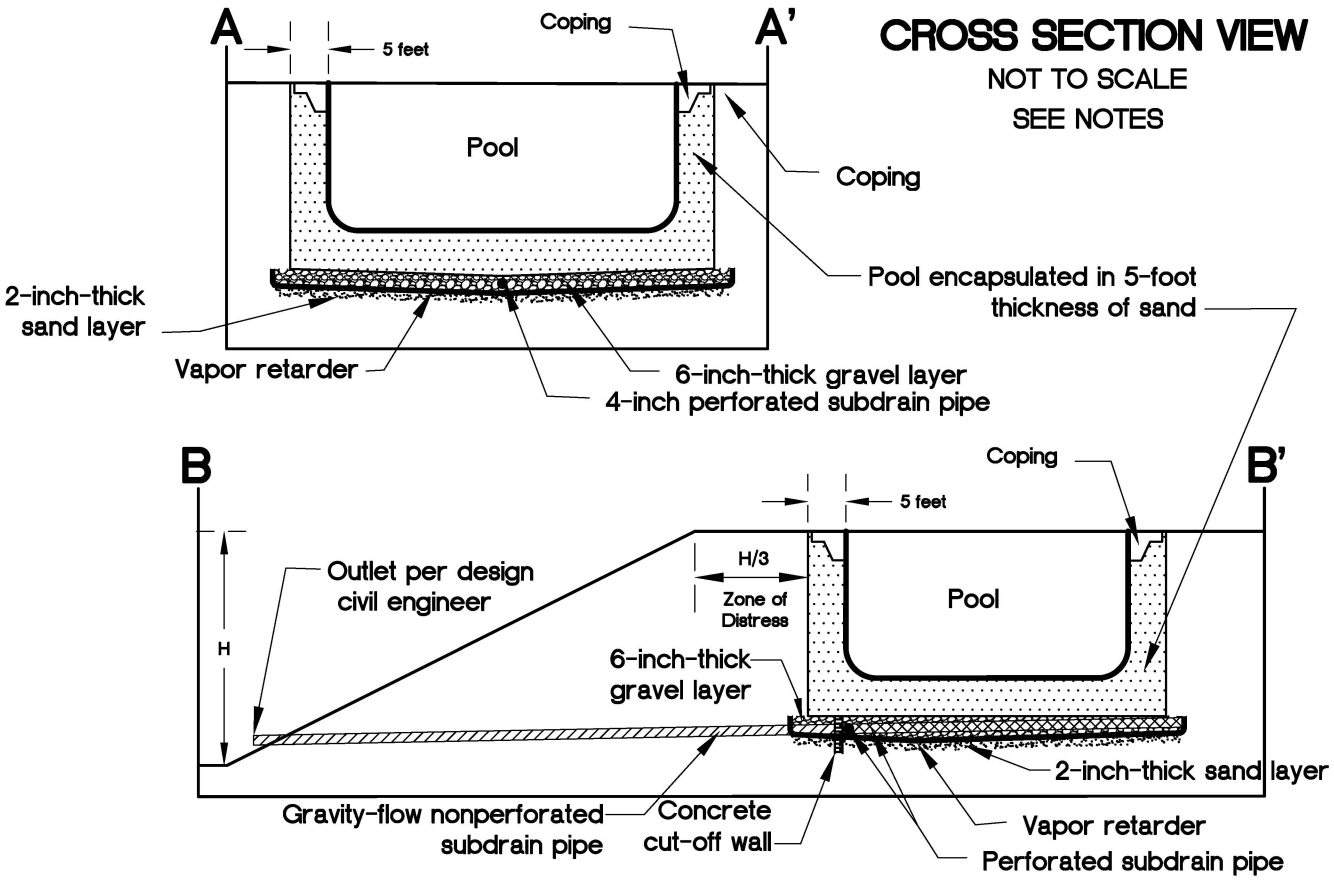
MAP VIEW

NOT TO SCALE
SEE NOTES



CROSS SECTION VIEW

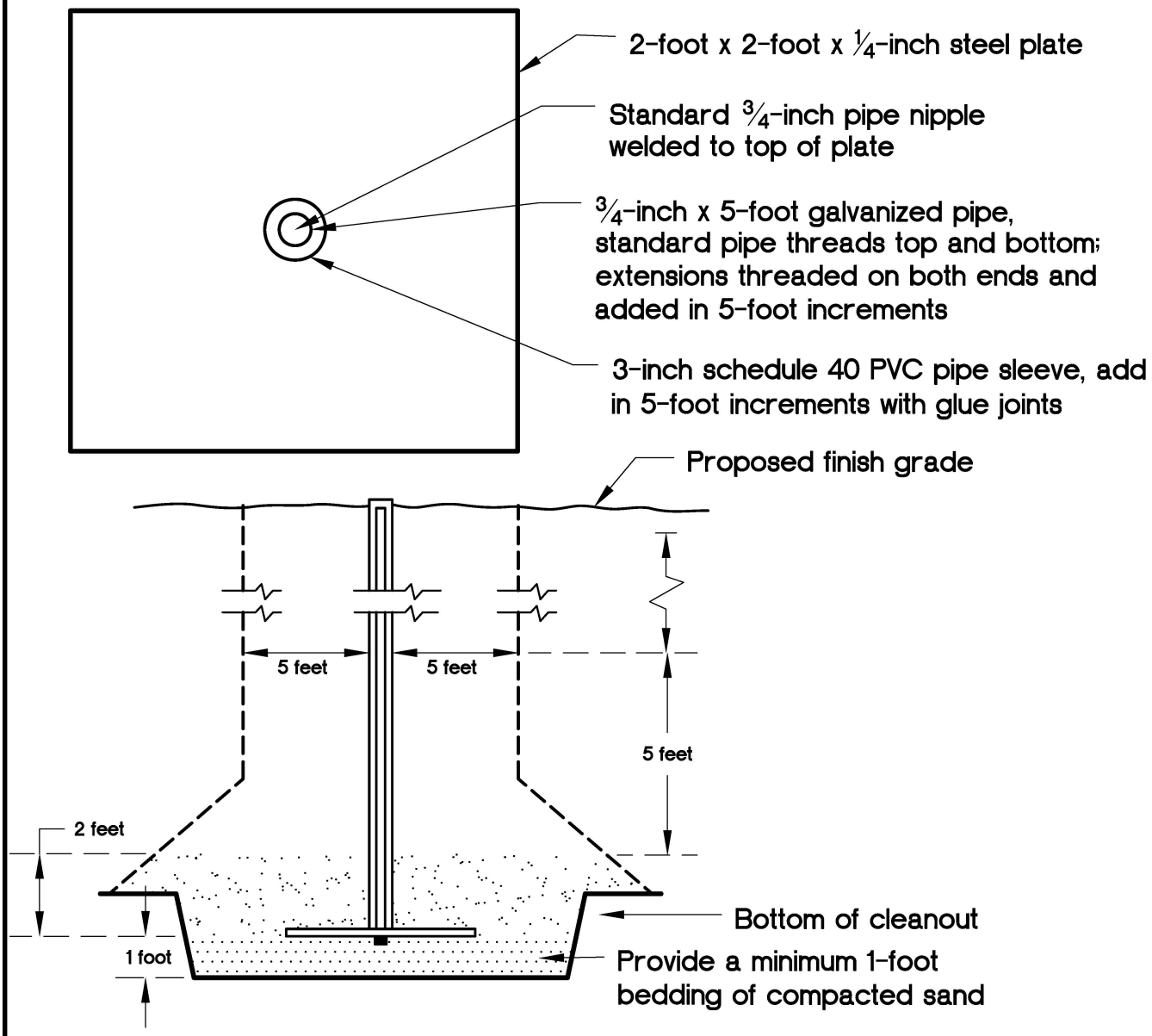
NOT TO SCALE
SEE NOTES



NOTES:

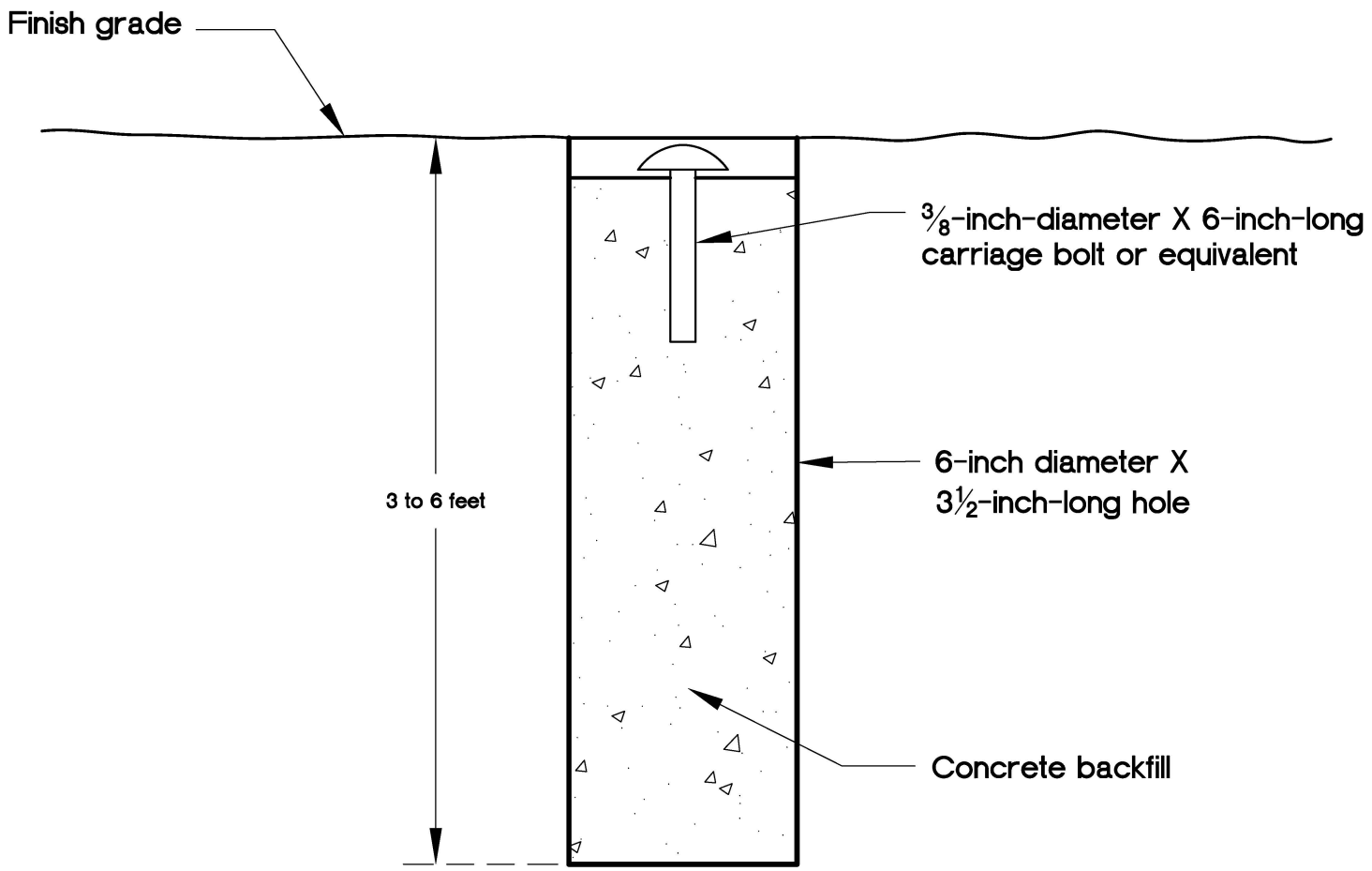
1. 6-inch-thick, clean gravel (¾ to 1½ inch) sub-base encapsulated in Mirafi 140N or equivalent, underlain by a 15-mil vapor retarder, with 4-inch-diameter perforated pipe longitudinal connected to 4-inch-diameter perforated pipe transverse. Connect transverse pipe to 4-inch-diameter nonperforated pipe at low point and outlet or to sump pump area.
2. Pools on fills thicker than 20 feet should be constructed on deep foundations; otherwise, distress (tilting, cracking, etc.) should be expected.
3. Design does not apply to infinity-edge pools/spas.

GeoSoils, Inc.	TYPICAL POOL/SPA DETAIL	Plate F–17



NOTES:

1. Locations of settlement plates should be clearly marked and readily visible (red flagged) to equipment operators.
2. Contractor should maintain clearance of a 5-foot radius of plate base and withiin 5 feet (vertical) for heavy equipment. Fill within clearance area should be hand compacted to project specifications or compacted by alternative approved method by the geotechnical consultant (in writing, prior to construction).
3. After 5 feet (vertical) of fill is in place, contractor should maintain a 5-foot radius equipment clearance from riser.
4. Place and mechanically hand compact initial 2 feet of fill prior to establishing the initial reading.
5. In the event of damage to the settlement plate or extension resulting from equipment operating within the specified clearance area, contractor should immediately notify the geotechnical consultant and should be responsible for restoring the settlement plates to working order.
6. An alternate design and method of installation may be provided at the discretion of the geotechnical consultant.

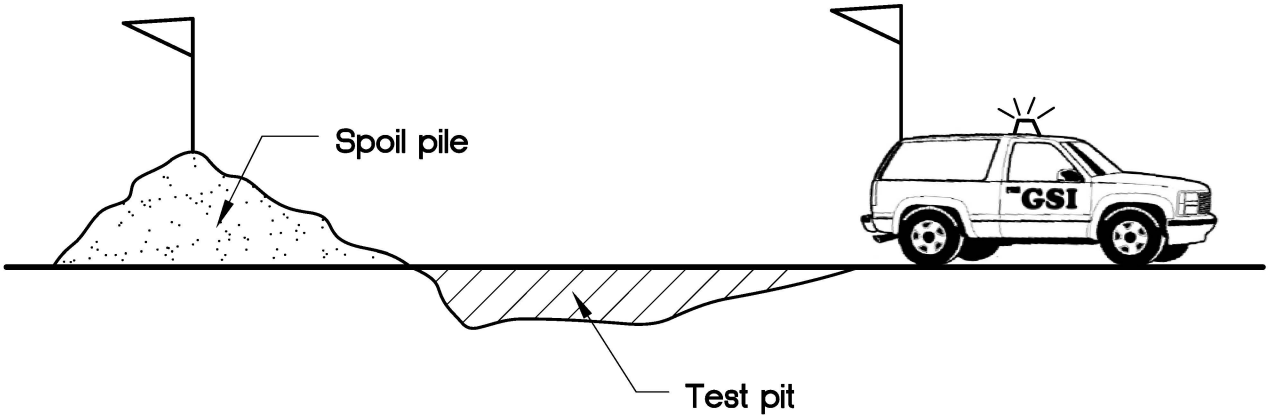


GeoSoils, Inc.

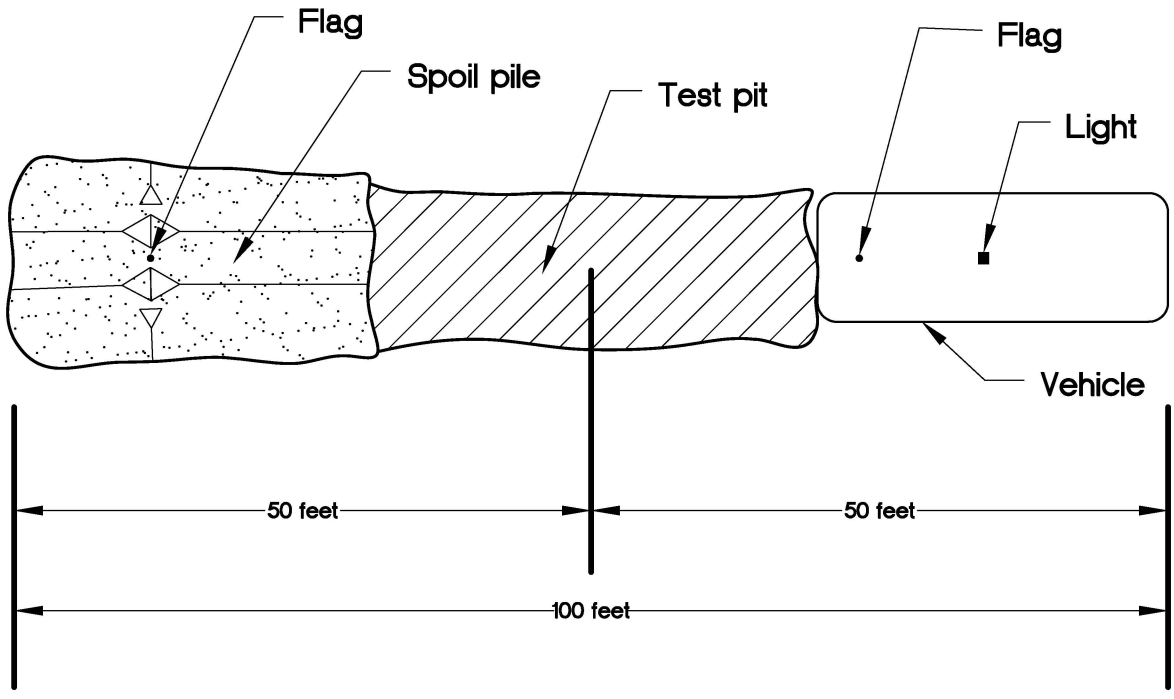
TYPICAL SURFACE SETTLEMENT MONUMENT

Plate F–19

SIDE VIEW



TOP VIEW



GeoSoils, Inc. | TEST PIT SAFETY DIAGRAM | Plate F-20

Appendix 4: Historical Site Conditions

Phase I Environmental Site Assessment or Other Information on Past Site Use

N/A

Appendix 5: LID Infeasibility

LID Technical Infeasibility Analysis

N/A

Appendix 6: BMP Design Details

BMP Sizing, Design Details and other Supporting Documentation

Santa Ana Watershed - BMP Design Volume, V_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name: ADKAN ENGINEERS
Date: 10/11/2024
Designed by: CASSI MATULIONIS
Case No:
Company Project Number/Name: FARM BUREAU 140

BMP Identification

BMP NAME / ID: DMA A - BIORETENTION BASIN

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

85th Percentile, 24-hour Rainfall Depth, from the Isohyetal Map in Handbook Appendix E

D_{85}= 0.64 inches

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
A-1	*89,631.00*	*Roofs*	*1*	*0.89*	*79950.9*			
A-2	*79,909.00*	*Concrete or Asphalt*	*1*	*0.89*	*71278.8*			
A-3	*87,983*	*Ornamental Landscaping*	*0.1*	*0.11*	*9718.4*			

Bioretention Facility - Design Procedure	BMP ID: BIO BASIN	Legend:	Required Entries / Calculated Cells

Company Name: Adkan Engineers — Date: 10/11/2024

Designed by: CASSI MATULIONIS — County/City Case No.:

Design Volume

Enter the area tributary to this feature — A_T = 5.92 acres

Enter V_{BMP} determined from Section 2.1 of this Handbook — V_{BMP} = 8,584 ft^3

Type of Bioretention Facility Design

(●) Side slopes required (parallel to parking spaces or adjacent to walkways)

( ) No side slopes required (perpendicular to parking space or Planter Boxes)

Bioretention Facility Surface Area

Depth of Soil Filter Media Layer — d_S = 1.5 ft

Top Width of Bioretention Facility, excluding curb — w_T = 72.0 ft

Total Effective Depth, d_E

$d_E = (0.3) \times d_S + (0.4) \times 1 - (0.7/w_T) + 0.5$ — d_E = 1.34 ft

Minimum Surface Area, A_m

$$A_M\,(ft^2) = \frac{V_{BMP}\,(ft^3)}{d_E\,(ft)}$$

A_M = 6,405 ft^2

Proposed Surface Area — A= 7,728 ft^2

Bioretention Facility Properties

Side Slopes in Bioretention Facility — z = 4 :1

Diameter of Underdrain — 6 inches

Longitudinal Slope of Site (3% maximum) — 0 %

6" Check Dam Spacing — 0 feet

Describe Vegetation:

Notes:

Santa Ana Watershed - BMP Design Volume, V_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name	ADKAN ENGINEERS	Date	10/11/2024
Designed by	CASSI MATULIONIS	Case No	
Company Project Number/Name	FARM BUREAU 140		

BMP Identification

BMP NAME / ID: DMA B - BIORETENTION TRENCH 1

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

85th Percentile, 24-hour Rainfall Depth, from the Isohyetal Map in Handbook Appendix E

D_{85}= 0.64 inches

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
B-1	*5,319.00*	*Roofs*	*1*	*0.89*	*4744.5*			
B-2	*6,333.00*	*Concrete or Asphalt*	*1*	*0.89*	*5649*			
B-3	*2,355*	*Ornamental Landscaping*	*0.1*	*0.11*	*260.1*			
	14007	**Total**			**10653.6**	**0.64**	***568.2***	***602***

Notes:

Bioretention Facility - Design Procedure	BMP ID: BIO TRENCH 1	Legend:	Required Entries / Calculated Cells

Company Name: Adkan Engineers — Date: 10/11/2024

Designed by: CASSI MATULIONIS — County/City Case No.:

Design Volume

Enter the area tributary to this feature	A_T =	0.32	acres
Enter V_{BMP} determined from Section 2.1 of this Handbook	V_{BMP} =	568	ft^3

Type of Bioretention Facility Design

(●) Side slopes required (parallel to parking spaces or adjacent to walkways)

( ) No side slopes required (perpendicular to parking space or Planter Boxes)

Bioretention Facility Surface Area

Depth of Soil Filter Media Layer	d_S =	3.0	ft
Top Width of Bioretention Facility, excluding curb	w_T =	8.0	ft
Total Effective Depth, d_E $d_E = (0.3) \times d_S + (0.4) \times 1 - (0.7/w_T) + 0.5$	d_E =	1.71	ft
Minimum Surface Area, A_m $A_M\ (ft^2) = \frac{V_{BMP}\ (ft^3)}{d_E\ (ft)}$	A_M =	332	ft^2
Proposed Surface Area	A=	352	ft^2

Bioretention Facility Properties

Side Slopes in Bioretention Facility	z =	4	:1
Diameter of Underdrain		6	inches
Longitudinal Slope of Site (3% maximum)		0	%
6" Check Dam Spacing		0	feet

Describe Vegetation:

Notes:

Santa Ana Watershed - BMP Design Volume, V_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name	ADKAN ENGINEERS	Date	11/1/2024
Designed by	CASSI MATULIONIS	Case No	
Company Project Number/Name	FARM BUREAU 140		

BMP Identification

BMP NAME / ID: DMA C - BIORETENTION TRENCH 2

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

85th Percentile, 24-hour Rainfall Depth, from the Isohyetal Map in Handbook Appendix E

D_{85}= 0.64 inches

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
C-1	*15,957.00*	*Roofs*	*1*	*0.89*	*14233.6*			
C-2	*24,621.00*	*Concrete or Asphalt*	*1*	*0.89*	*21961.9*			
C-3	*7,249*	*Ornamental Landscaping*	*0.1*	*0.11*	*800.7*			

Bioretention Facility - Design Procedure	BMP ID: BIO TRENCH 2	Legend:	Required Entries / Calculated Cells

Company Name: Adkan Engineers — Date: 11/1/2024

Designed by: CASSI MATULIONIS — County/City Case No.:

Design Volume

Enter the area tributary to this feature — A_T = 1.1 acres

Enter V_{BMP} determined from Section 2.1 of this Handbook — V_{BMP} = 1,973 ft^3

Type of Bioretention Facility Design

(●) Side slopes required (parallel to parking spaces or adjacent to walkways)

( ) No side slopes required (perpendicular to parking space or Planter Boxes)

Bioretention Facility Surface Area

Depth of Soil Filter Media Layer — d_S = 3.0 ft

Top Width of Bioretention Facility, excluding curb — w_T = 8.0 ft

Total Effective Depth, d_E

$d_E = (0.3) \times d_S + (0.4) \times 1 - (0.7/w_T) + 0.5$ — d_E = 1.71 ft

Minimum Surface Area, A_m

$$A_M\,(ft^2) = \frac{V_{BMP}\,(ft^3)}{d_E\,(ft)}$$

A_M = 1,153 ft^2

Proposed Surface Area — A= 1,300 ft^2

Bioretention Facility Properties

Side Slopes in Bioretention Facility — z = 4 :1

Diameter of Underdrain — 6 inches

Longitudinal Slope of Site (3% maximum) — 0 %

6" Check Dam Spacing — 0 feet

Describe Vegetation:

Notes:

Santa Ana Watershed - BMP Design Volume, V_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name	ADKAN ENGINEERS	Date	10/11/2024
Designed by	CASSI MATULIONIS	Case No	
Company Project Number/Name	FARM BUREAU 140		

BMP Identification

BMP NAME / ID: DMA D - BIORETENTION TRENCH 3

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

85th Percentile, 24-hour Rainfall Depth, from the Isohyetal Map in Handbook Appendix E

D_{85}= 0.64 inches

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
D-1	*23,469.00*	*Roofs*	*1*	*0.89*	*20934.3*			
D-2	*19,655.00*	*Concrete or Asphalt*	*1*	*0.89*	*17532.3*			
D-3	*13,301*	*Ornamental Landscaping*	*0.1*	*0.11*	*1469.2*			

Bioretention Facility - Design Procedure	BMP ID	Legend:	Required Entries	
	BIO TRENCH 3		Calculated Cells	

Company Name:	Adkan Engineers	Date:	10/11/2024
Designed by:	CASSI MATULIONIS	County/City Case No.:	

Design Volume

Enter the area tributary to this feature	A_T=	1.3	acres
Enter V_{BMP} determined from Section 2.1 of this Handbook	V_{BMP}=	2,130	ft^3

Type of Bioretention Facility Design

(●) Side slopes required (parallel to parking spaces or adjacent to walkways)

( ) No side slopes required (perpendicular to parking space or Planter Boxes)

Bioretention Facility Surface Area

Depth of Soil Filter Media Layer	d_S =	3.0	ft
Top Width of Bioretention Facility, excluding curb	w_T =	8.0	ft
Total Effective Depth, d_E $d_E = (0.3) \times d_S + (0.4) \times 1 - (0.7/w_T) + 0.5$	d_E =	1.71	ft
Minimum Surface Area, A_m $A_M\ (ft^2) = \frac{V_{BMP}\ (ft^3)}{d_E\ (ft)}$	A_M =	1,244	ft^2
Proposed Surface Area	A=	2,020	ft^2

Bioretention Facility Properties

Side Slopes in Bioretention Facility	z =	4	:1
Diameter of Underdrain		6	inches
Longitudinal Slope of Site (3% maximum)		0	%
6" Check Dam Spacing		0	feet
Describe Vegetation:			

Notes:

Appendix 7: Hydromodification

Supporting Detail Relating to Hydrologic Conditions of Concern

SITE

JURUPA VALLEY
EASTVALE
NORCO
PRADO DAM
CORONA
RIVERSIDE
ZONE 1
LAKE MATHEWS
ZONE 2
MORENO VALLEY
CALIMESA
ZONE 5
BEAUMONT
BANNING
MYSTIC LAKE
SAN JACINTO
ZONE 4
PERRIS
HEMET
MENIFEE
CANYON LAKE
LAKE ELSINORE
ZONE 3
WILDOMAR
MURRIETA
ZONE 7

Legend

Stream Type
- Not Susceptible Stream Channels
- Potentially Susceptible Stream Channels
- Large River (Not Susceptible)
- Santa Ana River
- Adequate Sump

Watershed Areas
- Not Applicable Area
- Applicable Area
- Applicable Area Watershed Boundaries

- Flood Control and Water Conservation District Boundary
- Study Area
- County Boundary

0 1 2 3 4 Miles

HCOC Applicability Map

Hydromodification Susceptibility Documentation Report and Mapping
Riverside County Flood Control and Water Conservation District

Map 2

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

Copyright (c) CIVILCADD/CIVILDESIGN, 1989 - 2008, Version 8.1
Study date 10/10/24 File: EXA2242.out

++

Riverside County Synthetic Unit Hydrology Method
RCFC & WCD Manual date - April 1978

Program License Serial Number 5006

English (in-lb) Input Units Used
English Rainfall Data (Inches) Input Values Used

English Units used in output format

Drainage Area = 5.91(Ac.) = 0.009 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 5.91(Ac.) = 0.009 Sq. Mi.
Length along longest watercourse = 799.00(Ft.)
Length along longest watercourse measured to centroid = 400.00(Ft.)
Length along longest watercourse = 0.151 Mi.
Length along longest watercourse measured to centroid = 0.076 Mi.
Difference in elevation = 36.00(Ft.)
Slope along watercourse = 237.8974 Ft./Mi.
Average Manning's 'N' = 0.030
Lag time = 0.047 Hr.
Lag time = 2.80 Min.
25% of lag time = 0.70 Min.
40% of lag time = 1.12 Min.
Unit time = 5.00 Min.
Duration of storm = 24 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
5.91	2.00	11.82

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
5.91	6.00	35.46

STORM EVENT (YEAR) = 2.00
Area Averaged 2-Year Rainfall = 2.000(In)
Area Averaged 100-Year Rainfall = 6.000(In)

Point rain (area averaged) = 2.000(In)
Areal adjustment factor = 100.00 %
Adjusted average point rain = 2.000(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
5.910	89.00	0.000

Total Area Entered = 5.91(Ac.)

RI AMC2	RI AMC-1	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
89.0	76.4	0.286	0.000	0.286	1.000	0.286
					Sum (F) =	0.286

Area averaged mean soil loss (F) (In/Hr) = 0.286
Minimum soil loss rate ((In/Hr)) = 0.143
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.900

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)	Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)

1	0.083	178.835	39.492	2.352
2	0.167	357.669	44.870	2.673
3	0.250	536.504	9.713	0.579
4	0.333	715.338	3.993	0.238
5	0.417	894.173	1.932	0.115
			Sum = 100.000 Sum=	5.956

The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	0.07	0.016	(0.508)	0.014	0.002
2	0.17	0.07	0.016	(0.506)	0.014	0.002
3	0.25	0.07	0.016	(0.504)	0.014	0.002
4	0.33	0.10	0.024	(0.502)	0.022	0.002
5	0.42	0.10	0.024	(0.500)	0.022	0.002
6	0.50	0.10	0.024	(0.498)	0.022	0.002
7	0.58	0.10	0.024	(0.496)	0.022	0.002
8	0.67	0.10	0.024	(0.494)	0.022	0.002
9	0.75	0.10	0.024	(0.492)	0.022	0.002
10	0.83	0.13	0.032	(0.490)	0.029	0.003
11	0.92	0.13	0.032	(0.488)	0.029	0.003
12	1.00	0.13	0.032	(0.486)	0.029	0.003
13	1.08	0.10	0.024	(0.485)	0.022	0.002
14	1.17	0.10	0.024	(0.483)	0.022	0.002
15	1.25	0.10	0.024	(0.481)	0.022	0.002
16	1.33	0.10	0.024	(0.479)	0.022	0.002
17	1.42	0.10	0.024	(0.477)	0.022	0.002
18	1.50	0.10	0.024	(0.475)	0.022	0.002
19	1.58	0.10	0.024	(0.473)	0.022	0.002
20	1.67	0.10	0.024	(0.471)	0.022	0.002
21	1.75	0.10	0.024	(0.469)	0.022	0.002
22	1.83	0.13	0.032	(0.467)	0.029	0.003
23	1.92	0.13	0.032	(0.466)	0.029	0.003
24	2.00	0.13	0.032	(0.464)	0.029	0.003
25	2.08	0.13	0.032	(0.462)	0.029	0.003
26	2.17	0.13	0.032	(0.460)	0.029	0.003
27	2.25	0.13	0.032	(0.458)	0.029	0.003
28	2.33	0.13	0.032	(0.456)	0.029	0.003
29	2.42	0.13	0.032	(0.454)	0.029	0.003
30	2.50	0.13	0.032	(0.452)	0.029	0.003
31	2.58	0.17	0.040	(0.451)	0.036	0.004
32	2.67	0.17	0.040	(0.449)	0.036	0.004
33	2.75	0.17	0.040	(0.447)	0.036	0.004
34	2.83	0.17	0.040	(0.445)	0.036	0.004
35	2.92	0.17	0.040	(0.443)	0.036	0.004
36	3.00	0.17	0.040	(0.441)	0.036	0.004
37	3.08	0.17	0.040	(0.440)	0.036	0.004
38	3.17	0.17	0.040	(0.438)	0.036	0.004
39	3.25	0.17	0.040	(0.436)	0.036	0.004
40	3.33	0.17	0.040	(0.434)	0.036	0.004
41	3.42	0.17	0.040	(0.432)	0.036	0.004
42	3.50	0.17	0.040	(0.430)	0.036	0.004
43	3.58	0.17	0.040	(0.429)	0.036	0.004
44	3.67	0.17	0.040	(0.427)	0.036	0.004
45	3.75	0.17	0.040	(0.425)	0.036	0.004
46	3.83	0.20	0.048	(0.423)	0.043	0.005
47	3.92	0.20	0.048	(0.422)	0.043	0.005
48	4.00	0.20	0.048	(0.420)	0.043	0.005
49	4.08	0.20	0.048	(0.418)	0.043	0.005
50	4.17	0.20	0.048	(0.416)	0.043	0.005
51	4.25	0.20	0.048	(0.414)	0.043	0.005
52	4.33	0.23	0.056	(0.413)	0.050	0.006
53	4.42	0.23	0.056	(0.411)	0.050	0.006
54	4.50	0.23	0.056	(0.409)	0.050	0.006
55	4.58	0.23	0.056	(0.407)	0.050	0.006
56	4.67	0.23	0.056	(0.406)	0.050	0.006
57	4.75	0.23	0.056	(0.404)	0.050	0.006
58	4.83	0.27	0.064	(0.402)	0.058	0.006
59	4.92	0.27	0.064	(0.400)	0.058	0.006
60	5.00	0.27	0.064	(0.399)	0.058	0.006
61	5.08	0.20	0.048	(0.397)	0.043	0.005
62	5.17	0.20	0.048	(0.395)	0.043	0.005
63	5.25	0.20	0.048	(0.393)	0.043	0.005
64	5.33	0.23	0.056	(0.392)	0.050	0.006
65	5.42	0.23	0.056	(0.390)	0.050	0.006
66	5.50	0.23	0.056	(0.388)	0.050	0.006
67	5.58	0.27	0.064	(0.387)	0.058	0.006
68	5.67	0.27	0.064	(0.385)	0.058	0.006
69	5.75	0.27	0.064	(0.383)	0.058	0.006
70	5.83	0.27	0.064	(0.382)	0.058	0.006
71	5.92	0.27	0.064	(0.380)	0.058	0.006

72	6.00	0.27	0.064	(0.378)	0.058	0.006
73	6.08	0.30	0.072	(0.376)	0.065	0.007
74	6.17	0.30	0.072	(0.375)	0.065	0.007
75	6.25	0.30	0.072	(0.373)	0.065	0.007
76	6.33	0.30	0.072	(0.371)	0.065	0.007
77	6.42	0.30	0.072	(0.370)	0.065	0.007
78	6.50	0.30	0.072	(0.368)	0.065	0.007
79	6.58	0.33	0.080	(0.366)	0.072	0.008
80	6.67	0.33	0.080	(0.365)	0.072	0.008
81	6.75	0.33	0.080	(0.363)	0.072	0.008
82	6.83	0.33	0.080	(0.362)	0.072	0.008
83	6.92	0.33	0.080	(0.360)	0.072	0.008
84	7.00	0.33	0.080	(0.358)	0.072	0.008
85	7.08	0.33	0.080	(0.357)	0.072	0.008
86	7.17	0.33	0.080	(0.355)	0.072	0.008
87	7.25	0.33	0.080	(0.353)	0.072	0.008
88	7.33	0.37	0.088	(0.352)	0.079	0.009
89	7.42	0.37	0.088	(0.350)	0.079	0.009
90	7.50	0.37	0.088	(0.349)	0.079	0.009
91	7.58	0.40	0.096	(0.347)	0.086	0.010
92	7.67	0.40	0.096	(0.345)	0.086	0.010
93	7.75	0.40	0.096	(0.344)	0.086	0.010
94	7.83	0.43	0.104	(0.342)	0.094	0.010
95	7.92	0.43	0.104	(0.341)	0.094	0.010
96	8.00	0.43	0.104	(0.339)	0.094	0.010
97	8.08	0.50	0.120	(0.337)	0.108	0.012
98	8.17	0.50	0.120	(0.336)	0.108	0.012
99	8.25	0.50	0.120	(0.334)	0.108	0.012
100	8.33	0.50	0.120	(0.333)	0.108	0.012
101	8.42	0.50	0.120	(0.331)	0.108	0.012
102	8.50	0.50	0.120	(0.330)	0.108	0.012
103	8.58	0.53	0.128	(0.328)	0.115	0.013
104	8.67	0.53	0.128	(0.327)	0.115	0.013
105	8.75	0.53	0.128	(0.325)	0.115	0.013
106	8.83	0.57	0.136	(0.323)	0.122	0.014
107	8.92	0.57	0.136	(0.322)	0.122	0.014
108	9.00	0.57	0.136	(0.320)	0.122	0.014
109	9.08	0.63	0.152	(0.319)	0.137	0.015
110	9.17	0.63	0.152	(0.317)	0.137	0.015
111	9.25	0.63	0.152	(0.316)	0.137	0.015
112	9.33	0.67	0.160	(0.314)	0.144	0.016
113	9.42	0.67	0.160	(0.313)	0.144	0.016
114	9.50	0.67	0.160	(0.311)	0.144	0.016
115	9.58	0.70	0.168	(0.310)	0.151	0.017
116	9.67	0.70	0.168	(0.308)	0.151	0.017
117	9.75	0.70	0.168	(0.307)	0.151	0.017
118	9.83	0.73	0.176	(0.305)	0.158	0.018
119	9.92	0.73	0.176	(0.304)	0.158	0.018
120	10.00	0.73	0.176	(0.303)	0.158	0.018
121	10.08	0.50	0.120	(0.301)	0.108	0.012
122	10.17	0.50	0.120	(0.300)	0.108	0.012
123	10.25	0.50	0.120	(0.298)	0.108	0.012
124	10.33	0.50	0.120	(0.297)	0.108	0.012
125	10.42	0.50	0.120	(0.295)	0.108	0.012
126	10.50	0.50	0.120	(0.294)	0.108	0.012
127	10.58	0.67	0.160	(0.292)	0.144	0.016
128	10.67	0.67	0.160	(0.291)	0.144	0.016
129	10.75	0.67	0.160	(0.290)	0.144	0.016
130	10.83	0.67	0.160	(0.288)	0.144	0.016
131	10.92	0.67	0.160	(0.287)	0.144	0.016
132	11.00	0.67	0.160	(0.285)	0.144	0.016
133	11.08	0.63	0.152	(0.284)	0.137	0.015
134	11.17	0.63	0.152	(0.282)	0.137	0.015
135	11.25	0.63	0.152	(0.281)	0.137	0.015
136	11.33	0.63	0.152	(0.280)	0.137	0.015
137	11.42	0.63	0.152	(0.278)	0.137	0.015
138	11.50	0.63	0.152	(0.277)	0.137	0.015
139	11.58	0.57	0.136	(0.276)	0.122	0.014
140	11.67	0.57	0.136	(0.274)	0.122	0.014
141	11.75	0.57	0.136	(0.273)	0.122	0.014
142	11.83	0.60	0.144	(0.271)	0.130	0.014
143	11.92	0.60	0.144	(0.270)	0.130	0.014
144	12.00	0.60	0.144	(0.269)	0.130	0.014
145	12.08	0.83	0.200	(0.267)	0.180	0.020
146	12.17	0.83	0.200	(0.266)	0.180	0.020
147	12.25	0.83	0.200	(0.265)	0.180	0.020
148	12.33	0.87	0.208	(0.263)	0.187	0.021
149	12.42	0.87	0.208	(0.262)	0.187	0.021
150	12.50	0.87	0.208	(0.261)	0.187	0.021
151	12.58	0.93	0.224	(0.259)	0.202	0.022
152	12.67	0.93	0.224	(0.258)	0.202	0.022
153	12.75	0.93	0.224	(0.257)	0.202	0.022
154	12.83	0.97	0.232	(0.256)	0.209	0.023
155	12.92	0.97	0.232	(0.254)	0.209	0.023
156	13.00	0.97	0.232	(0.253)	0.209	0.023
157	13.08	1.13	0.272	(0.252)	0.245	0.027

158	13.17	1.13	0.272	(0.250)	0.245	0.027
159	13.25	1.13	0.272	(0.249)	0.245	0.027
160	13.33	1.13	0.272	(0.248)	0.245	0.027
161	13.42	1.13	0.272	(0.247)	0.245	0.027
162	13.50	1.13	0.272	(0.245)	0.245	0.027
163	13.58	0.77	0.184	(0.244)	0.166	0.018
164	13.67	0.77	0.184	(0.243)	0.166	0.018
165	13.75	0.77	0.184	(0.242)	0.166	0.018
166	13.83	0.77	0.184	(0.240)	0.166	0.018
167	13.92	0.77	0.184	(0.239)	0.166	0.018
168	14.00	0.77	0.184	(0.238)	0.166	0.018
169	14.08	0.90	0.216	(0.237)	0.194	0.022
170	14.17	0.90	0.216	(0.236)	0.194	0.022
171	14.25	0.90	0.216	(0.234)	0.194	0.022
172	14.33	0.87	0.208	(0.233)	0.187	0.021
173	14.42	0.87	0.208	(0.232)	0.187	0.021
174	14.50	0.87	0.208	(0.231)	0.187	0.021
175	14.58	0.87	0.208	(0.230)	0.187	0.021
176	14.67	0.87	0.208	(0.228)	0.187	0.021
177	14.75	0.87	0.208	(0.227)	0.187	0.021
178	14.83	0.83	0.200	(0.226)	0.180	0.020
179	14.92	0.83	0.200	(0.225)	0.180	0.020
180	15.00	0.83	0.200	(0.224)	0.180	0.020
181	15.08	0.80	0.192	(0.223)	0.173	0.019
182	15.17	0.80	0.192	(0.221)	0.173	0.019
183	15.25	0.80	0.192	(0.220)	0.173	0.019
184	15.33	0.77	0.184	(0.219)	0.166	0.018
185	15.42	0.77	0.184	(0.218)	0.166	0.018
186	15.50	0.77	0.184	(0.217)	0.166	0.018
187	15.58	0.63	0.152	(0.216)	0.137	0.015
188	15.67	0.63	0.152	(0.215)	0.137	0.015
189	15.75	0.63	0.152	(0.214)	0.137	0.015
190	15.83	0.63	0.152	(0.213)	0.137	0.015
191	15.92	0.63	0.152	(0.211)	0.137	0.015
192	16.00	0.63	0.152	(0.210)	0.137	0.015
193	16.08	0.13	0.032	(0.209)	0.029	0.003
194	16.17	0.13	0.032	(0.208)	0.029	0.003
195	16.25	0.13	0.032	(0.207)	0.029	0.003
196	16.33	0.13	0.032	(0.206)	0.029	0.003
197	16.42	0.13	0.032	(0.205)	0.029	0.003
198	16.50	0.13	0.032	(0.204)	0.029	0.003
199	16.58	0.10	0.024	(0.203)	0.022	0.002
200	16.67	0.10	0.024	(0.202)	0.022	0.002
201	16.75	0.10	0.024	(0.201)	0.022	0.002
202	16.83	0.10	0.024	(0.200)	0.022	0.002
203	16.92	0.10	0.024	(0.199)	0.022	0.002
204	17.00	0.10	0.024	(0.198)	0.022	0.002
205	17.08	0.17	0.040	(0.197)	0.036	0.004
206	17.17	0.17	0.040	(0.196)	0.036	0.004
207	17.25	0.17	0.040	(0.195)	0.036	0.004
208	17.33	0.17	0.040	(0.194)	0.036	0.004
209	17.42	0.17	0.040	(0.193)	0.036	0.004
210	17.50	0.17	0.040	(0.192)	0.036	0.004
211	17.58	0.17	0.040	(0.191)	0.036	0.004
212	17.67	0.17	0.040	(0.190)	0.036	0.004
213	17.75	0.17	0.040	(0.189)	0.036	0.004
214	17.83	0.13	0.032	(0.188)	0.029	0.003
215	17.92	0.13	0.032	(0.187)	0.029	0.003
216	18.00	0.13	0.032	(0.186)	0.029	0.003
217	18.08	0.13	0.032	(0.185)	0.029	0.003
218	18.17	0.13	0.032	(0.185)	0.029	0.003
219	18.25	0.13	0.032	(0.184)	0.029	0.003
220	18.33	0.13	0.032	(0.183)	0.029	0.003
221	18.42	0.13	0.032	(0.182)	0.029	0.003
222	18.50	0.13	0.032	(0.181)	0.029	0.003
223	18.58	0.10	0.024	(0.180)	0.022	0.002
224	18.67	0.10	0.024	(0.179)	0.022	0.002
225	18.75	0.10	0.024	(0.178)	0.022	0.002
226	18.83	0.07	0.016	(0.177)	0.014	0.002
227	18.92	0.07	0.016	(0.177)	0.014	0.002
228	19.00	0.07	0.016	(0.176)	0.014	0.002
229	19.08	0.10	0.024	(0.175)	0.022	0.002
230	19.17	0.10	0.024	(0.174)	0.022	0.002
231	19.25	0.10	0.024	(0.173)	0.022	0.002
232	19.33	0.13	0.032	(0.173)	0.029	0.003
233	19.42	0.13	0.032	(0.172)	0.029	0.003
234	19.50	0.13	0.032	(0.171)	0.029	0.003
235	19.58	0.10	0.024	(0.170)	0.022	0.002
236	19.67	0.10	0.024	(0.169)	0.022	0.002
237	19.75	0.10	0.024	(0.169)	0.022	0.002
238	19.83	0.07	0.016	(0.168)	0.014	0.002
239	19.92	0.07	0.016	(0.167)	0.014	0.002
240	20.00	0.07	0.016	(0.166)	0.014	0.002
241	20.08	0.10	0.024	(0.166)	0.022	0.002
242	20.17	0.10	0.024	(0.165)	0.022	0.002
243	20.25	0.10	0.024	(0.164)	0.022	0.002

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244  20.33     0.10      0.024       (  0.163)       0.022        0.002
245  20.42     0.10      0.024       (  0.163)       0.022        0.002
246  20.50     0.10      0.024       (  0.162)       0.022        0.002
247  20.58     0.10      0.024       (  0.161)       0.022        0.002
248  20.67     0.10      0.024       (  0.161)       0.022        0.002
249  20.75     0.10      0.024       (  0.160)       0.022        0.002
250  20.83     0.07      0.016       (  0.159)       0.014        0.002
251  20.92     0.07      0.016       (  0.159)       0.014        0.002
252  21.00     0.07      0.016       (  0.158)       0.014        0.002
253  21.08     0.10      0.024       (  0.157)       0.022        0.002
254  21.17     0.10      0.024       (  0.157)       0.022        0.002
255  21.25     0.10      0.024       (  0.156)       0.022        0.002
256  21.33     0.07      0.016       (  0.156)       0.014        0.002
257  21.42     0.07      0.016       (  0.155)       0.014        0.002
258  21.50     0.07      0.016       (  0.155)       0.014        0.002
259  21.58     0.10      0.024       (  0.154)       0.022        0.002
260  21.67     0.10      0.024       (  0.153)       0.022        0.002
261  21.75     0.10      0.024       (  0.153)       0.022        0.002
262  21.83     0.07      0.016       (  0.152)       0.014        0.002
263  21.92     0.07      0.016       (  0.152)       0.014        0.002
264  22.00     0.07      0.016       (  0.151)       0.014        0.002
265  22.08     0.10      0.024       (  0.151)       0.022        0.002
266  22.17     0.10      0.024       (  0.150)       0.022        0.002
267  22.25     0.10      0.024       (  0.150)       0.022        0.002
268  22.33     0.07      0.016       (  0.149)       0.014        0.002
269  22.42     0.07      0.016       (  0.149)       0.014        0.002
270  22.50     0.07      0.016       (  0.148)       0.014        0.002
271  22.58     0.07      0.016       (  0.148)       0.014        0.002
272  22.67     0.07      0.016       (  0.148)       0.014        0.002
273  22.75     0.07      0.016       (  0.147)       0.014        0.002
274  22.83     0.07      0.016       (  0.147)       0.014        0.002
275  22.92     0.07      0.016       (  0.146)       0.014        0.002
276  23.00     0.07      0.016       (  0.146)       0.014        0.002
277  23.08     0.07      0.016       (  0.146)       0.014        0.002
278  23.17     0.07      0.016       (  0.145)       0.014        0.002
279  23.25     0.07      0.016       (  0.145)       0.014        0.002
280  23.33     0.07      0.016       (  0.145)       0.014        0.002
281  23.42     0.07      0.016       (  0.145)       0.014        0.002
282  23.50     0.07      0.016       (  0.144)       0.014        0.002
283  23.58     0.07      0.016       (  0.144)       0.014        0.002
284  23.67     0.07      0.016       (  0.144)       0.014        0.002
285  23.75     0.07      0.016       (  0.144)       0.014        0.002
286  23.83     0.07      0.016       (  0.143)       0.014        0.002
287  23.92     0.07      0.016       (  0.143)       0.014        0.002
288  24.00     0.07      0.016       (  0.143)       0.014        0.002
               (Loss Rate Not Used)
    Sum =     100.0                                  Sum =      2.4
      Flood volume = Effective rainfall      0.20(In)
       times area       5.9(Ac.)/[(In)/(Ft.)] =       0.1(Ac.Ft)
      Total soil loss =      1.80(In)
      Total soil loss =     0.886(Ac.Ft)
      Total rainfall =      2.00(In)
      Flood volume =        4290.6 Cubic Feet
      Total soil loss =       38615.5 Cubic Feet
      ---------------------------------------------------------------------
       Peak flow rate of this hydrograph =      0.162(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      0.01  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      0.01  Q         |         |         |         |
  0+35       0.0005      0.01  Q         |         |         |         |
  0+40       0.0006      0.01  Q         |         |         |         |
  0+45       0.0007      0.01  Q         |         |         |         |
  0+50       0.0008      0.02  Q         |         |         |         |
  0+55       0.0009      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      0.01  Q         |         |         |         |
  1+20       0.0015      0.01  Q         |         |         |         |
  1+25       0.0016      0.01  Q         |         |         |         |
  1+30       0.0017      0.01  Q         |         |         |         |
  1+35       0.0018      0.01  Q         |         |         |         |
  1+40       0.0019      0.01  Q         |         |         |         |
```

1+45	0.0020	0.01	Q	|	|	|	|
1+50	0.0021	0.02	Q	|	|	|	|
1+55	0.0022	0.02	Q	|	|	|	|
2+ 0	0.0024	0.02	Q	|	|	|	|
2+ 5	0.0025	0.02	QV	|	|	|	|
2+10	0.0026	0.02	QV	|	|	|	|
2+15	0.0027	0.02	QV	|	|	|	|
2+20	0.0029	0.02	QV	|	|	|	|
2+25	0.0030	0.02	QV	|	|	|	|
2+30	0.0031	0.02	QV	|	|	|	|
2+35	0.0033	0.02	QV	|	|	|	|
2+40	0.0034	0.02	QV	|	|	|	|
2+45	0.0036	0.02	QV	|	|	|	|
2+50	0.0038	0.02	QV	|	|	|	|
2+55	0.0039	0.02	QV	|	|	|	|
3+ 0	0.0041	0.02	QV	|	|	|	|
3+ 5	0.0043	0.02	QV	|	|	|	|
3+10	0.0044	0.02	QV	|	|	|	|
3+15	0.0046	0.02	QV	|	|	|	|
3+20	0.0048	0.02	QV	|	|	|	|
3+25	0.0049	0.02	QV	|	|	|	|
3+30	0.0051	0.02	Q V	|	|	|	|
3+35	0.0052	0.02	Q V	|	|	|	|
3+40	0.0054	0.02	Q V	|	|	|	|
3+45	0.0056	0.02	Q V	|	|	|	|
3+50	0.0058	0.03	Q V	|	|	|	|
3+55	0.0059	0.03	Q V	|	|	|	|
4+ 0	0.0061	0.03	Q V	|	|	|	|
4+ 5	0.0063	0.03	Q V	|	|	|	|
4+10	0.0065	0.03	Q V	|	|	|	|
4+15	0.0067	0.03	Q V	|	|	|	|
4+20	0.0069	0.03	Q V	|	|	|	|
4+25	0.0072	0.03	Q V	|	|	|	|
4+30	0.0074	0.03	Q V	|	|	|	|
4+35	0.0076	0.03	Q V	|	|	|	|
4+40	0.0079	0.03	Q V	|	|	|	|
4+45	0.0081	0.03	Q V	|	|	|	|
4+50	0.0083	0.04	Q V	|	|	|	|
4+55	0.0086	0.04	Q V	|	|	|	|
5+ 0	0.0088	0.04	Q V	|	|	|	|
5+ 5	0.0091	0.03	Q V	|	|	|	|
5+10	0.0093	0.03	Q V	|	|	|	|
5+15	0.0095	0.03	Q V	|	|	|	|
5+20	0.0097	0.03	Q V	|	|	|	|
5+25	0.0099	0.03	Q V	|	|	|	|
5+30	0.0101	0.03	Q V	|	|	|	|
5+35	0.0104	0.04	Q V	|	|	|	|
5+40	0.0106	0.04	Q V	|	|	|	|
5+45	0.0109	0.04	Q V	|	|	|	|
5+50	0.0112	0.04	Q V	|	|	|	|
5+55	0.0114	0.04	Q V	|	|	|	|
6+ 0	0.0117	0.04	Q V	|	|	|	|
6+ 5	0.0120	0.04	Q V	|	|	|	|
6+10	0.0123	0.04	Q V	|	|	|	|
6+15	0.0126	0.04	Q V	|	|	|	|
6+20	0.0129	0.04	Q V	|	|	|	|
6+25	0.0131	0.04	Q V	|	|	|	|
6+30	0.0134	0.04	Q V	|	|	|	|
6+35	0.0138	0.04	Q V	|	|	|	|
6+40	0.0141	0.05	Q V	|	|	|	|
6+45	0.0144	0.05	Q V	|	|	|	|
6+50	0.0147	0.05	Q V	|	|	|	|
6+55	0.0151	0.05	Q V	|	|	|	|
7+ 0	0.0154	0.05	Q V	|	|	|	|
7+ 5	0.0157	0.05	Q V	|	|	|	|
7+10	0.0160	0.05	Q V	|	|	|	|
7+15	0.0164	0.05	Q V	|	|	|	|
7+20	0.0167	0.05	Q V	|	|	|	|
7+25	0.0171	0.05	Q V	|	|	|	|
7+30	0.0174	0.05	Q V	|	|	|	|
7+35	0.0178	0.05	Q V	|	|	|	|
7+40	0.0182	0.06	Q V	|	|	|	|
7+45	0.0186	0.06	Q V	|	|	|	|
7+50	0.0190	0.06	Q V	|	|	|	|
7+55	0.0194	0.06	Q V	|	|	|	|
8+ 0	0.0198	0.06	Q V	|	|	|	|
8+ 5	0.0203	0.07	Q V	|	|	|	|
8+10	0.0208	0.07	Q V	|	|	|	|
8+15	0.0213	0.07	Q V	|	|	|	|
8+20	0.0217	0.07	Q V	|	|	|	|
8+25	0.0222	0.07	Q V|	|	|	|
8+30	0.0227	0.07	Q V|	|	|	|
8+35	0.0232	0.07	Q V|	|	|	|
8+40	0.0238	0.08	Q V|	|	|	|
8+45	0.0243	0.08	Q V|	|	|	|
8+50	0.0248	0.08	Q V	|	|	|	|

8+55	0.0254	0.08	Q	
9+ 0	0.0259	0.08	Q	
9+ 5	0.0265	0.08	Q	
9+10	0.0271	0.09	Q	
9+15	0.0277	0.09	Q	
9+20	0.0284	0.09	Q	
9+25	0.0290	0.09	Q	
9+30	0.0297	0.10	Q	
9+35	0.0304	0.10	Q	
9+40	0.0310	0.10	Q	
9+45	0.0317	0.10	Q	
9+50	0.0324	0.10	Q	
9+55	0.0331	0.10	Q	
10+ 0	0.0339	0.10	Q	
10+ 5	0.0345	0.09	Q	
10+10	0.0350	0.08	Q	
10+15	0.0355	0.07	Q	
10+20	0.0360	0.07	Q	
10+25	0.0365	0.07	Q	
10+30	0.0370	0.07	Q	
10+35	0.0376	0.08	Q	
10+40	0.0382	0.09	Q	
10+45	0.0389	0.09	Q	
10+50	0.0395	0.09	Q	
10+55	0.0402	0.10	Q	
11+ 0	0.0408	0.10	Q	
11+ 5	0.0415	0.09	Q	
11+10	0.0421	0.09	Q	
11+15	0.0427	0.09	Q	
11+20	0.0433	0.09	Q	
11+25	0.0440	0.09	Q	
11+30	0.0446	0.09	Q	
11+35	0.0452	0.09	Q	
11+40	0.0458	0.08	Q	
11+45	0.0463	0.08	Q	
11+50	0.0469	0.08	Q	
11+55	0.0475	0.09	Q	
12+ 0	0.0481	0.09	Q	
12+ 5	0.0487	0.10	Q	
12+10	0.0495	0.11	Q	
12+15	0.0503	0.12	Q	
12+20	0.0512	0.12	Q	
12+25	0.0520	0.12	Q	
12+30	0.0529	0.12	Q	
12+35	0.0537	0.13	Q	
12+40	0.0547	0.13	Q	
12+45	0.0556	0.13	Q	
12+50	0.0565	0.14	Q	
12+55	0.0574	0.14	Q	
13+ 0	0.0584	0.14	Q	
13+ 5	0.0594	0.15	Q	
13+10	0.0605	0.16	Q	
13+15	0.0616	0.16	Q	
13+20	0.0627	0.16	Q	
13+25	0.0638	0.16	Q	
13+30	0.0650	0.16	Q	
13+35	0.0659	0.14	Q	
13+40	0.0667	0.12	Q	
13+45	0.0675	0.11	Q	
13+50	0.0683	0.11	Q	
13+55	0.0690	0.11	Q	
14+ 0	0.0698	0.11	Q	
14+ 5	0.0706	0.12	Q	
14+10	0.0715	0.13	Q	
14+15	0.0723	0.13	Q	
14+20	0.0732	0.13	Q	
14+25	0.0741	0.12	Q	
14+30	0.0749	0.12	Q	
14+35	0.0758	0.12	Q	
14+40	0.0766	0.12	Q	
14+45	0.0775	0.12	Q	
14+50	0.0783	0.12	Q	
14+55	0.0792	0.12	Q	
15+ 0	0.0800	0.12	Q	
15+ 5	0.0808	0.12	Q	
15+10	0.0816	0.12	Q	
15+15	0.0824	0.11	Q	
15+20	0.0831	0.11	Q	
15+25	0.0839	0.11	Q	
15+30	0.0847	0.11	Q	
15+35	0.0854	0.10	Q	
15+40	0.0860	0.09	Q	
15+45	0.0866	0.09	Q	
15+50	0.0873	0.09	Q	
15+55	0.0879	0.09	Q	
16+ 0	0.0885	0.09	Q	

16+ 5	0.0889	0.06	Q	|	|	|	V |
16+10	0.0892	0.03	Q	|	|	|	V |
16+15	0.0893	0.02	Q	|	|	|	V |
16+20	0.0895	0.02	Q	|	|	|	V |
16+25	0.0896	0.02	Q	|	|	|	V |
16+30	0.0897	0.02	Q	|	|	|	V |
16+35	0.0898	0.02	Q	|	|	|	V |
16+40	0.0899	0.02	Q	|	|	|	V |
16+45	0.0900	0.01	Q	|	|	|	V |
16+50	0.0901	0.01	Q	|	|	|	V |
16+55	0.0902	0.01	Q	|	|	|	V |
17+ 0	0.0903	0.01	Q	|	|	|	V |
17+ 5	0.0905	0.02	Q	|	|	|	V |
17+10	0.0906	0.02	Q	|	|	|	V |
17+15	0.0908	0.02	Q	|	|	|	V |
17+20	0.0909	0.02	Q	|	|	|	V |
17+25	0.0911	0.02	Q	|	|	|	V |
17+30	0.0913	0.02	Q	|	|	|	V |
17+35	0.0914	0.02	Q	|	|	|	V |
17+40	0.0916	0.02	Q	|	|	|	V |
17+45	0.0918	0.02	Q	|	|	|	V |
17+50	0.0919	0.02	Q	|	|	|	V |
17+55	0.0920	0.02	Q	|	|	|	V |
18+ 0	0.0922	0.02	Q	|	|	|	V |
18+ 5	0.0923	0.02	Q	|	|	|	V |
18+10	0.0924	0.02	Q	|	|	|	V |
18+15	0.0926	0.02	Q	|	|	|	V |
18+20	0.0927	0.02	Q	|	|	|	V |
18+25	0.0928	0.02	Q	|	|	|	V |
18+30	0.0930	0.02	Q	|	|	|	V |
18+35	0.0931	0.02	Q	|	|	|	V |
18+40	0.0932	0.02	Q	|	|	|	V |
18+45	0.0933	0.01	Q	|	|	|	V |
18+50	0.0934	0.01	Q	|	|	|	V |
18+55	0.0935	0.01	Q	|	|	|	V |
19+ 0	0.0935	0.01	Q	|	|	|	V |
19+ 5	0.0936	0.01	Q	|	|	|	V |
19+10	0.0937	0.01	Q	|	|	|	V |
19+15	0.0938	0.01	Q	|	|	|	V |
19+20	0.0939	0.02	Q	|	|	|	V |
19+25	0.0940	0.02	Q	|	|	|	V |
19+30	0.0942	0.02	Q	|	|	|	V |
19+35	0.0943	0.02	Q	|	|	|	V |
19+40	0.0944	0.02	Q	|	|	|	V |
19+45	0.0945	0.01	Q	|	|	|	V |
19+50	0.0946	0.01	Q	|	|	|	V |
19+55	0.0946	0.01	Q	|	|	|	V |
20+ 0	0.0947	0.01	Q	|	|	|	V |
20+ 5	0.0948	0.01	Q	|	|	|	V |
20+10	0.0949	0.01	Q	|	|	|	V |
20+15	0.0950	0.01	Q	|	|	|	V |
20+20	0.0951	0.01	Q	|	|	|	V |
20+25	0.0952	0.01	Q	|	|	|	V |
20+30	0.0953	0.01	Q	|	|	|	V |
20+35	0.0954	0.01	Q	|	|	|	V |
20+40	0.0955	0.01	Q	|	|	|	V |
20+45	0.0956	0.01	Q	|	|	|	V |
20+50	0.0956	0.01	Q	|	|	|	V |
20+55	0.0957	0.01	Q	|	|	|	V |
21+ 0	0.0958	0.01	Q	|	|	|	V |
21+ 5	0.0959	0.01	Q	|	|	|	V |
21+10	0.0960	0.01	Q	|	|	|	V |
21+15	0.0961	0.01	Q	|	|	|	V|
21+20	0.0961	0.01	Q	|	|	|	V|
21+25	0.0962	0.01	Q	|	|	|	V|
21+30	0.0963	0.01	Q	|	|	|	V|
21+35	0.0964	0.01	Q	|	|	|	V|
21+40	0.0964	0.01	Q	|	|	|	V|
21+45	0.0965	0.01	Q	|	|	|	V|
21+50	0.0966	0.01	Q	|	|	|	V|
21+55	0.0967	0.01	Q	|	|	|	V|
22+ 0	0.0968	0.01	Q	|	|	|	V|
22+ 5	0.0968	0.01	Q	|	|	|	V|
22+10	0.0969	0.01	Q	|	|	|	V|
22+15	0.0970	0.01	Q	|	|	|	V|
22+20	0.0971	0.01	Q	|	|	|	V|
22+25	0.0972	0.01	Q	|	|	|	V|
22+30	0.0973	0.01	Q	|	|	|	V|
22+35	0.0973	0.01	Q	|	|	|	V|
22+40	0.0974	0.01	Q	|	|	|	V|
22+45	0.0975	0.01	Q	|	|	|	V|
22+50	0.0975	0.01	Q	|	|	|	V|
22+55	0.0976	0.01	Q	|	|	|	V|
23+ 0	0.0977	0.01	Q	|	|	|	V|
23+ 5	0.0977	0.01	Q	|	|	|	V|
23+10	0.0978	0.01	Q	|	|	|	V|

```
   23+15       0.0979      0.01  Q          |          |          |          v|
   23+20       0.0979      0.01  Q          |          |          |          v|
   23+25       0.0980      0.01  Q          |          |          |          v|
   23+30       0.0980      0.01  Q          |          |          |          v|
   23+35       0.0981      0.01  Q          |          |          |          v|
   23+40       0.0982      0.01  Q          |          |          |          v|
   23+45       0.0982      0.01  Q          |          |          |          v|
   23+50       0.0983      0.01  Q          |          |          |          v|
   23+55       0.0984      0.01  Q          |          |          |          v|
   24+ 0       0.0984      0.01  Q          |          |          |          v|
   24+ 5       0.0985      0.01  Q          |          |          |          v|
   24+10       0.0985      0.00  Q          |          |          |          v|
   24+15       0.0985      0.00  Q          |          |          |          v|
   24+20       0.0985      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

       Copyright (c) CIVILCADD/CIVILDESIGN, 1989 - 2008, Version 8.1
              Study date  10/10/24 File: EXB2242.out

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

Riverside County Synthetic Unit Hydrology Method
RCFC & WCD Manual date - April 1978


Program License Serial Number 5006

------------------------------------------------------------------------
 English (in-lb) Input Units Used
 English Rainfall Data (Inches) Input Values Used

 English Units used in output format



------------------------------------------------------------------------
------------------------------------------------------------------------
Drainage Area =       0.32(Ac.)  =      0.001 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment =       0.32(Ac.)  =      0.001 Sq. Mi.
Length along longest watercourse =      83.00(Ft.)
Length along longest watercourse measured to centroid =      42.00(Ft.)
Length along longest watercourse =      0.016 Mi.
Length along longest watercourse measured to centroid =      0.008 Mi.
Difference in elevation =       6.00(Ft.)
Slope along watercourse =    381.6867 Ft./Mi.
Average Manning's 'N' = 0.030
Lag time =    0.008 Hr.
Lag time =     0.46 Min.
25% of lag time =     0.11 Min.
40% of lag time =     0.18 Min.
Unit time =     5.00 Min.
Duration of storm = 24 Hour(s)
User Entered Base Flow =     0.00(CFS)

2 YEAR Area rainfall data:


Area(Ac.)[1]       Rainfall(In)[2]      Weighting[1*2]
        0.32            2.00                  0.64

100 YEAR Area rainfall data:


Area(Ac.)[1]       Rainfall(In)[2]      Weighting[1*2]
        0.32            6.00                  1.92

STORM EVENT (YEAR) =    2.00
Area Averaged 2-Year Rainfall =    2.000(In)
Area Averaged 100-Year Rainfall =    6.000(In)

Point rain (area averaged) =    2.000(In)
Areal adjustment factor =  100.00 %
Adjusted average point rain =    2.000(In)

Sub-Area Data:
Area(Ac.)         Runoff Index   Impervious %
     0.320           89.00          0.000
 Total Area Entered =      0.32(Ac.)


RI    RI   Infil. Rate Impervious   Adj. Infil. Rate  Area%     F
AMC2 AMC-1     (In/Hr)    (Dec.%)     (In/Hr)      (Dec.)    (In/Hr)
89.0  76.4      0.286     0.000        0.286       1.000      0.286
                                                 Sum (F) =   0.286
Area averaged mean soil loss (F) (In/Hr) =  0.286
Minimum soil loss rate ((In/Hr)) =  0.143
(for 24 hour storm duration)
Soil low loss rate (decimal) =   0.900
------------------------------------------------------------------------

               U n i t  H y d r o g r a p h
                      VALLEY S-Curve
------------------------------------------------------------------
               Unit Hydrograph Data
------------------------------------------------------------------
Unit time period   Time % of lag   Distribution   Unit Hydrograph
    (hrs)                          Graph %           (CFS)
```

1	0.083	1089.251	100.000		0.323
			Sum = 100.000	Sum=	0.323

The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	0.07	0.016	(0.508)	0.014	0.002
2	0.17	0.07	0.016	(0.506)	0.014	0.002
3	0.25	0.07	0.016	(0.504)	0.014	0.002
4	0.33	0.10	0.024	(0.502)	0.022	0.002
5	0.42	0.10	0.024	(0.500)	0.022	0.002
6	0.50	0.10	0.024	(0.498)	0.022	0.002
7	0.58	0.10	0.024	(0.496)	0.022	0.002
8	0.67	0.10	0.024	(0.494)	0.022	0.002
9	0.75	0.10	0.024	(0.492)	0.022	0.002
10	0.83	0.13	0.032	(0.490)	0.029	0.003
11	0.92	0.13	0.032	(0.488)	0.029	0.003
12	1.00	0.13	0.032	(0.486)	0.029	0.003
13	1.08	0.10	0.024	(0.485)	0.022	0.002
14	1.17	0.10	0.024	(0.483)	0.022	0.002
15	1.25	0.10	0.024	(0.481)	0.022	0.002
16	1.33	0.10	0.024	(0.479)	0.022	0.002
17	1.42	0.10	0.024	(0.477)	0.022	0.002
18	1.50	0.10	0.024	(0.475)	0.022	0.002
19	1.58	0.10	0.024	(0.473)	0.022	0.002
20	1.67	0.10	0.024	(0.471)	0.022	0.002
21	1.75	0.10	0.024	(0.469)	0.022	0.002
22	1.83	0.13	0.032	(0.467)	0.029	0.003
23	1.92	0.13	0.032	(0.466)	0.029	0.003
24	2.00	0.13	0.032	(0.464)	0.029	0.003
25	2.08	0.13	0.032	(0.462)	0.029	0.003
26	2.17	0.13	0.032	(0.460)	0.029	0.003
27	2.25	0.13	0.032	(0.458)	0.029	0.003
28	2.33	0.13	0.032	(0.456)	0.029	0.003
29	2.42	0.13	0.032	(0.454)	0.029	0.003
30	2.50	0.13	0.032	(0.452)	0.029	0.003
31	2.58	0.17	0.040	(0.451)	0.036	0.004
32	2.67	0.17	0.040	(0.449)	0.036	0.004
33	2.75	0.17	0.040	(0.447)	0.036	0.004
34	2.83	0.17	0.040	(0.445)	0.036	0.004
35	2.92	0.17	0.040	(0.443)	0.036	0.004
36	3.00	0.17	0.040	(0.441)	0.036	0.004
37	3.08	0.17	0.040	(0.440)	0.036	0.004
38	3.17	0.17	0.040	(0.438)	0.036	0.004
39	3.25	0.17	0.040	(0.436)	0.036	0.004
40	3.33	0.17	0.040	(0.434)	0.036	0.004
41	3.42	0.17	0.040	(0.432)	0.036	0.004
42	3.50	0.17	0.040	(0.430)	0.036	0.004
43	3.58	0.17	0.040	(0.429)	0.036	0.004
44	3.67	0.17	0.040	(0.427)	0.036	0.004
45	3.75	0.17	0.040	(0.425)	0.036	0.004
46	3.83	0.20	0.048	(0.423)	0.043	0.005
47	3.92	0.20	0.048	(0.422)	0.043	0.005
48	4.00	0.20	0.048	(0.420)	0.043	0.005
49	4.08	0.20	0.048	(0.418)	0.043	0.005
50	4.17	0.20	0.048	(0.416)	0.043	0.005
51	4.25	0.20	0.048	(0.414)	0.043	0.005
52	4.33	0.23	0.056	(0.413)	0.050	0.006
53	4.42	0.23	0.056	(0.411)	0.050	0.006
54	4.50	0.23	0.056	(0.409)	0.050	0.006
55	4.58	0.23	0.056	(0.407)	0.050	0.006
56	4.67	0.23	0.056	(0.406)	0.050	0.006
57	4.75	0.23	0.056	(0.404)	0.050	0.006
58	4.83	0.27	0.064	(0.402)	0.058	0.006
59	4.92	0.27	0.064	(0.400)	0.058	0.006
60	5.00	0.27	0.064	(0.399)	0.058	0.006
61	5.08	0.20	0.048	(0.397)	0.043	0.005
62	5.17	0.20	0.048	(0.395)	0.043	0.005
63	5.25	0.20	0.048	(0.393)	0.043	0.005
64	5.33	0.23	0.056	(0.392)	0.050	0.006
65	5.42	0.23	0.056	(0.390)	0.050	0.006
66	5.50	0.23	0.056	(0.388)	0.050	0.006
67	5.58	0.27	0.064	(0.387)	0.058	0.006
68	5.67	0.27	0.064	(0.385)	0.058	0.006
69	5.75	0.27	0.064	(0.383)	0.058	0.006
70	5.83	0.27	0.064	(0.382)	0.058	0.006
71	5.92	0.27	0.064	(0.380)	0.058	0.006
72	6.00	0.27	0.064	(0.378)	0.058	0.006
73	6.08	0.30	0.072	(0.376)	0.065	0.007
74	6.17	0.30	0.072	(0.375)	0.065	0.007
75	6.25	0.30	0.072	(0.373)	0.065	0.007

76	6.33	0.30	0.072	(0.371)	0.065	0.007
77	6.42	0.30	0.072	(0.370)	0.065	0.007
78	6.50	0.30	0.072	(0.368)	0.065	0.007
79	6.58	0.33	0.080	(0.366)	0.072	0.008
80	6.67	0.33	0.080	(0.365)	0.072	0.008
81	6.75	0.33	0.080	(0.363)	0.072	0.008
82	6.83	0.33	0.080	(0.362)	0.072	0.008
83	6.92	0.33	0.080	(0.360)	0.072	0.008
84	7.00	0.33	0.080	(0.358)	0.072	0.008
85	7.08	0.33	0.080	(0.357)	0.072	0.008
86	7.17	0.33	0.080	(0.355)	0.072	0.008
87	7.25	0.33	0.080	(0.353)	0.072	0.008
88	7.33	0.37	0.088	(0.352)	0.079	0.009
89	7.42	0.37	0.088	(0.350)	0.079	0.009
90	7.50	0.37	0.088	(0.349)	0.079	0.009
91	7.58	0.40	0.096	(0.347)	0.086	0.010
92	7.67	0.40	0.096	(0.345)	0.086	0.010
93	7.75	0.40	0.096	(0.344)	0.086	0.010
94	7.83	0.43	0.104	(0.342)	0.094	0.010
95	7.92	0.43	0.104	(0.341)	0.094	0.010
96	8.00	0.43	0.104	(0.339)	0.094	0.010
97	8.08	0.50	0.120	(0.337)	0.108	0.012
98	8.17	0.50	0.120	(0.336)	0.108	0.012
99	8.25	0.50	0.120	(0.334)	0.108	0.012
100	8.33	0.50	0.120	(0.333)	0.108	0.012
101	8.42	0.50	0.120	(0.331)	0.108	0.012
102	8.50	0.50	0.120	(0.330)	0.108	0.012
103	8.58	0.53	0.128	(0.328)	0.115	0.013
104	8.67	0.53	0.128	(0.327)	0.115	0.013
105	8.75	0.53	0.128	(0.325)	0.115	0.013
106	8.83	0.57	0.136	(0.323)	0.122	0.014
107	8.92	0.57	0.136	(0.322)	0.122	0.014
108	9.00	0.57	0.136	(0.320)	0.122	0.014
109	9.08	0.63	0.152	(0.319)	0.137	0.015
110	9.17	0.63	0.152	(0.317)	0.137	0.015
111	9.25	0.63	0.152	(0.316)	0.137	0.015
112	9.33	0.67	0.160	(0.314)	0.144	0.016
113	9.42	0.67	0.160	(0.313)	0.144	0.016
114	9.50	0.67	0.160	(0.311)	0.144	0.016
115	9.58	0.70	0.168	(0.310)	0.151	0.017
116	9.67	0.70	0.168	(0.308)	0.151	0.017
117	9.75	0.70	0.168	(0.307)	0.151	0.017
118	9.83	0.73	0.176	(0.305)	0.158	0.018
119	9.92	0.73	0.176	(0.304)	0.158	0.018
120	10.00	0.73	0.176	(0.303)	0.158	0.018
121	10.08	0.50	0.120	(0.301)	0.108	0.012
122	10.17	0.50	0.120	(0.300)	0.108	0.012
123	10.25	0.50	0.120	(0.298)	0.108	0.012
124	10.33	0.50	0.120	(0.297)	0.108	0.012
125	10.42	0.50	0.120	(0.295)	0.108	0.012
126	10.50	0.50	0.120	(0.294)	0.108	0.012
127	10.58	0.67	0.160	(0.292)	0.144	0.016
128	10.67	0.67	0.160	(0.291)	0.144	0.016
129	10.75	0.67	0.160	(0.290)	0.144	0.016
130	10.83	0.67	0.160	(0.288)	0.144	0.016
131	10.92	0.67	0.160	(0.287)	0.144	0.016
132	11.00	0.67	0.160	(0.285)	0.144	0.016
133	11.08	0.63	0.152	(0.284)	0.137	0.015
134	11.17	0.63	0.152	(0.282)	0.137	0.015
135	11.25	0.63	0.152	(0.281)	0.137	0.015
136	11.33	0.63	0.152	(0.280)	0.137	0.015
137	11.42	0.63	0.152	(0.278)	0.137	0.015
138	11.50	0.63	0.152	(0.277)	0.137	0.015
139	11.58	0.57	0.136	(0.276)	0.122	0.014
140	11.67	0.57	0.136	(0.274)	0.122	0.014
141	11.75	0.57	0.136	(0.273)	0.122	0.014
142	11.83	0.60	0.144	(0.271)	0.130	0.014
143	11.92	0.60	0.144	(0.270)	0.130	0.014
144	12.00	0.60	0.144	(0.269)	0.130	0.014
145	12.08	0.83	0.200	(0.267)	0.180	0.020
146	12.17	0.83	0.200	(0.266)	0.180	0.020
147	12.25	0.83	0.200	(0.265)	0.180	0.020
148	12.33	0.87	0.208	(0.263)	0.187	0.021
149	12.42	0.87	0.208	(0.262)	0.187	0.021
150	12.50	0.87	0.208	(0.261)	0.187	0.021
151	12.58	0.93	0.224	(0.259)	0.202	0.022
152	12.67	0.93	0.224	(0.258)	0.202	0.022
153	12.75	0.93	0.224	(0.257)	0.202	0.022
154	12.83	0.97	0.232	(0.256)	0.209	0.023
155	12.92	0.97	0.232	(0.254)	0.209	0.023
156	13.00	0.97	0.232	(0.253)	0.209	0.023
157	13.08	1.13	0.272	(0.252)	0.245	0.027
158	13.17	1.13	0.272	(0.250)	0.245	0.027
159	13.25	1.13	0.272	(0.249)	0.245	0.027
160	13.33	1.13	0.272	(0.248)	0.245	0.027
161	13.42	1.13	0.272	(0.247)	0.245	0.027

162	13.50	1.13	0.272	(0.245)	0.245	0.027
163	13.58	0.77	0.184	(0.244)	0.166	0.018
164	13.67	0.77	0.184	(0.243)	0.166	0.018
165	13.75	0.77	0.184	(0.242)	0.166	0.018
166	13.83	0.77	0.184	(0.240)	0.166	0.018
167	13.92	0.77	0.184	(0.239)	0.166	0.018
168	14.00	0.77	0.184	(0.238)	0.166	0.018
169	14.08	0.90	0.216	(0.237)	0.194	0.022
170	14.17	0.90	0.216	(0.236)	0.194	0.022
171	14.25	0.90	0.216	(0.234)	0.194	0.022
172	14.33	0.87	0.208	(0.233)	0.187	0.021
173	14.42	0.87	0.208	(0.232)	0.187	0.021
174	14.50	0.87	0.208	(0.231)	0.187	0.021
175	14.58	0.87	0.208	(0.230)	0.187	0.021
176	14.67	0.87	0.208	(0.228)	0.187	0.021
177	14.75	0.87	0.208	(0.227)	0.187	0.021
178	14.83	0.83	0.200	(0.226)	0.180	0.020
179	14.92	0.83	0.200	(0.225)	0.180	0.020
180	15.00	0.83	0.200	(0.224)	0.180	0.020
181	15.08	0.80	0.192	(0.223)	0.173	0.019
182	15.17	0.80	0.192	(0.221)	0.173	0.019
183	15.25	0.80	0.192	(0.220)	0.173	0.019
184	15.33	0.77	0.184	(0.219)	0.166	0.018
185	15.42	0.77	0.184	(0.218)	0.166	0.018
186	15.50	0.77	0.184	(0.217)	0.166	0.018
187	15.58	0.63	0.152	(0.216)	0.137	0.015
188	15.67	0.63	0.152	(0.215)	0.137	0.015
189	15.75	0.63	0.152	(0.214)	0.137	0.015
190	15.83	0.63	0.152	(0.213)	0.137	0.015
191	15.92	0.63	0.152	(0.211)	0.137	0.015
192	16.00	0.63	0.152	(0.210)	0.137	0.015
193	16.08	0.13	0.032	(0.209)	0.029	0.003
194	16.17	0.13	0.032	(0.208)	0.029	0.003
195	16.25	0.13	0.032	(0.207)	0.029	0.003
196	16.33	0.13	0.032	(0.206)	0.029	0.003
197	16.42	0.13	0.032	(0.205)	0.029	0.003
198	16.50	0.13	0.032	(0.204)	0.029	0.003
199	16.58	0.10	0.024	(0.203)	0.022	0.002
200	16.67	0.10	0.024	(0.202)	0.022	0.002
201	16.75	0.10	0.024	(0.201)	0.022	0.002
202	16.83	0.10	0.024	(0.200)	0.022	0.002
203	16.92	0.10	0.024	(0.199)	0.022	0.002
204	17.00	0.10	0.024	(0.198)	0.022	0.002
205	17.08	0.17	0.040	(0.197)	0.036	0.004
206	17.17	0.17	0.040	(0.196)	0.036	0.004
207	17.25	0.17	0.040	(0.195)	0.036	0.004
208	17.33	0.17	0.040	(0.194)	0.036	0.004
209	17.42	0.17	0.040	(0.193)	0.036	0.004
210	17.50	0.17	0.040	(0.192)	0.036	0.004
211	17.58	0.17	0.040	(0.191)	0.036	0.004
212	17.67	0.17	0.040	(0.190)	0.036	0.004
213	17.75	0.17	0.040	(0.189)	0.036	0.004
214	17.83	0.13	0.032	(0.188)	0.029	0.003
215	17.92	0.13	0.032	(0.187)	0.029	0.003
216	18.00	0.13	0.032	(0.186)	0.029	0.003
217	18.08	0.13	0.032	(0.185)	0.029	0.003
218	18.17	0.13	0.032	(0.185)	0.029	0.003
219	18.25	0.13	0.032	(0.184)	0.029	0.003
220	18.33	0.13	0.032	(0.183)	0.029	0.003
221	18.42	0.13	0.032	(0.182)	0.029	0.003
222	18.50	0.13	0.032	(0.181)	0.029	0.003
223	18.58	0.10	0.024	(0.180)	0.022	0.002
224	18.67	0.10	0.024	(0.179)	0.022	0.002
225	18.75	0.10	0.024	(0.178)	0.022	0.002
226	18.83	0.07	0.016	(0.177)	0.014	0.002
227	18.92	0.07	0.016	(0.177)	0.014	0.002
228	19.00	0.07	0.016	(0.176)	0.014	0.002
229	19.08	0.10	0.024	(0.175)	0.022	0.002
230	19.17	0.10	0.024	(0.174)	0.022	0.002
231	19.25	0.10	0.024	(0.173)	0.022	0.002
232	19.33	0.13	0.032	(0.173)	0.029	0.003
233	19.42	0.13	0.032	(0.172)	0.029	0.003
234	19.50	0.13	0.032	(0.171)	0.029	0.003
235	19.58	0.10	0.024	(0.170)	0.022	0.002
236	19.67	0.10	0.024	(0.169)	0.022	0.002
237	19.75	0.10	0.024	(0.169)	0.022	0.002
238	19.83	0.07	0.016	(0.168)	0.014	0.002
239	19.92	0.07	0.016	(0.167)	0.014	0.002
240	20.00	0.07	0.016	(0.166)	0.014	0.002
241	20.08	0.10	0.024	(0.166)	0.022	0.002
242	20.17	0.10	0.024	(0.165)	0.022	0.002
243	20.25	0.10	0.024	(0.164)	0.022	0.002
244	20.33	0.10	0.024	(0.163)	0.022	0.002
245	20.42	0.10	0.024	(0.163)	0.022	0.002
246	20.50	0.10	0.024	(0.162)	0.022	0.002
247	20.58	0.10	0.024	(0.161)	0.022	0.002

248	20.67	0.10	0.024	(0.161)	0.022	0.002
249	20.75	0.10	0.024	(0.160)	0.022	0.002
250	20.83	0.07	0.016	(0.159)	0.014	0.002
251	20.92	0.07	0.016	(0.159)	0.014	0.002
252	21.00	0.07	0.016	(0.158)	0.014	0.002
253	21.08	0.10	0.024	(0.157)	0.022	0.002
254	21.17	0.10	0.024	(0.157)	0.022	0.002
255	21.25	0.10	0.024	(0.156)	0.022	0.002
256	21.33	0.07	0.016	(0.156)	0.014	0.002
257	21.42	0.07	0.016	(0.155)	0.014	0.002
258	21.50	0.07	0.016	(0.155)	0.014	0.002
259	21.58	0.10	0.024	(0.154)	0.022	0.002
260	21.67	0.10	0.024	(0.153)	0.022	0.002
261	21.75	0.10	0.024	(0.153)	0.022	0.002
262	21.83	0.07	0.016	(0.152)	0.014	0.002
263	21.92	0.07	0.016	(0.152)	0.014	0.002
264	22.00	0.07	0.016	(0.151)	0.014	0.002
265	22.08	0.10	0.024	(0.151)	0.022	0.002
266	22.17	0.10	0.024	(0.150)	0.022	0.002
267	22.25	0.10	0.024	(0.150)	0.022	0.002
268	22.33	0.07	0.016	(0.149)	0.014	0.002
269	22.42	0.07	0.016	(0.149)	0.014	0.002
270	22.50	0.07	0.016	(0.148)	0.014	0.002
271	22.58	0.07	0.016	(0.148)	0.014	0.002
272	22.67	0.07	0.016	(0.148)	0.014	0.002
273	22.75	0.07	0.016	(0.147)	0.014	0.002
274	22.83	0.07	0.016	(0.147)	0.014	0.002
275	22.92	0.07	0.016	(0.146)	0.014	0.002
276	23.00	0.07	0.016	(0.146)	0.014	0.002
277	23.08	0.07	0.016	(0.146)	0.014	0.002
278	23.17	0.07	0.016	(0.145)	0.014	0.002
279	23.25	0.07	0.016	(0.145)	0.014	0.002
280	23.33	0.07	0.016	(0.145)	0.014	0.002
281	23.42	0.07	0.016	(0.145)	0.014	0.002
282	23.50	0.07	0.016	(0.144)	0.014	0.002
283	23.58	0.07	0.016	(0.144)	0.014	0.002
284	23.67	0.07	0.016	(0.144)	0.014	0.002
285	23.75	0.07	0.016	(0.144)	0.014	0.002
286	23.83	0.07	0.016	(0.143)	0.014	0.002
287	23.92	0.07	0.016	(0.143)	0.014	0.002
288	24.00	0.07	0.016	(0.143)	0.014	0.002

(Loss Rate Not Used)

Sum = 100.0 Sum = 2.4

Flood volume = Effective rainfall times area 0.20(In) 0.3(Ac.)/[(In)/(Ft.)] = 0.0(Ac.Ft)

Total soil loss = 1.80(In)

Total soil loss = 0.048(Ac.Ft)

Total rainfall = 2.00(In)

Flood volume = 232.3 Cubic Feet

Total soil loss = 2090.9 Cubic Feet

Peak flow rate of this hydrograph = 0.009(CFS)

++

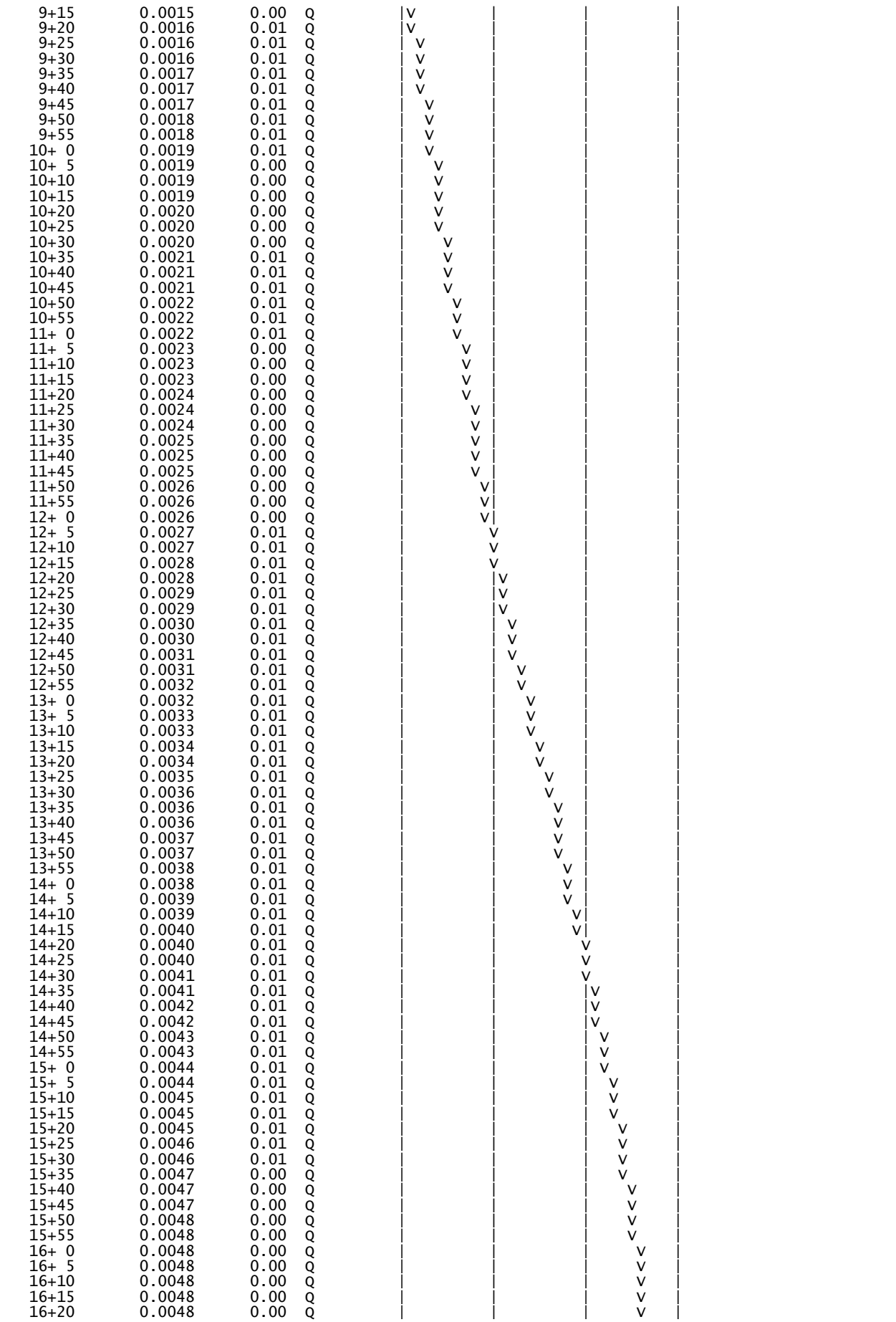
24 - H O U R S T O R M

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	0.0000	0.00	Q				
0+20	0.0000	0.00	Q				
0+25	0.0000	0.00	Q				
0+30	0.0000	0.00	Q				
0+35	0.0000	0.00	Q				
0+40	0.0000	0.00	Q				
0+45	0.0000	0.00	Q				
0+50	0.0000	0.00	Q				
0+55	0.0001	0.00	Q				
1+ 0	0.0001	0.00	Q				
1+ 5	0.0001	0.00	Q				
1+10	0.0001	0.00	Q				
1+15	0.0001	0.00	Q				
1+20	0.0001	0.00	Q				
1+25	0.0001	0.00	Q				
1+30	0.0001	0.00	Q				
1+35	0.0001	0.00	Q				
1+40	0.0001	0.00	Q				
1+45	0.0001	0.00	Q				
1+50	0.0001	0.00	Q				
1+55	0.0001	0.00	Q				
2+ 0	0.0001	0.00	Q				

```
2+ 5       0.0001      0.00  QV        |         |         |         |
2+10       0.0001      0.00  QV        |         |         |         |
2+15       0.0002      0.00  QV        |         |         |         |
2+20       0.0002      0.00  QV        |         |         |         |
2+25       0.0002      0.00  QV        |         |         |         |
2+30       0.0002      0.00  QV        |         |         |         |
2+35       0.0002      0.00  QV        |         |         |         |
2+40       0.0002      0.00  QV        |         |         |         |
2+45       0.0002      0.00  QV        |         |         |         |
2+50       0.0002      0.00  QV        |         |         |         |
2+55       0.0002      0.00  QV        |         |         |         |
3+ 0       0.0002      0.00  QV        |         |         |         |
3+ 5       0.0002      0.00  QV        |         |         |         |
3+10       0.0002      0.00  QV        |         |         |         |
3+15       0.0003      0.00  QV        |         |         |         |
3+20       0.0003      0.00  QV        |         |         |         |
3+25       0.0003      0.00  Q V       |         |         |         |
3+30       0.0003      0.00  Q V       |         |         |         |
3+35       0.0003      0.00  Q V       |         |         |         |
3+40       0.0003      0.00  Q V       |         |         |         |
3+45       0.0003      0.00  Q V       |         |         |         |
3+50       0.0003      0.00  Q V       |         |         |         |
3+55       0.0003      0.00  Q V       |         |         |         |
4+ 0       0.0003      0.00  Q V       |         |         |         |
4+ 5       0.0004      0.00  Q V       |         |         |         |
4+10       0.0004      0.00  Q V       |         |         |         |
4+15       0.0004      0.00  Q V       |         |         |         |
4+20       0.0004      0.00  Q V       |         |         |         |
4+25       0.0004      0.00  Q V       |         |         |         |
4+30       0.0004      0.00  Q  V      |         |         |         |
4+35       0.0004      0.00  Q  V      |         |         |         |
4+40       0.0004      0.00  Q  V      |         |         |         |
4+45       0.0004      0.00  Q  V      |         |         |         |
4+50       0.0005      0.00  Q  V      |         |         |         |
4+55       0.0005      0.00  Q  V      |         |         |         |
5+ 0       0.0005      0.00  Q  V      |         |         |         |
5+ 5       0.0005      0.00  Q  V      |         |         |         |
5+10       0.0005      0.00  Q  V      |         |         |         |
5+15       0.0005      0.00  Q  V      |         |         |         |
5+20       0.0005      0.00  Q   V     |         |         |         |
5+25       0.0005      0.00  Q   V     |         |         |         |
5+30       0.0006      0.00  Q   V     |         |         |         |
5+35       0.0006      0.00  Q   V     |         |         |         |
5+40       0.0006      0.00  Q   V     |         |         |         |
5+45       0.0006      0.00  Q   V     |         |         |         |
5+50       0.0006      0.00  Q   V     |         |         |         |
5+55       0.0006      0.00  Q   V     |         |         |         |
6+ 0       0.0006      0.00  Q   V     |         |         |         |
6+ 5       0.0007      0.00  Q   V     |         |         |         |
6+10       0.0007      0.00  Q    V    |         |         |         |
6+15       0.0007      0.00  Q    V    |         |         |         |
6+20       0.0007      0.00  Q    V    |         |         |         |
6+25       0.0007      0.00  Q    V    |         |         |         |
6+30       0.0007      0.00  Q    V    |         |         |         |
6+35       0.0008      0.00  Q    V    |         |         |         |
6+40       0.0008      0.00  Q    V    |         |         |         |
6+45       0.0008      0.00  Q    V    |         |         |         |
6+50       0.0008      0.00  Q     V   |         |         |         |
6+55       0.0008      0.00  Q     V   |         |         |         |
7+ 0       0.0008      0.00  Q     V   |         |         |         |
7+ 5       0.0009      0.00  Q     V   |         |         |         |
7+10       0.0009      0.00  Q     V   |         |         |         |
7+15       0.0009      0.00  Q     V   |         |         |         |
7+20       0.0009      0.00  Q     V   |         |         |         |
7+25       0.0009      0.00  Q      V  |         |         |         |
7+30       0.0010      0.00  Q      V  |         |         |         |
7+35       0.0010      0.00  Q      V  |         |         |         |
7+40       0.0010      0.00  Q      V  |         |         |         |
7+45       0.0010      0.00  Q      V  |         |         |         |
7+50       0.0010      0.00  Q      V  |         |         |         |
7+55       0.0011      0.00  Q       V |         |         |         |
8+ 0       0.0011      0.00  Q       V |         |         |         |
8+ 5       0.0011      0.00  Q       V |         |         |         |
8+10       0.0011      0.00  Q       V |         |         |         |
8+15       0.0012      0.00  Q       V |         |         |         |
8+20       0.0012      0.00  Q       V |         |         |         |
8+25       0.0012      0.00  Q        V|         |         |         |
8+30       0.0013      0.00  Q        V|         |         |         |
8+35       0.0013      0.00  Q        V|         |         |         |
8+40       0.0013      0.00  Q        V|         |         |         |
8+45       0.0013      0.00  Q         V        |         |         |
8+50       0.0014      0.00  Q         V        |         |         |
8+55       0.0014      0.00  Q         V        |         |         |
9+ 0       0.0014      0.00  Q         V        |         |         |
9+ 5       0.0015      0.00  Q         V        |         |         |
9+10       0.0015      0.00  Q         |V       |         |         |
```



9+15	0.0015	0.00	Q	
9+20	0.0016	0.01	Q	
9+25	0.0016	0.01	Q	
9+30	0.0016	0.01	Q	
9+35	0.0017	0.01	Q	
9+40	0.0017	0.01	Q	
9+45	0.0017	0.01	Q	
9+50	0.0018	0.01	Q	
9+55	0.0018	0.01	Q	
10+ 0	0.0019	0.01	Q	
10+ 5	0.0019	0.00	Q	
10+10	0.0019	0.00	Q	
10+15	0.0019	0.00	Q	
10+20	0.0020	0.00	Q	
10+25	0.0020	0.00	Q	
10+30	0.0020	0.00	Q	
10+35	0.0021	0.01	Q	
10+40	0.0021	0.01	Q	
10+45	0.0021	0.01	Q	
10+50	0.0022	0.01	Q	
10+55	0.0022	0.01	Q	
11+ 0	0.0022	0.01	Q	
11+ 5	0.0023	0.00	Q	
11+10	0.0023	0.00	Q	
11+15	0.0023	0.00	Q	
11+20	0.0024	0.00	Q	
11+25	0.0024	0.00	Q	
11+30	0.0024	0.00	Q	
11+35	0.0025	0.00	Q	
11+40	0.0025	0.00	Q	
11+45	0.0025	0.00	Q	
11+50	0.0026	0.00	Q	
11+55	0.0026	0.00	Q	
12+ 0	0.0026	0.00	Q	
12+ 5	0.0027	0.01	Q	
12+10	0.0027	0.01	Q	
12+15	0.0028	0.01	Q	
12+20	0.0028	0.01	Q	
12+25	0.0029	0.01	Q	
12+30	0.0029	0.01	Q	
12+35	0.0030	0.01	Q	
12+40	0.0030	0.01	Q	
12+45	0.0031	0.01	Q	
12+50	0.0031	0.01	Q	
12+55	0.0032	0.01	Q	
13+ 0	0.0032	0.01	Q	
13+ 5	0.0033	0.01	Q	
13+10	0.0033	0.01	Q	
13+15	0.0034	0.01	Q	
13+20	0.0034	0.01	Q	
13+25	0.0035	0.01	Q	
13+30	0.0036	0.01	Q	
13+35	0.0036	0.01	Q	
13+40	0.0036	0.01	Q	
13+45	0.0037	0.01	Q	
13+50	0.0037	0.01	Q	
13+55	0.0038	0.01	Q	
14+ 0	0.0038	0.01	Q	
14+ 5	0.0039	0.01	Q	
14+10	0.0039	0.01	Q	
14+15	0.0040	0.01	Q	
14+20	0.0040	0.01	Q	
14+25	0.0040	0.01	Q	
14+30	0.0041	0.01	Q	
14+35	0.0041	0.01	Q	
14+40	0.0042	0.01	Q	
14+45	0.0042	0.01	Q	
14+50	0.0043	0.01	Q	
14+55	0.0043	0.01	Q	
15+ 0	0.0044	0.01	Q	
15+ 5	0.0044	0.01	Q	
15+10	0.0045	0.01	Q	
15+15	0.0045	0.01	Q	
15+20	0.0045	0.01	Q	
15+25	0.0046	0.01	Q	
15+30	0.0046	0.01	Q	
15+35	0.0047	0.00	Q	
15+40	0.0047	0.00	Q	
15+45	0.0047	0.00	Q	
15+50	0.0048	0.00	Q	
15+55	0.0048	0.00	Q	
16+ 0	0.0048	0.00	Q	
16+ 5	0.0048	0.00	Q	
16+10	0.0048	0.00	Q	
16+15	0.0048	0.00	Q	
16+20	0.0048	0.00	Q	

```
16+25       0.0049      0.00  Q        |          |          |      V   |
16+30       0.0049      0.00  Q        |          |          |      V   |
16+35       0.0049      0.00  Q        |          |          |      V   |
16+40       0.0049      0.00  Q        |          |          |      V   |
16+45       0.0049      0.00  Q        |          |          |      V   |
16+50       0.0049      0.00  Q        |          |          |      V   |
16+55       0.0049      0.00  Q        |          |          |      V   |
17+ 0       0.0049      0.00  Q        |          |          |      V   |
17+ 5       0.0049      0.00  Q        |          |          |      V   |
17+10       0.0049      0.00  Q        |          |          |      V   |
17+15       0.0049      0.00  Q        |          |          |      V   |
17+20       0.0049      0.00  Q        |          |          |      V   |
17+25       0.0049      0.00  Q        |          |          |       V  |
17+30       0.0049      0.00  Q        |          |          |       V  |
17+35       0.0050      0.00  Q        |          |          |       V  |
17+40       0.0050      0.00  Q        |          |          |       V  |
17+45       0.0050      0.00  Q        |          |          |       V  |
17+50       0.0050      0.00  Q        |          |          |       V  |
17+55       0.0050      0.00  Q        |          |          |       V  |
18+ 0       0.0050      0.00  Q        |          |          |       V  |
18+ 5       0.0050      0.00  Q        |          |          |       V  |
18+10       0.0050      0.00  Q        |          |          |       V  |
18+15       0.0050      0.00  Q        |          |          |       V  |
18+20       0.0050      0.00  Q        |          |          |       V  |
18+25       0.0050      0.00  Q        |          |          |       V  |
18+30       0.0050      0.00  Q        |          |          |       V  |
18+35       0.0050      0.00  Q        |          |          |       V  |
18+40       0.0051      0.00  Q        |          |          |       V  |
18+45       0.0051      0.00  Q        |          |          |       V  |
18+50       0.0051      0.00  Q        |          |          |       V  |
18+55       0.0051      0.00  Q        |          |          |       V  |
19+ 0       0.0051      0.00  Q        |          |          |       V  |
19+ 5       0.0051      0.00  Q        |          |          |        V |
19+10       0.0051      0.00  Q        |          |          |        V |
19+15       0.0051      0.00  Q        |          |          |        V |
19+20       0.0051      0.00  Q        |          |          |        V |
19+25       0.0051      0.00  Q        |          |          |        V |
19+30       0.0051      0.00  Q        |          |          |        V |
19+35       0.0051      0.00  Q        |          |          |        V |
19+40       0.0051      0.00  Q        |          |          |        V |
19+45       0.0051      0.00  Q        |          |          |        V |
19+50       0.0051      0.00  Q        |          |          |        V |
19+55       0.0051      0.00  Q        |          |          |        V |
20+ 0       0.0051      0.00  Q        |          |          |        V |
20+ 5       0.0051      0.00  Q        |          |          |        V |
20+10       0.0051      0.00  Q        |          |          |        V |
20+15       0.0051      0.00  Q        |          |          |        V |
20+20       0.0052      0.00  Q        |          |          |        V |
20+25       0.0052      0.00  Q        |          |          |        V |
20+30       0.0052      0.00  Q        |          |          |        V |
20+35       0.0052      0.00  Q        |          |          |        V |
20+40       0.0052      0.00  Q        |          |          |        V |
20+45       0.0052      0.00  Q        |          |          |        V |
20+50       0.0052      0.00  Q        |          |          |        V |
20+55       0.0052      0.00  Q        |          |          |        V |
21+ 0       0.0052      0.00  Q        |          |          |        V |
21+ 5       0.0052      0.00  Q        |          |          |        V |
21+10       0.0052      0.00  Q        |          |          |        V |
21+15       0.0052      0.00  Q        |          |          |         V|
21+20       0.0052      0.00  Q        |          |          |         V|
21+25       0.0052      0.00  Q        |          |          |         V|
21+30       0.0052      0.00  Q        |          |          |         V|
21+35       0.0052      0.00  Q        |          |          |         V|
21+40       0.0052      0.00  Q        |          |          |         V|
21+45       0.0052      0.00  Q        |          |          |         V|
21+50       0.0052      0.00  Q        |          |          |         V|
21+55       0.0052      0.00  Q        |          |          |         V|
22+ 0       0.0052      0.00  Q        |          |          |         V|
22+ 5       0.0052      0.00  Q        |          |          |         V|
22+10       0.0053      0.00  Q        |          |          |         V|
22+15       0.0053      0.00  Q        |          |          |         V|
22+20       0.0053      0.00  Q        |          |          |         V|
22+25       0.0053      0.00  Q        |          |          |         V|
22+30       0.0053      0.00  Q        |          |          |         V|
22+35       0.0053      0.00  Q        |          |          |         V|
22+40       0.0053      0.00  Q        |          |          |         V|
22+45       0.0053      0.00  Q        |          |          |         V|
22+50       0.0053      0.00  Q        |          |          |         V|
22+55       0.0053      0.00  Q        |          |          |         V|
23+ 0       0.0053      0.00  Q        |          |          |         V|
23+ 5       0.0053      0.00  Q        |          |          |         V|
23+10       0.0053      0.00  Q        |          |          |         V|
23+15       0.0053      0.00  Q        |          |          |         V|
23+20       0.0053      0.00  Q        |          |          |         V|
23+25       0.0053      0.00  Q        |          |          |         V|
23+30       0.0053      0.00  Q        |          |          |         V|
```

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   23+35       0.0053      0.00  Q          |          |          |        v|
   23+40       0.0053      0.00  Q          |          |          |        v|
   23+45       0.0053      0.00  Q          |          |          |        v|
   23+50       0.0053      0.00  Q          |          |          |        v|
   23+55       0.0053      0.00  Q          |          |          |        v|
   24+ 0       0.0053      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

Copyright (c) CIVILCADD/CIVILDESIGN, 1989 - 2008, Version 8.1
Study date 10/10/24 File: EXC2242.out

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Riverside County Synthetic Unit Hydrology Method
RCFC & WCD Manual date - April 1978

Program License Serial Number 5006

English (in-lb) Input Units Used
English Rainfall Data (Inches) Input Values Used

English Units used in output format

Drainage Area = 1.04(Ac.) = 0.002 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 1.04(Ac.) = 0.002 Sq. Mi.
Length along longest watercourse = 249.00(Ft.)
Length along longest watercourse measured to centroid = 125.00(Ft.)
Length along longest watercourse = 0.047 Mi.
Length along longest watercourse measured to centroid = 0.024 Mi.
Difference in elevation = 9.00(Ft.)
Slope along watercourse = 190.8434 Ft./Mi.
Average Manning's 'N' = 0.020
Lag time = 0.013 Hr.
Lag time = 0.80 Min.
25% of lag time = 0.20 Min.
40% of lag time = 0.32 Min.
Unit time = 5.00 Min.
Duration of storm = 24 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
1.04	2.00	2.08

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
1.04	6.00	6.24

STORM EVENT (YEAR) = 2.00
Area Averaged 2-Year Rainfall = 2.000(In)
Area Averaged 100-Year Rainfall = 6.000(In)

Point rain (area averaged) = 2.000(In)
Areal adjustment factor = 100.00 %
Adjusted average point rain = 2.000(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
1.040	62.50	0.530

Total Area Entered = 1.04(Ac.)

RI AMC2	RI AMC-1	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
62.5	42.5	0.645	0.530	0.338	1.000	0.338
					Sum (F) =	0.338

Area averaged mean soil loss (F) (In/Hr) = 0.338
Minimum soil loss rate ((In/Hr)) = 0.169
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.476

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)	Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)

1	0.083	623.342	76.095	0.798
2	0.167	1246.684	23.905	0.251
			Sum = 100.000	Sum= 1.048

The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	0.07	0.016	(0.598)	0.008	0.008
2	0.17	0.07	0.016	(0.596)	0.008	0.008
3	0.25	0.07	0.016	(0.594)	0.008	0.008
4	0.33	0.10	0.024	(0.592)	0.011	0.013
5	0.42	0.10	0.024	(0.589)	0.011	0.013
6	0.50	0.10	0.024	(0.587)	0.011	0.013
7	0.58	0.10	0.024	(0.585)	0.011	0.013
8	0.67	0.10	0.024	(0.582)	0.011	0.013
9	0.75	0.10	0.024	(0.580)	0.011	0.013
10	0.83	0.13	0.032	(0.578)	0.015	0.017
11	0.92	0.13	0.032	(0.576)	0.015	0.017
12	1.00	0.13	0.032	(0.573)	0.015	0.017
13	1.08	0.10	0.024	(0.571)	0.011	0.013
14	1.17	0.10	0.024	(0.569)	0.011	0.013
15	1.25	0.10	0.024	(0.566)	0.011	0.013
16	1.33	0.10	0.024	(0.564)	0.011	0.013
17	1.42	0.10	0.024	(0.562)	0.011	0.013
18	1.50	0.10	0.024	(0.560)	0.011	0.013
19	1.58	0.10	0.024	(0.557)	0.011	0.013
20	1.67	0.10	0.024	(0.555)	0.011	0.013
21	1.75	0.10	0.024	(0.553)	0.011	0.013
22	1.83	0.13	0.032	(0.551)	0.015	0.017
23	1.92	0.13	0.032	(0.549)	0.015	0.017
24	2.00	0.13	0.032	(0.546)	0.015	0.017
25	2.08	0.13	0.032	(0.544)	0.015	0.017
26	2.17	0.13	0.032	(0.542)	0.015	0.017
27	2.25	0.13	0.032	(0.540)	0.015	0.017
28	2.33	0.13	0.032	(0.538)	0.015	0.017
29	2.42	0.13	0.032	(0.535)	0.015	0.017
30	2.50	0.13	0.032	(0.533)	0.015	0.017
31	2.58	0.17	0.040	(0.531)	0.019	0.021
32	2.67	0.17	0.040	(0.529)	0.019	0.021
33	2.75	0.17	0.040	(0.527)	0.019	0.021
34	2.83	0.17	0.040	(0.524)	0.019	0.021
35	2.92	0.17	0.040	(0.522)	0.019	0.021
36	3.00	0.17	0.040	(0.520)	0.019	0.021
37	3.08	0.17	0.040	(0.518)	0.019	0.021
38	3.17	0.17	0.040	(0.516)	0.019	0.021
39	3.25	0.17	0.040	(0.514)	0.019	0.021
40	3.33	0.17	0.040	(0.512)	0.019	0.021
41	3.42	0.17	0.040	(0.509)	0.019	0.021
42	3.50	0.17	0.040	(0.507)	0.019	0.021
43	3.58	0.17	0.040	(0.505)	0.019	0.021
44	3.67	0.17	0.040	(0.503)	0.019	0.021
45	3.75	0.17	0.040	(0.501)	0.019	0.021
46	3.83	0.20	0.048	(0.499)	0.023	0.025
47	3.92	0.20	0.048	(0.497)	0.023	0.025
48	4.00	0.20	0.048	(0.495)	0.023	0.025
49	4.08	0.20	0.048	(0.493)	0.023	0.025
50	4.17	0.20	0.048	(0.490)	0.023	0.025
51	4.25	0.20	0.048	(0.488)	0.023	0.025
52	4.33	0.23	0.056	(0.486)	0.027	0.029
53	4.42	0.23	0.056	(0.484)	0.027	0.029
54	4.50	0.23	0.056	(0.482)	0.027	0.029
55	4.58	0.23	0.056	(0.480)	0.027	0.029
56	4.67	0.23	0.056	(0.478)	0.027	0.029
57	4.75	0.23	0.056	(0.476)	0.027	0.029
58	4.83	0.27	0.064	(0.474)	0.030	0.034
59	4.92	0.27	0.064	(0.472)	0.030	0.034
60	5.00	0.27	0.064	(0.470)	0.030	0.034
61	5.08	0.20	0.048	(0.468)	0.023	0.025
62	5.17	0.20	0.048	(0.466)	0.023	0.025
63	5.25	0.20	0.048	(0.464)	0.023	0.025
64	5.33	0.23	0.056	(0.462)	0.027	0.029
65	5.42	0.23	0.056	(0.460)	0.027	0.029
66	5.50	0.23	0.056	(0.458)	0.027	0.029
67	5.58	0.27	0.064	(0.456)	0.030	0.034
68	5.67	0.27	0.064	(0.454)	0.030	0.034
69	5.75	0.27	0.064	(0.452)	0.030	0.034
70	5.83	0.27	0.064	(0.450)	0.030	0.034
71	5.92	0.27	0.064	(0.448)	0.030	0.034
72	6.00	0.27	0.064	(0.446)	0.030	0.034
73	6.08	0.30	0.072	(0.444)	0.034	0.038
74	6.17	0.30	0.072	(0.442)	0.034	0.038

75	6.25	0.30	0.072	(0.440)	0.034	0.038
76	6.33	0.30	0.072	(0.438)	0.034	0.038
77	6.42	0.30	0.072	(0.436)	0.034	0.038
78	6.50	0.30	0.072	(0.434)	0.034	0.038
79	6.58	0.33	0.080	(0.432)	0.038	0.042
80	6.67	0.33	0.080	(0.430)	0.038	0.042
81	6.75	0.33	0.080	(0.428)	0.038	0.042
82	6.83	0.33	0.080	(0.426)	0.038	0.042
83	6.92	0.33	0.080	(0.424)	0.038	0.042
84	7.00	0.33	0.080	(0.422)	0.038	0.042
85	7.08	0.33	0.080	(0.420)	0.038	0.042
86	7.17	0.33	0.080	(0.418)	0.038	0.042
87	7.25	0.33	0.080	(0.416)	0.038	0.042
88	7.33	0.37	0.088	(0.415)	0.042	0.046
89	7.42	0.37	0.088	(0.413)	0.042	0.046
90	7.50	0.37	0.088	(0.411)	0.042	0.046
91	7.58	0.40	0.096	(0.409)	0.046	0.050
92	7.67	0.40	0.096	(0.407)	0.046	0.050
93	7.75	0.40	0.096	(0.405)	0.046	0.050
94	7.83	0.43	0.104	(0.403)	0.050	0.054
95	7.92	0.43	0.104	(0.401)	0.050	0.054
96	8.00	0.43	0.104	(0.400)	0.050	0.054
97	8.08	0.50	0.120	(0.398)	0.057	0.063
98	8.17	0.50	0.120	(0.396)	0.057	0.063
99	8.25	0.50	0.120	(0.394)	0.057	0.063
100	8.33	0.50	0.120	(0.392)	0.057	0.063
101	8.42	0.50	0.120	(0.390)	0.057	0.063
102	8.50	0.50	0.120	(0.388)	0.057	0.063
103	8.58	0.53	0.128	(0.387)	0.061	0.067
104	8.67	0.53	0.128	(0.385)	0.061	0.067
105	8.75	0.53	0.128	(0.383)	0.061	0.067
106	8.83	0.57	0.136	(0.381)	0.065	0.071
107	8.92	0.57	0.136	(0.379)	0.065	0.071
108	9.00	0.57	0.136	(0.378)	0.065	0.071
109	9.08	0.63	0.152	(0.376)	0.072	0.080
110	9.17	0.63	0.152	(0.374)	0.072	0.080
111	9.25	0.63	0.152	(0.372)	0.072	0.080
112	9.33	0.67	0.160	(0.370)	0.076	0.084
113	9.42	0.67	0.160	(0.369)	0.076	0.084
114	9.50	0.67	0.160	(0.367)	0.076	0.084
115	9.58	0.70	0.168	(0.365)	0.080	0.088
116	9.67	0.70	0.168	(0.363)	0.080	0.088
117	9.75	0.70	0.168	(0.362)	0.080	0.088
118	9.83	0.73	0.176	(0.360)	0.084	0.092
119	9.92	0.73	0.176	(0.358)	0.084	0.092
120	10.00	0.73	0.176	(0.357)	0.084	0.092
121	10.08	0.50	0.120	(0.355)	0.057	0.063
122	10.17	0.50	0.120	(0.353)	0.057	0.063
123	10.25	0.50	0.120	(0.351)	0.057	0.063
124	10.33	0.50	0.120	(0.350)	0.057	0.063
125	10.42	0.50	0.120	(0.348)	0.057	0.063
126	10.50	0.50	0.120	(0.346)	0.057	0.063
127	10.58	0.67	0.160	(0.345)	0.076	0.084
128	10.67	0.67	0.160	(0.343)	0.076	0.084
129	10.75	0.67	0.160	(0.341)	0.076	0.084
130	10.83	0.67	0.160	(0.340)	0.076	0.084
131	10.92	0.67	0.160	(0.338)	0.076	0.084
132	11.00	0.67	0.160	(0.336)	0.076	0.084
133	11.08	0.63	0.152	(0.335)	0.072	0.080
134	11.17	0.63	0.152	(0.333)	0.072	0.080
135	11.25	0.63	0.152	(0.331)	0.072	0.080
136	11.33	0.63	0.152	(0.330)	0.072	0.080
137	11.42	0.63	0.152	(0.328)	0.072	0.080
138	11.50	0.63	0.152	(0.326)	0.072	0.080
139	11.58	0.57	0.136	(0.325)	0.065	0.071
140	11.67	0.57	0.136	(0.323)	0.065	0.071
141	11.75	0.57	0.136	(0.322)	0.065	0.071
142	11.83	0.60	0.144	(0.320)	0.069	0.075
143	11.92	0.60	0.144	(0.318)	0.069	0.075
144	12.00	0.60	0.144	(0.317)	0.069	0.075
145	12.08	0.83	0.200	(0.315)	0.095	0.105
146	12.17	0.83	0.200	(0.314)	0.095	0.105
147	12.25	0.83	0.200	(0.312)	0.095	0.105
148	12.33	0.87	0.208	(0.310)	0.099	0.109
149	12.42	0.87	0.208	(0.309)	0.099	0.109
150	12.50	0.87	0.208	(0.307)	0.099	0.109
151	12.58	0.93	0.224	(0.306)	0.107	0.117
152	12.67	0.93	0.224	(0.304)	0.107	0.117
153	12.75	0.93	0.224	(0.303)	0.107	0.117
154	12.83	0.97	0.232	(0.301)	0.110	0.122
155	12.92	0.97	0.232	(0.300)	0.110	0.122
156	13.00	0.97	0.232	(0.298)	0.110	0.122
157	13.08	1.13	0.272	(0.297)	0.129	0.143
158	13.17	1.13	0.272	(0.295)	0.129	0.143
159	13.25	1.13	0.272	(0.294)	0.129	0.143
160	13.33	1.13	0.272	(0.292)	0.129	0.143

161	13.42	1.13	0.272	(0.291)	0.129	0.143
162	13.50	1.13	0.272	(0.289)	0.129	0.143
163	13.58	0.77	0.184	(0.288)	0.088	0.096
164	13.67	0.77	0.184	(0.286)	0.088	0.096
165	13.75	0.77	0.184	(0.285)	0.088	0.096
166	13.83	0.77	0.184	(0.283)	0.088	0.096
167	13.92	0.77	0.184	(0.282)	0.088	0.096
168	14.00	0.77	0.184	(0.280)	0.088	0.096
169	14.08	0.90	0.216	(0.279)	0.103	0.113
170	14.17	0.90	0.216	(0.278)	0.103	0.113
171	14.25	0.90	0.216	(0.276)	0.103	0.113
172	14.33	0.87	0.208	(0.275)	0.099	0.109
173	14.42	0.87	0.208	(0.273)	0.099	0.109
174	14.50	0.87	0.208	(0.272)	0.099	0.109
175	14.58	0.87	0.208	(0.271)	0.099	0.109
176	14.67	0.87	0.208	(0.269)	0.099	0.109
177	14.75	0.87	0.208	(0.268)	0.099	0.109
178	14.83	0.83	0.200	(0.266)	0.095	0.105
179	14.92	0.83	0.200	(0.265)	0.095	0.105
180	15.00	0.83	0.200	(0.264)	0.095	0.105
181	15.08	0.80	0.192	(0.262)	0.091	0.101
182	15.17	0.80	0.192	(0.261)	0.091	0.101
183	15.25	0.80	0.192	(0.260)	0.091	0.101
184	15.33	0.77	0.184	(0.258)	0.088	0.096
185	15.42	0.77	0.184	(0.257)	0.088	0.096
186	15.50	0.77	0.184	(0.256)	0.088	0.096
187	15.58	0.63	0.152	(0.254)	0.072	0.080
188	15.67	0.63	0.152	(0.253)	0.072	0.080
189	15.75	0.63	0.152	(0.252)	0.072	0.080
190	15.83	0.63	0.152	(0.250)	0.072	0.080
191	15.92	0.63	0.152	(0.249)	0.072	0.080
192	16.00	0.63	0.152	(0.248)	0.072	0.080
193	16.08	0.13	0.032	(0.247)	0.015	0.017
194	16.17	0.13	0.032	(0.245)	0.015	0.017
195	16.25	0.13	0.032	(0.244)	0.015	0.017
196	16.33	0.13	0.032	(0.243)	0.015	0.017
197	16.42	0.13	0.032	(0.242)	0.015	0.017
198	16.50	0.13	0.032	(0.240)	0.015	0.017
199	16.58	0.10	0.024	(0.239)	0.011	0.013
200	16.67	0.10	0.024	(0.238)	0.011	0.013
201	16.75	0.10	0.024	(0.237)	0.011	0.013
202	16.83	0.10	0.024	(0.236)	0.011	0.013
203	16.92	0.10	0.024	(0.234)	0.011	0.013
204	17.00	0.10	0.024	(0.233)	0.011	0.013
205	17.08	0.17	0.040	(0.232)	0.019	0.021
206	17.17	0.17	0.040	(0.231)	0.019	0.021
207	17.25	0.17	0.040	(0.230)	0.019	0.021
208	17.33	0.17	0.040	(0.229)	0.019	0.021
209	17.42	0.17	0.040	(0.227)	0.019	0.021
210	17.50	0.17	0.040	(0.226)	0.019	0.021
211	17.58	0.17	0.040	(0.225)	0.019	0.021
212	17.67	0.17	0.040	(0.224)	0.019	0.021
213	17.75	0.17	0.040	(0.223)	0.019	0.021
214	17.83	0.13	0.032	(0.222)	0.015	0.017
215	17.92	0.13	0.032	(0.221)	0.015	0.017
216	18.00	0.13	0.032	(0.220)	0.015	0.017
217	18.08	0.13	0.032	(0.219)	0.015	0.017
218	18.17	0.13	0.032	(0.217)	0.015	0.017
219	18.25	0.13	0.032	(0.216)	0.015	0.017
220	18.33	0.13	0.032	(0.215)	0.015	0.017
221	18.42	0.13	0.032	(0.214)	0.015	0.017
222	18.50	0.13	0.032	(0.213)	0.015	0.017
223	18.58	0.10	0.024	(0.212)	0.011	0.013
224	18.67	0.10	0.024	(0.211)	0.011	0.013
225	18.75	0.10	0.024	(0.210)	0.011	0.013
226	18.83	0.07	0.016	(0.209)	0.008	0.008
227	18.92	0.07	0.016	(0.208)	0.008	0.008
228	19.00	0.07	0.016	(0.207)	0.008	0.008
229	19.08	0.10	0.024	(0.206)	0.011	0.013
230	19.17	0.10	0.024	(0.205)	0.011	0.013
231	19.25	0.10	0.024	(0.204)	0.011	0.013
232	19.33	0.13	0.032	(0.203)	0.015	0.017
233	19.42	0.13	0.032	(0.202)	0.015	0.017
234	19.50	0.13	0.032	(0.201)	0.015	0.017
235	19.58	0.10	0.024	(0.201)	0.011	0.013
236	19.67	0.10	0.024	(0.200)	0.011	0.013
237	19.75	0.10	0.024	(0.199)	0.011	0.013
238	19.83	0.07	0.016	(0.198)	0.008	0.008
239	19.92	0.07	0.016	(0.197)	0.008	0.008
240	20.00	0.07	0.016	(0.196)	0.008	0.008
241	20.08	0.10	0.024	(0.195)	0.011	0.013
242	20.17	0.10	0.024	(0.194)	0.011	0.013
243	20.25	0.10	0.024	(0.193)	0.011	0.013
244	20.33	0.10	0.024	(0.193)	0.011	0.013
245	20.42	0.10	0.024	(0.192)	0.011	0.013
246	20.50	0.10	0.024	(0.191)	0.011	0.013

247	20.58	0.10	0.024	(0.190)	0.011	0.013
248	20.67	0.10	0.024	(0.189)	0.011	0.013
249	20.75	0.10	0.024	(0.189)	0.011	0.013
250	20.83	0.07	0.016	(0.188)	0.008	0.008
251	20.92	0.07	0.016	(0.187)	0.008	0.008
252	21.00	0.07	0.016	(0.186)	0.008	0.008
253	21.08	0.10	0.024	(0.186)	0.011	0.013
254	21.17	0.10	0.024	(0.185)	0.011	0.013
255	21.25	0.10	0.024	(0.184)	0.011	0.013
256	21.33	0.07	0.016	(0.183)	0.008	0.008
257	21.42	0.07	0.016	(0.183)	0.008	0.008
258	21.50	0.07	0.016	(0.182)	0.008	0.008
259	21.58	0.10	0.024	(0.181)	0.011	0.013
260	21.67	0.10	0.024	(0.181)	0.011	0.013
261	21.75	0.10	0.024	(0.180)	0.011	0.013
262	21.83	0.07	0.016	(0.179)	0.008	0.008
263	21.92	0.07	0.016	(0.179)	0.008	0.008
264	22.00	0.07	0.016	(0.178)	0.008	0.008
265	22.08	0.10	0.024	(0.178)	0.011	0.013
266	22.17	0.10	0.024	(0.177)	0.011	0.013
267	22.25	0.10	0.024	(0.177)	0.011	0.013
268	22.33	0.07	0.016	(0.176)	0.008	0.008
269	22.42	0.07	0.016	(0.175)	0.008	0.008
270	22.50	0.07	0.016	(0.175)	0.008	0.008
271	22.58	0.07	0.016	(0.174)	0.008	0.008
272	22.67	0.07	0.016	(0.174)	0.008	0.008
273	22.75	0.07	0.016	(0.173)	0.008	0.008
274	22.83	0.07	0.016	(0.173)	0.008	0.008
275	22.92	0.07	0.016	(0.173)	0.008	0.008
276	23.00	0.07	0.016	(0.172)	0.008	0.008
277	23.08	0.07	0.016	(0.172)	0.008	0.008
278	23.17	0.07	0.016	(0.171)	0.008	0.008
279	23.25	0.07	0.016	(0.171)	0.008	0.008
280	23.33	0.07	0.016	(0.171)	0.008	0.008
281	23.42	0.07	0.016	(0.170)	0.008	0.008
282	23.50	0.07	0.016	(0.170)	0.008	0.008
283	23.58	0.07	0.016	(0.170)	0.008	0.008
284	23.67	0.07	0.016	(0.169)	0.008	0.008
285	23.75	0.07	0.016	(0.169)	0.008	0.008
286	23.83	0.07	0.016	(0.169)	0.008	0.008
287	23.92	0.07	0.016	(0.169)	0.008	0.008
288	24.00	0.07	0.016	(0.169)	0.008	0.008

(Loss Rate Not Used)

Sum = 100.0 Sum = 12.6

Flood volume = Effective rainfall 1.05(In)
times area 1.0(Ac.)/[(In)/(Ft.)] = 0.1(Ac.Ft)
Total soil loss = 0.95(In)
Total soil loss = 0.083(Ac.Ft)
Total rainfall = 2.00(In)
Flood volume = 3956.4 Cubic Feet
Total soil loss = 3594.0 Cubic Feet

Peak flow rate of this hydrograph = 0.149(CFS)

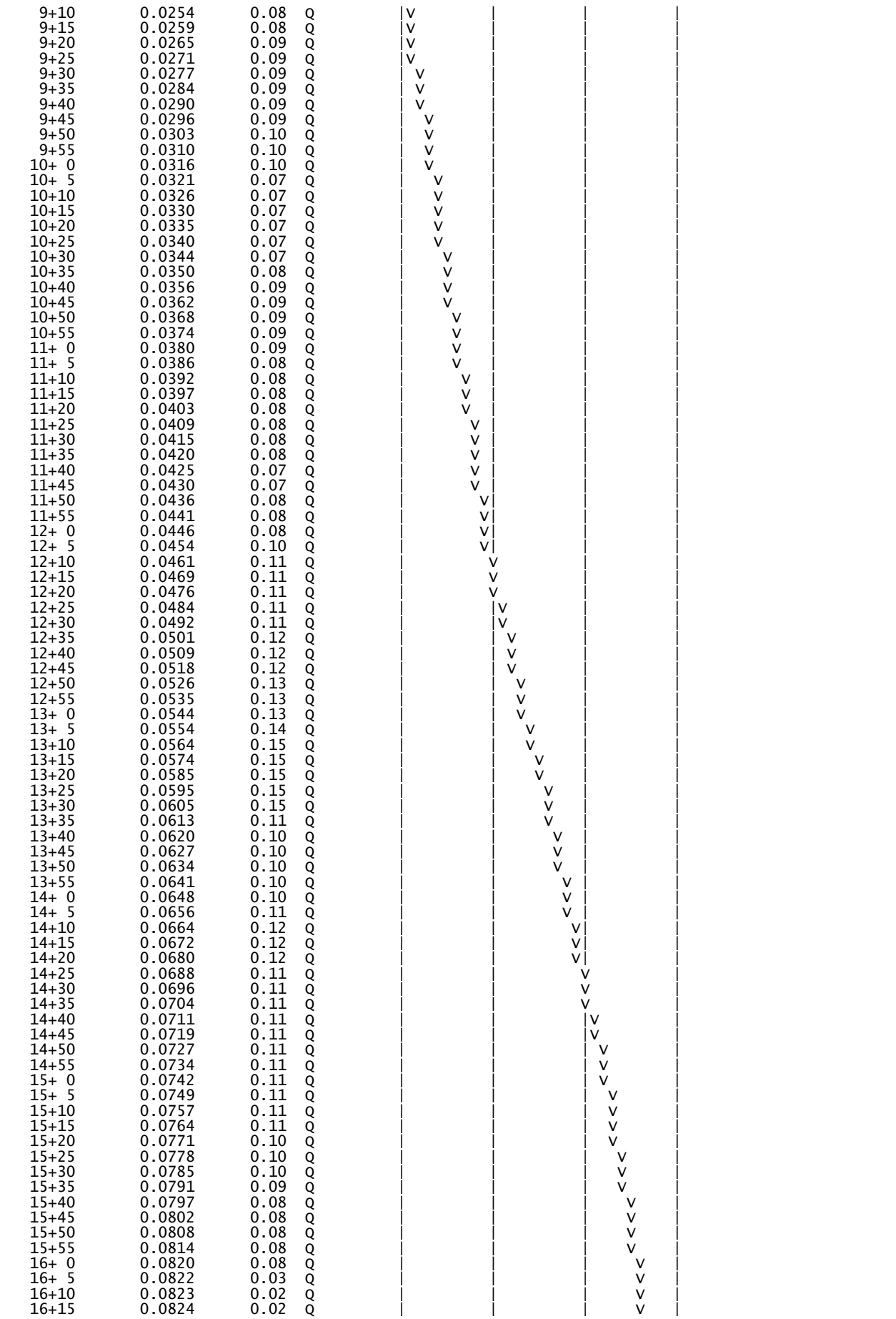
++

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	0.01	Q	|	|	|	|
0+10	0.0001	0.01	Q	|	|	|	|
0+15	0.0002	0.01	Q	|	|	|	|
0+20	0.0003	0.01	Q	|	|	|	|
0+25	0.0003	0.01	Q	|	|	|	|
0+30	0.0004	0.01	Q	|	|	|	|
0+35	0.0005	0.01	Q	|	|	|	|
0+40	0.0006	0.01	Q	|	|	|	|
0+45	0.0007	0.01	Q	|	|	|	|
0+50	0.0008	0.02	Q	|	|	|	|
0+55	0.0009	0.02	Q	|	|	|	|
1+ 0	0.0011	0.02	Q	|	|	|	|
1+ 5	0.0012	0.01	Q	|	|	|	|
1+10	0.0012	0.01	Q	|	|	|	|
1+15	0.0013	0.01	Q	|	|	|	|
1+20	0.0014	0.01	Q	|	|	|	|
1+25	0.0015	0.01	Q	|	|	|	|
1+30	0.0016	0.01	Q	|	|	|	|
1+35	0.0017	0.01	Q	|	|	|	|
1+40	0.0018	0.01	Q	|	|	|	|
1+45	0.0019	0.01	Q	|	|	|	|
1+50	0.0020	0.02	Q	|	|	|	|
1+55	0.0021	0.02	Q	|	|	|	|

```
2+ 0       0.0022      0.02  Q          |          |          |          |
2+ 5       0.0024      0.02  QV         |          |          |          |
2+10       0.0025      0.02  QV         |          |          |          |
2+15       0.0026      0.02  QV         |          |          |          |
2+20       0.0027      0.02  QV         |          |          |          |
2+25       0.0028      0.02  QV         |          |          |          |
2+30       0.0030      0.02  QV         |          |          |          |
2+35       0.0031      0.02  QV         |          |          |          |
2+40       0.0033      0.02  QV         |          |          |          |
2+45       0.0034      0.02  QV         |          |          |          |
2+50       0.0036      0.02  QV         |          |          |          |
2+55       0.0037      0.02  QV         |          |          |          |
3+ 0       0.0039      0.02  QV         |          |          |          |
3+ 5       0.0040      0.02  QV         |          |          |          |
3+10       0.0042      0.02  QV         |          |          |          |
3+15       0.0043      0.02  QV         |          |          |          |
3+20       0.0045      0.02  QV         |          |          |          |
3+25       0.0046      0.02  Q V        |          |          |          |
3+30       0.0048      0.02  Q V        |          |          |          |
3+35       0.0049      0.02  Q V        |          |          |          |
3+40       0.0051      0.02  Q V        |          |          |          |
3+45       0.0052      0.02  Q V        |          |          |          |
3+50       0.0054      0.03  Q V        |          |          |          |
3+55       0.0056      0.03  Q V        |          |          |          |
4+ 0       0.0058      0.03  Q V        |          |          |          |
4+ 5       0.0060      0.03  Q V        |          |          |          |
4+10       0.0061      0.03  Q V        |          |          |          |
4+15       0.0063      0.03  Q V        |          |          |          |
4+20       0.0065      0.03  Q V        |          |          |          |
4+25       0.0067      0.03  Q V        |          |          |          |
4+30       0.0069      0.03  Q  V       |          |          |          |
4+35       0.0072      0.03  Q  V       |          |          |          |
4+40       0.0074      0.03  Q  V       |          |          |          |
4+45       0.0076      0.03  Q  V       |          |          |          |
4+50       0.0078      0.03  Q  V       |          |          |          |
4+55       0.0081      0.04  Q  V       |          |          |          |
5+ 0       0.0083      0.04  Q  V       |          |          |          |
5+ 5       0.0085      0.03  Q  V       |          |          |          |
5+10       0.0087      0.03  Q  V       |          |          |          |
5+15       0.0089      0.03  Q  V       |          |          |          |
5+20       0.0091      0.03  Q  V       |          |          |          |
5+25       0.0093      0.03  Q   V      |          |          |          |
5+30       0.0095      0.03  Q   V      |          |          |          |
5+35       0.0097      0.03  Q   V      |          |          |          |
5+40       0.0100      0.04  Q   V      |          |          |          |
5+45       0.0102      0.04  Q   V      |          |          |          |
5+50       0.0104      0.04  Q   V      |          |          |          |
5+55       0.0107      0.04  Q   V      |          |          |          |
6+ 0       0.0109      0.04  Q   V      |          |          |          |
6+ 5       0.0112      0.04  Q   V      |          |          |          |
6+10       0.0115      0.04  Q    V     |          |          |          |
6+15       0.0117      0.04  Q    V     |          |          |          |
6+20       0.0120      0.04  Q    V     |          |          |          |
6+25       0.0123      0.04  Q    V     |          |          |          |
6+30       0.0126      0.04  Q    V     |          |          |          |
6+35       0.0129      0.04  Q    V     |          |          |          |
6+40       0.0132      0.04  Q    V     |          |          |          |
6+45       0.0135      0.04  Q    V     |          |          |          |
6+50       0.0138      0.04  Q     V    |          |          |          |
6+55       0.0141      0.04  Q     V    |          |          |          |
7+ 0       0.0144      0.04  Q     V    |          |          |          |
7+ 5       0.0147      0.04  Q     V    |          |          |          |
7+10       0.0150      0.04  Q     V    |          |          |          |
7+15       0.0153      0.04  Q     V    |          |          |          |
7+20       0.0156      0.05  Q     V    |          |          |          |
7+25       0.0159      0.05  Q      V   |          |          |          |
7+30       0.0163      0.05  Q      V   |          |          |          |
7+35       0.0166      0.05  Q      V   |          |          |          |
7+40       0.0170      0.05  Q      V   |          |          |          |
7+45       0.0174      0.05  Q      V   |          |          |          |
7+50       0.0177      0.06  Q      V   |          |          |          |
7+55       0.0181      0.06  Q      V   |          |          |          |
8+ 0       0.0185      0.06  Q       V  |          |          |          |
8+ 5       0.0190      0.06  Q       V  |          |          |          |
8+10       0.0194      0.07  Q       V  |          |          |          |
8+15       0.0199      0.07  Q       V  |          |          |          |
8+20       0.0203      0.07  Q       V  |          |          |          |
8+25       0.0208      0.07  Q        V |          |          |          |
8+30       0.0212      0.07  Q        V |          |          |          |
8+35       0.0217      0.07  Q        V |          |          |          |
8+40       0.0222      0.07  Q        V |          |          |          |
8+45       0.0227      0.07  Q        V |          |          |          |
8+50       0.0232      0.07  Q         V          |          |          |
8+55       0.0237      0.07  Q         V          |          |          |
9+ 0       0.0242      0.07  Q         V          |          |          |
9+ 5       0.0248      0.08  Q         V          |          |          |
```



9+10	0.0254	0.08	Q	
9+15	0.0259	0.08	Q	
9+20	0.0265	0.09	Q	
9+25	0.0271	0.09	Q	
9+30	0.0277	0.09	Q	
9+35	0.0284	0.09	Q	
9+40	0.0290	0.09	Q	
9+45	0.0296	0.09	Q	
9+50	0.0303	0.10	Q	
9+55	0.0310	0.10	Q	
10+ 0	0.0316	0.10	Q	
10+ 5	0.0321	0.07	Q	
10+10	0.0326	0.07	Q	
10+15	0.0330	0.07	Q	
10+20	0.0335	0.07	Q	
10+25	0.0340	0.07	Q	
10+30	0.0344	0.07	Q	
10+35	0.0350	0.08	Q	
10+40	0.0356	0.09	Q	
10+45	0.0362	0.09	Q	
10+50	0.0368	0.09	Q	
10+55	0.0374	0.09	Q	
11+ 0	0.0380	0.09	Q	
11+ 5	0.0386	0.08	Q	
11+10	0.0392	0.08	Q	
11+15	0.0397	0.08	Q	
11+20	0.0403	0.08	Q	
11+25	0.0409	0.08	Q	
11+30	0.0415	0.08	Q	
11+35	0.0420	0.08	Q	
11+40	0.0425	0.07	Q	
11+45	0.0430	0.07	Q	
11+50	0.0436	0.08	Q	
11+55	0.0441	0.08	Q	
12+ 0	0.0446	0.08	Q	
12+ 5	0.0454	0.10	Q	
12+10	0.0461	0.11	Q	
12+15	0.0469	0.11	Q	
12+20	0.0476	0.11	Q	
12+25	0.0484	0.11	Q	
12+30	0.0492	0.11	Q	
12+35	0.0501	0.12	Q	
12+40	0.0509	0.12	Q	
12+45	0.0518	0.12	Q	
12+50	0.0526	0.13	Q	
12+55	0.0535	0.13	Q	
13+ 0	0.0544	0.13	Q	
13+ 5	0.0554	0.14	Q	
13+10	0.0564	0.15	Q	
13+15	0.0574	0.15	Q	
13+20	0.0585	0.15	Q	
13+25	0.0595	0.15	Q	
13+30	0.0605	0.15	Q	
13+35	0.0613	0.11	Q	
13+40	0.0620	0.10	Q	
13+45	0.0627	0.10	Q	
13+50	0.0634	0.10	Q	
13+55	0.0641	0.10	Q	
14+ 0	0.0648	0.10	Q	
14+ 5	0.0656	0.11	Q	
14+10	0.0664	0.12	Q	
14+15	0.0672	0.12	Q	
14+20	0.0680	0.12	Q	
14+25	0.0688	0.11	Q	
14+30	0.0696	0.11	Q	
14+35	0.0704	0.11	Q	
14+40	0.0711	0.11	Q	
14+45	0.0719	0.11	Q	
14+50	0.0727	0.11	Q	
14+55	0.0734	0.11	Q	
15+ 0	0.0742	0.11	Q	
15+ 5	0.0749	0.11	Q	
15+10	0.0757	0.11	Q	
15+15	0.0764	0.11	Q	
15+20	0.0771	0.10	Q	
15+25	0.0778	0.10	Q	
15+30	0.0785	0.10	Q	
15+35	0.0791	0.09	Q	
15+40	0.0797	0.08	Q	
15+45	0.0802	0.08	Q	
15+50	0.0808	0.08	Q	
15+55	0.0814	0.08	Q	
16+ 0	0.0820	0.08	Q	
16+ 5	0.0822	0.03	Q	
16+10	0.0823	0.02	Q	
16+15	0.0824	0.02	Q	

```
16+20    0.0826    0.02  Q  |  |  |  V  |
16+25    0.0827    0.02  Q  |  |  |  V  |
16+30    0.0828    0.02  Q  |  |  |  V  |
16+35    0.0829    0.01  Q  |  |  |  V  |
16+40    0.0830    0.01  Q  |  |  |  V  |
16+45    0.0831    0.01  Q  |  |  |  V  |
16+50    0.0832    0.01  Q  |  |  |  V  |
16+55    0.0833    0.01  Q  |  |  |  V  |
17+ 0    0.0834    0.01  Q  |  |  |  V  |
17+ 5    0.0835    0.02  Q  |  |  |  V  |
17+10    0.0836    0.02  Q  |  |  |  V  |
17+15    0.0838    0.02  Q  |  |  |  V  |
17+20    0.0839    0.02  Q  |  |  |  V  |
17+25    0.0841    0.02  Q  |  |  |   V |
17+30    0.0843    0.02  Q  |  |  |   V |
17+35    0.0844    0.02  Q  |  |  |   V |
17+40    0.0846    0.02  Q  |  |  |   V |
17+45    0.0847    0.02  Q  |  |  |   V |
17+50    0.0848    0.02  Q  |  |  |   V |
17+55    0.0850    0.02  Q  |  |  |   V |
18+ 0    0.0851    0.02  Q  |  |  |   V |
18+ 5    0.0852    0.02  Q  |  |  |   V |
18+10    0.0853    0.02  Q  |  |  |   V |
18+15    0.0854    0.02  Q  |  |  |   V |
18+20    0.0856    0.02  Q  |  |  |   V |
18+25    0.0857    0.02  Q  |  |  |   V |
18+30    0.0858    0.02  Q  |  |  |   V |
18+35    0.0859    0.01  Q  |  |  |   V |
18+40    0.0860    0.01  Q  |  |  |   V |
18+45    0.0861    0.01  Q  |  |  |   V |
18+50    0.0861    0.01  Q  |  |  |   V |
18+55    0.0862    0.01  Q  |  |  |   V |
19+ 0    0.0863    0.01  Q  |  |  |   V |
19+ 5    0.0864    0.01  Q  |  |  |    V |
19+10    0.0864    0.01  Q  |  |  |    V |
19+15    0.0865    0.01  Q  |  |  |    V |
19+20    0.0866    0.02  Q  |  |  |    V |
19+25    0.0868    0.02  Q  |  |  |    V |
19+30    0.0869    0.02  Q  |  |  |    V |
19+35    0.0870    0.01  Q  |  |  |    V |
19+40    0.0871    0.01  Q  |  |  |    V |
19+45    0.0872    0.01  Q  |  |  |    V |
19+50    0.0872    0.01  Q  |  |  |    V |
19+55    0.0873    0.01  Q  |  |  |    V |
20+ 0    0.0874    0.01  Q  |  |  |    V |
20+ 5    0.0874    0.01  Q  |  |  |    V |
20+10    0.0875    0.01  Q  |  |  |    V |
20+15    0.0876    0.01  Q  |  |  |    V |
20+20    0.0877    0.01  Q  |  |  |    V |
20+25    0.0878    0.01  Q  |  |  |    V |
20+30    0.0879    0.01  Q  |  |  |    V |
20+35    0.0880    0.01  Q  |  |  |    V |
20+40    0.0881    0.01  Q  |  |  |    V |
20+45    0.0882    0.01  Q  |  |  |    V |
20+50    0.0882    0.01  Q  |  |  |    V |
20+55    0.0883    0.01  Q  |  |  |    V |
21+ 0    0.0884    0.01  Q  |  |  |    V |
21+ 5    0.0884    0.01  Q  |  |  |    V |
21+10    0.0885    0.01  Q  |  |  |    V |
21+15    0.0886    0.01  Q  |  |  |     V|
21+20    0.0887    0.01  Q  |  |  |     V|
21+25    0.0888    0.01  Q  |  |  |     V|
21+30    0.0888    0.01  Q  |  |  |     V|
21+35    0.0889    0.01  Q  |  |  |     V|
21+40    0.0890    0.01  Q  |  |  |     V|
21+45    0.0891    0.01  Q  |  |  |     V|
21+50    0.0891    0.01  Q  |  |  |     V|
21+55    0.0892    0.01  Q  |  |  |     V|
22+ 0    0.0893    0.01  Q  |  |  |     V|
22+ 5    0.0894    0.01  Q  |  |  |     V|
22+10    0.0894    0.01  Q  |  |  |     V|
22+15    0.0895    0.01  Q  |  |  |     V|
22+20    0.0896    0.01  Q  |  |  |     V|
22+25    0.0897    0.01  Q  |  |  |     V|
22+30    0.0897    0.01  Q  |  |  |     V|
22+35    0.0898    0.01  Q  |  |  |     V|
22+40    0.0898    0.01  Q  |  |  |     V|
22+45    0.0899    0.01  Q  |  |  |     V|
22+50    0.0900    0.01  Q  |  |  |     V|
22+55    0.0900    0.01  Q  |  |  |     V|
23+ 0    0.0901    0.01  Q  |  |  |     V|
23+ 5    0.0901    0.01  Q  |  |  |     V|
23+10    0.0902    0.01  Q  |  |  |     V|
23+15    0.0903    0.01  Q  |  |  |     V|
23+20    0.0903    0.01  Q  |  |  |     V|
23+25    0.0904    0.01  Q  |  |  |     V|
```

```
   23+30       0.0904      0.01  Q          |          |          |        v|
   23+35       0.0905      0.01  Q          |          |          |        v|
   23+40       0.0906      0.01  Q          |          |          |        v|
   23+45       0.0906      0.01  Q          |          |          |        v|
   23+50       0.0907      0.01  Q          |          |          |        v|
   23+55       0.0908      0.01  Q          |          |          |        v|
   24+ 0       0.0908      0.01  Q          |          |          |        v|
   24+ 5       0.0908      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

Copyright (c) CIVILCADD/CIVILDESIGN, 1989 - 2008, Version 8.1
Study date 10/10/24 File: EXD2242.out

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Riverside County Synthetic Unit Hydrology Method
RCFC & WCD Manual date - April 1978

Program License Serial Number 5006

English (in-lb) Input Units Used
English Rainfall Data (Inches) Input Values Used

English Units used in output format

Drainage Area = 1.29(Ac.) = 0.002 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 1.29(Ac.) = 0.002 Sq. Mi.
Length along longest watercourse = 387.00(Ft.)
Length along longest watercourse measured to centroid = 194.00(Ft.)
Length along longest watercourse = 0.073 Mi.
Length along longest watercourse measured to centroid = 0.037 Mi.
Difference in elevation = 15.50(Ft.)
Slope along watercourse = 211.4729 Ft./Mi.
Average Manning's 'N' = 0.020
Lag time = 0.018 Hr.
Lag time = 1.10 Min.
25% of lag time = 0.27 Min.
40% of lag time = 0.44 Min.
Unit time = 5.00 Min.
Duration of storm = 24 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
1.29	2.00	2.58

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
1.29	6.00	7.74

STORM EVENT (YEAR) = 2.00
Area Averaged 2-Year Rainfall = 2.000(In)
Area Averaged 100-Year Rainfall = 6.000(In)

Point rain (area averaged) = 2.000(In)
Areal adjustment factor = 100.00 %
Adjusted average point rain = 2.000(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
1.290	62.50	0.350

Total Area Entered = 1.29(Ac.)

RI AMC2	RI AMC-1	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
62.5	42.5	0.645	0.350	0.442	1.000	0.442
					Sum (F) =	0.442

Area averaged mean soil loss (F) (In/Hr) = 0.442
Minimum soil loss rate ((In/Hr)) = 0.221
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.620

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)	Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)

1	0.083	454.865	68.522	0.891
2	0.167	909.731	31.478	0.409
		Sum = 100.000	Sum=	1.300

The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	0.07	0.016	(0.784)	0.010	0.006
2	0.17	0.07	0.016	(0.781)	0.010	0.006
3	0.25	0.07	0.016	(0.778)	0.010	0.006
4	0.33	0.10	0.024	(0.775)	0.015	0.009
5	0.42	0.10	0.024	(0.772)	0.015	0.009
6	0.50	0.10	0.024	(0.769)	0.015	0.009
7	0.58	0.10	0.024	(0.766)	0.015	0.009
8	0.67	0.10	0.024	(0.763)	0.015	0.009
9	0.75	0.10	0.024	(0.760)	0.015	0.009
10	0.83	0.13	0.032	(0.757)	0.020	0.012
11	0.92	0.13	0.032	(0.754)	0.020	0.012
12	1.00	0.13	0.032	(0.751)	0.020	0.012
13	1.08	0.10	0.024	(0.748)	0.015	0.009
14	1.17	0.10	0.024	(0.745)	0.015	0.009
15	1.25	0.10	0.024	(0.742)	0.015	0.009
16	1.33	0.10	0.024	(0.739)	0.015	0.009
17	1.42	0.10	0.024	(0.736)	0.015	0.009
18	1.50	0.10	0.024	(0.733)	0.015	0.009
19	1.58	0.10	0.024	(0.730)	0.015	0.009
20	1.67	0.10	0.024	(0.727)	0.015	0.009
21	1.75	0.10	0.024	(0.724)	0.015	0.009
22	1.83	0.13	0.032	(0.721)	0.020	0.012
23	1.92	0.13	0.032	(0.719)	0.020	0.012
24	2.00	0.13	0.032	(0.716)	0.020	0.012
25	2.08	0.13	0.032	(0.713)	0.020	0.012
26	2.17	0.13	0.032	(0.710)	0.020	0.012
27	2.25	0.13	0.032	(0.707)	0.020	0.012
28	2.33	0.13	0.032	(0.704)	0.020	0.012
29	2.42	0.13	0.032	(0.701)	0.020	0.012
30	2.50	0.13	0.032	(0.698)	0.020	0.012
31	2.58	0.17	0.040	(0.695)	0.025	0.015
32	2.67	0.17	0.040	(0.693)	0.025	0.015
33	2.75	0.17	0.040	(0.690)	0.025	0.015
34	2.83	0.17	0.040	(0.687)	0.025	0.015
35	2.92	0.17	0.040	(0.684)	0.025	0.015
36	3.00	0.17	0.040	(0.681)	0.025	0.015
37	3.08	0.17	0.040	(0.678)	0.025	0.015
38	3.17	0.17	0.040	(0.676)	0.025	0.015
39	3.25	0.17	0.040	(0.673)	0.025	0.015
40	3.33	0.17	0.040	(0.670)	0.025	0.015
41	3.42	0.17	0.040	(0.667)	0.025	0.015
42	3.50	0.17	0.040	(0.664)	0.025	0.015
43	3.58	0.17	0.040	(0.662)	0.025	0.015
44	3.67	0.17	0.040	(0.659)	0.025	0.015
45	3.75	0.17	0.040	(0.656)	0.025	0.015
46	3.83	0.20	0.048	(0.653)	0.030	0.018
47	3.92	0.20	0.048	(0.651)	0.030	0.018
48	4.00	0.20	0.048	(0.648)	0.030	0.018
49	4.08	0.20	0.048	(0.645)	0.030	0.018
50	4.17	0.20	0.048	(0.642)	0.030	0.018
51	4.25	0.20	0.048	(0.640)	0.030	0.018
52	4.33	0.23	0.056	(0.637)	0.035	0.021
53	4.42	0.23	0.056	(0.634)	0.035	0.021
54	4.50	0.23	0.056	(0.631)	0.035	0.021
55	4.58	0.23	0.056	(0.629)	0.035	0.021
56	4.67	0.23	0.056	(0.626)	0.035	0.021
57	4.75	0.23	0.056	(0.623)	0.035	0.021
58	4.83	0.27	0.064	(0.621)	0.040	0.024
59	4.92	0.27	0.064	(0.618)	0.040	0.024
60	5.00	0.27	0.064	(0.615)	0.040	0.024
61	5.08	0.20	0.048	(0.613)	0.030	0.018
62	5.17	0.20	0.048	(0.610)	0.030	0.018
63	5.25	0.20	0.048	(0.607)	0.030	0.018
64	5.33	0.23	0.056	(0.605)	0.035	0.021
65	5.42	0.23	0.056	(0.602)	0.035	0.021
66	5.50	0.23	0.056	(0.599)	0.035	0.021
67	5.58	0.27	0.064	(0.597)	0.040	0.024
68	5.67	0.27	0.064	(0.594)	0.040	0.024
69	5.75	0.27	0.064	(0.591)	0.040	0.024
70	5.83	0.27	0.064	(0.589)	0.040	0.024
71	5.92	0.27	0.064	(0.586)	0.040	0.024
72	6.00	0.27	0.064	(0.584)	0.040	0.024
73	6.08	0.30	0.072	(0.581)	0.045	0.027
74	6.17	0.30	0.072	(0.578)	0.045	0.027

75	6.25	0.30	0.072	(0.576)	0.045	0.027
76	6.33	0.30	0.072	(0.573)	0.045	0.027
77	6.42	0.30	0.072	(0.571)	0.045	0.027
78	6.50	0.30	0.072	(0.568)	0.045	0.027
79	6.58	0.33	0.080	(0.566)	0.050	0.030
80	6.67	0.33	0.080	(0.563)	0.050	0.030
81	6.75	0.33	0.080	(0.561)	0.050	0.030
82	6.83	0.33	0.080	(0.558)	0.050	0.030
83	6.92	0.33	0.080	(0.556)	0.050	0.030
84	7.00	0.33	0.080	(0.553)	0.050	0.030
85	7.08	0.33	0.080	(0.550)	0.050	0.030
86	7.17	0.33	0.080	(0.548)	0.050	0.030
87	7.25	0.33	0.080	(0.545)	0.050	0.030
88	7.33	0.37	0.088	(0.543)	0.055	0.033
89	7.42	0.37	0.088	(0.540)	0.055	0.033
90	7.50	0.37	0.088	(0.538)	0.055	0.033
91	7.58	0.40	0.096	(0.536)	0.060	0.036
92	7.67	0.40	0.096	(0.533)	0.060	0.036
93	7.75	0.40	0.096	(0.531)	0.060	0.036
94	7.83	0.43	0.104	(0.528)	0.064	0.040
95	7.92	0.43	0.104	(0.526)	0.064	0.040
96	8.00	0.43	0.104	(0.523)	0.064	0.040
97	8.08	0.50	0.120	(0.521)	0.074	0.046
98	8.17	0.50	0.120	(0.518)	0.074	0.046
99	8.25	0.50	0.120	(0.516)	0.074	0.046
100	8.33	0.50	0.120	(0.514)	0.074	0.046
101	8.42	0.50	0.120	(0.511)	0.074	0.046
102	8.50	0.50	0.120	(0.509)	0.074	0.046
103	8.58	0.53	0.128	(0.506)	0.079	0.049
104	8.67	0.53	0.128	(0.504)	0.079	0.049
105	8.75	0.53	0.128	(0.502)	0.079	0.049
106	8.83	0.57	0.136	(0.499)	0.084	0.052
107	8.92	0.57	0.136	(0.497)	0.084	0.052
108	9.00	0.57	0.136	(0.495)	0.084	0.052
109	9.08	0.63	0.152	(0.492)	0.094	0.058
110	9.17	0.63	0.152	(0.490)	0.094	0.058
111	9.25	0.63	0.152	(0.488)	0.094	0.058
112	9.33	0.67	0.160	(0.485)	0.099	0.061
113	9.42	0.67	0.160	(0.483)	0.099	0.061
114	9.50	0.67	0.160	(0.481)	0.099	0.061
115	9.58	0.70	0.168	(0.478)	0.104	0.064
116	9.67	0.70	0.168	(0.476)	0.104	0.064
117	9.75	0.70	0.168	(0.474)	0.104	0.064
118	9.83	0.73	0.176	(0.471)	0.109	0.067
119	9.92	0.73	0.176	(0.469)	0.109	0.067
120	10.00	0.73	0.176	(0.467)	0.109	0.067
121	10.08	0.50	0.120	(0.465)	0.074	0.046
122	10.17	0.50	0.120	(0.462)	0.074	0.046
123	10.25	0.50	0.120	(0.460)	0.074	0.046
124	10.33	0.50	0.120	(0.458)	0.074	0.046
125	10.42	0.50	0.120	(0.456)	0.074	0.046
126	10.50	0.50	0.120	(0.453)	0.074	0.046
127	10.58	0.67	0.160	(0.451)	0.099	0.061
128	10.67	0.67	0.160	(0.449)	0.099	0.061
129	10.75	0.67	0.160	(0.447)	0.099	0.061
130	10.83	0.67	0.160	(0.445)	0.099	0.061
131	10.92	0.67	0.160	(0.443)	0.099	0.061
132	11.00	0.67	0.160	(0.440)	0.099	0.061
133	11.08	0.63	0.152	(0.438)	0.094	0.058
134	11.17	0.63	0.152	(0.436)	0.094	0.058
135	11.25	0.63	0.152	(0.434)	0.094	0.058
136	11.33	0.63	0.152	(0.432)	0.094	0.058
137	11.42	0.63	0.152	(0.430)	0.094	0.058
138	11.50	0.63	0.152	(0.427)	0.094	0.058
139	11.58	0.57	0.136	(0.425)	0.084	0.052
140	11.67	0.57	0.136	(0.423)	0.084	0.052
141	11.75	0.57	0.136	(0.421)	0.084	0.052
142	11.83	0.60	0.144	(0.419)	0.089	0.055
143	11.92	0.60	0.144	(0.417)	0.089	0.055
144	12.00	0.60	0.144	(0.415)	0.089	0.055
145	12.08	0.83	0.200	(0.413)	0.124	0.076
146	12.17	0.83	0.200	(0.411)	0.124	0.076
147	12.25	0.83	0.200	(0.409)	0.124	0.076
148	12.33	0.87	0.208	(0.407)	0.129	0.079
149	12.42	0.87	0.208	(0.405)	0.129	0.079
150	12.50	0.87	0.208	(0.403)	0.129	0.079
151	12.58	0.93	0.224	(0.400)	0.139	0.085
152	12.67	0.93	0.224	(0.398)	0.139	0.085
153	12.75	0.93	0.224	(0.396)	0.139	0.085
154	12.83	0.97	0.232	(0.394)	0.144	0.088
155	12.92	0.97	0.232	(0.392)	0.144	0.088
156	13.00	0.97	0.232	(0.390)	0.144	0.088
157	13.08	1.13	0.272	(0.388)	0.169	0.103
158	13.17	1.13	0.272	(0.387)	0.169	0.103
159	13.25	1.13	0.272	(0.385)	0.169	0.103
160	13.33	1.13	0.272	(0.383)	0.169	0.103

161	13.42	1.13	0.272	(0.381)	0.169	0.103
162	13.50	1.13	0.272	(0.379)	0.169	0.103
163	13.58	0.77	0.184	(0.377)	0.114	0.070
164	13.67	0.77	0.184	(0.375)	0.114	0.070
165	13.75	0.77	0.184	(0.373)	0.114	0.070
166	13.83	0.77	0.184	(0.371)	0.114	0.070
167	13.92	0.77	0.184	(0.369)	0.114	0.070
168	14.00	0.77	0.184	(0.367)	0.114	0.070
169	14.08	0.90	0.216	(0.365)	0.134	0.082
170	14.17	0.90	0.216	(0.364)	0.134	0.082
171	14.25	0.90	0.216	(0.362)	0.134	0.082
172	14.33	0.87	0.208	(0.360)	0.129	0.079
173	14.42	0.87	0.208	(0.358)	0.129	0.079
174	14.50	0.87	0.208	(0.356)	0.129	0.079
175	14.58	0.87	0.208	(0.354)	0.129	0.079
176	14.67	0.87	0.208	(0.353)	0.129	0.079
177	14.75	0.87	0.208	(0.351)	0.129	0.079
178	14.83	0.83	0.200	(0.349)	0.124	0.076
179	14.92	0.83	0.200	(0.347)	0.124	0.076
180	15.00	0.83	0.200	(0.345)	0.124	0.076
181	15.08	0.80	0.192	(0.344)	0.119	0.073
182	15.17	0.80	0.192	(0.342)	0.119	0.073
183	15.25	0.80	0.192	(0.340)	0.119	0.073
184	15.33	0.77	0.184	(0.338)	0.114	0.070
185	15.42	0.77	0.184	(0.337)	0.114	0.070
186	15.50	0.77	0.184	(0.335)	0.114	0.070
187	15.58	0.63	0.152	(0.333)	0.094	0.058
188	15.67	0.63	0.152	(0.331)	0.094	0.058
189	15.75	0.63	0.152	(0.330)	0.094	0.058
190	15.83	0.63	0.152	(0.328)	0.094	0.058
191	15.92	0.63	0.152	(0.326)	0.094	0.058
192	16.00	0.63	0.152	(0.325)	0.094	0.058
193	16.08	0.13	0.032	(0.323)	0.020	0.012
194	16.17	0.13	0.032	(0.321)	0.020	0.012
195	16.25	0.13	0.032	(0.320)	0.020	0.012
196	16.33	0.13	0.032	(0.318)	0.020	0.012
197	16.42	0.13	0.032	(0.317)	0.020	0.012
198	16.50	0.13	0.032	(0.315)	0.020	0.012
199	16.58	0.10	0.024	(0.313)	0.015	0.009
200	16.67	0.10	0.024	(0.312)	0.015	0.009
201	16.75	0.10	0.024	(0.310)	0.015	0.009
202	16.83	0.10	0.024	(0.309)	0.015	0.009
203	16.92	0.10	0.024	(0.307)	0.015	0.009
204	17.00	0.10	0.024	(0.305)	0.015	0.009
205	17.08	0.17	0.040	(0.304)	0.025	0.015
206	17.17	0.17	0.040	(0.302)	0.025	0.015
207	17.25	0.17	0.040	(0.301)	0.025	0.015
208	17.33	0.17	0.040	(0.299)	0.025	0.015
209	17.42	0.17	0.040	(0.298)	0.025	0.015
210	17.50	0.17	0.040	(0.296)	0.025	0.015
211	17.58	0.17	0.040	(0.295)	0.025	0.015
212	17.67	0.17	0.040	(0.293)	0.025	0.015
213	17.75	0.17	0.040	(0.292)	0.025	0.015
214	17.83	0.13	0.032	(0.290)	0.020	0.012
215	17.92	0.13	0.032	(0.289)	0.020	0.012
216	18.00	0.13	0.032	(0.288)	0.020	0.012
217	18.08	0.13	0.032	(0.286)	0.020	0.012
218	18.17	0.13	0.032	(0.285)	0.020	0.012
219	18.25	0.13	0.032	(0.283)	0.020	0.012
220	18.33	0.13	0.032	(0.282)	0.020	0.012
221	18.42	0.13	0.032	(0.281)	0.020	0.012
222	18.50	0.13	0.032	(0.279)	0.020	0.012
223	18.58	0.10	0.024	(0.278)	0.015	0.009
224	18.67	0.10	0.024	(0.277)	0.015	0.009
225	18.75	0.10	0.024	(0.275)	0.015	0.009
226	18.83	0.07	0.016	(0.274)	0.010	0.006
227	18.92	0.07	0.016	(0.273)	0.010	0.006
228	19.00	0.07	0.016	(0.271)	0.010	0.006
229	19.08	0.10	0.024	(0.270)	0.015	0.009
230	19.17	0.10	0.024	(0.269)	0.015	0.009
231	19.25	0.10	0.024	(0.268)	0.015	0.009
232	19.33	0.13	0.032	(0.266)	0.020	0.012
233	19.42	0.13	0.032	(0.265)	0.020	0.012
234	19.50	0.13	0.032	(0.264)	0.020	0.012
235	19.58	0.10	0.024	(0.263)	0.015	0.009
236	19.67	0.10	0.024	(0.261)	0.015	0.009
237	19.75	0.10	0.024	(0.260)	0.015	0.009
238	19.83	0.07	0.016	(0.259)	0.010	0.006
239	19.92	0.07	0.016	(0.258)	0.010	0.006
240	20.00	0.07	0.016	(0.257)	0.010	0.006
241	20.08	0.10	0.024	(0.256)	0.015	0.009
242	20.17	0.10	0.024	(0.255)	0.015	0.009
243	20.25	0.10	0.024	(0.253)	0.015	0.009
244	20.33	0.10	0.024	(0.252)	0.015	0.009
245	20.42	0.10	0.024	(0.251)	0.015	0.009
246	20.50	0.10	0.024	(0.250)	0.015	0.009

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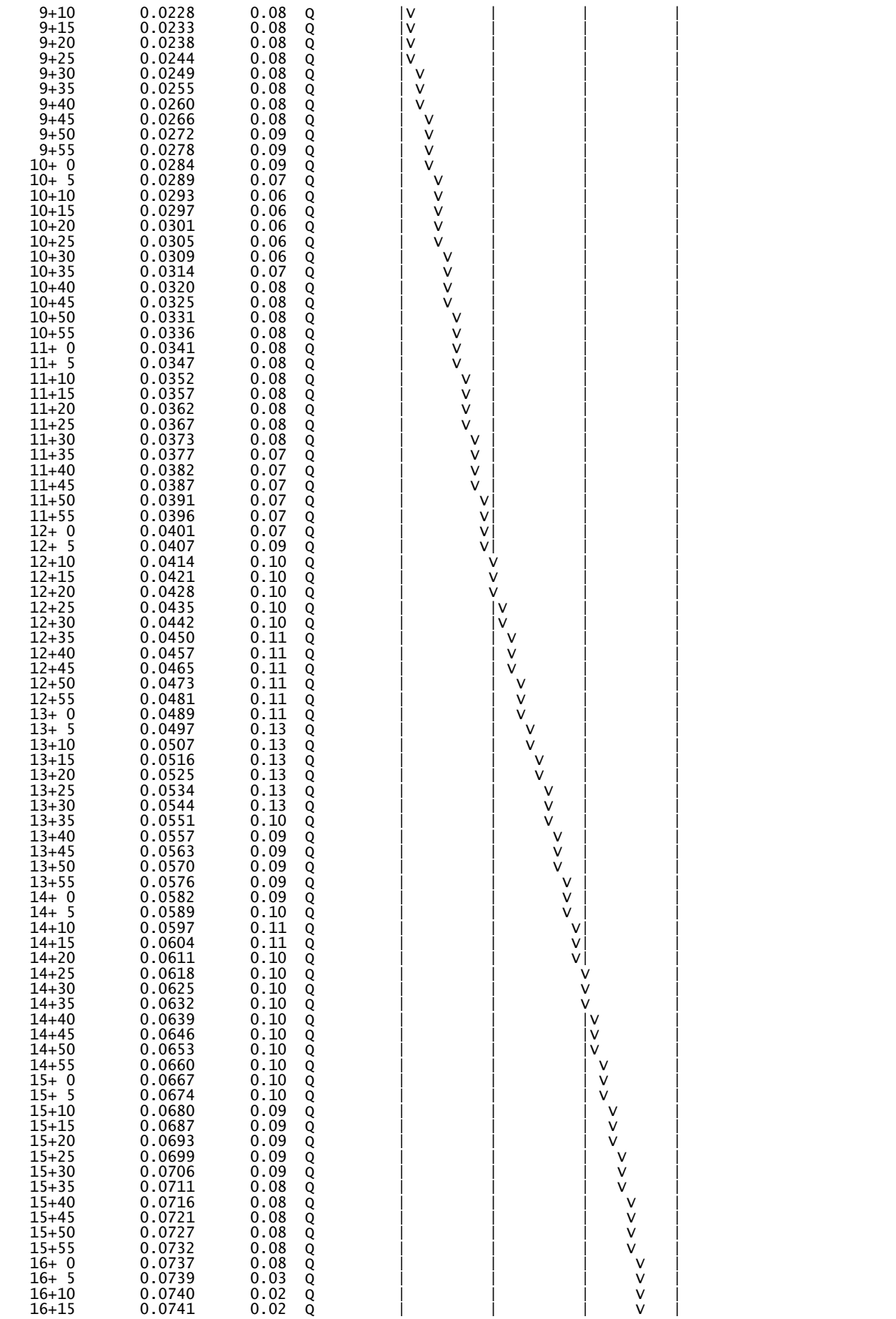
247  20.58     0.10      0.024       (  0.249)       0.015        0.009
248  20.67     0.10      0.024       (  0.248)       0.015        0.009
249  20.75     0.10      0.024       (  0.247)       0.015        0.009
250  20.83     0.07      0.016       (  0.246)       0.010        0.006
251  20.92     0.07      0.016       (  0.245)       0.010        0.006
252  21.00     0.07      0.016       (  0.244)       0.010        0.006
253  21.08     0.10      0.024       (  0.243)       0.015        0.009
254  21.17     0.10      0.024       (  0.242)       0.015        0.009
255  21.25     0.10      0.024       (  0.241)       0.015        0.009
256  21.33     0.07      0.016       (  0.240)       0.010        0.006
257  21.42     0.07      0.016       (  0.239)       0.010        0.006
258  21.50     0.07      0.016       (  0.238)       0.010        0.006
259  21.58     0.10      0.024       (  0.238)       0.015        0.009
260  21.67     0.10      0.024       (  0.237)       0.015        0.009
261  21.75     0.10      0.024       (  0.236)       0.015        0.009
262  21.83     0.07      0.016       (  0.235)       0.010        0.006
263  21.92     0.07      0.016       (  0.234)       0.010        0.006
264  22.00     0.07      0.016       (  0.233)       0.010        0.006
265  22.08     0.10      0.024       (  0.233)       0.015        0.009
266  22.17     0.10      0.024       (  0.232)       0.015        0.009
267  22.25     0.10      0.024       (  0.231)       0.015        0.009
268  22.33     0.07      0.016       (  0.230)       0.010        0.006
269  22.42     0.07      0.016       (  0.230)       0.010        0.006
270  22.50     0.07      0.016       (  0.229)       0.010        0.006
271  22.58     0.07      0.016       (  0.228)       0.010        0.006
272  22.67     0.07      0.016       (  0.228)       0.010        0.006
273  22.75     0.07      0.016       (  0.227)       0.010        0.006
274  22.83     0.07      0.016       (  0.227)       0.010        0.006
275  22.92     0.07      0.016       (  0.226)       0.010        0.006
276  23.00     0.07      0.016       (  0.225)       0.010        0.006
277  23.08     0.07      0.016       (  0.225)       0.010        0.006
278  23.17     0.07      0.016       (  0.224)       0.010        0.006
279  23.25     0.07      0.016       (  0.224)       0.010        0.006
280  23.33     0.07      0.016       (  0.223)       0.010        0.006
281  23.42     0.07      0.016       (  0.223)       0.010        0.006
282  23.50     0.07      0.016       (  0.223)       0.010        0.006
283  23.58     0.07      0.016       (  0.222)       0.010        0.006
284  23.67     0.07      0.016       (  0.222)       0.010        0.006
285  23.75     0.07      0.016       (  0.222)       0.010        0.006
286  23.83     0.07      0.016       (  0.221)       0.010        0.006
287  23.92     0.07      0.016       (  0.221)       0.010        0.006
288  24.00     0.07      0.016       (  0.221)       0.010        0.006
               (Loss Rate Not Used)
    Sum =     100.0                                  Sum =     9.1
      Flood volume = Effective rainfall      0.76(In)
       times area       1.3(Ac.)/[(In)/(Ft.)] =       0.1(Ac.Ft)
      Total soil loss =      1.24(In)
      Total soil loss =     0.133(Ac.Ft)
      Total rainfall =      2.00(In)
      Flood volume =        3558.8 Cubic Feet
      Total soil loss =        5806.5 Cubic Feet
      ---------------------------------------------------------------------
       Peak flow rate of this hydrograph =      0.134(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      0.01  Q          |         |         |         |
   0+10       0.0001      0.01  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      0.01  Q          |         |         |         |
   0+35       0.0005      0.01  Q          |         |         |         |
   0+40       0.0005      0.01  Q          |         |         |         |
   0+45       0.0006      0.01  Q          |         |         |         |
   0+50       0.0007      0.01  Q          |         |         |         |
   0+55       0.0008      0.02  Q          |         |         |         |
   1+ 0       0.0009      0.02  Q          |         |         |         |
   1+ 5       0.0010      0.01  Q          |         |         |         |
   1+10       0.0011      0.01  Q          |         |         |         |
   1+15       0.0012      0.01  Q          |         |         |         |
   1+20       0.0013      0.01  Q          |         |         |         |
   1+25       0.0014      0.01  Q          |         |         |         |
   1+30       0.0014      0.01  Q          |         |         |         |
   1+35       0.0015      0.01  Q          |         |         |         |
   1+40       0.0016      0.01  Q          |         |         |         |
   1+45       0.0017      0.01  Q          |         |         |         |
   1+50       0.0018      0.01  Q          |         |         |         |
   1+55       0.0019      0.02  Q          |         |         |         |
```

```
2+ 0       0.0020      0.02  Q          |          |          |          |
2+ 5       0.0021      0.02  QV         |          |          |          |
2+10       0.0022      0.02  QV         |          |          |          |
2+15       0.0023      0.02  QV         |          |          |          |
2+20       0.0024      0.02  QV         |          |          |          |
2+25       0.0026      0.02  QV         |          |          |          |
2+30       0.0027      0.02  QV         |          |          |          |
2+35       0.0028      0.02  QV         |          |          |          |
2+40       0.0029      0.02  QV         |          |          |          |
2+45       0.0031      0.02  QV         |          |          |          |
2+50       0.0032      0.02  QV         |          |          |          |
2+55       0.0033      0.02  QV         |          |          |          |
3+ 0       0.0035      0.02  QV         |          |          |          |
3+ 5       0.0036      0.02  QV         |          |          |          |
3+10       0.0037      0.02  QV         |          |          |          |
3+15       0.0039      0.02  QV         |          |          |          |
3+20       0.0040      0.02  QV         |          |          |          |
3+25       0.0042      0.02  Q V        |          |          |          |
3+30       0.0043      0.02  Q V        |          |          |          |
3+35       0.0044      0.02  Q V        |          |          |          |
3+40       0.0046      0.02  Q V        |          |          |          |
3+45       0.0047      0.02  Q V        |          |          |          |
3+50       0.0049      0.02  Q V        |          |          |          |
3+55       0.0050      0.02  Q V        |          |          |          |
4+ 0       0.0052      0.02  Q V        |          |          |          |
4+ 5       0.0053      0.02  Q V        |          |          |          |
4+10       0.0055      0.02  Q V        |          |          |          |
4+15       0.0057      0.02  Q V        |          |          |          |
4+20       0.0058      0.03  Q V        |          |          |          |
4+25       0.0060      0.03  Q V        |          |          |          |
4+30       0.0062      0.03  Q  V       |          |          |          |
4+35       0.0064      0.03  Q  V       |          |          |          |
4+40       0.0066      0.03  Q  V       |          |          |          |
4+45       0.0068      0.03  Q  V       |          |          |          |
4+50       0.0070      0.03  Q  V       |          |          |          |
4+55       0.0072      0.03  Q  V       |          |          |          |
5+ 0       0.0074      0.03  Q  V       |          |          |          |
5+ 5       0.0076      0.03  Q  V       |          |          |          |
5+10       0.0078      0.02  Q  V       |          |          |          |
5+15       0.0080      0.02  Q  V       |          |          |          |
5+20       0.0081      0.03  Q  V       |          |          |          |
5+25       0.0083      0.03  Q   V      |          |          |          |
5+30       0.0085      0.03  Q   V      |          |          |          |
5+35       0.0087      0.03  Q   V      |          |          |          |
5+40       0.0089      0.03  Q   V      |          |          |          |
5+45       0.0092      0.03  Q   V      |          |          |          |
5+50       0.0094      0.03  Q   V      |          |          |          |
5+55       0.0096      0.03  Q   V      |          |          |          |
6+ 0       0.0098      0.03  Q   V      |          |          |          |
6+ 5       0.0101      0.03  Q   V      |          |          |          |
6+10       0.0103      0.04  Q    V     |          |          |          |
6+15       0.0105      0.04  Q    V     |          |          |          |
6+20       0.0108      0.04  Q    V     |          |          |          |
6+25       0.0110      0.04  Q    V     |          |          |          |
6+30       0.0113      0.04  Q    V     |          |          |          |
6+35       0.0115      0.04  Q    V     |          |          |          |
6+40       0.0118      0.04  Q    V     |          |          |          |
6+45       0.0121      0.04  Q    V     |          |          |          |
6+50       0.0124      0.04  Q     V    |          |          |          |
6+55       0.0126      0.04  Q     V    |          |          |          |
7+ 0       0.0129      0.04  Q     V    |          |          |          |
7+ 5       0.0132      0.04  Q     V    |          |          |          |
7+10       0.0134      0.04  Q     V    |          |          |          |
7+15       0.0137      0.04  Q     V    |          |          |          |
7+20       0.0140      0.04  Q     V    |          |          |          |
7+25       0.0143      0.04  Q      V   |          |          |          |
7+30       0.0146      0.04  Q      V   |          |          |          |
7+35       0.0149      0.05  Q      V   |          |          |          |
7+40       0.0153      0.05  Q      V   |          |          |          |
7+45       0.0156      0.05  Q      V   |          |          |          |
7+50       0.0159      0.05  Q      V   |          |          |          |
7+55       0.0163      0.05  Q      V   |          |          |          |
8+ 0       0.0166      0.05  Q       V  |          |          |          |
8+ 5       0.0170      0.06  Q       V  |          |          |          |
8+10       0.0174      0.06  Q       V  |          |          |          |
8+15       0.0178      0.06  Q       V  |          |          |          |
8+20       0.0183      0.06  Q       V  |          |          |          |
8+25       0.0187      0.06  Q        V |          |          |          |
8+30       0.0191      0.06  Q        V |          |          |          |
8+35       0.0195      0.06  Q        V |          |          |          |
8+40       0.0199      0.06  Q        V |          |          |          |
8+45       0.0204      0.06  Q        V |          |          |          |
8+50       0.0208      0.07  Q         V          |          |          |
8+55       0.0213      0.07  Q         V          |          |          |
9+ 0       0.0217      0.07  Q         V          |          |          |
9+ 5       0.0223      0.07  Q         V          |          |          |
```



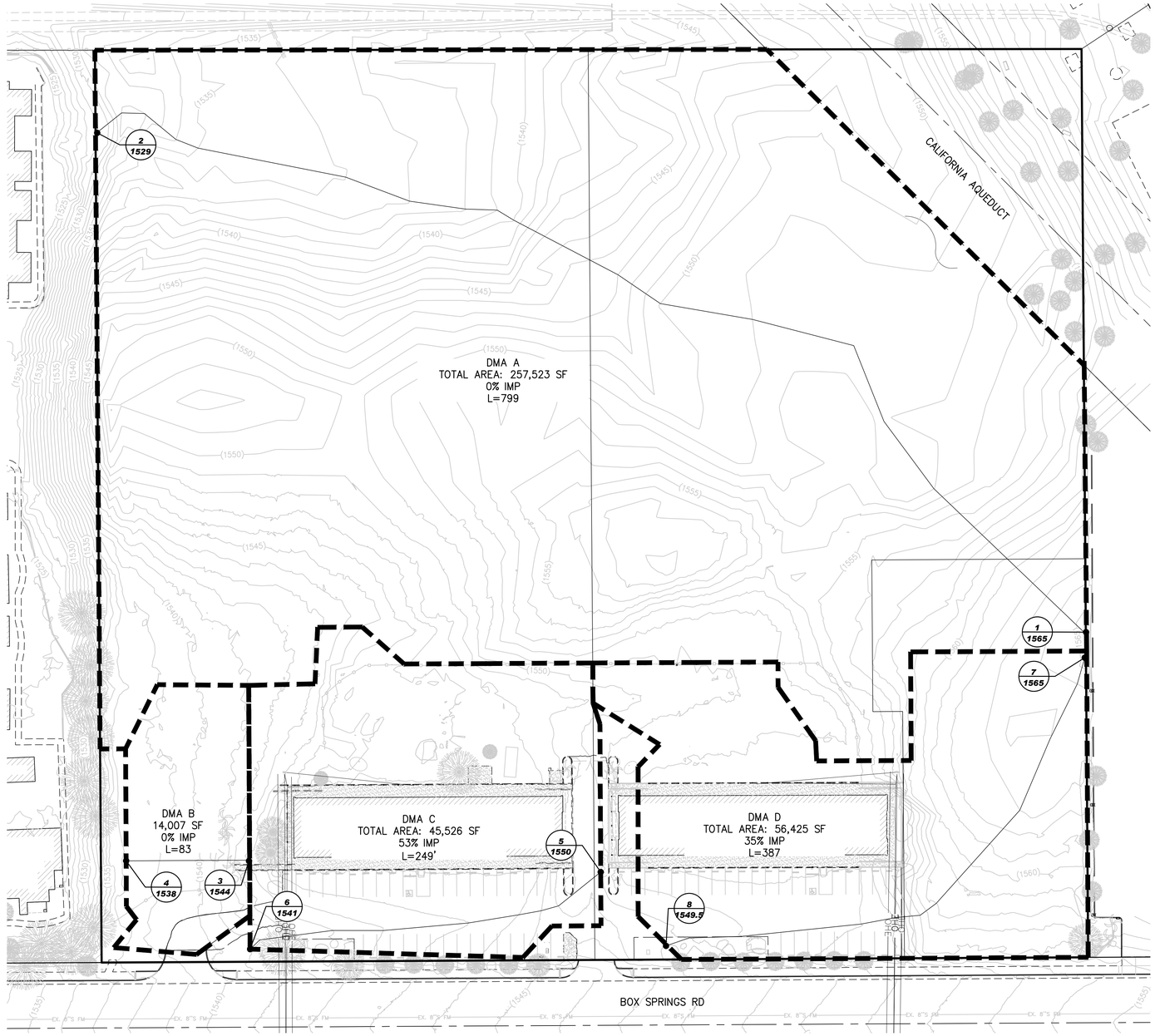
9+10	0.0228	0.08	Q	
9+15	0.0233	0.08	Q	
9+20	0.0238	0.08	Q	
9+25	0.0244	0.08	Q	
9+30	0.0249	0.08	Q	
9+35	0.0255	0.08	Q	
9+40	0.0260	0.08	Q	
9+45	0.0266	0.08	Q	
9+50	0.0272	0.09	Q	
9+55	0.0278	0.09	Q	
10+ 0	0.0284	0.09	Q	
10+ 5	0.0289	0.07	Q	
10+10	0.0293	0.06	Q	
10+15	0.0297	0.06	Q	
10+20	0.0301	0.06	Q	
10+25	0.0305	0.06	Q	
10+30	0.0309	0.06	Q	
10+35	0.0314	0.07	Q	
10+40	0.0320	0.08	Q	
10+45	0.0325	0.08	Q	
10+50	0.0331	0.08	Q	
10+55	0.0336	0.08	Q	
11+ 0	0.0341	0.08	Q	
11+ 5	0.0347	0.08	Q	
11+10	0.0352	0.08	Q	
11+15	0.0357	0.08	Q	
11+20	0.0362	0.08	Q	
11+25	0.0367	0.08	Q	
11+30	0.0373	0.08	Q	
11+35	0.0377	0.07	Q	
11+40	0.0382	0.07	Q	
11+45	0.0387	0.07	Q	
11+50	0.0391	0.07	Q	
11+55	0.0396	0.07	Q	
12+ 0	0.0401	0.07	Q	
12+ 5	0.0407	0.09	Q	
12+10	0.0414	0.10	Q	
12+15	0.0421	0.10	Q	
12+20	0.0428	0.10	Q	
12+25	0.0435	0.10	Q	
12+30	0.0442	0.10	Q	
12+35	0.0450	0.11	Q	
12+40	0.0457	0.11	Q	
12+45	0.0465	0.11	Q	
12+50	0.0473	0.11	Q	
12+55	0.0481	0.11	Q	
13+ 0	0.0489	0.11	Q	
13+ 5	0.0497	0.13	Q	
13+10	0.0507	0.13	Q	
13+15	0.0516	0.13	Q	
13+20	0.0525	0.13	Q	
13+25	0.0534	0.13	Q	
13+30	0.0544	0.13	Q	
13+35	0.0551	0.10	Q	
13+40	0.0557	0.09	Q	
13+45	0.0563	0.09	Q	
13+50	0.0570	0.09	Q	
13+55	0.0576	0.09	Q	
14+ 0	0.0582	0.09	Q	
14+ 5	0.0589	0.10	Q	
14+10	0.0597	0.11	Q	
14+15	0.0604	0.11	Q	
14+20	0.0611	0.10	Q	
14+25	0.0618	0.10	Q	
14+30	0.0625	0.10	Q	
14+35	0.0632	0.10	Q	
14+40	0.0639	0.10	Q	
14+45	0.0646	0.10	Q	
14+50	0.0653	0.10	Q	
14+55	0.0660	0.10	Q	
15+ 0	0.0667	0.10	Q	
15+ 5	0.0674	0.10	Q	
15+10	0.0680	0.09	Q	
15+15	0.0687	0.09	Q	
15+20	0.0693	0.09	Q	
15+25	0.0699	0.09	Q	
15+30	0.0706	0.09	Q	
15+35	0.0711	0.08	Q	
15+40	0.0716	0.08	Q	
15+45	0.0721	0.08	Q	
15+50	0.0727	0.08	Q	
15+55	0.0732	0.08	Q	
16+ 0	0.0737	0.08	Q	
16+ 5	0.0739	0.03	Q	
16+10	0.0740	0.02	Q	
16+15	0.0741	0.02	Q	

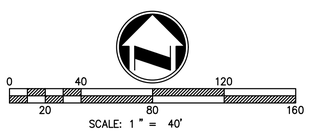
```
16+20    0.0743    0.02  Q  |  |  |  V  |
16+25    0.0744    0.02  Q  |  |  |  V  |
16+30    0.0745    0.02  Q  |  |  |  V  |
16+35    0.0746    0.01  Q  |  |  |  V  |
16+40    0.0746    0.01  Q  |  |  |  V  |
16+45    0.0747    0.01  Q  |  |  |  V  |
16+50    0.0748    0.01  Q  |  |  |  V  |
16+55    0.0749    0.01  Q  |  |  |  V  |
17+ 0    0.0750    0.01  Q  |  |  |  V  |
17+ 5    0.0751    0.02  Q  |  |  |  V  |
17+10    0.0752    0.02  Q  |  |  |  V  |
17+15    0.0754    0.02  Q  |  |  |  V  |
17+20    0.0755    0.02  Q  |  |  |  V  |
17+25    0.0756    0.02  Q  |  |  |   V |
17+30    0.0758    0.02  Q  |  |  |   V |
17+35    0.0759    0.02  Q  |  |  |   V |
17+40    0.0760    0.02  Q  |  |  |   V |
17+45    0.0762    0.02  Q  |  |  |   V |
17+50    0.0763    0.02  Q  |  |  |   V |
17+55    0.0764    0.02  Q  |  |  |   V |
18+ 0    0.0765    0.02  Q  |  |  |   V |
18+ 5    0.0766    0.02  Q  |  |  |   V |
18+10    0.0767    0.02  Q  |  |  |   V |
18+15    0.0768    0.02  Q  |  |  |   V |
18+20    0.0770    0.02  Q  |  |  |   V |
18+25    0.0771    0.02  Q  |  |  |   V |
18+30    0.0772    0.02  Q  |  |  |   V |
18+35    0.0773    0.01  Q  |  |  |   V |
18+40    0.0773    0.01  Q  |  |  |   V |
18+45    0.0774    0.01  Q  |  |  |   V |
18+50    0.0775    0.01  Q  |  |  |   V |
18+55    0.0775    0.01  Q  |  |  |   V |
19+ 0    0.0776    0.01  Q  |  |  |   V |
19+ 5    0.0777    0.01  Q  |  |  |    V |
19+10    0.0778    0.01  Q  |  |  |    V |
19+15    0.0778    0.01  Q  |  |  |    V |
19+20    0.0779    0.01  Q  |  |  |    V |
19+25    0.0780    0.02  Q  |  |  |    V |
19+30    0.0782    0.02  Q  |  |  |    V |
19+35    0.0782    0.01  Q  |  |  |    V |
19+40    0.0783    0.01  Q  |  |  |    V |
19+45    0.0784    0.01  Q  |  |  |    V |
19+50    0.0785    0.01  Q  |  |  |    V |
19+55    0.0785    0.01  Q  |  |  |    V |
20+ 0    0.0786    0.01  Q  |  |  |    V |
20+ 5    0.0787    0.01  Q  |  |  |    V |
20+10    0.0787    0.01  Q  |  |  |    V |
20+15    0.0788    0.01  Q  |  |  |    V |
20+20    0.0789    0.01  Q  |  |  |    V |
20+25    0.0790    0.01  Q  |  |  |    V |
20+30    0.0791    0.01  Q  |  |  |    V |
20+35    0.0791    0.01  Q  |  |  |    V |
20+40    0.0792    0.01  Q  |  |  |    V |
20+45    0.0793    0.01  Q  |  |  |    V |
20+50    0.0794    0.01  Q  |  |  |    V |
20+55    0.0794    0.01  Q  |  |  |    V |
21+ 0    0.0795    0.01  Q  |  |  |    V |
21+ 5    0.0795    0.01  Q  |  |  |    V |
21+10    0.0796    0.01  Q  |  |  |    V |
21+15    0.0797    0.01  Q  |  |  |     V|
21+20    0.0798    0.01  Q  |  |  |     V|
21+25    0.0798    0.01  Q  |  |  |     V|
21+30    0.0799    0.01  Q  |  |  |     V|
21+35    0.0800    0.01  Q  |  |  |     V|
21+40    0.0800    0.01  Q  |  |  |     V|
21+45    0.0801    0.01  Q  |  |  |     V|
21+50    0.0802    0.01  Q  |  |  |     V|
21+55    0.0802    0.01  Q  |  |  |     V|
22+ 0    0.0803    0.01  Q  |  |  |     V|
22+ 5    0.0804    0.01  Q  |  |  |     V|
22+10    0.0804    0.01  Q  |  |  |     V|
22+15    0.0805    0.01  Q  |  |  |     V|
22+20    0.0806    0.01  Q  |  |  |     V|
22+25    0.0806    0.01  Q  |  |  |     V|
22+30    0.0807    0.01  Q  |  |  |     V|
22+35    0.0808    0.01  Q  |  |  |     V|
22+40    0.0808    0.01  Q  |  |  |     V|
22+45    0.0809    0.01  Q  |  |  |     V|
22+50    0.0809    0.01  Q  |  |  |     V|
22+55    0.0810    0.01  Q  |  |  |     V|
23+ 0    0.0810    0.01  Q  |  |  |     V|
23+ 5    0.0811    0.01  Q  |  |  |     V|
23+10    0.0811    0.01  Q  |  |  |     V|
23+15    0.0812    0.01  Q  |  |  |     V|
23+20    0.0812    0.01  Q  |  |  |     V|
23+25    0.0813    0.01  Q  |  |  |     V|
```

```
   23+30       0.0814      0.01  Q          |          |          |         v|
   23+35       0.0814      0.01  Q          |          |          |         v|
   23+40       0.0815      0.01  Q          |          |          |         v|
   23+45       0.0815      0.01  Q          |          |          |         v|
   23+50       0.0816      0.01  Q          |          |          |         v|
   23+55       0.0816      0.01  Q          |          |          |         v|
   24+ 0       0.0817      0.01  Q          |          |          |         v|
   24+ 5       0.0817      0.00  Q          |          |          |          v
-------------------------------------------------------------------------------
```

IN THE CITY OF MORENO VALLEY, COUNTY OF RIVERSIDE, STATE OF CALIFORNIA

TENTATIVE TRACT 38955
EXISTING UNIT HYDROGRAPH MAP





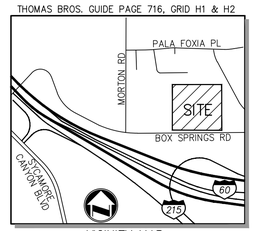
ENGINEER
ADKAN ENGINEERS
6879 AIRPORT DRIVE
RIVERSIDE, CA 92504
TELEPHONE: (951) 688-0241
MBRENDECKE@ADKAN.COM

ASSESSORS PARCEL NUMBERS
256-200-002, 256-200-003, &
256-200-004

OWNER
RIVERSIDE COUNTY FARM BUREAU, INC.
21160 BOX SPRINGS RD, SUITE 102
MORENO VALLEY, CA 92557

APPLICANT
FOREMOST PACIFIC GROUP
27271 LAS RAMBLAS, SUITE 100
MISSION VIEJO, CA 92691
949-748-6714

THOMAS BROS. GUIDE PAGE 716, GRID H1 & H2



VICINITY MAP
NTS
T2SR4W SEC 34 SW

PLANS PREPARED BY:
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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

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Study date 10/09/24 File: PROA2242.out

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Riverside County Synthetic Unit Hydrology Method
RCFC & WCD Manual date - April 1978

Program License Serial Number 5006

English (in-lb) Input Units Used
English Rainfall Data (Inches) Input Values Used

English Units used in output format

Drainage Area = 5.91(Ac.) = 0.009 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 5.91(Ac.) = 0.009 Sq. Mi.
Length along longest watercourse = 946.00(Ft.)
Length along longest watercourse measured to centroid = 475.00(Ft.)
Length along longest watercourse = 0.179 Mi.
Length along longest watercourse measured to centroid = 0.090 Mi.
Difference in elevation = 15.48(Ft.)
Slope along watercourse = 86.4000 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time = 0.032 Hr.
Lag time = 1.93 Min.
25% of lag time = 0.48 Min.
40% of lag time = 0.77 Min.
Unit time = 5.00 Min.
Duration of storm = 24 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
5.91	2.00	11.82

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
5.91	6.00	35.46

STORM EVENT (YEAR) = 2.00
Area Averaged 2-Year Rainfall = 2.000(In)
Area Averaged 100-Year Rainfall = 6.000(In)

Point rain (area averaged) = 2.000(In)
Areal adjustment factor = 100.00 %
Adjusted average point rain = 2.000(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
5.910	62.50	0.650

Total Area Entered = 5.91(Ac.)

RI AMC2	RI AMC-1	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
62.5	42.5	0.645	0.650	0.268	1.000	0.268
					Sum (F) =	0.268

Area averaged mean soil loss (F) (In/Hr) = 0.268
Minimum soil loss rate ((In/Hr)) = 0.134
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.380

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	259.223	52.070	3.101
2	0.167	518.446	39.490	2.352
3	0.250	777.669	6.728	0.401
4	0.333	1036.892	1.712	0.102
			Sum = 100.000	Sum= 5.956

The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	0.07	0.016	(0.475)	0.006	0.010
2	0.17	0.07	0.016	(0.473)	0.006	0.010
3	0.25	0.07	0.016	(0.471)	0.006	0.010
4	0.33	0.10	0.024	(0.469)	0.009	0.015
5	0.42	0.10	0.024	(0.468)	0.009	0.015
6	0.50	0.10	0.024	(0.466)	0.009	0.015
7	0.58	0.10	0.024	(0.464)	0.009	0.015
8	0.67	0.10	0.024	(0.462)	0.009	0.015
9	0.75	0.10	0.024	(0.460)	0.009	0.015
10	0.83	0.13	0.032	(0.458)	0.012	0.020
11	0.92	0.13	0.032	(0.457)	0.012	0.020
12	1.00	0.13	0.032	(0.455)	0.012	0.020
13	1.08	0.10	0.024	(0.453)	0.009	0.015
14	1.17	0.10	0.024	(0.451)	0.009	0.015
15	1.25	0.10	0.024	(0.449)	0.009	0.015
16	1.33	0.10	0.024	(0.448)	0.009	0.015
17	1.42	0.10	0.024	(0.446)	0.009	0.015
18	1.50	0.10	0.024	(0.444)	0.009	0.015
19	1.58	0.10	0.024	(0.442)	0.009	0.015
20	1.67	0.10	0.024	(0.441)	0.009	0.015
21	1.75	0.10	0.024	(0.439)	0.009	0.015
22	1.83	0.13	0.032	(0.437)	0.012	0.020
23	1.92	0.13	0.032	(0.435)	0.012	0.020
24	2.00	0.13	0.032	(0.434)	0.012	0.020
25	2.08	0.13	0.032	(0.432)	0.012	0.020
26	2.17	0.13	0.032	(0.430)	0.012	0.020
27	2.25	0.13	0.032	(0.428)	0.012	0.020
28	2.33	0.13	0.032	(0.427)	0.012	0.020
29	2.42	0.13	0.032	(0.425)	0.012	0.020
30	2.50	0.13	0.032	(0.423)	0.012	0.020
31	2.58	0.17	0.040	(0.421)	0.015	0.025
32	2.67	0.17	0.040	(0.420)	0.015	0.025
33	2.75	0.17	0.040	(0.418)	0.015	0.025
34	2.83	0.17	0.040	(0.416)	0.015	0.025
35	2.92	0.17	0.040	(0.414)	0.015	0.025
36	3.00	0.17	0.040	(0.413)	0.015	0.025
37	3.08	0.17	0.040	(0.411)	0.015	0.025
38	3.17	0.17	0.040	(0.409)	0.015	0.025
39	3.25	0.17	0.040	(0.408)	0.015	0.025
40	3.33	0.17	0.040	(0.406)	0.015	0.025
41	3.42	0.17	0.040	(0.404)	0.015	0.025
42	3.50	0.17	0.040	(0.403)	0.015	0.025
43	3.58	0.17	0.040	(0.401)	0.015	0.025
44	3.67	0.17	0.040	(0.399)	0.015	0.025
45	3.75	0.17	0.040	(0.397)	0.015	0.025
46	3.83	0.20	0.048	(0.396)	0.018	0.030
47	3.92	0.20	0.048	(0.394)	0.018	0.030
48	4.00	0.20	0.048	(0.392)	0.018	0.030
49	4.08	0.20	0.048	(0.391)	0.018	0.030
50	4.17	0.20	0.048	(0.389)	0.018	0.030
51	4.25	0.20	0.048	(0.387)	0.018	0.030
52	4.33	0.23	0.056	(0.386)	0.021	0.035
53	4.42	0.23	0.056	(0.384)	0.021	0.035
54	4.50	0.23	0.056	(0.383)	0.021	0.035
55	4.58	0.23	0.056	(0.381)	0.021	0.035
56	4.67	0.23	0.056	(0.379)	0.021	0.035
57	4.75	0.23	0.056	(0.378)	0.021	0.035
58	4.83	0.27	0.064	(0.376)	0.024	0.040
59	4.92	0.27	0.064	(0.374)	0.024	0.040
60	5.00	0.27	0.064	(0.373)	0.024	0.040
61	5.08	0.20	0.048	(0.371)	0.018	0.030
62	5.17	0.20	0.048	(0.370)	0.018	0.030

63	5.25	0.20	0.048	(0.368)	0.018	0.030
64	5.33	0.23	0.056	(0.366)	0.021	0.035
65	5.42	0.23	0.056	(0.365)	0.021	0.035
66	5.50	0.23	0.056	(0.363)	0.021	0.035
67	5.58	0.27	0.064	(0.362)	0.024	0.040
68	5.67	0.27	0.064	(0.360)	0.024	0.040
69	5.75	0.27	0.064	(0.358)	0.024	0.040
70	5.83	0.27	0.064	(0.357)	0.024	0.040
71	5.92	0.27	0.064	(0.355)	0.024	0.040
72	6.00	0.27	0.064	(0.354)	0.024	0.040
73	6.08	0.30	0.072	(0.352)	0.027	0.045
74	6.17	0.30	0.072	(0.350)	0.027	0.045
75	6.25	0.30	0.072	(0.349)	0.027	0.045
76	6.33	0.30	0.072	(0.347)	0.027	0.045
77	6.42	0.30	0.072	(0.346)	0.027	0.045
78	6.50	0.30	0.072	(0.344)	0.027	0.045
79	6.58	0.33	0.080	(0.343)	0.030	0.050
80	6.67	0.33	0.080	(0.341)	0.030	0.050
81	6.75	0.33	0.080	(0.340)	0.030	0.050
82	6.83	0.33	0.080	(0.338)	0.030	0.050
83	6.92	0.33	0.080	(0.337)	0.030	0.050
84	7.00	0.33	0.080	(0.335)	0.030	0.050
85	7.08	0.33	0.080	(0.333)	0.030	0.050
86	7.17	0.33	0.080	(0.332)	0.030	0.050
87	7.25	0.33	0.080	(0.330)	0.030	0.050
88	7.33	0.37	0.088	(0.329)	0.033	0.055
89	7.42	0.37	0.088	(0.327)	0.033	0.055
90	7.50	0.37	0.088	(0.326)	0.033	0.055
91	7.58	0.40	0.096	(0.324)	0.036	0.060
92	7.67	0.40	0.096	(0.323)	0.036	0.060
93	7.75	0.40	0.096	(0.321)	0.036	0.060
94	7.83	0.43	0.104	(0.320)	0.040	0.064
95	7.92	0.43	0.104	(0.319)	0.040	0.064
96	8.00	0.43	0.104	(0.317)	0.040	0.064
97	8.08	0.50	0.120	(0.316)	0.046	0.074
98	8.17	0.50	0.120	(0.314)	0.046	0.074
99	8.25	0.50	0.120	(0.313)	0.046	0.074
100	8.33	0.50	0.120	(0.311)	0.046	0.074
101	8.42	0.50	0.120	(0.310)	0.046	0.074
102	8.50	0.50	0.120	(0.308)	0.046	0.074
103	8.58	0.53	0.128	(0.307)	0.049	0.079
104	8.67	0.53	0.128	(0.305)	0.049	0.079
105	8.75	0.53	0.128	(0.304)	0.049	0.079
106	8.83	0.57	0.136	(0.302)	0.052	0.084
107	8.92	0.57	0.136	(0.301)	0.052	0.084
108	9.00	0.57	0.136	(0.300)	0.052	0.084
109	9.08	0.63	0.152	(0.298)	0.058	0.094
110	9.17	0.63	0.152	(0.297)	0.058	0.094
111	9.25	0.63	0.152	(0.295)	0.058	0.094
112	9.33	0.67	0.160	(0.294)	0.061	0.099
113	9.42	0.67	0.160	(0.293)	0.061	0.099
114	9.50	0.67	0.160	(0.291)	0.061	0.099
115	9.58	0.70	0.168	(0.290)	0.064	0.104
116	9.67	0.70	0.168	(0.288)	0.064	0.104
117	9.75	0.70	0.168	(0.287)	0.064	0.104
118	9.83	0.73	0.176	(0.286)	0.067	0.109
119	9.92	0.73	0.176	(0.284)	0.067	0.109
120	10.00	0.73	0.176	(0.283)	0.067	0.109
121	10.08	0.50	0.120	(0.282)	0.046	0.074
122	10.17	0.50	0.120	(0.280)	0.046	0.074
123	10.25	0.50	0.120	(0.279)	0.046	0.074
124	10.33	0.50	0.120	(0.277)	0.046	0.074
125	10.42	0.50	0.120	(0.276)	0.046	0.074
126	10.50	0.50	0.120	(0.275)	0.046	0.074
127	10.58	0.67	0.160	(0.273)	0.061	0.099
128	10.67	0.67	0.160	(0.272)	0.061	0.099
129	10.75	0.67	0.160	(0.271)	0.061	0.099
130	10.83	0.67	0.160	(0.269)	0.061	0.099
131	10.92	0.67	0.160	(0.268)	0.061	0.099
132	11.00	0.67	0.160	(0.267)	0.061	0.099
133	11.08	0.63	0.152	(0.265)	0.058	0.094
134	11.17	0.63	0.152	(0.264)	0.058	0.094
135	11.25	0.63	0.152	(0.263)	0.058	0.094
136	11.33	0.63	0.152	(0.262)	0.058	0.094
137	11.42	0.63	0.152	(0.260)	0.058	0.094
138	11.50	0.63	0.152	(0.259)	0.058	0.094
139	11.58	0.57	0.136	(0.258)	0.052	0.084
140	11.67	0.57	0.136	(0.256)	0.052	0.084
141	11.75	0.57	0.136	(0.255)	0.052	0.084
142	11.83	0.60	0.144	(0.254)	0.055	0.089
143	11.92	0.60	0.144	(0.253)	0.055	0.089

144	12.00	0.60	0.144	(0.251)	0.055	0.089
145	12.08	0.83	0.200	(0.250)	0.076	0.124
146	12.17	0.83	0.200	(0.249)	0.076	0.124
147	12.25	0.83	0.200	(0.248)	0.076	0.124
148	12.33	0.87	0.208	(0.246)	0.079	0.129
149	12.42	0.87	0.208	(0.245)	0.079	0.129
150	12.50	0.87	0.208	(0.244)	0.079	0.129
151	12.58	0.93	0.224	(0.243)	0.085	0.139
152	12.67	0.93	0.224	(0.241)	0.085	0.139
153	12.75	0.93	0.224	(0.240)	0.085	0.139
154	12.83	0.97	0.232	(0.239)	0.088	0.144
155	12.92	0.97	0.232	(0.238)	0.088	0.144
156	13.00	0.97	0.232	(0.237)	0.088	0.144
157	13.08	1.13	0.272	(0.235)	0.103	0.169
158	13.17	1.13	0.272	(0.234)	0.103	0.169
159	13.25	1.13	0.272	(0.233)	0.103	0.169
160	13.33	1.13	0.272	(0.232)	0.103	0.169
161	13.42	1.13	0.272	(0.231)	0.103	0.169
162	13.50	1.13	0.272	(0.229)	0.103	0.169
163	13.58	0.77	0.184	(0.228)	0.070	0.114
164	13.67	0.77	0.184	(0.227)	0.070	0.114
165	13.75	0.77	0.184	(0.226)	0.070	0.114
166	13.83	0.77	0.184	(0.225)	0.070	0.114
167	13.92	0.77	0.184	(0.224)	0.070	0.114
168	14.00	0.77	0.184	(0.223)	0.070	0.114
169	14.08	0.90	0.216	(0.221)	0.082	0.134
170	14.17	0.90	0.216	(0.220)	0.082	0.134
171	14.25	0.90	0.216	(0.219)	0.082	0.134
172	14.33	0.87	0.208	(0.218)	0.079	0.129
173	14.42	0.87	0.208	(0.217)	0.079	0.129
174	14.50	0.87	0.208	(0.216)	0.079	0.129
175	14.58	0.87	0.208	(0.215)	0.079	0.129
176	14.67	0.87	0.208	(0.214)	0.079	0.129
177	14.75	0.87	0.208	(0.212)	0.079	0.129
178	14.83	0.83	0.200	(0.211)	0.076	0.124
179	14.92	0.83	0.200	(0.210)	0.076	0.124
180	15.00	0.83	0.200	(0.209)	0.076	0.124
181	15.08	0.80	0.192	(0.208)	0.073	0.119
182	15.17	0.80	0.192	(0.207)	0.073	0.119
183	15.25	0.80	0.192	(0.206)	0.073	0.119
184	15.33	0.77	0.184	(0.205)	0.070	0.114
185	15.42	0.77	0.184	(0.204)	0.070	0.114
186	15.50	0.77	0.184	(0.203)	0.070	0.114
187	15.58	0.63	0.152	(0.202)	0.058	0.094
188	15.67	0.63	0.152	(0.201)	0.058	0.094
189	15.75	0.63	0.152	(0.200)	0.058	0.094
190	15.83	0.63	0.152	(0.199)	0.058	0.094
191	15.92	0.63	0.152	(0.198)	0.058	0.094
192	16.00	0.63	0.152	(0.197)	0.058	0.094
193	16.08	0.13	0.032	(0.196)	0.012	0.020
194	16.17	0.13	0.032	(0.195)	0.012	0.020
195	16.25	0.13	0.032	(0.194)	0.012	0.020
196	16.33	0.13	0.032	(0.193)	0.012	0.020
197	16.42	0.13	0.032	(0.192)	0.012	0.020
198	16.50	0.13	0.032	(0.191)	0.012	0.020
199	16.58	0.10	0.024	(0.190)	0.009	0.015
200	16.67	0.10	0.024	(0.189)	0.009	0.015
201	16.75	0.10	0.024	(0.188)	0.009	0.015
202	16.83	0.10	0.024	(0.187)	0.009	0.015
203	16.92	0.10	0.024	(0.186)	0.009	0.015
204	17.00	0.10	0.024	(0.185)	0.009	0.015
205	17.08	0.17	0.040	(0.184)	0.015	0.025
206	17.17	0.17	0.040	(0.183)	0.015	0.025
207	17.25	0.17	0.040	(0.182)	0.015	0.025
208	17.33	0.17	0.040	(0.181)	0.015	0.025
209	17.42	0.17	0.040	(0.180)	0.015	0.025
210	17.50	0.17	0.040	(0.180)	0.015	0.025
211	17.58	0.17	0.040	(0.179)	0.015	0.025
212	17.67	0.17	0.040	(0.178)	0.015	0.025
213	17.75	0.17	0.040	(0.177)	0.015	0.025
214	17.83	0.13	0.032	(0.176)	0.012	0.020
215	17.92	0.13	0.032	(0.175)	0.012	0.020
216	18.00	0.13	0.032	(0.174)	0.012	0.020
217	18.08	0.13	0.032	(0.173)	0.012	0.020
218	18.17	0.13	0.032	(0.173)	0.012	0.020
219	18.25	0.13	0.032	(0.172)	0.012	0.020
220	18.33	0.13	0.032	(0.171)	0.012	0.020
221	18.42	0.13	0.032	(0.170)	0.012	0.020
222	18.50	0.13	0.032	(0.169)	0.012	0.020
223	18.58	0.10	0.024	(0.168)	0.009	0.015
224	18.67	0.10	0.024	(0.168)	0.009	0.015

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225  18.75     0.10      0.024       (  0.167)       0.009        0.015
226  18.83     0.07      0.016       (  0.166)       0.006        0.010
227  18.92     0.07      0.016       (  0.165)       0.006        0.010
228  19.00     0.07      0.016       (  0.164)       0.006        0.010
229  19.08     0.10      0.024       (  0.164)       0.009        0.015
230  19.17     0.10      0.024       (  0.163)       0.009        0.015
231  19.25     0.10      0.024       (  0.162)       0.009        0.015
232  19.33     0.13      0.032       (  0.161)       0.012        0.020
233  19.42     0.13      0.032       (  0.161)       0.012        0.020
234  19.50     0.13      0.032       (  0.160)       0.012        0.020
235  19.58     0.10      0.024       (  0.159)       0.009        0.015
236  19.67     0.10      0.024       (  0.158)       0.009        0.015
237  19.75     0.10      0.024       (  0.158)       0.009        0.015
238  19.83     0.07      0.016       (  0.157)       0.006        0.010
239  19.92     0.07      0.016       (  0.156)       0.006        0.010
240  20.00     0.07      0.016       (  0.156)       0.006        0.010
241  20.08     0.10      0.024       (  0.155)       0.009        0.015
242  20.17     0.10      0.024       (  0.154)       0.009        0.015
243  20.25     0.10      0.024       (  0.154)       0.009        0.015
244  20.33     0.10      0.024       (  0.153)       0.009        0.015
245  20.42     0.10      0.024       (  0.152)       0.009        0.015
246  20.50     0.10      0.024       (  0.152)       0.009        0.015
247  20.58     0.10      0.024       (  0.151)       0.009        0.015
248  20.67     0.10      0.024       (  0.150)       0.009        0.015
249  20.75     0.10      0.024       (  0.150)       0.009        0.015
250  20.83     0.07      0.016       (  0.149)       0.006        0.010
251  20.92     0.07      0.016       (  0.148)       0.006        0.010
252  21.00     0.07      0.016       (  0.148)       0.006        0.010
253  21.08     0.10      0.024       (  0.147)       0.009        0.015
254  21.17     0.10      0.024       (  0.147)       0.009        0.015
255  21.25     0.10      0.024       (  0.146)       0.009        0.015
256  21.33     0.07      0.016       (  0.146)       0.006        0.010
257  21.42     0.07      0.016       (  0.145)       0.006        0.010
258  21.50     0.07      0.016       (  0.144)       0.006        0.010
259  21.58     0.10      0.024       (  0.144)       0.009        0.015
260  21.67     0.10      0.024       (  0.143)       0.009        0.015
261  21.75     0.10      0.024       (  0.143)       0.009        0.015
262  21.83     0.07      0.016       (  0.142)       0.006        0.010
263  21.92     0.07      0.016       (  0.142)       0.006        0.010
264  22.00     0.07      0.016       (  0.141)       0.006        0.010
265  22.08     0.10      0.024       (  0.141)       0.009        0.015
266  22.17     0.10      0.024       (  0.141)       0.009        0.015
267  22.25     0.10      0.024       (  0.140)       0.009        0.015
268  22.33     0.07      0.016       (  0.140)       0.006        0.010
269  22.42     0.07      0.016       (  0.139)       0.006        0.010
270  22.50     0.07      0.016       (  0.139)       0.006        0.010
271  22.58     0.07      0.016       (  0.138)       0.006        0.010
272  22.67     0.07      0.016       (  0.138)       0.006        0.010
273  22.75     0.07      0.016       (  0.138)       0.006        0.010
274  22.83     0.07      0.016       (  0.137)       0.006        0.010
275  22.92     0.07      0.016       (  0.137)       0.006        0.010
276  23.00     0.07      0.016       (  0.137)       0.006        0.010
277  23.08     0.07      0.016       (  0.136)       0.006        0.010
278  23.17     0.07      0.016       (  0.136)       0.006        0.010
279  23.25     0.07      0.016       (  0.136)       0.006        0.010
280  23.33     0.07      0.016       (  0.135)       0.006        0.010
281  23.42     0.07      0.016       (  0.135)       0.006        0.010
282  23.50     0.07      0.016       (  0.135)       0.006        0.010
283  23.58     0.07      0.016       (  0.135)       0.006        0.010
284  23.67     0.07      0.016       (  0.134)       0.006        0.010
285  23.75     0.07      0.016       (  0.134)       0.006        0.010
286  23.83     0.07      0.016       (  0.134)       0.006        0.010
287  23.92     0.07      0.016       (  0.134)       0.006        0.010
288  24.00     0.07      0.016       (  0.134)       0.006        0.010
               (Loss Rate Not Used)
    Sum =     100.0                                  Sum =    14.9
      Flood volume = Effective rainfall      1.24(In)
       times area       5.9(Ac.)/[(In)/(Ft.)] =       0.6(Ac.Ft)
      Total soil loss =      0.76(In)
      Total soil loss =     0.374(Ac.Ft)
      Total rainfall =      2.00(In)
      Flood volume =       26601.8 Cubic Feet
      Total soil loss =       16304.3 Cubic Feet
      ---------------------------------------------------------------------
       Peak flow rate of this hydrograph =      1.005(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	0.0002	0.03	Q				
0+10	0.0006	0.05	Q				
0+15	0.0010	0.06	Q				
0+20	0.0015	0.07	Q				
0+25	0.0021	0.09	Q				
0+30	0.0027	0.09	Q				
0+35	0.0033	0.09	Q				
0+40	0.0039	0.09	Q				
0+45	0.0045	0.09	Q				
0+50	0.0052	0.10	Q				
0+55	0.0060	0.12	Q				
1+ 0	0.0069	0.12	Q				
1+ 5	0.0076	0.10	Q				
1+10	0.0082	0.09	Q				
1+15	0.0088	0.09	Q				
1+20	0.0094	0.09	Q				
1+25	0.0100	0.09	Q				
1+30	0.0106	0.09	Q				
1+35	0.0112	0.09	Q				
1+40	0.0119	0.09	Q				
1+45	0.0125	0.09	Q				
1+50	0.0132	0.10	Q				
1+55	0.0140	0.12	Q				
2+ 0	0.0148	0.12	Q				
2+ 5	0.0156	0.12	QV				
2+10	0.0164	0.12	QV				
2+15	0.0172	0.12	QV				
2+20	0.0181	0.12	QV				
2+25	0.0189	0.12	QV				
2+30	0.0197	0.12	QV				
2+35	0.0206	0.13	QV				
2+40	0.0216	0.15	QV				
2+45	0.0226	0.15	QV				
2+50	0.0236	0.15	QV				
2+55	0.0247	0.15	QV				
3+ 0	0.0257	0.15	QV				
3+ 5	0.0267	0.15	QV				
3+10	0.0277	0.15	QV				
3+15	0.0287	0.15	QV				
3+20	0.0297	0.15	QV				
3+25	0.0308	0.15	Q V				
3+30	0.0318	0.15	Q V				
3+35	0.0328	0.15	Q V				
3+40	0.0338	0.15	Q V				
3+45	0.0348	0.15	Q V				
3+50	0.0360	0.16	Q V				
3+55	0.0372	0.17	Q V				
4+ 0	0.0384	0.18	Q V				
4+ 5	0.0396	0.18	Q V				
4+10	0.0408	0.18	Q V				
4+15	0.0420	0.18	Q V				
4+20	0.0434	0.19	Q V				
4+25	0.0448	0.20	Q V				
4+30	0.0462	0.21	Q V				
4+35	0.0476	0.21	Q V				
4+40	0.0490	0.21	Q V				
4+45	0.0505	0.21	Q V				
4+50	0.0520	0.22	Q V				
4+55	0.0536	0.23	Q V				
5+ 0	0.0552	0.24	Q V				
5+ 5	0.0567	0.21	Q V				
5+10	0.0579	0.18	Q V				
5+15	0.0591	0.18	Q V				
5+20	0.0605	0.19	Q V				
5+25	0.0619	0.20	Q V				
5+30	0.0633	0.21	Q V				
5+35	0.0648	0.22	Q V				
5+40	0.0664	0.23	Q V				
5+45	0.0681	0.24	Q V				
5+50	0.0697	0.24	Q V				
5+55	0.0713	0.24	Q V				
6+ 0	0.0729	0.24	Q V				
6+ 5	0.0747	0.25	|Q V				
6+10	0.0765	0.26	|Q V				
6+15	0.0783	0.27	|Q V				
6+20	0.0802	0.27	|Q V				
6+25	0.0820	0.27	|Q V				

6+30	0.0838	0.27	Q V				
6+35	0.0858	0.28	Q V				
6+40	0.0878	0.29	Q V				
6+45	0.0898	0.30	Q V				
6+50	0.0918	0.30	Q V				
6+55	0.0939	0.30	Q V				
7+ 0	0.0959	0.30	Q V				
7+ 5	0.0980	0.30	Q V				
7+10	0.1000	0.30	Q V				
7+15	0.1020	0.30	Q V				
7+20	0.1042	0.31	Q V				
7+25	0.1064	0.32	Q V				
7+30	0.1086	0.32	Q V				
7+35	0.1110	0.34	Q V				
7+40	0.1134	0.35	Q V				
7+45	0.1158	0.35	Q V				
7+50	0.1184	0.37	Q V				
7+55	0.1210	0.38	Q V				
8+ 0	0.1237	0.38	Q V				
8+ 5	0.1265	0.42	Q V				
8+10	0.1295	0.44	Q V				
8+15	0.1326	0.44	Q V				
8+20	0.1356	0.44	Q V				
8+25	0.1387	0.44	Q V				
8+30	0.1417	0.44	Q V				
8+35	0.1449	0.46	Q V				
8+40	0.1481	0.47	Q V				
8+45	0.1514	0.47	Q V				
8+50	0.1548	0.49	Q V				
8+55	0.1582	0.50	Q V				
9+ 0	0.1617	0.50	Q V				
9+ 5	0.1653	0.53	Q V				
9+10	0.1692	0.56	Q V				
9+15	0.1730	0.56	Q V				
9+20	0.1770	0.58	Q V				
9+25	0.1811	0.59	Q V				
9+30	0.1851	0.59	Q V				
9+35	0.1893	0.61	Q V				
9+40	0.1936	0.62	Q V				
9+45	0.1978	0.62	Q V				
9+50	0.2022	0.64	Q V				
9+55	0.2067	0.65	Q V				
10+ 0	0.2111	0.65	Q V				
10+ 5	0.2149	0.54	Q V				
10+10	0.2181	0.46	Q V				
10+15	0.2211	0.45	Q V				
10+20	0.2242	0.44	Q V				
10+25	0.2272	0.44	Q V				
10+30	0.2303	0.44	Q V				
10+35	0.2339	0.52	Q V				
10+40	0.2379	0.58	Q V				
10+45	0.2419	0.59	Q V				
10+50	0.2460	0.59	Q V				
10+55	0.2501	0.59	Q V				
11+ 0	0.2541	0.59	Q V				
11+ 5	0.2581	0.58	Q V				
11+10	0.2620	0.56	Q V				
11+15	0.2658	0.56	Q V				
11+20	0.2697	0.56	Q V				
11+25	0.2736	0.56	Q V				
11+30	0.2775	0.56	Q V				
11+35	0.2811	0.53	Q V				
11+40	0.2846	0.51	Q V				
11+45	0.2881	0.50	Q V				
11+50	0.2916	0.52	Q V				
11+55	0.2953	0.53	Q V				
12+ 0	0.2989	0.53	Q V				
12+ 5	0.3033	0.64	Q V				
12+10	0.3083	0.72	Q V				
12+15	0.3134	0.74	Q V				
12+20	0.3186	0.75	Q V				
12+25	0.3239	0.77	Q V				
12+30	0.3291	0.77	Q V				
12+35	0.3346	0.80	Q V				
12+40	0.3403	0.82	Q V				
12+45	0.3460	0.83	Q V				
12+50	0.3518	0.84	Q V				
12+55	0.3577	0.85	Q V				
13+ 0	0.3636	0.86	Q V				
13+ 5	0.3700	0.93	Q V				
13+10	0.3769	0.99	Q V				

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13+15       0.3838      1.00  |    Q      |           |     V     |           |
13+20       0.3907      1.00  |    Q      |           |     V     |           |
13+25       0.3976      1.00  |    Q      |           |      V    |           |
13+30       0.4045      1.00  |    Q      |           |      V    |           |
13+35       0.4103      0.84  |   Q       |           |      V    |           |
13+40       0.4152      0.71  |  Q        |           |       V   |           |
13+45       0.4199      0.69  |  Q        |           |       V   |           |
13+50       0.4246      0.68  |  Q        |           |       V   |           |
13+55       0.4292      0.68  |  Q        |           |        V  |           |
14+ 0       0.4339      0.68  |  Q        |           |        V  |           |
14+ 5       0.4390      0.74  |  Q        |           |        V  |           |
14+10       0.4445      0.79  |   Q       |           |         V |           |
14+15       0.4499      0.80  |   Q       |           |         V |           |
14+20       0.4553      0.78  |   Q       |           |         V |           |
14+25       0.4606      0.77  |   Q       |           |          V|           |
14+30       0.4659      0.77  |   Q       |           |          V|           |
14+35       0.4712      0.77  |   Q       |           |          V|           |
14+40       0.4765      0.77  |   Q       |           |           |V          |
14+45       0.4818      0.77  |   Q       |           |           |V          |
14+50       0.4870      0.75  |   Q       |           |           |V          |
14+55       0.4921      0.74  |  Q        |           |           | V         |
15+ 0       0.4972      0.74  |  Q        |           |           | V         |
15+ 5       0.5022      0.72  |  Q        |           |           | V         |
15+10       0.5071      0.71  |  Q        |           |           |  V        |
15+15       0.5120      0.71  |  Q        |           |           |  V        |
15+20       0.5168      0.69  |  Q        |           |           |  V        |
15+25       0.5215      0.68  |  Q        |           |           |   V       |
15+30       0.5261      0.68  |  Q        |           |           |   V       |
15+35       0.5304      0.62  |  Q        |           |           |   V       |
15+40       0.5343      0.57  |  Q        |           |           |   V       |
15+45       0.5382      0.56  |  Q        |           |           |    V      |
15+50       0.5421      0.56  |  Q        |           |           |    V      |
15+55       0.5460      0.56  |  Q        |           |           |    V      |
16+ 0       0.5498      0.56  |  Q        |           |           |     V     |
16+ 5       0.5521      0.33  |Q          |           |           |     V     |
16+10       0.5532      0.16  Q           |           |           |     V     |
16+15       0.5540      0.13  Q           |           |           |     V     |
16+20       0.5549      0.12  Q           |           |           |     V     |
16+25       0.5557      0.12  Q           |           |           |     V     |
16+30       0.5565      0.12  Q           |           |           |     V     |
16+35       0.5572      0.10  Q           |           |           |     V     |
16+40       0.5578      0.09  Q           |           |           |     V     |
16+45       0.5584      0.09  Q           |           |           |     V     |
16+50       0.5590      0.09  Q           |           |           |     V     |
16+55       0.5597      0.09  Q           |           |           |     V     |
17+ 0       0.5603      0.09  Q           |           |           |     V     |
17+ 5       0.5611      0.12  Q           |           |           |     V     |
17+10       0.5621      0.14  Q           |           |           |     V     |
17+15       0.5631      0.15  Q           |           |           |     V     |
17+20       0.5641      0.15  Q           |           |           |     V     |
17+25       0.5651      0.15  Q           |           |           |      V    |
17+30       0.5661      0.15  Q           |           |           |      V    |
17+35       0.5671      0.15  Q           |           |           |      V    |
17+40       0.5682      0.15  Q           |           |           |      V    |
17+45       0.5692      0.15  Q           |           |           |      V    |
17+50       0.5701      0.13  Q           |           |           |      V    |
17+55       0.5709      0.12  Q           |           |           |      V    |
18+ 0       0.5717      0.12  Q           |           |           |      V    |
18+ 5       0.5726      0.12  Q           |           |           |      V    |
18+10       0.5734      0.12  Q           |           |           |      V    |
18+15       0.5742      0.12  Q           |           |           |      V    |
18+20       0.5750      0.12  Q           |           |           |      V    |
18+25       0.5758      0.12  Q           |           |           |      V    |
18+30       0.5766      0.12  Q           |           |           |      V    |
18+35       0.5773      0.10  Q           |           |           |      V    |
18+40       0.5780      0.09  Q           |           |           |      V    |
18+45       0.5786      0.09  Q           |           |           |      V    |
18+50       0.5791      0.07  Q           |           |           |      V    |
18+55       0.5795      0.06  Q           |           |           |      V    |
19+ 0       0.5799      0.06  Q           |           |           |      V    |
19+ 5       0.5804      0.07  Q           |           |           |       V   |
19+10       0.5810      0.09  Q           |           |           |       V   |
19+15       0.5816      0.09  Q           |           |           |       V   |
19+20       0.5824      0.10  Q           |           |           |       V   |
19+25       0.5831      0.12  Q           |           |           |       V   |
19+30       0.5840      0.12  Q           |           |           |       V   |
19+35       0.5847      0.10  Q           |           |           |       V   |
19+40       0.5853      0.09  Q           |           |           |       V   |
19+45       0.5859      0.09  Q           |           |           |       V   |
19+50       0.5864      0.07  Q           |           |           |       V   |
19+55       0.5868      0.06  Q           |           |           |       V   |
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   20+ 0       0.5873      0.06  Q          |          |          |        V |
   20+ 5       0.5878      0.07  Q          |          |          |        V |
   20+10       0.5884      0.09  Q          |          |          |        V |
   20+15       0.5890      0.09  Q          |          |          |        V |
   20+20       0.5896      0.09  Q          |          |          |        V |
   20+25       0.5902      0.09  Q          |          |          |        V |
   20+30       0.5908      0.09  Q          |          |          |        V |
   20+35       0.5914      0.09  Q          |          |          |        V |
   20+40       0.5920      0.09  Q          |          |          |        V |
   20+45       0.5926      0.09  Q          |          |          |        V |
   20+50       0.5931      0.07  Q          |          |          |        V |
   20+55       0.5936      0.06  Q          |          |          |        V |
   21+ 0       0.5940      0.06  Q          |          |          |        V |
   21+ 5       0.5945      0.07  Q          |          |          |        V |
   21+10       0.5951      0.09  Q          |          |          |        V |
   21+15       0.5957      0.09  Q          |          |          |         V|
   21+20       0.5962      0.07  Q          |          |          |         V|
   21+25       0.5966      0.06  Q          |          |          |         V|
   21+30       0.5970      0.06  Q          |          |          |         V|
   21+35       0.5975      0.07  Q          |          |          |         V|
   21+40       0.5981      0.09  Q          |          |          |         V|
   21+45       0.5987      0.09  Q          |          |          |         V|
   21+50       0.5992      0.07  Q          |          |          |         V|
   21+55       0.5997      0.06  Q          |          |          |         V|
   22+ 0       0.6001      0.06  Q          |          |          |         V|
   22+ 5       0.6006      0.07  Q          |          |          |         V|
   22+10       0.6012      0.09  Q          |          |          |         V|
   22+15       0.6018      0.09  Q          |          |          |         V|
   22+20       0.6023      0.07  Q          |          |          |         V|
   22+25       0.6027      0.06  Q          |          |          |         V|
   22+30       0.6031      0.06  Q          |          |          |         V|
   22+35       0.6035      0.06  Q          |          |          |         V|
   22+40       0.6039      0.06  Q          |          |          |         V|
   22+45       0.6043      0.06  Q          |          |          |         V|
   22+50       0.6048      0.06  Q          |          |          |         V|
   22+55       0.6052      0.06  Q          |          |          |         V|
   23+ 0       0.6056      0.06  Q          |          |          |         V|
   23+ 5       0.6060      0.06  Q          |          |          |         V|
   23+10       0.6064      0.06  Q          |          |          |         V|
   23+15       0.6068      0.06  Q          |          |          |         V|
   23+20       0.6072      0.06  Q          |          |          |         V|
   23+25       0.6076      0.06  Q          |          |          |         V|
   23+30       0.6080      0.06  Q          |          |          |         V|
   23+35       0.6084      0.06  Q          |          |          |         V|
   23+40       0.6088      0.06  Q          |          |          |         V|
   23+45       0.6092      0.06  Q          |          |          |         V|
   23+50       0.6096      0.06  Q          |          |          |         V|
   23+55       0.6100      0.06  Q          |          |          |         V|
   24+ 0       0.6105      0.06  Q          |          |          |         V|
   24+ 5       0.6107      0.03  Q          |          |          |         V|
   24+10       0.6107      0.00  Q          |          |          |         V|
   24+15       0.6107      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

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              Study date  10/09/24 File: PROB2242.out

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Riverside County Synthetic Unit Hydrology Method
RCFC & WCD Manual date - April 1978


Program License Serial Number 5006

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 English (in-lb) Input Units Used
 English Rainfall Data (Inches) Input Values Used

 English Units used in output format



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Drainage Area =       0.32(Ac.)  =      0.001 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment =       0.32(Ac.)  =      0.001 Sq. Mi.
Length along longest watercourse =     217.00(Ft.)
Length along longest watercourse measured to centroid =     110.00(Ft.)
Length along longest watercourse =      0.041 Mi.
Length along longest watercourse measured to centroid =      0.021 Mi.
Difference in elevation =       9.07(Ft.)
Slope along watercourse =    220.6894 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time =    0.009 Hr.
Lag time =     0.53 Min.
25% of lag time =     0.13 Min.
40% of lag time =     0.21 Min.
Unit time =     5.00 Min.
Duration of storm = 24 Hour(s)
User Entered Base Flow =     0.00(CFS)

2 YEAR Area rainfall data:


Area(Ac.)[1]       Rainfall(In)[2]      Weighting[1*2]
        0.32            2.00                  0.64

100 YEAR Area rainfall data:


Area(Ac.)[1]       Rainfall(In)[2]      Weighting[1*2]
        0.32            6.00                  1.92

STORM EVENT (YEAR) =    2.00
Area Averaged 2-Year Rainfall =    2.000(In)
Area Averaged 100-Year Rainfall =    6.000(In)

Point rain (area averaged) =    2.000(In)
Areal adjustment factor =  100.00 %
Adjusted average point rain =    2.000(In)

Sub-Area Data:
Area(Ac.)         Runoff Index   Impervious %
     0.320           62.50          0.650
 Total Area Entered =      0.32(Ac.)


RI    RI   Infil. Rate Impervious   Adj. Infil. Rate  Area%     F
AMC2 AMC-1     (In/Hr)    (Dec.%)     (In/Hr)      (Dec.)    (In/Hr)
62.5  42.5      0.645     0.650        0.268       1.000      0.268
                                                 Sum (F) =   0.268
Area averaged mean soil loss (F) (In/Hr) =  0.268
Minimum soil loss rate ((In/Hr)) =  0.134
(for 24 hour storm duration)
Soil low loss rate (decimal) =   0.380
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               U n i t  H y d r o g r a p h
                      VALLEY S-Curve
------------------------------------------------------------------------
               Unit Hydrograph Data
------------------------------------------------------------------------
Unit time period   Time % of lag   Distribution   Unit Hydrograph
    (hrs)                          Graph %           (CFS)
```

1	0.083	945.045	100.000		0.323
			Sum = 100.000	Sum=	0.323

The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	0.07	0.016	(0.475)	0.006	0.010
2	0.17	0.07	0.016	(0.473)	0.006	0.010
3	0.25	0.07	0.016	(0.471)	0.006	0.010
4	0.33	0.10	0.024	(0.469)	0.009	0.015
5	0.42	0.10	0.024	(0.468)	0.009	0.015
6	0.50	0.10	0.024	(0.466)	0.009	0.015
7	0.58	0.10	0.024	(0.464)	0.009	0.015
8	0.67	0.10	0.024	(0.462)	0.009	0.015
9	0.75	0.10	0.024	(0.460)	0.009	0.015
10	0.83	0.13	0.032	(0.458)	0.012	0.020
11	0.92	0.13	0.032	(0.457)	0.012	0.020
12	1.00	0.13	0.032	(0.455)	0.012	0.020
13	1.08	0.10	0.024	(0.453)	0.009	0.015
14	1.17	0.10	0.024	(0.451)	0.009	0.015
15	1.25	0.10	0.024	(0.449)	0.009	0.015
16	1.33	0.10	0.024	(0.448)	0.009	0.015
17	1.42	0.10	0.024	(0.446)	0.009	0.015
18	1.50	0.10	0.024	(0.444)	0.009	0.015
19	1.58	0.10	0.024	(0.442)	0.009	0.015
20	1.67	0.10	0.024	(0.441)	0.009	0.015
21	1.75	0.10	0.024	(0.439)	0.009	0.015
22	1.83	0.13	0.032	(0.437)	0.012	0.020
23	1.92	0.13	0.032	(0.435)	0.012	0.020
24	2.00	0.13	0.032	(0.434)	0.012	0.020
25	2.08	0.13	0.032	(0.432)	0.012	0.020
26	2.17	0.13	0.032	(0.430)	0.012	0.020
27	2.25	0.13	0.032	(0.428)	0.012	0.020
28	2.33	0.13	0.032	(0.427)	0.012	0.020
29	2.42	0.13	0.032	(0.425)	0.012	0.020
30	2.50	0.13	0.032	(0.423)	0.012	0.020
31	2.58	0.17	0.040	(0.421)	0.015	0.025
32	2.67	0.17	0.040	(0.420)	0.015	0.025
33	2.75	0.17	0.040	(0.418)	0.015	0.025
34	2.83	0.17	0.040	(0.416)	0.015	0.025
35	2.92	0.17	0.040	(0.414)	0.015	0.025
36	3.00	0.17	0.040	(0.413)	0.015	0.025
37	3.08	0.17	0.040	(0.411)	0.015	0.025
38	3.17	0.17	0.040	(0.409)	0.015	0.025
39	3.25	0.17	0.040	(0.408)	0.015	0.025
40	3.33	0.17	0.040	(0.406)	0.015	0.025
41	3.42	0.17	0.040	(0.404)	0.015	0.025
42	3.50	0.17	0.040	(0.403)	0.015	0.025
43	3.58	0.17	0.040	(0.401)	0.015	0.025
44	3.67	0.17	0.040	(0.399)	0.015	0.025
45	3.75	0.17	0.040	(0.397)	0.015	0.025
46	3.83	0.20	0.048	(0.396)	0.018	0.030
47	3.92	0.20	0.048	(0.394)	0.018	0.030
48	4.00	0.20	0.048	(0.392)	0.018	0.030
49	4.08	0.20	0.048	(0.391)	0.018	0.030
50	4.17	0.20	0.048	(0.389)	0.018	0.030
51	4.25	0.20	0.048	(0.387)	0.018	0.030
52	4.33	0.23	0.056	(0.386)	0.021	0.035
53	4.42	0.23	0.056	(0.384)	0.021	0.035
54	4.50	0.23	0.056	(0.383)	0.021	0.035
55	4.58	0.23	0.056	(0.381)	0.021	0.035
56	4.67	0.23	0.056	(0.379)	0.021	0.035
57	4.75	0.23	0.056	(0.378)	0.021	0.035
58	4.83	0.27	0.064	(0.376)	0.024	0.040
59	4.92	0.27	0.064	(0.374)	0.024	0.040
60	5.00	0.27	0.064	(0.373)	0.024	0.040
61	5.08	0.20	0.048	(0.371)	0.018	0.030
62	5.17	0.20	0.048	(0.370)	0.018	0.030
63	5.25	0.20	0.048	(0.368)	0.018	0.030
64	5.33	0.23	0.056	(0.366)	0.021	0.035
65	5.42	0.23	0.056	(0.365)	0.021	0.035
66	5.50	0.23	0.056	(0.363)	0.021	0.035
67	5.58	0.27	0.064	(0.362)	0.024	0.040
68	5.67	0.27	0.064	(0.360)	0.024	0.040
69	5.75	0.27	0.064	(0.358)	0.024	0.040
70	5.83	0.27	0.064	(0.357)	0.024	0.040
71	5.92	0.27	0.064	(0.355)	0.024	0.040
72	6.00	0.27	0.064	(0.354)	0.024	0.040
73	6.08	0.30	0.072	(0.352)	0.027	0.045
74	6.17	0.30	0.072	(0.350)	0.027	0.045
75	6.25	0.30	0.072	(0.349)	0.027	0.045

76	6.33	0.30	0.072	(0.347)	0.027	0.045
77	6.42	0.30	0.072	(0.346)	0.027	0.045
78	6.50	0.30	0.072	(0.344)	0.027	0.045
79	6.58	0.33	0.080	(0.343)	0.030	0.050
80	6.67	0.33	0.080	(0.341)	0.030	0.050
81	6.75	0.33	0.080	(0.340)	0.030	0.050
82	6.83	0.33	0.080	(0.338)	0.030	0.050
83	6.92	0.33	0.080	(0.337)	0.030	0.050
84	7.00	0.33	0.080	(0.335)	0.030	0.050
85	7.08	0.33	0.080	(0.333)	0.030	0.050
86	7.17	0.33	0.080	(0.332)	0.030	0.050
87	7.25	0.33	0.080	(0.330)	0.030	0.050
88	7.33	0.37	0.088	(0.329)	0.033	0.055
89	7.42	0.37	0.088	(0.327)	0.033	0.055
90	7.50	0.37	0.088	(0.326)	0.033	0.055
91	7.58	0.40	0.096	(0.324)	0.036	0.060
92	7.67	0.40	0.096	(0.323)	0.036	0.060
93	7.75	0.40	0.096	(0.321)	0.036	0.060
94	7.83	0.43	0.104	(0.320)	0.040	0.064
95	7.92	0.43	0.104	(0.319)	0.040	0.064
96	8.00	0.43	0.104	(0.317)	0.040	0.064
97	8.08	0.50	0.120	(0.316)	0.046	0.074
98	8.17	0.50	0.120	(0.314)	0.046	0.074
99	8.25	0.50	0.120	(0.313)	0.046	0.074
100	8.33	0.50	0.120	(0.311)	0.046	0.074
101	8.42	0.50	0.120	(0.310)	0.046	0.074
102	8.50	0.50	0.120	(0.308)	0.046	0.074
103	8.58	0.53	0.128	(0.307)	0.049	0.079
104	8.67	0.53	0.128	(0.305)	0.049	0.079
105	8.75	0.53	0.128	(0.304)	0.049	0.079
106	8.83	0.57	0.136	(0.302)	0.052	0.084
107	8.92	0.57	0.136	(0.301)	0.052	0.084
108	9.00	0.57	0.136	(0.300)	0.052	0.084
109	9.08	0.63	0.152	(0.298)	0.058	0.094
110	9.17	0.63	0.152	(0.297)	0.058	0.094
111	9.25	0.63	0.152	(0.295)	0.058	0.094
112	9.33	0.67	0.160	(0.294)	0.061	0.099
113	9.42	0.67	0.160	(0.293)	0.061	0.099
114	9.50	0.67	0.160	(0.291)	0.061	0.099
115	9.58	0.70	0.168	(0.290)	0.064	0.104
116	9.67	0.70	0.168	(0.288)	0.064	0.104
117	9.75	0.70	0.168	(0.287)	0.064	0.104
118	9.83	0.73	0.176	(0.286)	0.067	0.109
119	9.92	0.73	0.176	(0.284)	0.067	0.109
120	10.00	0.73	0.176	(0.283)	0.067	0.109
121	10.08	0.50	0.120	(0.282)	0.046	0.074
122	10.17	0.50	0.120	(0.280)	0.046	0.074
123	10.25	0.50	0.120	(0.279)	0.046	0.074
124	10.33	0.50	0.120	(0.277)	0.046	0.074
125	10.42	0.50	0.120	(0.276)	0.046	0.074
126	10.50	0.50	0.120	(0.275)	0.046	0.074
127	10.58	0.67	0.160	(0.273)	0.061	0.099
128	10.67	0.67	0.160	(0.272)	0.061	0.099
129	10.75	0.67	0.160	(0.271)	0.061	0.099
130	10.83	0.67	0.160	(0.269)	0.061	0.099
131	10.92	0.67	0.160	(0.268)	0.061	0.099
132	11.00	0.67	0.160	(0.267)	0.061	0.099
133	11.08	0.63	0.152	(0.265)	0.058	0.094
134	11.17	0.63	0.152	(0.264)	0.058	0.094
135	11.25	0.63	0.152	(0.263)	0.058	0.094
136	11.33	0.63	0.152	(0.262)	0.058	0.094
137	11.42	0.63	0.152	(0.260)	0.058	0.094
138	11.50	0.63	0.152	(0.259)	0.058	0.094
139	11.58	0.57	0.136	(0.258)	0.052	0.084
140	11.67	0.57	0.136	(0.256)	0.052	0.084
141	11.75	0.57	0.136	(0.255)	0.052	0.084
142	11.83	0.60	0.144	(0.254)	0.055	0.089
143	11.92	0.60	0.144	(0.253)	0.055	0.089
144	12.00	0.60	0.144	(0.251)	0.055	0.089
145	12.08	0.83	0.200	(0.250)	0.076	0.124
146	12.17	0.83	0.200	(0.249)	0.076	0.124
147	12.25	0.83	0.200	(0.248)	0.076	0.124
148	12.33	0.87	0.208	(0.246)	0.079	0.129
149	12.42	0.87	0.208	(0.245)	0.079	0.129
150	12.50	0.87	0.208	(0.244)	0.079	0.129
151	12.58	0.93	0.224	(0.243)	0.085	0.139
152	12.67	0.93	0.224	(0.241)	0.085	0.139
153	12.75	0.93	0.224	(0.240)	0.085	0.139
154	12.83	0.97	0.232	(0.239)	0.088	0.144
155	12.92	0.97	0.232	(0.238)	0.088	0.144
156	13.00	0.97	0.232	(0.237)	0.088	0.144
157	13.08	1.13	0.272	(0.235)	0.103	0.169
158	13.17	1.13	0.272	(0.234)	0.103	0.169
159	13.25	1.13	0.272	(0.233)	0.103	0.169
160	13.33	1.13	0.272	(0.232)	0.103	0.169
161	13.42	1.13	0.272	(0.231)	0.103	0.169

162	13.50	1.13	0.272	(0.229)	0.103	0.169
163	13.58	0.77	0.184	(0.228)	0.070	0.114
164	13.67	0.77	0.184	(0.227)	0.070	0.114
165	13.75	0.77	0.184	(0.226)	0.070	0.114
166	13.83	0.77	0.184	(0.225)	0.070	0.114
167	13.92	0.77	0.184	(0.224)	0.070	0.114
168	14.00	0.77	0.184	(0.223)	0.070	0.114
169	14.08	0.90	0.216	(0.221)	0.082	0.134
170	14.17	0.90	0.216	(0.220)	0.082	0.134
171	14.25	0.90	0.216	(0.219)	0.082	0.134
172	14.33	0.87	0.208	(0.218)	0.079	0.129
173	14.42	0.87	0.208	(0.217)	0.079	0.129
174	14.50	0.87	0.208	(0.216)	0.079	0.129
175	14.58	0.87	0.208	(0.215)	0.079	0.129
176	14.67	0.87	0.208	(0.214)	0.079	0.129
177	14.75	0.87	0.208	(0.212)	0.079	0.129
178	14.83	0.83	0.200	(0.211)	0.076	0.124
179	14.92	0.83	0.200	(0.210)	0.076	0.124
180	15.00	0.83	0.200	(0.209)	0.076	0.124
181	15.08	0.80	0.192	(0.208)	0.073	0.119
182	15.17	0.80	0.192	(0.207)	0.073	0.119
183	15.25	0.80	0.192	(0.206)	0.073	0.119
184	15.33	0.77	0.184	(0.205)	0.070	0.114
185	15.42	0.77	0.184	(0.204)	0.070	0.114
186	15.50	0.77	0.184	(0.203)	0.070	0.114
187	15.58	0.63	0.152	(0.202)	0.058	0.094
188	15.67	0.63	0.152	(0.201)	0.058	0.094
189	15.75	0.63	0.152	(0.200)	0.058	0.094
190	15.83	0.63	0.152	(0.199)	0.058	0.094
191	15.92	0.63	0.152	(0.198)	0.058	0.094
192	16.00	0.63	0.152	(0.197)	0.058	0.094
193	16.08	0.13	0.032	(0.196)	0.012	0.020
194	16.17	0.13	0.032	(0.195)	0.012	0.020
195	16.25	0.13	0.032	(0.194)	0.012	0.020
196	16.33	0.13	0.032	(0.193)	0.012	0.020
197	16.42	0.13	0.032	(0.192)	0.012	0.020
198	16.50	0.13	0.032	(0.191)	0.012	0.020
199	16.58	0.10	0.024	(0.190)	0.009	0.015
200	16.67	0.10	0.024	(0.189)	0.009	0.015
201	16.75	0.10	0.024	(0.188)	0.009	0.015
202	16.83	0.10	0.024	(0.187)	0.009	0.015
203	16.92	0.10	0.024	(0.186)	0.009	0.015
204	17.00	0.10	0.024	(0.185)	0.009	0.015
205	17.08	0.17	0.040	(0.184)	0.015	0.025
206	17.17	0.17	0.040	(0.183)	0.015	0.025
207	17.25	0.17	0.040	(0.182)	0.015	0.025
208	17.33	0.17	0.040	(0.181)	0.015	0.025
209	17.42	0.17	0.040	(0.180)	0.015	0.025
210	17.50	0.17	0.040	(0.180)	0.015	0.025
211	17.58	0.17	0.040	(0.179)	0.015	0.025
212	17.67	0.17	0.040	(0.178)	0.015	0.025
213	17.75	0.17	0.040	(0.177)	0.015	0.025
214	17.83	0.13	0.032	(0.176)	0.012	0.020
215	17.92	0.13	0.032	(0.175)	0.012	0.020
216	18.00	0.13	0.032	(0.174)	0.012	0.020
217	18.08	0.13	0.032	(0.173)	0.012	0.020
218	18.17	0.13	0.032	(0.173)	0.012	0.020
219	18.25	0.13	0.032	(0.172)	0.012	0.020
220	18.33	0.13	0.032	(0.171)	0.012	0.020
221	18.42	0.13	0.032	(0.170)	0.012	0.020
222	18.50	0.13	0.032	(0.169)	0.012	0.020
223	18.58	0.10	0.024	(0.168)	0.009	0.015
224	18.67	0.10	0.024	(0.168)	0.009	0.015
225	18.75	0.10	0.024	(0.167)	0.009	0.015
226	18.83	0.07	0.016	(0.166)	0.006	0.010
227	18.92	0.07	0.016	(0.165)	0.006	0.010
228	19.00	0.07	0.016	(0.164)	0.006	0.010
229	19.08	0.10	0.024	(0.164)	0.009	0.015
230	19.17	0.10	0.024	(0.163)	0.009	0.015
231	19.25	0.10	0.024	(0.162)	0.009	0.015
232	19.33	0.13	0.032	(0.161)	0.012	0.020
233	19.42	0.13	0.032	(0.161)	0.012	0.020
234	19.50	0.13	0.032	(0.160)	0.012	0.020
235	19.58	0.10	0.024	(0.159)	0.009	0.015
236	19.67	0.10	0.024	(0.158)	0.009	0.015
237	19.75	0.10	0.024	(0.158)	0.009	0.015
238	19.83	0.07	0.016	(0.157)	0.006	0.010
239	19.92	0.07	0.016	(0.156)	0.006	0.010
240	20.00	0.07	0.016	(0.156)	0.006	0.010
241	20.08	0.10	0.024	(0.155)	0.009	0.015
242	20.17	0.10	0.024	(0.154)	0.009	0.015
243	20.25	0.10	0.024	(0.154)	0.009	0.015
244	20.33	0.10	0.024	(0.153)	0.009	0.015
245	20.42	0.10	0.024	(0.152)	0.009	0.015
246	20.50	0.10	0.024	(0.152)	0.009	0.015
247	20.58	0.10	0.024	(0.151)	0.009	0.015

248	20.67	0.10	0.024	(0.150)	0.009	0.015
249	20.75	0.10	0.024	(0.150)	0.009	0.015
250	20.83	0.07	0.016	(0.149)	0.006	0.010
251	20.92	0.07	0.016	(0.148)	0.006	0.010
252	21.00	0.07	0.016	(0.148)	0.006	0.010
253	21.08	0.10	0.024	(0.147)	0.009	0.015
254	21.17	0.10	0.024	(0.147)	0.009	0.015
255	21.25	0.10	0.024	(0.146)	0.009	0.015
256	21.33	0.07	0.016	(0.146)	0.006	0.010
257	21.42	0.07	0.016	(0.145)	0.006	0.010
258	21.50	0.07	0.016	(0.144)	0.006	0.010
259	21.58	0.10	0.024	(0.144)	0.009	0.015
260	21.67	0.10	0.024	(0.143)	0.009	0.015
261	21.75	0.10	0.024	(0.143)	0.009	0.015
262	21.83	0.07	0.016	(0.142)	0.006	0.010
263	21.92	0.07	0.016	(0.142)	0.006	0.010
264	22.00	0.07	0.016	(0.141)	0.006	0.010
265	22.08	0.10	0.024	(0.141)	0.009	0.015
266	22.17	0.10	0.024	(0.141)	0.009	0.015
267	22.25	0.10	0.024	(0.140)	0.009	0.015
268	22.33	0.07	0.016	(0.140)	0.006	0.010
269	22.42	0.07	0.016	(0.139)	0.006	0.010
270	22.50	0.07	0.016	(0.139)	0.006	0.010
271	22.58	0.07	0.016	(0.138)	0.006	0.010
272	22.67	0.07	0.016	(0.138)	0.006	0.010
273	22.75	0.07	0.016	(0.138)	0.006	0.010
274	22.83	0.07	0.016	(0.137)	0.006	0.010
275	22.92	0.07	0.016	(0.137)	0.006	0.010
276	23.00	0.07	0.016	(0.137)	0.006	0.010
277	23.08	0.07	0.016	(0.136)	0.006	0.010
278	23.17	0.07	0.016	(0.136)	0.006	0.010
279	23.25	0.07	0.016	(0.136)	0.006	0.010
280	23.33	0.07	0.016	(0.135)	0.006	0.010
281	23.42	0.07	0.016	(0.135)	0.006	0.010
282	23.50	0.07	0.016	(0.135)	0.006	0.010
283	23.58	0.07	0.016	(0.135)	0.006	0.010
284	23.67	0.07	0.016	(0.134)	0.006	0.010
285	23.75	0.07	0.016	(0.134)	0.006	0.010
286	23.83	0.07	0.016	(0.134)	0.006	0.010
287	23.92	0.07	0.016	(0.134)	0.006	0.010
288	24.00	0.07	0.016	(0.134)	0.006	0.010

(Loss Rate Not Used)

Sum = 100.0 Sum = 14.9

Flood volume = Effective rainfall 1.24(In)
times area 0.3(Ac.)/[(In)/(Ft.)] = 0.0(Ac.Ft)
Total soil loss = 0.76(In)
Total soil loss = 0.020(Ac.Ft)
Total rainfall = 2.00(In)
Flood volume = 1440.4 Cubic Feet
Total soil loss = 882.8 Cubic Feet

Peak flow rate of this hydrograph = 0.054(CFS)

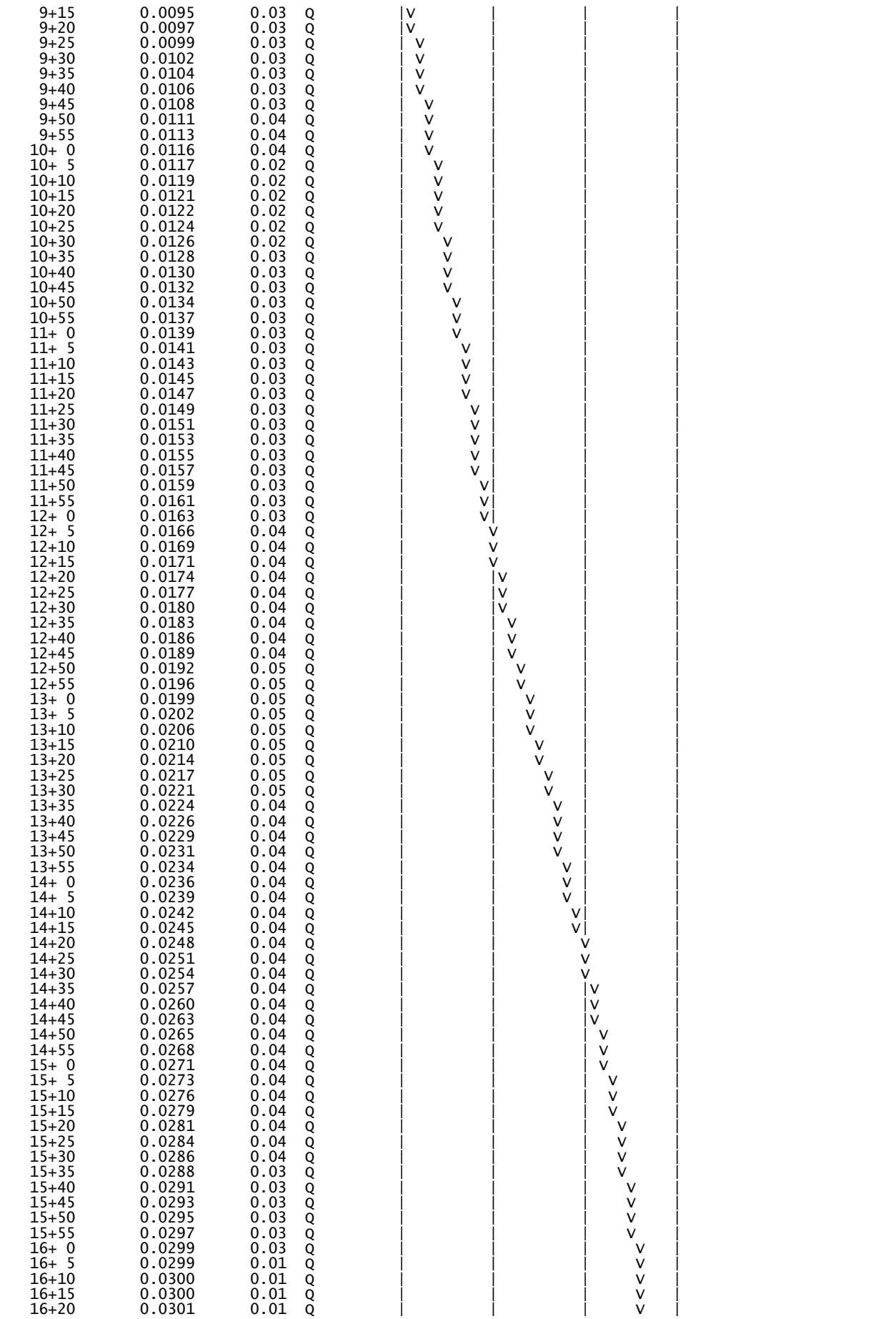
++

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	0.00	Q	|	|	|	|
0+20	0.0001	0.00	Q	|	|	|	|
0+25	0.0001	0.00	Q	|	|	|	|
0+30	0.0002	0.00	Q	|	|	|	|
0+35	0.0002	0.00	Q	|	|	|	|
0+40	0.0002	0.00	Q	|	|	|	|
0+45	0.0003	0.00	Q	|	|	|	|
0+50	0.0003	0.01	Q	|	|	|	|
0+55	0.0004	0.01	Q	|	|	|	|
1+ 0	0.0004	0.01	Q	|	|	|	|
1+ 5	0.0004	0.00	Q	|	|	|	|
1+10	0.0005	0.00	Q	|	|	|	|
1+15	0.0005	0.00	Q	|	|	|	|
1+20	0.0005	0.00	Q	|	|	|	|
1+25	0.0006	0.00	Q	|	|	|	|
1+30	0.0006	0.00	Q	|	|	|	|
1+35	0.0006	0.00	Q	|	|	|	|
1+40	0.0007	0.00	Q	|	|	|	|
1+45	0.0007	0.00	Q	|	|	|	|
1+50	0.0007	0.01	Q	|	|	|	|
1+55	0.0008	0.01	Q	|	|	|	|
2+ 0	0.0008	0.01	Q	|	|	|	|

```
2+ 5       0.0009      0.01  QV        |         |         |         |
2+10       0.0009      0.01  QV        |         |         |         |
2+15       0.0010      0.01  QV        |         |         |         |
2+20       0.0010      0.01  QV        |         |         |         |
2+25       0.0010      0.01  QV        |         |         |         |
2+30       0.0011      0.01  QV        |         |         |         |
2+35       0.0011      0.01  QV        |         |         |         |
2+40       0.0012      0.01  QV        |         |         |         |
2+45       0.0013      0.01  QV        |         |         |         |
2+50       0.0013      0.01  QV        |         |         |         |
2+55       0.0014      0.01  QV        |         |         |         |
3+ 0       0.0014      0.01  QV        |         |         |         |
3+ 5       0.0015      0.01  QV        |         |         |         |
3+10       0.0015      0.01  QV        |         |         |         |
3+15       0.0016      0.01  QV        |         |         |         |
3+20       0.0016      0.01  QV        |         |         |         |
3+25       0.0017      0.01  Q V       |         |         |         |
3+30       0.0018      0.01  Q V       |         |         |         |
3+35       0.0018      0.01  Q V       |         |         |         |
3+40       0.0019      0.01  Q V       |         |         |         |
3+45       0.0019      0.01  Q V       |         |         |         |
3+50       0.0020      0.01  Q V       |         |         |         |
3+55       0.0021      0.01  Q V       |         |         |         |
4+ 0       0.0021      0.01  Q V       |         |         |         |
4+ 5       0.0022      0.01  Q V       |         |         |         |
4+10       0.0022      0.01  Q V       |         |         |         |
4+15       0.0023      0.01  Q V       |         |         |         |
4+20       0.0024      0.01  Q V       |         |         |         |
4+25       0.0025      0.01  Q V       |         |         |         |
4+30       0.0025      0.01  Q  V      |         |         |         |
4+35       0.0026      0.01  Q  V      |         |         |         |
4+40       0.0027      0.01  Q  V      |         |         |         |
4+45       0.0028      0.01  Q  V      |         |         |         |
4+50       0.0029      0.01  Q  V      |         |         |         |
4+55       0.0030      0.01  Q  V      |         |         |         |
5+ 0       0.0030      0.01  Q  V      |         |         |         |
5+ 5       0.0031      0.01  Q  V      |         |         |         |
5+10       0.0032      0.01  Q  V      |         |         |         |
5+15       0.0032      0.01  Q  V      |         |         |         |
5+20       0.0033      0.01  Q   V     |         |         |         |
5+25       0.0034      0.01  Q   V     |         |         |         |
5+30       0.0035      0.01  Q   V     |         |         |         |
5+35       0.0036      0.01  Q   V     |         |         |         |
5+40       0.0036      0.01  Q   V     |         |         |         |
5+45       0.0037      0.01  Q   V     |         |         |         |
5+50       0.0038      0.01  Q   V     |         |         |         |
5+55       0.0039      0.01  Q   V     |         |         |         |
6+ 0       0.0040      0.01  Q   V     |         |         |         |
6+ 5       0.0041      0.01  Q   V     |         |         |         |
6+10       0.0042      0.01  Q    V    |         |         |         |
6+15       0.0043      0.01  Q    V    |         |         |         |
6+20       0.0044      0.01  Q    V    |         |         |         |
6+25       0.0045      0.01  Q    V    |         |         |         |
6+30       0.0046      0.01  Q    V    |         |         |         |
6+35       0.0047      0.02  Q    V    |         |         |         |
6+40       0.0048      0.02  Q    V    |         |         |         |
6+45       0.0049      0.02  Q    V    |         |         |         |
6+50       0.0050      0.02  Q     V   |         |         |         |
6+55       0.0051      0.02  Q     V   |         |         |         |
7+ 0       0.0053      0.02  Q     V   |         |         |         |
7+ 5       0.0054      0.02  Q     V   |         |         |         |
7+10       0.0055      0.02  Q     V   |         |         |         |
7+15       0.0056      0.02  Q     V   |         |         |         |
7+20       0.0057      0.02  Q     V   |         |         |         |
7+25       0.0058      0.02  Q      V  |         |         |         |
7+30       0.0060      0.02  Q      V  |         |         |         |
7+35       0.0061      0.02  Q      V  |         |         |         |
7+40       0.0062      0.02  Q      V  |         |         |         |
7+45       0.0063      0.02  Q      V  |         |         |         |
7+50       0.0065      0.02  Q      V  |         |         |         |
7+55       0.0066      0.02  Q       V |         |         |         |
8+ 0       0.0068      0.02  Q       V |         |         |         |
8+ 5       0.0069      0.02  Q       V |         |         |         |
8+10       0.0071      0.02  Q       V |         |         |         |
8+15       0.0073      0.02  Q       V |         |         |         |
8+20       0.0074      0.02  Q       V |         |         |         |
8+25       0.0076      0.02  Q        V|         |         |         |
8+30       0.0078      0.02  Q        V|         |         |         |
8+35       0.0079      0.03  Q        V|         |         |         |
8+40       0.0081      0.03  Q        V|         |         |         |
8+45       0.0083      0.03  Q         V         |         |         |
8+50       0.0085      0.03  Q         V         |         |         |
8+55       0.0087      0.03  Q         V         |         |         |
9+ 0       0.0089      0.03  Q         V         |         |         |
9+ 5       0.0091      0.03  Q         V         |         |         |
9+10       0.0093      0.03  Q         |V        |         |         |
```



9+15	0.0095	0.03	Q	
9+20	0.0097	0.03	Q	
9+25	0.0099	0.03	Q	
9+30	0.0102	0.03	Q	
9+35	0.0104	0.03	Q	
9+40	0.0106	0.03	Q	
9+45	0.0108	0.03	Q	
9+50	0.0111	0.04	Q	
9+55	0.0113	0.04	Q	
10+ 0	0.0116	0.04	Q	
10+ 5	0.0117	0.02	Q	
10+10	0.0119	0.02	Q	
10+15	0.0121	0.02	Q	
10+20	0.0122	0.02	Q	
10+25	0.0124	0.02	Q	
10+30	0.0126	0.02	Q	
10+35	0.0128	0.03	Q	
10+40	0.0130	0.03	Q	
10+45	0.0132	0.03	Q	
10+50	0.0134	0.03	Q	
10+55	0.0137	0.03	Q	
11+ 0	0.0139	0.03	Q	
11+ 5	0.0141	0.03	Q	
11+10	0.0143	0.03	Q	
11+15	0.0145	0.03	Q	
11+20	0.0147	0.03	Q	
11+25	0.0149	0.03	Q	
11+30	0.0151	0.03	Q	
11+35	0.0153	0.03	Q	
11+40	0.0155	0.03	Q	
11+45	0.0157	0.03	Q	
11+50	0.0159	0.03	Q	
11+55	0.0161	0.03	Q	
12+ 0	0.0163	0.03	Q	
12+ 5	0.0166	0.04	Q	
12+10	0.0169	0.04	Q	
12+15	0.0171	0.04	Q	
12+20	0.0174	0.04	Q	
12+25	0.0177	0.04	Q	
12+30	0.0180	0.04	Q	
12+35	0.0183	0.04	Q	
12+40	0.0186	0.04	Q	
12+45	0.0189	0.04	Q	
12+50	0.0192	0.05	Q	
12+55	0.0196	0.05	Q	
13+ 0	0.0199	0.05	Q	
13+ 5	0.0202	0.05	Q	
13+10	0.0206	0.05	Q	
13+15	0.0210	0.05	Q	
13+20	0.0214	0.05	Q	
13+25	0.0217	0.05	Q	
13+30	0.0221	0.05	Q	
13+35	0.0224	0.04	Q	
13+40	0.0226	0.04	Q	
13+45	0.0229	0.04	Q	
13+50	0.0231	0.04	Q	
13+55	0.0234	0.04	Q	
14+ 0	0.0236	0.04	Q	
14+ 5	0.0239	0.04	Q	
14+10	0.0242	0.04	Q	
14+15	0.0245	0.04	Q	
14+20	0.0248	0.04	Q	
14+25	0.0251	0.04	Q	
14+30	0.0254	0.04	Q	
14+35	0.0257	0.04	Q	
14+40	0.0260	0.04	Q	
14+45	0.0263	0.04	Q	
14+50	0.0265	0.04	Q	
14+55	0.0268	0.04	Q	
15+ 0	0.0271	0.04	Q	
15+ 5	0.0273	0.04	Q	
15+10	0.0276	0.04	Q	
15+15	0.0279	0.04	Q	
15+20	0.0281	0.04	Q	
15+25	0.0284	0.04	Q	
15+30	0.0286	0.04	Q	
15+35	0.0288	0.03	Q	
15+40	0.0291	0.03	Q	
15+45	0.0293	0.03	Q	
15+50	0.0295	0.03	Q	
15+55	0.0297	0.03	Q	
16+ 0	0.0299	0.03	Q	
16+ 5	0.0299	0.01	Q	
16+10	0.0300	0.01	Q	
16+15	0.0300	0.01	Q	
16+20	0.0301	0.01	Q	

```
16+25       0.0301      0.01  Q        |          |          |      V   |
16+30       0.0302      0.01  Q        |          |          |      V   |
16+35       0.0302      0.00  Q        |          |          |      V   |
16+40       0.0302      0.00  Q        |          |          |      V   |
16+45       0.0303      0.00  Q        |          |          |      V   |
16+50       0.0303      0.00  Q        |          |          |      V   |
16+55       0.0303      0.00  Q        |          |          |      V   |
17+ 0       0.0304      0.00  Q        |          |          |      V   |
17+ 5       0.0304      0.01  Q        |          |          |      V   |
17+10       0.0305      0.01  Q        |          |          |      V   |
17+15       0.0305      0.01  Q        |          |          |      V   |
17+20       0.0306      0.01  Q        |          |          |      V   |
17+25       0.0306      0.01  Q        |          |          |       V  |
17+30       0.0307      0.01  Q        |          |          |       V  |
17+35       0.0307      0.01  Q        |          |          |       V  |
17+40       0.0308      0.01  Q        |          |          |       V  |
17+45       0.0309      0.01  Q        |          |          |       V  |
17+50       0.0309      0.01  Q        |          |          |       V  |
17+55       0.0309      0.01  Q        |          |          |       V  |
18+ 0       0.0310      0.01  Q        |          |          |       V  |
18+ 5       0.0310      0.01  Q        |          |          |       V  |
18+10       0.0311      0.01  Q        |          |          |       V  |
18+15       0.0311      0.01  Q        |          |          |       V  |
18+20       0.0312      0.01  Q        |          |          |       V  |
18+25       0.0312      0.01  Q        |          |          |       V  |
18+30       0.0312      0.01  Q        |          |          |       V  |
18+35       0.0313      0.00  Q        |          |          |       V  |
18+40       0.0313      0.00  Q        |          |          |       V  |
18+45       0.0313      0.00  Q        |          |          |       V  |
18+50       0.0314      0.00  Q        |          |          |       V  |
18+55       0.0314      0.00  Q        |          |          |       V  |
19+ 0       0.0314      0.00  Q        |          |          |       V  |
19+ 5       0.0314      0.00  Q        |          |          |        V |
19+10       0.0315      0.00  Q        |          |          |        V |
19+15       0.0315      0.00  Q        |          |          |        V |
19+20       0.0316      0.01  Q        |          |          |        V |
19+25       0.0316      0.01  Q        |          |          |        V |
19+30       0.0316      0.01  Q        |          |          |        V |
19+35       0.0317      0.00  Q        |          |          |        V |
19+40       0.0317      0.00  Q        |          |          |        V |
19+45       0.0317      0.00  Q        |          |          |        V |
19+50       0.0318      0.00  Q        |          |          |        V |
19+55       0.0318      0.00  Q        |          |          |        V |
20+ 0       0.0318      0.00  Q        |          |          |        V |
20+ 5       0.0318      0.00  Q        |          |          |        V |
20+10       0.0319      0.00  Q        |          |          |        V |
20+15       0.0319      0.00  Q        |          |          |        V |
20+20       0.0319      0.00  Q        |          |          |        V |
20+25       0.0320      0.00  Q        |          |          |        V |
20+30       0.0320      0.00  Q        |          |          |        V |
20+35       0.0320      0.00  Q        |          |          |        V |
20+40       0.0321      0.00  Q        |          |          |        V |
20+45       0.0321      0.00  Q        |          |          |        V |
20+50       0.0321      0.00  Q        |          |          |        V |
20+55       0.0322      0.00  Q        |          |          |        V |
21+ 0       0.0322      0.00  Q        |          |          |        V |
21+ 5       0.0322      0.00  Q        |          |          |        V |
21+10       0.0322      0.00  Q        |          |          |        V |
21+15       0.0323      0.00  Q        |          |          |         V|
21+20       0.0323      0.00  Q        |          |          |         V|
21+25       0.0323      0.00  Q        |          |          |         V|
21+30       0.0323      0.00  Q        |          |          |         V|
21+35       0.0324      0.00  Q        |          |          |         V|
21+40       0.0324      0.00  Q        |          |          |         V|
21+45       0.0324      0.00  Q        |          |          |         V|
21+50       0.0325      0.00  Q        |          |          |         V|
21+55       0.0325      0.00  Q        |          |          |         V|
22+ 0       0.0325      0.00  Q        |          |          |         V|
22+ 5       0.0325      0.00  Q        |          |          |         V|
22+10       0.0326      0.00  Q        |          |          |         V|
22+15       0.0326      0.00  Q        |          |          |         V|
22+20       0.0326      0.00  Q        |          |          |         V|
22+25       0.0326      0.00  Q        |          |          |         V|
22+30       0.0327      0.00  Q        |          |          |         V|
22+35       0.0327      0.00  Q        |          |          |         V|
22+40       0.0327      0.00  Q        |          |          |         V|
22+45       0.0327      0.00  Q        |          |          |         V|
22+50       0.0328      0.00  Q        |          |          |         V|
22+55       0.0328      0.00  Q        |          |          |         V|
23+ 0       0.0328      0.00  Q        |          |          |         V|
23+ 5       0.0328      0.00  Q        |          |          |         V|
23+10       0.0328      0.00  Q        |          |          |         V|
23+15       0.0329      0.00  Q        |          |          |         V|
23+20       0.0329      0.00  Q        |          |          |         V|
23+25       0.0329      0.00  Q        |          |          |         V|
23+30       0.0329      0.00  Q        |          |          |         V|
```

```
   23+35       0.0330      0.00  Q         |         |         |        v|
   23+40       0.0330      0.00  Q         |         |         |        v|
   23+45       0.0330      0.00  Q         |         |         |        v|
   23+50       0.0330      0.00  Q         |         |         |        v|
   23+55       0.0330      0.00  Q         |         |         |        v|
   24+ 0       0.0331      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

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              Study date  10/09/24 File: PROC2242.out

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Riverside County Synthetic Unit Hydrology Method
RCFC & WCD Manual date - April 1978


Program License Serial Number 5006

------------------------------------------------------------------------
 English (in-lb) Input Units Used
 English Rainfall Data (Inches) Input Values Used

 English Units used in output format



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------------------------------------------------------------------------
Drainage Area =       1.04(Ac.)  =      0.002 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment =       1.04(Ac.)  =      0.002 Sq. Mi.
Length along longest watercourse =     354.00(Ft.)
Length along longest watercourse measured to centroid =     180.00(Ft.)
Length along longest watercourse =      0.067 Mi.
Length along longest watercourse measured to centroid =      0.034 Mi.
Difference in elevation =      10.60(Ft.)
Slope along watercourse =    158.1017 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time =    0.014 Hr.
Lag time =     0.82 Min.
25% of lag time =     0.20 Min.
40% of lag time =     0.33 Min.
Unit time =     5.00 Min.
Duration of storm = 24 Hour(s)
User Entered Base Flow =     0.00(CFS)

2 YEAR Area rainfall data:


Area(Ac.)[1]       Rainfall(In)[2]      Weighting[1*2]
        1.04            2.00                 2.08

100 YEAR Area rainfall data:


Area(Ac.)[1]       Rainfall(In)[2]      Weighting[1*2]
        1.04            6.00                 6.24

STORM EVENT (YEAR) =    2.00
Area Averaged 2-Year Rainfall =    2.000(In)
Area Averaged 100-Year Rainfall =    6.000(In)

Point rain (area averaged) =    2.000(In)
Areal adjustment factor =  100.00 %
Adjusted average point rain =    2.000(In)

Sub-Area Data:
Area(Ac.)         Runoff Index   Impervious %
     1.040           62.50          0.650
 Total Area Entered =      1.04(Ac.)


RI    RI   Infil. Rate Impervious   Adj. Infil. Rate  Area%     F
AMC2 AMC-1     (In/Hr)    (Dec.%)     (In/Hr)      (Dec.)    (In/Hr)
62.5  42.5      0.645     0.650        0.268       1.000      0.268
                                                 Sum (F) =   0.268
Area averaged mean soil loss (F) (In/Hr) =  0.268
Minimum soil loss rate ((In/Hr)) =  0.134
(for 24 hour storm duration)
Soil low loss rate (decimal) =   0.380
------------------------------------------------------------------------

               U n i t  H y d r o g r a p h
                      VALLEY S-Curve
------------------------------------------------------------------------
               Unit Hydrograph Data
------------------------------------------------------------------------
Unit time period   Time % of lag   Distribution   Unit Hydrograph
    (hrs)                          Graph %           (CFS)
```

1	0.083	610.789	75.644	0.793
2	0.167	1221.578	24.356	0.255
			Sum = 100.000 Sum=	1.048

The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	0.07	0.016	(0.475)	0.006	0.010
2	0.17	0.07	0.016	(0.473)	0.006	0.010
3	0.25	0.07	0.016	(0.471)	0.006	0.010
4	0.33	0.10	0.024	(0.469)	0.009	0.015
5	0.42	0.10	0.024	(0.468)	0.009	0.015
6	0.50	0.10	0.024	(0.466)	0.009	0.015
7	0.58	0.10	0.024	(0.464)	0.009	0.015
8	0.67	0.10	0.024	(0.462)	0.009	0.015
9	0.75	0.10	0.024	(0.460)	0.009	0.015
10	0.83	0.13	0.032	(0.458)	0.012	0.020
11	0.92	0.13	0.032	(0.457)	0.012	0.020
12	1.00	0.13	0.032	(0.455)	0.012	0.020
13	1.08	0.10	0.024	(0.453)	0.009	0.015
14	1.17	0.10	0.024	(0.451)	0.009	0.015
15	1.25	0.10	0.024	(0.449)	0.009	0.015
16	1.33	0.10	0.024	(0.448)	0.009	0.015
17	1.42	0.10	0.024	(0.446)	0.009	0.015
18	1.50	0.10	0.024	(0.444)	0.009	0.015
19	1.58	0.10	0.024	(0.442)	0.009	0.015
20	1.67	0.10	0.024	(0.441)	0.009	0.015
21	1.75	0.10	0.024	(0.439)	0.009	0.015
22	1.83	0.13	0.032	(0.437)	0.012	0.020
23	1.92	0.13	0.032	(0.435)	0.012	0.020
24	2.00	0.13	0.032	(0.434)	0.012	0.020
25	2.08	0.13	0.032	(0.432)	0.012	0.020
26	2.17	0.13	0.032	(0.430)	0.012	0.020
27	2.25	0.13	0.032	(0.428)	0.012	0.020
28	2.33	0.13	0.032	(0.427)	0.012	0.020
29	2.42	0.13	0.032	(0.425)	0.012	0.020
30	2.50	0.13	0.032	(0.423)	0.012	0.020
31	2.58	0.17	0.040	(0.421)	0.015	0.025
32	2.67	0.17	0.040	(0.420)	0.015	0.025
33	2.75	0.17	0.040	(0.418)	0.015	0.025
34	2.83	0.17	0.040	(0.416)	0.015	0.025
35	2.92	0.17	0.040	(0.414)	0.015	0.025
36	3.00	0.17	0.040	(0.413)	0.015	0.025
37	3.08	0.17	0.040	(0.411)	0.015	0.025
38	3.17	0.17	0.040	(0.409)	0.015	0.025
39	3.25	0.17	0.040	(0.408)	0.015	0.025
40	3.33	0.17	0.040	(0.406)	0.015	0.025
41	3.42	0.17	0.040	(0.404)	0.015	0.025
42	3.50	0.17	0.040	(0.403)	0.015	0.025
43	3.58	0.17	0.040	(0.401)	0.015	0.025
44	3.67	0.17	0.040	(0.399)	0.015	0.025
45	3.75	0.17	0.040	(0.397)	0.015	0.025
46	3.83	0.20	0.048	(0.396)	0.018	0.030
47	3.92	0.20	0.048	(0.394)	0.018	0.030
48	4.00	0.20	0.048	(0.392)	0.018	0.030
49	4.08	0.20	0.048	(0.391)	0.018	0.030
50	4.17	0.20	0.048	(0.389)	0.018	0.030
51	4.25	0.20	0.048	(0.387)	0.018	0.030
52	4.33	0.23	0.056	(0.386)	0.021	0.035
53	4.42	0.23	0.056	(0.384)	0.021	0.035
54	4.50	0.23	0.056	(0.383)	0.021	0.035
55	4.58	0.23	0.056	(0.381)	0.021	0.035
56	4.67	0.23	0.056	(0.379)	0.021	0.035
57	4.75	0.23	0.056	(0.378)	0.021	0.035
58	4.83	0.27	0.064	(0.376)	0.024	0.040
59	4.92	0.27	0.064	(0.374)	0.024	0.040
60	5.00	0.27	0.064	(0.373)	0.024	0.040
61	5.08	0.20	0.048	(0.371)	0.018	0.030
62	5.17	0.20	0.048	(0.370)	0.018	0.030
63	5.25	0.20	0.048	(0.368)	0.018	0.030
64	5.33	0.23	0.056	(0.366)	0.021	0.035
65	5.42	0.23	0.056	(0.365)	0.021	0.035
66	5.50	0.23	0.056	(0.363)	0.021	0.035
67	5.58	0.27	0.064	(0.362)	0.024	0.040
68	5.67	0.27	0.064	(0.360)	0.024	0.040
69	5.75	0.27	0.064	(0.358)	0.024	0.040
70	5.83	0.27	0.064	(0.357)	0.024	0.040
71	5.92	0.27	0.064	(0.355)	0.024	0.040
72	6.00	0.27	0.064	(0.354)	0.024	0.040
73	6.08	0.30	0.072	(0.352)	0.027	0.045
74	6.17	0.30	0.072	(0.350)	0.027	0.045

75	6.25	0.30	0.072	(0.349)	0.027	0.045
76	6.33	0.30	0.072	(0.347)	0.027	0.045
77	6.42	0.30	0.072	(0.346)	0.027	0.045
78	6.50	0.30	0.072	(0.344)	0.027	0.045
79	6.58	0.33	0.080	(0.343)	0.030	0.050
80	6.67	0.33	0.080	(0.341)	0.030	0.050
81	6.75	0.33	0.080	(0.340)	0.030	0.050
82	6.83	0.33	0.080	(0.338)	0.030	0.050
83	6.92	0.33	0.080	(0.337)	0.030	0.050
84	7.00	0.33	0.080	(0.335)	0.030	0.050
85	7.08	0.33	0.080	(0.333)	0.030	0.050
86	7.17	0.33	0.080	(0.332)	0.030	0.050
87	7.25	0.33	0.080	(0.330)	0.030	0.050
88	7.33	0.37	0.088	(0.329)	0.033	0.055
89	7.42	0.37	0.088	(0.327)	0.033	0.055
90	7.50	0.37	0.088	(0.326)	0.033	0.055
91	7.58	0.40	0.096	(0.324)	0.036	0.060
92	7.67	0.40	0.096	(0.323)	0.036	0.060
93	7.75	0.40	0.096	(0.321)	0.036	0.060
94	7.83	0.43	0.104	(0.320)	0.040	0.064
95	7.92	0.43	0.104	(0.319)	0.040	0.064
96	8.00	0.43	0.104	(0.317)	0.040	0.064
97	8.08	0.50	0.120	(0.316)	0.046	0.074
98	8.17	0.50	0.120	(0.314)	0.046	0.074
99	8.25	0.50	0.120	(0.313)	0.046	0.074
100	8.33	0.50	0.120	(0.311)	0.046	0.074
101	8.42	0.50	0.120	(0.310)	0.046	0.074
102	8.50	0.50	0.120	(0.308)	0.046	0.074
103	8.58	0.53	0.128	(0.307)	0.049	0.079
104	8.67	0.53	0.128	(0.305)	0.049	0.079
105	8.75	0.53	0.128	(0.304)	0.049	0.079
106	8.83	0.57	0.136	(0.302)	0.052	0.084
107	8.92	0.57	0.136	(0.301)	0.052	0.084
108	9.00	0.57	0.136	(0.300)	0.052	0.084
109	9.08	0.63	0.152	(0.298)	0.058	0.094
110	9.17	0.63	0.152	(0.297)	0.058	0.094
111	9.25	0.63	0.152	(0.295)	0.058	0.094
112	9.33	0.67	0.160	(0.294)	0.061	0.099
113	9.42	0.67	0.160	(0.293)	0.061	0.099
114	9.50	0.67	0.160	(0.291)	0.061	0.099
115	9.58	0.70	0.168	(0.290)	0.064	0.104
116	9.67	0.70	0.168	(0.288)	0.064	0.104
117	9.75	0.70	0.168	(0.287)	0.064	0.104
118	9.83	0.73	0.176	(0.286)	0.067	0.109
119	9.92	0.73	0.176	(0.284)	0.067	0.109
120	10.00	0.73	0.176	(0.283)	0.067	0.109
121	10.08	0.50	0.120	(0.282)	0.046	0.074
122	10.17	0.50	0.120	(0.280)	0.046	0.074
123	10.25	0.50	0.120	(0.279)	0.046	0.074
124	10.33	0.50	0.120	(0.277)	0.046	0.074
125	10.42	0.50	0.120	(0.276)	0.046	0.074
126	10.50	0.50	0.120	(0.275)	0.046	0.074
127	10.58	0.67	0.160	(0.273)	0.061	0.099
128	10.67	0.67	0.160	(0.272)	0.061	0.099
129	10.75	0.67	0.160	(0.271)	0.061	0.099
130	10.83	0.67	0.160	(0.269)	0.061	0.099
131	10.92	0.67	0.160	(0.268)	0.061	0.099
132	11.00	0.67	0.160	(0.267)	0.061	0.099
133	11.08	0.63	0.152	(0.265)	0.058	0.094
134	11.17	0.63	0.152	(0.264)	0.058	0.094
135	11.25	0.63	0.152	(0.263)	0.058	0.094
136	11.33	0.63	0.152	(0.262)	0.058	0.094
137	11.42	0.63	0.152	(0.260)	0.058	0.094
138	11.50	0.63	0.152	(0.259)	0.058	0.094
139	11.58	0.57	0.136	(0.258)	0.052	0.084
140	11.67	0.57	0.136	(0.256)	0.052	0.084
141	11.75	0.57	0.136	(0.255)	0.052	0.084
142	11.83	0.60	0.144	(0.254)	0.055	0.089
143	11.92	0.60	0.144	(0.253)	0.055	0.089
144	12.00	0.60	0.144	(0.251)	0.055	0.089
145	12.08	0.83	0.200	(0.250)	0.076	0.124
146	12.17	0.83	0.200	(0.249)	0.076	0.124
147	12.25	0.83	0.200	(0.248)	0.076	0.124
148	12.33	0.87	0.208	(0.246)	0.079	0.129
149	12.42	0.87	0.208	(0.245)	0.079	0.129
150	12.50	0.87	0.208	(0.244)	0.079	0.129
151	12.58	0.93	0.224	(0.243)	0.085	0.139
152	12.67	0.93	0.224	(0.241)	0.085	0.139
153	12.75	0.93	0.224	(0.240)	0.085	0.139
154	12.83	0.97	0.232	(0.239)	0.088	0.144
155	12.92	0.97	0.232	(0.238)	0.088	0.144
156	13.00	0.97	0.232	(0.237)	0.088	0.144
157	13.08	1.13	0.272	(0.235)	0.103	0.169
158	13.17	1.13	0.272	(0.234)	0.103	0.169
159	13.25	1.13	0.272	(0.233)	0.103	0.169
160	13.33	1.13	0.272	(0.232)	0.103	0.169

161	13.42	1.13	0.272	(0.231)	0.103	0.169
162	13.50	1.13	0.272	(0.229)	0.103	0.169
163	13.58	0.77	0.184	(0.228)	0.070	0.114
164	13.67	0.77	0.184	(0.227)	0.070	0.114
165	13.75	0.77	0.184	(0.226)	0.070	0.114
166	13.83	0.77	0.184	(0.225)	0.070	0.114
167	13.92	0.77	0.184	(0.224)	0.070	0.114
168	14.00	0.77	0.184	(0.223)	0.070	0.114
169	14.08	0.90	0.216	(0.221)	0.082	0.134
170	14.17	0.90	0.216	(0.220)	0.082	0.134
171	14.25	0.90	0.216	(0.219)	0.082	0.134
172	14.33	0.87	0.208	(0.218)	0.079	0.129
173	14.42	0.87	0.208	(0.217)	0.079	0.129
174	14.50	0.87	0.208	(0.216)	0.079	0.129
175	14.58	0.87	0.208	(0.215)	0.079	0.129
176	14.67	0.87	0.208	(0.214)	0.079	0.129
177	14.75	0.87	0.208	(0.212)	0.079	0.129
178	14.83	0.83	0.200	(0.211)	0.076	0.124
179	14.92	0.83	0.200	(0.210)	0.076	0.124
180	15.00	0.83	0.200	(0.209)	0.076	0.124
181	15.08	0.80	0.192	(0.208)	0.073	0.119
182	15.17	0.80	0.192	(0.207)	0.073	0.119
183	15.25	0.80	0.192	(0.206)	0.073	0.119
184	15.33	0.77	0.184	(0.205)	0.070	0.114
185	15.42	0.77	0.184	(0.204)	0.070	0.114
186	15.50	0.77	0.184	(0.203)	0.070	0.114
187	15.58	0.63	0.152	(0.202)	0.058	0.094
188	15.67	0.63	0.152	(0.201)	0.058	0.094
189	15.75	0.63	0.152	(0.200)	0.058	0.094
190	15.83	0.63	0.152	(0.199)	0.058	0.094
191	15.92	0.63	0.152	(0.198)	0.058	0.094
192	16.00	0.63	0.152	(0.197)	0.058	0.094
193	16.08	0.13	0.032	(0.196)	0.012	0.020
194	16.17	0.13	0.032	(0.195)	0.012	0.020
195	16.25	0.13	0.032	(0.194)	0.012	0.020
196	16.33	0.13	0.032	(0.193)	0.012	0.020
197	16.42	0.13	0.032	(0.192)	0.012	0.020
198	16.50	0.13	0.032	(0.191)	0.012	0.020
199	16.58	0.10	0.024	(0.190)	0.009	0.015
200	16.67	0.10	0.024	(0.189)	0.009	0.015
201	16.75	0.10	0.024	(0.188)	0.009	0.015
202	16.83	0.10	0.024	(0.187)	0.009	0.015
203	16.92	0.10	0.024	(0.186)	0.009	0.015
204	17.00	0.10	0.024	(0.185)	0.009	0.015
205	17.08	0.17	0.040	(0.184)	0.015	0.025
206	17.17	0.17	0.040	(0.183)	0.015	0.025
207	17.25	0.17	0.040	(0.182)	0.015	0.025
208	17.33	0.17	0.040	(0.181)	0.015	0.025
209	17.42	0.17	0.040	(0.180)	0.015	0.025
210	17.50	0.17	0.040	(0.180)	0.015	0.025
211	17.58	0.17	0.040	(0.179)	0.015	0.025
212	17.67	0.17	0.040	(0.178)	0.015	0.025
213	17.75	0.17	0.040	(0.177)	0.015	0.025
214	17.83	0.13	0.032	(0.176)	0.012	0.020
215	17.92	0.13	0.032	(0.175)	0.012	0.020
216	18.00	0.13	0.032	(0.174)	0.012	0.020
217	18.08	0.13	0.032	(0.173)	0.012	0.020
218	18.17	0.13	0.032	(0.173)	0.012	0.020
219	18.25	0.13	0.032	(0.172)	0.012	0.020
220	18.33	0.13	0.032	(0.171)	0.012	0.020
221	18.42	0.13	0.032	(0.170)	0.012	0.020
222	18.50	0.13	0.032	(0.169)	0.012	0.020
223	18.58	0.10	0.024	(0.168)	0.009	0.015
224	18.67	0.10	0.024	(0.168)	0.009	0.015
225	18.75	0.10	0.024	(0.167)	0.009	0.015
226	18.83	0.07	0.016	(0.166)	0.006	0.010
227	18.92	0.07	0.016	(0.165)	0.006	0.010
228	19.00	0.07	0.016	(0.164)	0.006	0.010
229	19.08	0.10	0.024	(0.164)	0.009	0.015
230	19.17	0.10	0.024	(0.163)	0.009	0.015
231	19.25	0.10	0.024	(0.162)	0.009	0.015
232	19.33	0.13	0.032	(0.161)	0.012	0.020
233	19.42	0.13	0.032	(0.161)	0.012	0.020
234	19.50	0.13	0.032	(0.160)	0.012	0.020
235	19.58	0.10	0.024	(0.159)	0.009	0.015
236	19.67	0.10	0.024	(0.158)	0.009	0.015
237	19.75	0.10	0.024	(0.158)	0.009	0.015
238	19.83	0.07	0.016	(0.157)	0.006	0.010
239	19.92	0.07	0.016	(0.156)	0.006	0.010
240	20.00	0.07	0.016	(0.156)	0.006	0.010
241	20.08	0.10	0.024	(0.155)	0.009	0.015
242	20.17	0.10	0.024	(0.154)	0.009	0.015
243	20.25	0.10	0.024	(0.154)	0.009	0.015
244	20.33	0.10	0.024	(0.153)	0.009	0.015
245	20.42	0.10	0.024	(0.152)	0.009	0.015
246	20.50	0.10	0.024	(0.152)	0.009	0.015

```
247  20.58     0.10      0.024       (  0.151)       0.009        0.015
248  20.67     0.10      0.024       (  0.150)       0.009        0.015
249  20.75     0.10      0.024       (  0.150)       0.009        0.015
250  20.83     0.07      0.016       (  0.149)       0.006        0.010
251  20.92     0.07      0.016       (  0.148)       0.006        0.010
252  21.00     0.07      0.016       (  0.148)       0.006        0.010
253  21.08     0.10      0.024       (  0.147)       0.009        0.015
254  21.17     0.10      0.024       (  0.147)       0.009        0.015
255  21.25     0.10      0.024       (  0.146)       0.009        0.015
256  21.33     0.07      0.016       (  0.146)       0.006        0.010
257  21.42     0.07      0.016       (  0.145)       0.006        0.010
258  21.50     0.07      0.016       (  0.144)       0.006        0.010
259  21.58     0.10      0.024       (  0.144)       0.009        0.015
260  21.67     0.10      0.024       (  0.143)       0.009        0.015
261  21.75     0.10      0.024       (  0.143)       0.009        0.015
262  21.83     0.07      0.016       (  0.142)       0.006        0.010
263  21.92     0.07      0.016       (  0.142)       0.006        0.010
264  22.00     0.07      0.016       (  0.141)       0.006        0.010
265  22.08     0.10      0.024       (  0.141)       0.009        0.015
266  22.17     0.10      0.024       (  0.141)       0.009        0.015
267  22.25     0.10      0.024       (  0.140)       0.009        0.015
268  22.33     0.07      0.016       (  0.140)       0.006        0.010
269  22.42     0.07      0.016       (  0.139)       0.006        0.010
270  22.50     0.07      0.016       (  0.139)       0.006        0.010
271  22.58     0.07      0.016       (  0.138)       0.006        0.010
272  22.67     0.07      0.016       (  0.138)       0.006        0.010
273  22.75     0.07      0.016       (  0.138)       0.006        0.010
274  22.83     0.07      0.016       (  0.137)       0.006        0.010
275  22.92     0.07      0.016       (  0.137)       0.006        0.010
276  23.00     0.07      0.016       (  0.137)       0.006        0.010
277  23.08     0.07      0.016       (  0.136)       0.006        0.010
278  23.17     0.07      0.016       (  0.136)       0.006        0.010
279  23.25     0.07      0.016       (  0.136)       0.006        0.010
280  23.33     0.07      0.016       (  0.135)       0.006        0.010
281  23.42     0.07      0.016       (  0.135)       0.006        0.010
282  23.50     0.07      0.016       (  0.135)       0.006        0.010
283  23.58     0.07      0.016       (  0.135)       0.006        0.010
284  23.67     0.07      0.016       (  0.134)       0.006        0.010
285  23.75     0.07      0.016       (  0.134)       0.006        0.010
286  23.83     0.07      0.016       (  0.134)       0.006        0.010
287  23.92     0.07      0.016       (  0.134)       0.006        0.010
288  24.00     0.07      0.016       (  0.134)       0.006        0.010
               (Loss Rate Not Used)
    Sum =     100.0                                  Sum =    14.9
      Flood volume = Effective rainfall      1.24(In)
       times area       1.0(Ac.)/[(In)/(Ft.)] =       0.1(Ac.Ft)
      Total soil loss =      0.76(In)
      Total soil loss =     0.066(Ac.Ft)
      Total rainfall =      2.00(In)
      Flood volume =        4681.2 Cubic Feet
      Total soil loss =        2869.1 Cubic Feet
      ---------------------------------------------------------------------
       Peak flow rate of this hydrograph =      0.177(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       0.0001      0.01  Q          |         |         |         |
   0+15       0.0002      0.01  Q          |         |         |         |
   0+20       0.0003      0.01  Q          |         |         |         |
   0+25       0.0004      0.02  Q          |         |         |         |
   0+30       0.0005      0.02  Q          |         |         |         |
   0+35       0.0006      0.02  Q          |         |         |         |
   0+40       0.0007      0.02  Q          |         |         |         |
   0+45       0.0008      0.02  Q          |         |         |         |
   0+50       0.0010      0.02  Q          |         |         |         |
   0+55       0.0011      0.02  Q          |         |         |         |
   1+ 0       0.0013      0.02  Q          |         |         |         |
   1+ 5       0.0014      0.02  Q          |         |         |         |
   1+10       0.0015      0.02  Q          |         |         |         |
   1+15       0.0016      0.02  Q          |         |         |         |
   1+20       0.0017      0.02  Q          |         |         |         |
   1+25       0.0018      0.02  Q          |         |         |         |
   1+30       0.0019      0.02  Q          |         |         |         |
   1+35       0.0020      0.02  Q          |         |         |         |
   1+40       0.0021      0.02  Q          |         |         |         |
   1+45       0.0022      0.02  Q          |         |         |         |
   1+50       0.0024      0.02  Q          |         |         |         |
   1+55       0.0025      0.02  Q          |         |         |         |
```

```
2+ 0       0.0027      0.02  Q          |          |          |          |
2+ 5       0.0028      0.02  QV         |          |          |          |
2+10       0.0029      0.02  QV         |          |          |          |
2+15       0.0031      0.02  QV         |          |          |          |
2+20       0.0032      0.02  QV         |          |          |          |
2+25       0.0034      0.02  QV         |          |          |          |
2+30       0.0035      0.02  QV         |          |          |          |
2+35       0.0037      0.02  QV         |          |          |          |
2+40       0.0039      0.03  QV         |          |          |          |
2+45       0.0040      0.03  QV         |          |          |          |
2+50       0.0042      0.03  QV         |          |          |          |
2+55       0.0044      0.03  QV         |          |          |          |
3+ 0       0.0046      0.03  QV         |          |          |          |
3+ 5       0.0048      0.03  QV         |          |          |          |
3+10       0.0049      0.03  QV         |          |          |          |
3+15       0.0051      0.03  QV         |          |          |          |
3+20       0.0053      0.03  QV         |          |          |          |
3+25       0.0055      0.03  Q V        |          |          |          |
3+30       0.0057      0.03  Q V        |          |          |          |
3+35       0.0058      0.03  Q V        |          |          |          |
3+40       0.0060      0.03  Q V        |          |          |          |
3+45       0.0062      0.03  Q V        |          |          |          |
3+50       0.0064      0.03  Q V        |          |          |          |
3+55       0.0066      0.03  Q V        |          |          |          |
4+ 0       0.0068      0.03  Q V        |          |          |          |
4+ 5       0.0070      0.03  Q V        |          |          |          |
4+10       0.0073      0.03  Q V        |          |          |          |
4+15       0.0075      0.03  Q V        |          |          |          |
4+20       0.0077      0.04  Q V        |          |          |          |
4+25       0.0080      0.04  Q V        |          |          |          |
4+30       0.0082      0.04  Q  V       |          |          |          |
4+35       0.0085      0.04  Q  V       |          |          |          |
4+40       0.0087      0.04  Q  V       |          |          |          |
4+45       0.0090      0.04  Q  V       |          |          |          |
4+50       0.0092      0.04  Q  V       |          |          |          |
4+55       0.0095      0.04  Q  V       |          |          |          |
5+ 0       0.0098      0.04  Q  V       |          |          |          |
5+ 5       0.0100      0.03  Q  V       |          |          |          |
5+10       0.0103      0.03  Q  V       |          |          |          |
5+15       0.0105      0.03  Q  V       |          |          |          |
5+20       0.0107      0.04  Q  V       |          |          |          |
5+25       0.0110      0.04  Q   V      |          |          |          |
5+30       0.0112      0.04  Q   V      |          |          |          |
5+35       0.0115      0.04  Q   V      |          |          |          |
5+40       0.0118      0.04  Q   V      |          |          |          |
5+45       0.0121      0.04  Q   V      |          |          |          |
5+50       0.0124      0.04  Q   V      |          |          |          |
5+55       0.0126      0.04  Q   V      |          |          |          |
6+ 0       0.0129      0.04  Q   V      |          |          |          |
6+ 5       0.0132      0.05  Q   V      |          |          |          |
6+10       0.0136      0.05  Q    V     |          |          |          |
6+15       0.0139      0.05  Q    V     |          |          |          |
6+20       0.0142      0.05  Q    V     |          |          |          |
6+25       0.0145      0.05  Q    V     |          |          |          |
6+30       0.0149      0.05  Q    V     |          |          |          |
6+35       0.0152      0.05  Q    V     |          |          |          |
6+40       0.0156      0.05  Q    V     |          |          |          |
6+45       0.0159      0.05  Q    V     |          |          |          |
6+50       0.0163      0.05  Q     V    |          |          |          |
6+55       0.0166      0.05  Q     V    |          |          |          |
7+ 0       0.0170      0.05  Q     V    |          |          |          |
7+ 5       0.0174      0.05  Q     V    |          |          |          |
7+10       0.0177      0.05  Q     V    |          |          |          |
7+15       0.0181      0.05  Q     V    |          |          |          |
7+20       0.0185      0.06  Q     V    |          |          |          |
7+25       0.0189      0.06  Q      V   |          |          |          |
7+30       0.0192      0.06  Q      V   |          |          |          |
7+35       0.0197      0.06  Q      V   |          |          |          |
7+40       0.0201      0.06  Q      V   |          |          |          |
7+45       0.0205      0.06  Q      V   |          |          |          |
7+50       0.0210      0.07  Q      V   |          |          |          |
7+55       0.0215      0.07  Q      V   |          |          |          |
8+ 0       0.0219      0.07  Q       V  |          |          |          |
8+ 5       0.0224      0.08  Q       V  |          |          |          |
8+10       0.0230      0.08  Q       V  |          |          |          |
8+15       0.0235      0.08  Q       V  |          |          |          |
8+20       0.0240      0.08  Q       V  |          |          |          |
8+25       0.0246      0.08  Q        V |          |          |          |
8+30       0.0251      0.08  Q        V |          |          |          |
8+35       0.0257      0.08  Q        V |          |          |          |
8+40       0.0263      0.08  Q        V |          |          |          |
8+45       0.0268      0.08  Q        V |          |          |          |
8+50       0.0274      0.09  Q         V          |          |          |
8+55       0.0280      0.09  Q         V          |          |          |
9+ 0       0.0287      0.09  Q         V          |          |          |
9+ 5       0.0293      0.10  Q         V          |          |          |
```

9+10	0.0300	0.10	Q	
9+15	0.0307	0.10	Q	
9+20	0.0314	0.10	Q	
9+25	0.0321	0.10	Q	
9+30	0.0328	0.10	Q	
9+35	0.0336	0.11	Q	
9+40	0.0343	0.11	Q	
9+45	0.0351	0.11	Q	
9+50	0.0358	0.11	Q	
9+55	0.0366	0.11	Q	
10+ 0	0.0374	0.11	Q	
10+ 5	0.0380	0.09	Q	
10+10	0.0386	0.08	Q	
10+15	0.0391	0.08	Q	
10+20	0.0396	0.08	Q	
10+25	0.0402	0.08	Q	
10+30	0.0407	0.08	Q	
10+35	0.0414	0.10	Q	
10+40	0.0421	0.10	Q	
10+45	0.0428	0.10	Q	
10+50	0.0435	0.10	Q	
10+55	0.0442	0.10	Q	
11+ 0	0.0450	0.10	Q	
11+ 5	0.0457	0.10	Q	
11+10	0.0463	0.10	Q	
11+15	0.0470	0.10	Q	
11+20	0.0477	0.10	Q	
11+25	0.0484	0.10	Q	
11+30	0.0491	0.10	Q	
11+35	0.0497	0.09	Q	
11+40	0.0503	0.09	Q	
11+45	0.0509	0.09	Q	
11+50	0.0515	0.09	Q	
11+55	0.0522	0.09	Q	
12+ 0	0.0528	0.09	Q	
12+ 5	0.0537	0.12	Q	
12+10	0.0546	0.13	Q	
12+15	0.0554	0.13	Q	
12+20	0.0564	0.13	Q	
12+25	0.0573	0.14	Q	
12+30	0.0582	0.14	Q	
12+35	0.0592	0.14	Q	
12+40	0.0602	0.15	Q	
12+45	0.0612	0.15	Q	
12+50	0.0623	0.15	Q	
12+55	0.0633	0.15	Q	
13+ 0	0.0643	0.15	Q	
13+ 5	0.0655	0.17	Q	
13+10	0.0667	0.18	Q	
13+15	0.0679	0.18	Q	
13+20	0.0692	0.18	Q	
13+25	0.0704	0.18	Q	
13+30	0.0716	0.18	Q	
13+35	0.0725	0.13	Q	
13+40	0.0733	0.12	Q	
13+45	0.0742	0.12	Q	
13+50	0.0750	0.12	Q	
13+55	0.0758	0.12	Q	
14+ 0	0.0766	0.12	Q	
14+ 5	0.0776	0.14	Q	
14+10	0.0785	0.14	Q	
14+15	0.0795	0.14	Q	
14+20	0.0804	0.14	Q	
14+25	0.0814	0.14	Q	
14+30	0.0823	0.14	Q	
14+35	0.0832	0.14	Q	
14+40	0.0842	0.14	Q	
14+45	0.0851	0.14	Q	
14+50	0.0860	0.13	Q	
14+55	0.0869	0.13	Q	
15+ 0	0.0878	0.13	Q	
15+ 5	0.0887	0.13	Q	
15+10	0.0895	0.12	Q	
15+15	0.0904	0.12	Q	
15+20	0.0912	0.12	Q	
15+25	0.0920	0.12	Q	
15+30	0.0929	0.12	Q	
15+35	0.0936	0.10	Q	
15+40	0.0943	0.10	Q	
15+45	0.0949	0.10	Q	
15+50	0.0956	0.10	Q	
15+55	0.0963	0.10	Q	
16+ 0	0.0970	0.10	Q	
16+ 5	0.0973	0.04	Q	
16+10	0.0974	0.02	Q	
16+15	0.0975	0.02	Q	

16+20	0.0977	0.02	Q	|	|	|	V |
16+25	0.0978	0.02	Q	|	|	|	V |
16+30	0.0980	0.02	Q	|	|	|	V |
16+35	0.0981	0.02	Q	|	|	|	V |
16+40	0.0982	0.02	Q	|	|	|	V |
16+45	0.0983	0.02	Q	|	|	|	V |
16+50	0.0984	0.02	Q	|	|	|	V |
16+55	0.0985	0.02	Q	|	|	|	V |
17+ 0	0.0986	0.02	Q	|	|	|	V |
17+ 5	0.0988	0.02	Q	|	|	|	V |
17+10	0.0990	0.03	Q	|	|	|	V |
17+15	0.0991	0.03	Q	|	|	|	V |
17+20	0.0993	0.03	Q	|	|	|	V |
17+25	0.0995	0.03	Q	|	|	|	V |
17+30	0.0997	0.03	Q	|	|	|	V |
17+35	0.0999	0.03	Q	|	|	|	V |
17+40	0.1000	0.03	Q	|	|	|	V |
17+45	0.1002	0.03	Q	|	|	|	V |
17+50	0.1004	0.02	Q	|	|	|	V |
17+55	0.1005	0.02	Q	|	|	|	V |
18+ 0	0.1007	0.02	Q	|	|	|	V |
18+ 5	0.1008	0.02	Q	|	|	|	V |
18+10	0.1009	0.02	Q	|	|	|	V |
18+15	0.1011	0.02	Q	|	|	|	V |
18+20	0.1012	0.02	Q	|	|	|	V |
18+25	0.1014	0.02	Q	|	|	|	V |
18+30	0.1015	0.02	Q	|	|	|	V |
18+35	0.1016	0.02	Q	|	|	|	V |
18+40	0.1017	0.02	Q	|	|	|	V |
18+45	0.1019	0.02	Q	|	|	|	V |
18+50	0.1019	0.01	Q	|	|	|	V |
18+55	0.1020	0.01	Q	|	|	|	V |
19+ 0	0.1021	0.01	Q	|	|	|	V |
19+ 5	0.1022	0.01	Q	|	|	|	V |
19+10	0.1023	0.02	Q	|	|	|	V |
19+15	0.1024	0.02	Q	|	|	|	V |
19+20	0.1025	0.02	Q	|	|	|	V |
19+25	0.1027	0.02	Q	|	|	|	V |
19+30	0.1028	0.02	Q	|	|	|	V |
19+35	0.1029	0.02	Q	|	|	|	V |
19+40	0.1030	0.02	Q	|	|	|	V |
19+45	0.1031	0.02	Q	|	|	|	V |
19+50	0.1032	0.01	Q	|	|	|	V |
19+55	0.1033	0.01	Q	|	|	|	V |
20+ 0	0.1034	0.01	Q	|	|	|	V |
20+ 5	0.1035	0.01	Q	|	|	|	V |
20+10	0.1036	0.02	Q	|	|	|	V |
20+15	0.1037	0.02	Q	|	|	|	V |
20+20	0.1038	0.02	Q	|	|	|	V |
20+25	0.1039	0.02	Q	|	|	|	V |
20+30	0.1040	0.02	Q	|	|	|	V |
20+35	0.1041	0.02	Q	|	|	|	V |
20+40	0.1042	0.02	Q	|	|	|	V |
20+45	0.1043	0.02	Q	|	|	|	V |
20+50	0.1044	0.01	Q	|	|	|	V |
20+55	0.1045	0.01	Q	|	|	|	V |
21+ 0	0.1045	0.01	Q	|	|	|	V |
21+ 5	0.1046	0.01	Q	|	|	|	V |
21+10	0.1048	0.02	Q	|	|	|	V |
21+15	0.1049	0.02	Q	|	|	|	V|
21+20	0.1049	0.01	Q	|	|	|	V|
21+25	0.1050	0.01	Q	|	|	|	V|
21+30	0.1051	0.01	Q	|	|	|	V|
21+35	0.1052	0.01	Q	|	|	|	V|
21+40	0.1053	0.02	Q	|	|	|	V|
21+45	0.1054	0.02	Q	|	|	|	V|
21+50	0.1055	0.01	Q	|	|	|	V|
21+55	0.1056	0.01	Q	|	|	|	V|
22+ 0	0.1056	0.01	Q	|	|	|	V|
22+ 5	0.1057	0.01	Q	|	|	|	V|
22+10	0.1058	0.02	Q	|	|	|	V|
22+15	0.1059	0.02	Q	|	|	|	V|
22+20	0.1060	0.01	Q	|	|	|	V|
22+25	0.1061	0.01	Q	|	|	|	V|
22+30	0.1062	0.01	Q	|	|	|	V|
22+35	0.1062	0.01	Q	|	|	|	V|
22+40	0.1063	0.01	Q	|	|	|	V|
22+45	0.1064	0.01	Q	|	|	|	V|
22+50	0.1064	0.01	Q	|	|	|	V|
22+55	0.1065	0.01	Q	|	|	|	V|
23+ 0	0.1066	0.01	Q	|	|	|	V|
23+ 5	0.1067	0.01	Q	|	|	|	V|
23+10	0.1067	0.01	Q	|	|	|	V|
23+15	0.1068	0.01	Q	|	|	|	V|
23+20	0.1069	0.01	Q	|	|	|	V|
23+25	0.1069	0.01	Q	|	|	|	V|

```
   23+30       0.1070      0.01  Q          |          |          |        v|
   23+35       0.1071      0.01  Q          |          |          |        v|
   23+40       0.1072      0.01  Q          |          |          |        v|
   23+45       0.1072      0.01  Q          |          |          |        v|
   23+50       0.1073      0.01  Q          |          |          |        v|
   23+55       0.1074      0.01  Q          |          |          |        v|
   24+ 0       0.1074      0.01  Q          |          |          |        v|
   24+ 5       0.1075      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

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Study date 10/09/24 File: PROD2242.out

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Riverside County Synthetic Unit Hydrology Method
RCFC & WCD Manual date - April 1978

Program License Serial Number 5006

English (in-lb) Input Units Used
English Rainfall Data (Inches) Input Values Used

English Units used in output format

Drainage Area = 1.29(Ac.) = 0.002 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 1.29(Ac.) = 0.002 Sq. Mi.
Length along longest watercourse = 402.00(Ft.)
Length along longest watercourse measured to centroid = 201.00(Ft.)
Length along longest watercourse = 0.076 Mi.
Length along longest watercourse measured to centroid = 0.038 Mi.
Difference in elevation = 17.69(Ft.)
Slope along watercourse = 232.3463 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time = 0.014 Hr.
Lag time = 0.83 Min.
25% of lag time = 0.21 Min.
40% of lag time = 0.33 Min.
Unit time = 5.00 Min.
Duration of storm = 24 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
1.29	2.00	2.58

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
1.29	6.00	7.74

STORM EVENT (YEAR) = 2.00
Area Averaged 2-Year Rainfall = 2.000(In)
Area Averaged 100-Year Rainfall = 6.000(In)

Point rain (area averaged) = 2.000(In)
Areal adjustment factor = 100.00 %
Adjusted average point rain = 2.000(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
1.290	62.50	0.650

Total Area Entered = 1.29(Ac.)

RI AMC2	RI AMC-1	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
62.5	42.5	0.645	0.650	0.268	1.000	0.268
					Sum (F) =	0.268

Area averaged mean soil loss (F) (In/Hr) = 0.268
Minimum soil loss rate ((In/Hr)) = 0.134
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.380

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)	Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)

1	0.083	600.431	75.260	0.978
2	0.167	1200.863	24.740	0.322
			Sum = 100.000 Sum=	1.300

The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	0.07	0.016	(0.475)	0.006	0.010
2	0.17	0.07	0.016	(0.473)	0.006	0.010
3	0.25	0.07	0.016	(0.471)	0.006	0.010
4	0.33	0.10	0.024	(0.469)	0.009	0.015
5	0.42	0.10	0.024	(0.468)	0.009	0.015
6	0.50	0.10	0.024	(0.466)	0.009	0.015
7	0.58	0.10	0.024	(0.464)	0.009	0.015
8	0.67	0.10	0.024	(0.462)	0.009	0.015
9	0.75	0.10	0.024	(0.460)	0.009	0.015
10	0.83	0.13	0.032	(0.458)	0.012	0.020
11	0.92	0.13	0.032	(0.457)	0.012	0.020
12	1.00	0.13	0.032	(0.455)	0.012	0.020
13	1.08	0.10	0.024	(0.453)	0.009	0.015
14	1.17	0.10	0.024	(0.451)	0.009	0.015
15	1.25	0.10	0.024	(0.449)	0.009	0.015
16	1.33	0.10	0.024	(0.448)	0.009	0.015
17	1.42	0.10	0.024	(0.446)	0.009	0.015
18	1.50	0.10	0.024	(0.444)	0.009	0.015
19	1.58	0.10	0.024	(0.442)	0.009	0.015
20	1.67	0.10	0.024	(0.441)	0.009	0.015
21	1.75	0.10	0.024	(0.439)	0.009	0.015
22	1.83	0.13	0.032	(0.437)	0.012	0.020
23	1.92	0.13	0.032	(0.435)	0.012	0.020
24	2.00	0.13	0.032	(0.434)	0.012	0.020
25	2.08	0.13	0.032	(0.432)	0.012	0.020
26	2.17	0.13	0.032	(0.430)	0.012	0.020
27	2.25	0.13	0.032	(0.428)	0.012	0.020
28	2.33	0.13	0.032	(0.427)	0.012	0.020
29	2.42	0.13	0.032	(0.425)	0.012	0.020
30	2.50	0.13	0.032	(0.423)	0.012	0.020
31	2.58	0.17	0.040	(0.421)	0.015	0.025
32	2.67	0.17	0.040	(0.420)	0.015	0.025
33	2.75	0.17	0.040	(0.418)	0.015	0.025
34	2.83	0.17	0.040	(0.416)	0.015	0.025
35	2.92	0.17	0.040	(0.414)	0.015	0.025
36	3.00	0.17	0.040	(0.413)	0.015	0.025
37	3.08	0.17	0.040	(0.411)	0.015	0.025
38	3.17	0.17	0.040	(0.409)	0.015	0.025
39	3.25	0.17	0.040	(0.408)	0.015	0.025
40	3.33	0.17	0.040	(0.406)	0.015	0.025
41	3.42	0.17	0.040	(0.404)	0.015	0.025
42	3.50	0.17	0.040	(0.403)	0.015	0.025
43	3.58	0.17	0.040	(0.401)	0.015	0.025
44	3.67	0.17	0.040	(0.399)	0.015	0.025
45	3.75	0.17	0.040	(0.397)	0.015	0.025
46	3.83	0.20	0.048	(0.396)	0.018	0.030
47	3.92	0.20	0.048	(0.394)	0.018	0.030
48	4.00	0.20	0.048	(0.392)	0.018	0.030
49	4.08	0.20	0.048	(0.391)	0.018	0.030
50	4.17	0.20	0.048	(0.389)	0.018	0.030
51	4.25	0.20	0.048	(0.387)	0.018	0.030
52	4.33	0.23	0.056	(0.386)	0.021	0.035
53	4.42	0.23	0.056	(0.384)	0.021	0.035
54	4.50	0.23	0.056	(0.383)	0.021	0.035
55	4.58	0.23	0.056	(0.381)	0.021	0.035
56	4.67	0.23	0.056	(0.379)	0.021	0.035
57	4.75	0.23	0.056	(0.378)	0.021	0.035
58	4.83	0.27	0.064	(0.376)	0.024	0.040
59	4.92	0.27	0.064	(0.374)	0.024	0.040
60	5.00	0.27	0.064	(0.373)	0.024	0.040
61	5.08	0.20	0.048	(0.371)	0.018	0.030
62	5.17	0.20	0.048	(0.370)	0.018	0.030
63	5.25	0.20	0.048	(0.368)	0.018	0.030
64	5.33	0.23	0.056	(0.366)	0.021	0.035
65	5.42	0.23	0.056	(0.365)	0.021	0.035
66	5.50	0.23	0.056	(0.363)	0.021	0.035
67	5.58	0.27	0.064	(0.362)	0.024	0.040
68	5.67	0.27	0.064	(0.360)	0.024	0.040
69	5.75	0.27	0.064	(0.358)	0.024	0.040
70	5.83	0.27	0.064	(0.357)	0.024	0.040
71	5.92	0.27	0.064	(0.355)	0.024	0.040
72	6.00	0.27	0.064	(0.354)	0.024	0.040
73	6.08	0.30	0.072	(0.352)	0.027	0.045
74	6.17	0.30	0.072	(0.350)	0.027	0.045

75	6.25	0.30	0.072	(0.349)	0.027	0.045
76	6.33	0.30	0.072	(0.347)	0.027	0.045
77	6.42	0.30	0.072	(0.346)	0.027	0.045
78	6.50	0.30	0.072	(0.344)	0.027	0.045
79	6.58	0.33	0.080	(0.343)	0.030	0.050
80	6.67	0.33	0.080	(0.341)	0.030	0.050
81	6.75	0.33	0.080	(0.340)	0.030	0.050
82	6.83	0.33	0.080	(0.338)	0.030	0.050
83	6.92	0.33	0.080	(0.337)	0.030	0.050
84	7.00	0.33	0.080	(0.335)	0.030	0.050
85	7.08	0.33	0.080	(0.333)	0.030	0.050
86	7.17	0.33	0.080	(0.332)	0.030	0.050
87	7.25	0.33	0.080	(0.330)	0.030	0.050
88	7.33	0.37	0.088	(0.329)	0.033	0.055
89	7.42	0.37	0.088	(0.327)	0.033	0.055
90	7.50	0.37	0.088	(0.326)	0.033	0.055
91	7.58	0.40	0.096	(0.324)	0.036	0.060
92	7.67	0.40	0.096	(0.323)	0.036	0.060
93	7.75	0.40	0.096	(0.321)	0.036	0.060
94	7.83	0.43	0.104	(0.320)	0.040	0.064
95	7.92	0.43	0.104	(0.319)	0.040	0.064
96	8.00	0.43	0.104	(0.317)	0.040	0.064
97	8.08	0.50	0.120	(0.316)	0.046	0.074
98	8.17	0.50	0.120	(0.314)	0.046	0.074
99	8.25	0.50	0.120	(0.313)	0.046	0.074
100	8.33	0.50	0.120	(0.311)	0.046	0.074
101	8.42	0.50	0.120	(0.310)	0.046	0.074
102	8.50	0.50	0.120	(0.308)	0.046	0.074
103	8.58	0.53	0.128	(0.307)	0.049	0.079
104	8.67	0.53	0.128	(0.305)	0.049	0.079
105	8.75	0.53	0.128	(0.304)	0.049	0.079
106	8.83	0.57	0.136	(0.302)	0.052	0.084
107	8.92	0.57	0.136	(0.301)	0.052	0.084
108	9.00	0.57	0.136	(0.300)	0.052	0.084
109	9.08	0.63	0.152	(0.298)	0.058	0.094
110	9.17	0.63	0.152	(0.297)	0.058	0.094
111	9.25	0.63	0.152	(0.295)	0.058	0.094
112	9.33	0.67	0.160	(0.294)	0.061	0.099
113	9.42	0.67	0.160	(0.293)	0.061	0.099
114	9.50	0.67	0.160	(0.291)	0.061	0.099
115	9.58	0.70	0.168	(0.290)	0.064	0.104
116	9.67	0.70	0.168	(0.288)	0.064	0.104
117	9.75	0.70	0.168	(0.287)	0.064	0.104
118	9.83	0.73	0.176	(0.286)	0.067	0.109
119	9.92	0.73	0.176	(0.284)	0.067	0.109
120	10.00	0.73	0.176	(0.283)	0.067	0.109
121	10.08	0.50	0.120	(0.282)	0.046	0.074
122	10.17	0.50	0.120	(0.280)	0.046	0.074
123	10.25	0.50	0.120	(0.279)	0.046	0.074
124	10.33	0.50	0.120	(0.277)	0.046	0.074
125	10.42	0.50	0.120	(0.276)	0.046	0.074
126	10.50	0.50	0.120	(0.275)	0.046	0.074
127	10.58	0.67	0.160	(0.273)	0.061	0.099
128	10.67	0.67	0.160	(0.272)	0.061	0.099
129	10.75	0.67	0.160	(0.271)	0.061	0.099
130	10.83	0.67	0.160	(0.269)	0.061	0.099
131	10.92	0.67	0.160	(0.268)	0.061	0.099
132	11.00	0.67	0.160	(0.267)	0.061	0.099
133	11.08	0.63	0.152	(0.265)	0.058	0.094
134	11.17	0.63	0.152	(0.264)	0.058	0.094
135	11.25	0.63	0.152	(0.263)	0.058	0.094
136	11.33	0.63	0.152	(0.262)	0.058	0.094
137	11.42	0.63	0.152	(0.260)	0.058	0.094
138	11.50	0.63	0.152	(0.259)	0.058	0.094
139	11.58	0.57	0.136	(0.258)	0.052	0.084
140	11.67	0.57	0.136	(0.256)	0.052	0.084
141	11.75	0.57	0.136	(0.255)	0.052	0.084
142	11.83	0.60	0.144	(0.254)	0.055	0.089
143	11.92	0.60	0.144	(0.253)	0.055	0.089
144	12.00	0.60	0.144	(0.251)	0.055	0.089
145	12.08	0.83	0.200	(0.250)	0.076	0.124
146	12.17	0.83	0.200	(0.249)	0.076	0.124
147	12.25	0.83	0.200	(0.248)	0.076	0.124
148	12.33	0.87	0.208	(0.246)	0.079	0.129
149	12.42	0.87	0.208	(0.245)	0.079	0.129
150	12.50	0.87	0.208	(0.244)	0.079	0.129
151	12.58	0.93	0.224	(0.243)	0.085	0.139
152	12.67	0.93	0.224	(0.241)	0.085	0.139
153	12.75	0.93	0.224	(0.240)	0.085	0.139
154	12.83	0.97	0.232	(0.239)	0.088	0.144
155	12.92	0.97	0.232	(0.238)	0.088	0.144
156	13.00	0.97	0.232	(0.237)	0.088	0.144
157	13.08	1.13	0.272	(0.235)	0.103	0.169
158	13.17	1.13	0.272	(0.234)	0.103	0.169
159	13.25	1.13	0.272	(0.233)	0.103	0.169
160	13.33	1.13	0.272	(0.232)	0.103	0.169

161	13.42	1.13	0.272	(0.231)	0.103	0.169
162	13.50	1.13	0.272	(0.229)	0.103	0.169
163	13.58	0.77	0.184	(0.228)	0.070	0.114
164	13.67	0.77	0.184	(0.227)	0.070	0.114
165	13.75	0.77	0.184	(0.226)	0.070	0.114
166	13.83	0.77	0.184	(0.225)	0.070	0.114
167	13.92	0.77	0.184	(0.224)	0.070	0.114
168	14.00	0.77	0.184	(0.223)	0.070	0.114
169	14.08	0.90	0.216	(0.221)	0.082	0.134
170	14.17	0.90	0.216	(0.220)	0.082	0.134
171	14.25	0.90	0.216	(0.219)	0.082	0.134
172	14.33	0.87	0.208	(0.218)	0.079	0.129
173	14.42	0.87	0.208	(0.217)	0.079	0.129
174	14.50	0.87	0.208	(0.216)	0.079	0.129
175	14.58	0.87	0.208	(0.215)	0.079	0.129
176	14.67	0.87	0.208	(0.214)	0.079	0.129
177	14.75	0.87	0.208	(0.212)	0.079	0.129
178	14.83	0.83	0.200	(0.211)	0.076	0.124
179	14.92	0.83	0.200	(0.210)	0.076	0.124
180	15.00	0.83	0.200	(0.209)	0.076	0.124
181	15.08	0.80	0.192	(0.208)	0.073	0.119
182	15.17	0.80	0.192	(0.207)	0.073	0.119
183	15.25	0.80	0.192	(0.206)	0.073	0.119
184	15.33	0.77	0.184	(0.205)	0.070	0.114
185	15.42	0.77	0.184	(0.204)	0.070	0.114
186	15.50	0.77	0.184	(0.203)	0.070	0.114
187	15.58	0.63	0.152	(0.202)	0.058	0.094
188	15.67	0.63	0.152	(0.201)	0.058	0.094
189	15.75	0.63	0.152	(0.200)	0.058	0.094
190	15.83	0.63	0.152	(0.199)	0.058	0.094
191	15.92	0.63	0.152	(0.198)	0.058	0.094
192	16.00	0.63	0.152	(0.197)	0.058	0.094
193	16.08	0.13	0.032	(0.196)	0.012	0.020
194	16.17	0.13	0.032	(0.195)	0.012	0.020
195	16.25	0.13	0.032	(0.194)	0.012	0.020
196	16.33	0.13	0.032	(0.193)	0.012	0.020
197	16.42	0.13	0.032	(0.192)	0.012	0.020
198	16.50	0.13	0.032	(0.191)	0.012	0.020
199	16.58	0.10	0.024	(0.190)	0.009	0.015
200	16.67	0.10	0.024	(0.189)	0.009	0.015
201	16.75	0.10	0.024	(0.188)	0.009	0.015
202	16.83	0.10	0.024	(0.187)	0.009	0.015
203	16.92	0.10	0.024	(0.186)	0.009	0.015
204	17.00	0.10	0.024	(0.185)	0.009	0.015
205	17.08	0.17	0.040	(0.184)	0.015	0.025
206	17.17	0.17	0.040	(0.183)	0.015	0.025
207	17.25	0.17	0.040	(0.182)	0.015	0.025
208	17.33	0.17	0.040	(0.181)	0.015	0.025
209	17.42	0.17	0.040	(0.180)	0.015	0.025
210	17.50	0.17	0.040	(0.180)	0.015	0.025
211	17.58	0.17	0.040	(0.179)	0.015	0.025
212	17.67	0.17	0.040	(0.178)	0.015	0.025
213	17.75	0.17	0.040	(0.177)	0.015	0.025
214	17.83	0.13	0.032	(0.176)	0.012	0.020
215	17.92	0.13	0.032	(0.175)	0.012	0.020
216	18.00	0.13	0.032	(0.174)	0.012	0.020
217	18.08	0.13	0.032	(0.173)	0.012	0.020
218	18.17	0.13	0.032	(0.173)	0.012	0.020
219	18.25	0.13	0.032	(0.172)	0.012	0.020
220	18.33	0.13	0.032	(0.171)	0.012	0.020
221	18.42	0.13	0.032	(0.170)	0.012	0.020
222	18.50	0.13	0.032	(0.169)	0.012	0.020
223	18.58	0.10	0.024	(0.168)	0.009	0.015
224	18.67	0.10	0.024	(0.168)	0.009	0.015
225	18.75	0.10	0.024	(0.167)	0.009	0.015
226	18.83	0.07	0.016	(0.166)	0.006	0.010
227	18.92	0.07	0.016	(0.165)	0.006	0.010
228	19.00	0.07	0.016	(0.164)	0.006	0.010
229	19.08	0.10	0.024	(0.164)	0.009	0.015
230	19.17	0.10	0.024	(0.163)	0.009	0.015
231	19.25	0.10	0.024	(0.162)	0.009	0.015
232	19.33	0.13	0.032	(0.161)	0.012	0.020
233	19.42	0.13	0.032	(0.161)	0.012	0.020
234	19.50	0.13	0.032	(0.160)	0.012	0.020
235	19.58	0.10	0.024	(0.159)	0.009	0.015
236	19.67	0.10	0.024	(0.158)	0.009	0.015
237	19.75	0.10	0.024	(0.158)	0.009	0.015
238	19.83	0.07	0.016	(0.157)	0.006	0.010
239	19.92	0.07	0.016	(0.156)	0.006	0.010
240	20.00	0.07	0.016	(0.156)	0.006	0.010
241	20.08	0.10	0.024	(0.155)	0.009	0.015
242	20.17	0.10	0.024	(0.154)	0.009	0.015
243	20.25	0.10	0.024	(0.154)	0.009	0.015
244	20.33	0.10	0.024	(0.153)	0.009	0.015
245	20.42	0.10	0.024	(0.152)	0.009	0.015
246	20.50	0.10	0.024	(0.152)	0.009	0.015

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247  20.58     0.10      0.024       (  0.151)       0.009        0.015
248  20.67     0.10      0.024       (  0.150)       0.009        0.015
249  20.75     0.10      0.024       (  0.150)       0.009        0.015
250  20.83     0.07      0.016       (  0.149)       0.006        0.010
251  20.92     0.07      0.016       (  0.148)       0.006        0.010
252  21.00     0.07      0.016       (  0.148)       0.006        0.010
253  21.08     0.10      0.024       (  0.147)       0.009        0.015
254  21.17     0.10      0.024       (  0.147)       0.009        0.015
255  21.25     0.10      0.024       (  0.146)       0.009        0.015
256  21.33     0.07      0.016       (  0.146)       0.006        0.010
257  21.42     0.07      0.016       (  0.145)       0.006        0.010
258  21.50     0.07      0.016       (  0.144)       0.006        0.010
259  21.58     0.10      0.024       (  0.144)       0.009        0.015
260  21.67     0.10      0.024       (  0.143)       0.009        0.015
261  21.75     0.10      0.024       (  0.143)       0.009        0.015
262  21.83     0.07      0.016       (  0.142)       0.006        0.010
263  21.92     0.07      0.016       (  0.142)       0.006        0.010
264  22.00     0.07      0.016       (  0.141)       0.006        0.010
265  22.08     0.10      0.024       (  0.141)       0.009        0.015
266  22.17     0.10      0.024       (  0.141)       0.009        0.015
267  22.25     0.10      0.024       (  0.140)       0.009        0.015
268  22.33     0.07      0.016       (  0.140)       0.006        0.010
269  22.42     0.07      0.016       (  0.139)       0.006        0.010
270  22.50     0.07      0.016       (  0.139)       0.006        0.010
271  22.58     0.07      0.016       (  0.138)       0.006        0.010
272  22.67     0.07      0.016       (  0.138)       0.006        0.010
273  22.75     0.07      0.016       (  0.138)       0.006        0.010
274  22.83     0.07      0.016       (  0.137)       0.006        0.010
275  22.92     0.07      0.016       (  0.137)       0.006        0.010
276  23.00     0.07      0.016       (  0.137)       0.006        0.010
277  23.08     0.07      0.016       (  0.136)       0.006        0.010
278  23.17     0.07      0.016       (  0.136)       0.006        0.010
279  23.25     0.07      0.016       (  0.136)       0.006        0.010
280  23.33     0.07      0.016       (  0.135)       0.006        0.010
281  23.42     0.07      0.016       (  0.135)       0.006        0.010
282  23.50     0.07      0.016       (  0.135)       0.006        0.010
283  23.58     0.07      0.016       (  0.135)       0.006        0.010
284  23.67     0.07      0.016       (  0.134)       0.006        0.010
285  23.75     0.07      0.016       (  0.134)       0.006        0.010
286  23.83     0.07      0.016       (  0.134)       0.006        0.010
287  23.92     0.07      0.016       (  0.134)       0.006        0.010
288  24.00     0.07      0.016       (  0.134)       0.006        0.010
               (Loss Rate Not Used)
    Sum =     100.0                                  Sum =    14.9
      Flood volume = Effective rainfall      1.24(In)
       times area       1.3(Ac.)/[(In)/(Ft.)] =       0.1(Ac.Ft)
      Total soil loss =      0.76(In)
      Total soil loss =     0.082(Ac.Ft)
      Total rainfall =      2.00(In)
      Flood volume =        5806.5 Cubic Feet
      Total soil loss =        3558.8 Cubic Feet
      ---------------------------------------------------------------------
       Peak flow rate of this hydrograph =      0.219(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       0.0002      0.01  Q          |         |         |         |
   0+15       0.0002      0.01  Q          |         |         |         |
   0+20       0.0004      0.02  Q          |         |         |         |
   0+25       0.0005      0.02  Q          |         |         |         |
   0+30       0.0006      0.02  Q          |         |         |         |
   0+35       0.0008      0.02  Q          |         |         |         |
   0+40       0.0009      0.02  Q          |         |         |         |
   0+45       0.0010      0.02  Q          |         |         |         |
   0+50       0.0012      0.02  Q          |         |         |         |
   0+55       0.0014      0.03  Q          |         |         |         |
   1+ 0       0.0016      0.03  Q          |         |         |         |
   1+ 5       0.0017      0.02  Q          |         |         |         |
   1+10       0.0018      0.02  Q          |         |         |         |
   1+15       0.0020      0.02  Q          |         |         |         |
   1+20       0.0021      0.02  Q          |         |         |         |
   1+25       0.0022      0.02  Q          |         |         |         |
   1+30       0.0024      0.02  Q          |         |         |         |
   1+35       0.0025      0.02  Q          |         |         |         |
   1+40       0.0026      0.02  Q          |         |         |         |
   1+45       0.0028      0.02  Q          |         |         |         |
   1+50       0.0029      0.02  Q          |         |         |         |
   1+55       0.0031      0.03  Q          |         |         |         |
```

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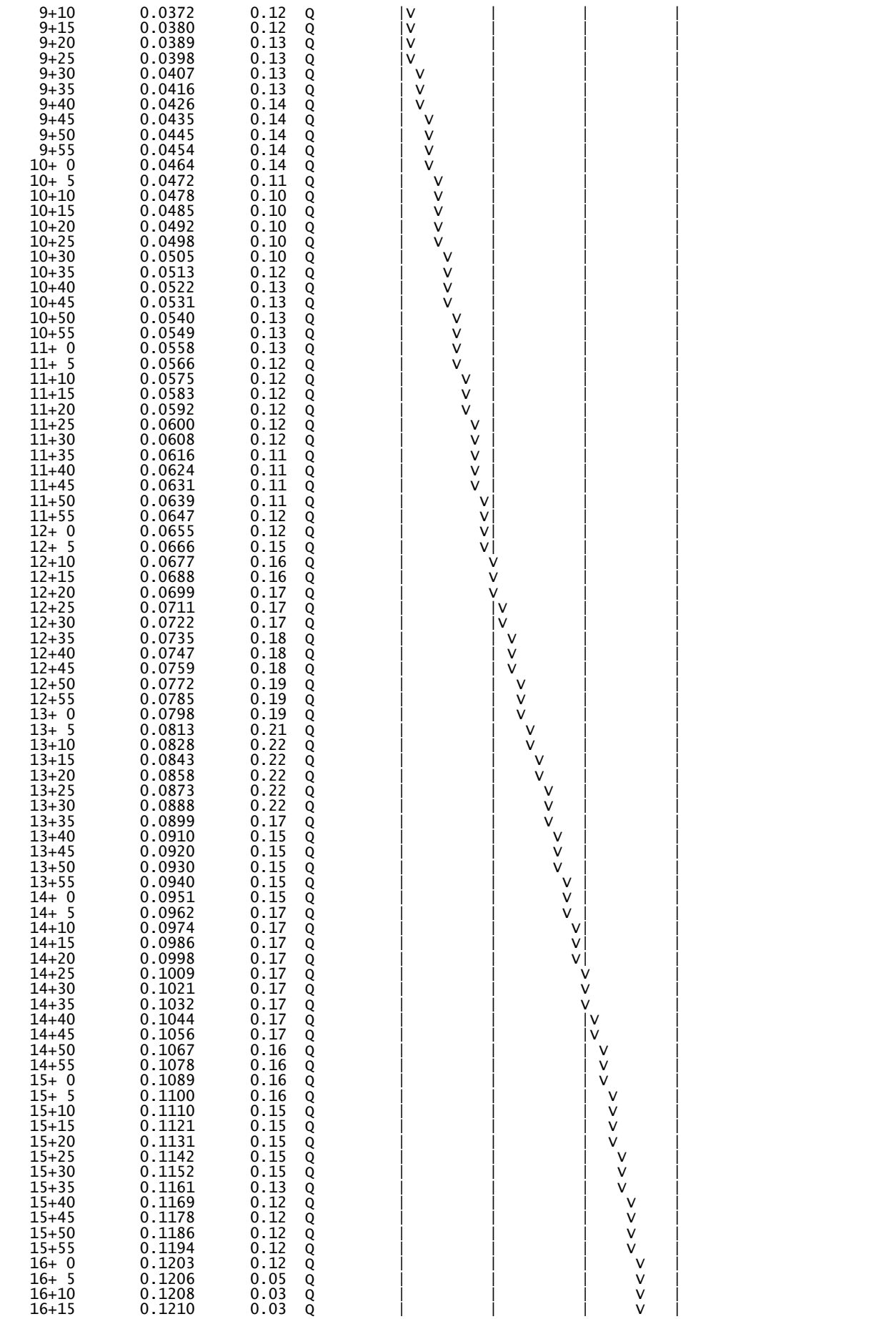
2+ 0       0.0033      0.03  Q          |          |          |          |
2+ 5       0.0035      0.03  QV         |          |          |          |
2+10       0.0036      0.03  QV         |          |          |          |
2+15       0.0038      0.03  QV         |          |          |          |
2+20       0.0040      0.03  QV         |          |          |          |
2+25       0.0042      0.03  QV         |          |          |          |
2+30       0.0044      0.03  QV         |          |          |          |
2+35       0.0046      0.03  QV         |          |          |          |
2+40       0.0048      0.03  QV         |          |          |          |
2+45       0.0050      0.03  QV         |          |          |          |
2+50       0.0052      0.03  QV         |          |          |          |
2+55       0.0055      0.03  QV         |          |          |          |
3+ 0       0.0057      0.03  QV         |          |          |          |
3+ 5       0.0059      0.03  QV         |          |          |          |
3+10       0.0061      0.03  QV         |          |          |          |
3+15       0.0063      0.03  QV         |          |          |          |
3+20       0.0066      0.03  QV         |          |          |          |
3+25       0.0068      0.03  Q V        |          |          |          |
3+30       0.0070      0.03  Q V        |          |          |          |
3+35       0.0072      0.03  Q V        |          |          |          |
3+40       0.0075      0.03  Q V        |          |          |          |
3+45       0.0077      0.03  Q V        |          |          |          |
3+50       0.0079      0.04  Q V        |          |          |          |
3+55       0.0082      0.04  Q V        |          |          |          |
4+ 0       0.0085      0.04  Q V        |          |          |          |
4+ 5       0.0087      0.04  Q V        |          |          |          |
4+10       0.0090      0.04  Q V        |          |          |          |
4+15       0.0093      0.04  Q V        |          |          |          |
4+20       0.0096      0.04  Q V        |          |          |          |
4+25       0.0099      0.05  Q V        |          |          |          |
4+30       0.0102      0.05  Q  V       |          |          |          |
4+35       0.0105      0.05  Q  V       |          |          |          |
4+40       0.0108      0.05  Q  V       |          |          |          |
4+45       0.0111      0.05  Q  V       |          |          |          |
4+50       0.0115      0.05  Q  V       |          |          |          |
4+55       0.0118      0.05  Q  V       |          |          |          |
5+ 0       0.0122      0.05  Q  V       |          |          |          |
5+ 5       0.0125      0.04  Q  V       |          |          |          |
5+10       0.0127      0.04  Q  V       |          |          |          |
5+15       0.0130      0.04  Q  V       |          |          |          |
5+20       0.0133      0.04  Q  V       |          |          |          |
5+25       0.0136      0.05  Q   V      |          |          |          |
5+30       0.0139      0.05  Q   V      |          |          |          |
5+35       0.0143      0.05  Q   V      |          |          |          |
5+40       0.0146      0.05  Q   V      |          |          |          |
5+45       0.0150      0.05  Q   V      |          |          |          |
5+50       0.0153      0.05  Q   V      |          |          |          |
5+55       0.0157      0.05  Q   V      |          |          |          |
6+ 0       0.0160      0.05  Q   V      |          |          |          |
6+ 5       0.0164      0.06  Q   V      |          |          |          |
6+10       0.0168      0.06  Q    V     |          |          |          |
6+15       0.0172      0.06  Q    V     |          |          |          |
6+20       0.0176      0.06  Q    V     |          |          |          |
6+25       0.0180      0.06  Q    V     |          |          |          |
6+30       0.0184      0.06  Q    V     |          |          |          |
6+35       0.0189      0.06  Q    V     |          |          |          |
6+40       0.0193      0.06  Q    V     |          |          |          |
6+45       0.0198      0.06  Q    V     |          |          |          |
6+50       0.0202      0.06  Q     V    |          |          |          |
6+55       0.0206      0.06  Q     V    |          |          |          |
7+ 0       0.0211      0.06  Q     V    |          |          |          |
7+ 5       0.0215      0.06  Q     V    |          |          |          |
7+10       0.0220      0.06  Q     V    |          |          |          |
7+15       0.0224      0.06  Q     V    |          |          |          |
7+20       0.0229      0.07  Q     V    |          |          |          |
7+25       0.0234      0.07  Q      V   |          |          |          |
7+30       0.0239      0.07  Q      V   |          |          |          |
7+35       0.0244      0.08  Q      V   |          |          |          |
7+40       0.0249      0.08  Q      V   |          |          |          |
7+45       0.0255      0.08  Q      V   |          |          |          |
7+50       0.0260      0.08  Q      V   |          |          |          |
7+55       0.0266      0.08  Q      V   |          |          |          |
8+ 0       0.0272      0.08  Q       V  |          |          |          |
8+ 5       0.0278      0.09  Q       V  |          |          |          |
8+10       0.0285      0.10  Q       V  |          |          |          |
8+15       0.0292      0.10  Q       V  |          |          |          |
8+20       0.0298      0.10  Q       V  |          |          |          |
8+25       0.0305      0.10  Q        V |          |          |          |
8+30       0.0312      0.10  Q        V |          |          |          |
8+35       0.0319      0.10  Q        V |          |          |          |
8+40       0.0326      0.10  Q        V |          |          |          |
8+45       0.0333      0.10  Q        V |          |          |          |
8+50       0.0340      0.11  Q         V          |          |          |
8+55       0.0348      0.11  Q         V          |          |          |
9+ 0       0.0355      0.11  Q         V          |          |          |
9+ 5       0.0364      0.12  Q         V          |          |          |
```



9+10	0.0372	0.12	Q	
9+15	0.0380	0.12	Q	
9+20	0.0389	0.13	Q	
9+25	0.0398	0.13	Q	
9+30	0.0407	0.13	Q	
9+35	0.0416	0.13	Q	
9+40	0.0426	0.14	Q	
9+45	0.0435	0.14	Q	
9+50	0.0445	0.14	Q	
9+55	0.0454	0.14	Q	
10+ 0	0.0464	0.14	Q	
10+ 5	0.0472	0.11	Q	
10+10	0.0478	0.10	Q	
10+15	0.0485	0.10	Q	
10+20	0.0492	0.10	Q	
10+25	0.0498	0.10	Q	
10+30	0.0505	0.10	Q	
10+35	0.0513	0.12	Q	
10+40	0.0522	0.13	Q	
10+45	0.0531	0.13	Q	
10+50	0.0540	0.13	Q	
10+55	0.0549	0.13	Q	
11+ 0	0.0558	0.13	Q	
11+ 5	0.0566	0.12	Q	
11+10	0.0575	0.12	Q	
11+15	0.0583	0.12	Q	
11+20	0.0592	0.12	Q	
11+25	0.0600	0.12	Q	
11+30	0.0608	0.12	Q	
11+35	0.0616	0.11	Q	
11+40	0.0624	0.11	Q	
11+45	0.0631	0.11	Q	
11+50	0.0639	0.11	Q	
11+55	0.0647	0.12	Q	
12+ 0	0.0655	0.12	Q	
12+ 5	0.0666	0.15	Q	
12+10	0.0677	0.16	Q	
12+15	0.0688	0.16	Q	
12+20	0.0699	0.17	Q	
12+25	0.0711	0.17	Q	
12+30	0.0722	0.17	Q	
12+35	0.0735	0.18	Q	
12+40	0.0747	0.18	Q	
12+45	0.0759	0.18	Q	
12+50	0.0772	0.19	Q	
12+55	0.0785	0.19	Q	
13+ 0	0.0798	0.19	Q	
13+ 5	0.0813	0.21	Q	
13+10	0.0828	0.22	Q	
13+15	0.0843	0.22	Q	
13+20	0.0858	0.22	Q	
13+25	0.0873	0.22	Q	
13+30	0.0888	0.22	Q	
13+35	0.0899	0.17	Q	
13+40	0.0910	0.15	Q	
13+45	0.0920	0.15	Q	
13+50	0.0930	0.15	Q	
13+55	0.0940	0.15	Q	
14+ 0	0.0951	0.15	Q	
14+ 5	0.0962	0.17	Q	
14+10	0.0974	0.17	Q	
14+15	0.0986	0.17	Q	
14+20	0.0998	0.17	Q	
14+25	0.1009	0.17	Q	
14+30	0.1021	0.17	Q	
14+35	0.1032	0.17	Q	
14+40	0.1044	0.17	Q	
14+45	0.1056	0.17	Q	
14+50	0.1067	0.16	Q	
14+55	0.1078	0.16	Q	
15+ 0	0.1089	0.16	Q	
15+ 5	0.1100	0.16	Q	
15+10	0.1110	0.15	Q	
15+15	0.1121	0.15	Q	
15+20	0.1131	0.15	Q	
15+25	0.1142	0.15	Q	
15+30	0.1152	0.15	Q	
15+35	0.1161	0.13	Q	
15+40	0.1169	0.12	Q	
15+45	0.1178	0.12	Q	
15+50	0.1186	0.12	Q	
15+55	0.1194	0.12	Q	
16+ 0	0.1203	0.12	Q	
16+ 5	0.1206	0.05	Q	
16+10	0.1208	0.03	Q	
16+15	0.1210	0.03	Q	

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16+20       0.1212      0.03  Q       |         |         |      V    |
16+25       0.1213      0.03  Q       |         |         |      V    |
16+30       0.1215      0.03  Q       |         |         |      V    |
16+35       0.1217      0.02  Q       |         |         |      V    |
16+40       0.1218      0.02  Q       |         |         |      V    |
16+45       0.1219      0.02  Q       |         |         |      V    |
16+50       0.1221      0.02  Q       |         |         |      V    |
16+55       0.1222      0.02  Q       |         |         |      V    |
17+ 0       0.1223      0.02  Q       |         |         |      V    |
17+ 5       0.1225      0.03  Q       |         |         |      V    |
17+10       0.1228      0.03  Q       |         |         |      V    |
17+15       0.1230      0.03  Q       |         |         |      V    |
17+20       0.1232      0.03  Q       |         |         |      V    |
17+25       0.1234      0.03  Q       |         |         |       V   |
17+30       0.1236      0.03  Q       |         |         |       V   |
17+35       0.1239      0.03  Q       |         |         |       V   |
17+40       0.1241      0.03  Q       |         |         |       V   |
17+45       0.1243      0.03  Q       |         |         |       V   |
17+50       0.1245      0.03  Q       |         |         |       V   |
17+55       0.1247      0.03  Q       |         |         |       V   |
18+ 0       0.1249      0.03  Q       |         |         |       V   |
18+ 5       0.1250      0.03  Q       |         |         |       V   |
18+10       0.1252      0.03  Q       |         |         |       V   |
18+15       0.1254      0.03  Q       |         |         |       V   |
18+20       0.1256      0.03  Q       |         |         |       V   |
18+25       0.1257      0.03  Q       |         |         |       V   |
18+30       0.1259      0.03  Q       |         |         |       V   |
18+35       0.1261      0.02  Q       |         |         |       V   |
18+40       0.1262      0.02  Q       |         |         |       V   |
18+45       0.1263      0.02  Q       |         |         |       V   |
18+50       0.1264      0.01  Q       |         |         |       V   |
18+55       0.1265      0.01  Q       |         |         |       V   |
19+ 0       0.1266      0.01  Q       |         |         |       V   |
19+ 5       0.1267      0.02  Q       |         |         |        V  |
19+10       0.1269      0.02  Q       |         |         |        V  |
19+15       0.1270      0.02  Q       |         |         |        V  |
19+20       0.1272      0.02  Q       |         |         |        V  |
19+25       0.1273      0.03  Q       |         |         |        V  |
19+30       0.1275      0.03  Q       |         |         |        V  |
19+35       0.1277      0.02  Q       |         |         |        V  |
19+40       0.1278      0.02  Q       |         |         |        V  |
19+45       0.1279      0.02  Q       |         |         |        V  |
19+50       0.1280      0.01  Q       |         |         |        V  |
19+55       0.1281      0.01  Q       |         |         |        V  |
20+ 0       0.1282      0.01  Q       |         |         |        V  |
20+ 5       0.1283      0.02  Q       |         |         |        V  |
20+10       0.1285      0.02  Q       |         |         |        V  |
20+15       0.1286      0.02  Q       |         |         |        V  |
20+20       0.1287      0.02  Q       |         |         |        V  |
20+25       0.1289      0.02  Q       |         |         |        V  |
20+30       0.1290      0.02  Q       |         |         |        V  |
20+35       0.1291      0.02  Q       |         |         |        V  |
20+40       0.1293      0.02  Q       |         |         |        V  |
20+45       0.1294      0.02  Q       |         |         |        V  |
20+50       0.1295      0.01  Q       |         |         |        V  |
20+55       0.1296      0.01  Q       |         |         |        V  |
21+ 0       0.1297      0.01  Q       |         |         |        V  |
21+ 5       0.1298      0.02  Q       |         |         |        V  |
21+10       0.1299      0.02  Q       |         |         |        V  |
21+15       0.1301      0.02  Q       |         |         |         V |
21+20       0.1302      0.01  Q       |         |         |         V |
21+25       0.1303      0.01  Q       |         |         |         V |
21+30       0.1303      0.01  Q       |         |         |         V |
21+35       0.1305      0.02  Q       |         |         |         V |
21+40       0.1306      0.02  Q       |         |         |         V |
21+45       0.1307      0.02  Q       |         |         |         V |
21+50       0.1308      0.01  Q       |         |         |         V |
21+55       0.1309      0.01  Q       |         |         |         V |
22+ 0       0.1310      0.01  Q       |         |         |         V |
22+ 5       0.1311      0.02  Q       |         |         |         V |
22+10       0.1313      0.02  Q       |         |         |         V |
22+15       0.1314      0.02  Q       |         |         |         V |
22+20       0.1315      0.01  Q       |         |         |         V |
22+25       0.1316      0.01  Q       |         |         |         V |
22+30       0.1317      0.01  Q       |         |         |         V |
22+35       0.1318      0.01  Q       |         |         |         V |
22+40       0.1319      0.01  Q       |         |         |         V |
22+45       0.1319      0.01  Q       |         |         |         V |
22+50       0.1320      0.01  Q       |         |         |         V |
22+55       0.1321      0.01  Q       |         |         |         V |
23+ 0       0.1322      0.01  Q       |         |         |         V |
23+ 5       0.1323      0.01  Q       |         |         |         V |
23+10       0.1324      0.01  Q       |         |         |         V |
23+15       0.1325      0.01  Q       |         |         |         V |
23+20       0.1326      0.01  Q       |         |         |         V |
23+25       0.1327      0.01  Q       |         |         |         V |
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   23+30       0.1327      0.01  Q          |          |          |        v|
   23+35       0.1328      0.01  Q          |          |          |        v|
   23+40       0.1329      0.01  Q          |          |          |        v|
   23+45       0.1330      0.01  Q          |          |          |        v|
   23+50       0.1331      0.01  Q          |          |          |        v|
   23+55       0.1332      0.01  Q          |          |          |        v|
   24+ 0       0.1333      0.01  Q          |          |          |        v|
   24+ 5       0.1333      0.00  Q          |          |          |        v|
-------------------------------------------------------------------------------
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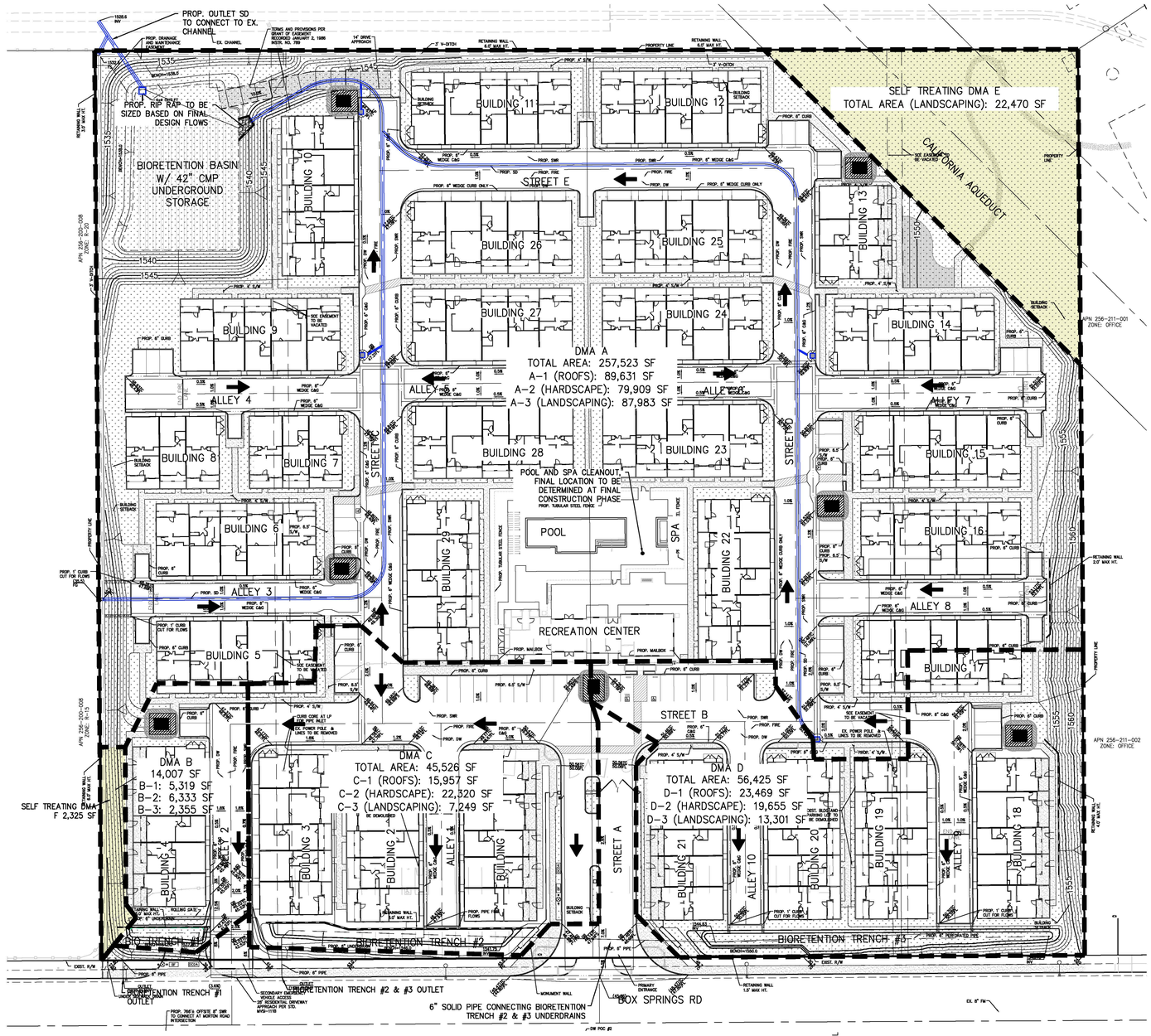
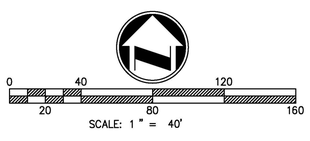
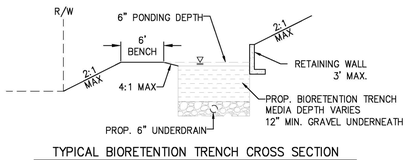
IN THE CITY OF MORENO VALLEY, COUNTY OF RIVERSIDE, STATE OF CALIFORNIA

TENTATIVE TRACT 38955
PROPOSED UNIT HYDROGRAPH MAP

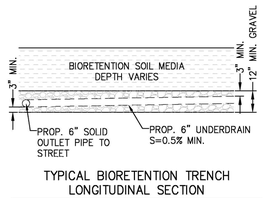






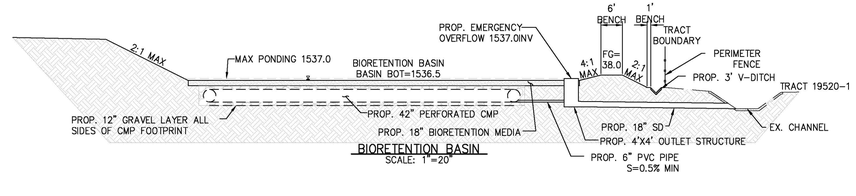
TYPICAL BIORETENTION TRENCH CROSS SECTION

NTS



TYPICAL BIORETENTION TRENCH LONGITUDINAL SECTION

NTS



BIORETENTION BASIN

SCALE: 1"=20'

ENGINEER

ADKAN ENGINEERS
6879 AIRPORT DRIVE
RIVERSIDE, CA 92504
TELEPHONE: (951) 688-0241
MBRENDECKE@ADKAN.COM

ASSESSORS PARCEL NUMBERS

256-200-002, 256-200-003, &
256-200-004

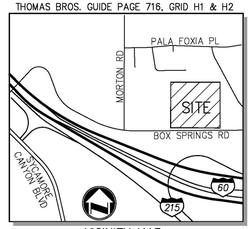
OWNER

RIVERSIDE COUNTY FARM BUREAU, INC.
21160 BOX SPRINGS RD, SUITE 102
MORENO VALLEY, CA 92557

APPLICANT

FOREMOST PACIFIC GROUP
27271 LAS RAMBLAS, SUITE 100
MISSION VIEJO, CA 92691
949-748-6714

THOMAS BROS. GUIDE PAGE 716, GRID H1 & H2



VICINITY MAP

N.T.S.

T2SR4W SEC 34 SW

PLANS PREPARED BY:
adkan ENGINEERS
Civil Engineering • Surveying • Planning
6879 Airport Drive, Riverside, CA 92504
Tel:(951) 688-0241 • Fax:(951) 688-0599

BIORETENTION BASINS

DMA	Storm Event	Existing		Proposed		Basin Routing		
		Volume ac.ft.	Q cfs	Volume ac.ft.	Q cfs	Volume ac.ft.	Q cfs	Depth ft.
A	2yr24hr	0.0985	0.162	0.6107	1.005	0.4100	0.238	3.12
B	2yr24hr	0.0053	0.009	0.0331	0.054	0.0220	0.049	3.50
C	2yr24hr	0.0908	0.149	0.1075	0.177	0.0750	0.183	3.51
D	2yr24hr	0.0817	0.134	0.1333	0.219	0.1250	0.022	3.50
TOTAL CFS	2yr24hr		0.454		1.455		0.492	

Total Existing vs. Routed Flow % Difference: 108%

As detailed above, the sum of existing vs proposed Qs for all proposed drainage areas meets the required 110% max increase in accordance with hydro-modification requirements. It is noted that each individual DMA area may not meet this requirement, but the site has been designed to over-mitigate in available areas to offset the more constrained DMAs. The project flows that leave the project site at the North and South both join together just downstream of the project site, roughly 700 ft west of our project site in the existing drainage area just west of Morton Road. There are no anticipated negative impacts to downstream watercourses.

UNDERGROUND STORAGE SIZE & FLOW CALCULATIONS

	ELEVATION	DEPTH	ROCK/MEDIA VOLUME (CF)	42" PIPE CROSS-SECTIONAL AREA (SF)	42" PIPE VOLUME (CF)	STORAGE IN ONSITE SD SYSTEM	CUMULATIVE STORAGE VOLUME (CF)	CUMULATIVE STORAGE VOLUME (AC-FT)	SYSTEM OUTFLOW				
										ORIFICE (CFS)	WEIR	EMERGENCY SPILLWAY	TOTAL (CFS)
TOP OF BASIN	1538	8.5	7,728.00				45443.36	1.043		0.47	53.28	21.73	75.486
PONDING STORAGE	1537	7.5	3,864.00				37715.36	0.866		0.44	0.00	0.00	0.437
BIORETENTION	1536.5	7	3,477.60				33851.36	0.777		0.42	0.00	0.00	0.418
TOP OF ROCK	1535	5.5	3699.60	0.00	0.00	30373.76	30373.76	0.697		0.35	0.00	0.00	0.353
TOP OF CMP	1534	4.5	2123.79	2.27	3939.52	26674.16	26674.16	0.612		0.30	0.00	0.00	0.302
ORIFICE	1533	3.5	1327.55	3.41	5930.12	20610.85	20610.85	0.473		0.24	0.00	0.00	0.241
ORIFICE	1532	2.5	1549.19	3.10	5376.02	13353.18	13353.18	0.307		0.16	0.00	0.00	0.158
	1531	1.5	1264.08	0.84	1464.29	6427.97	6427.97	0.148		0.00	0.00	0.00	0.000
INVERT OF CMP	1530.5	1	3699.60	0.00	0.00	3699.60	3699.60	0.085		0.00	0.00	0.00	0.000
BOT OF EXCAVATION	1529.5	0					-	0.000		0.00	0.00	0.00	0.000

PIPE DETAILS		
DIAMETER OF CMP	42	IN
LINEAR FEET OF CMP	1737	FT
CORRUGATION	5X1	
GAGE	16	
COATING	ALT2	
WALL TYPE	PERF	
BARREL SPACING	21	IN
SITE DRAINAGE DIA	0	IN
SITE DRAINAGE LENGTH	0	FT
SITE DRAINAGE VOLUME	-	CF

BACKFILL DETAILS		
BACKFILL TYPE	CRUSHED ROCK	
WIDTH AT ENDS	12	IN
ABOVE PIPE	12	IN
WIDTH AT SIDES	12	IN
BELOW PIPE	12	IN
ROCK POROSITY	40%	
EXCAVATION WIDTH		FT
EXCAVATION LENGTH		FT
EXCAVATION FOOT	9,249.00	SF
VBMP	13900	

BIORETENTION MEDIA		
BACKFILL TYPE	ENGINEERED SOIL	
POROSITY	30%	
BIORETENTION FOOTPRINT	7,728.00	SF

ORIFICE 1		
NO. OF ORIFICES	1	
ORIFICE DIA	2.5	IN
ORIFICE AREA	0.03	SF
ORIFICE INV.	1531.3	
ORIFICE COEFF	0.6667	

WEIR		
Crest Wier Elev.	1537.00	
Q100	15	
Weir Length	16	FT
Weir Coeff.	3.33	
H Weir	0.4295543	
Q100 Elevation	**1537.43**	

EMERGENCY SPILLWAY		
Crest Wier Elev.	1537.45	
Q100	15	
Weir Length	40	FT
Weir Coeff.	3.33	
H Weir	0.2331979	
Q100 Elevation	**1537.68**	

```
                    FLOOD HYDROGRAPH ROUTING PROGRAM
                Copyright (c) CIVILCADD/CIVILDESIGN, 1989 - 2004
                            Study date: 10/11/24

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



      Program License Serial Number 5006

      ---------------------------------------------------------------------
      ********************* HYDROGRAPH INFORMATION **********************

                  From study/file name: PROA2242.rte
      ****************************HYDROGRAPH DATA****************************
                  Number of intervals =   291
                  Time interval =    5.0 (Min.)
                  Maximum/Peak flow rate =        1.005 (CFS)
                  Total volume =       0.611 (Ac.Ft)
             Status of hydrographs being held in storage
                       Stream 1  Stream 2  Stream 3  Stream 4  Stream 5
             Peak (CFS)      0.000     0.000     0.000     0.000     0.000
             Vol (Ac.Ft)      0.000     0.000     0.000     0.000     0.000
      *************************************************************************



      +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
      Process from Point/Station        1.000 to Point/Station        2.000
      **** RETARDING BASIN ROUTING ****
      _________________________________________________________________________

      User entry of depth-outflow-storage data
      ---------------------------------------------------------------------
      Total number of inflow hydrograph intervals = 291
      Hydrograph time unit =  5.000 (Min.)
      Initial depth in storage basin =   0.00(Ft.)
      ---------------------------------------------------------------------
      ---------------------------------------------------------------------
      Initial basin depth =   0.00 (Ft.)
      Initial basin storage =      0.00 (Ac.Ft)
      Initial basin outflow =   0.00 (CFS)
      ---------------------------------------------------------------------
      ---------------------------------------------------------------------
      Depth vs. Storage and Depth vs. Discharge data:
       Basin Depth  Storage    Outflow   (S-O*dt/2)   (S+O*dt/2)
            (Ft.)    (Ac.Ft)    (CFS)     (Ac.Ft)    (Ac.Ft)
      ---------------------------------------------------------------------
        0.000      0.000      0.000      0.000        0.000
        1.000      0.085      0.001      0.085        0.085
        1.500      0.148      0.002      0.148        0.148
        2.500      0.307      0.158      0.306        0.308
        3.500      0.473      0.241      0.472        0.474
        4.500      0.612      0.302      0.611        0.613
        5.500      0.697      0.353      0.696        0.698
        7.000      0.777      0.418      0.776        0.778
        7.500      0.866      0.437      0.864        0.868
        8.500      1.043     75.486      0.783        1.303
      ---------------------------------------------------------------------
                     Hydrograph Detention Basin Routing
      ---------------------------------------------------------------------

      Graph values: 'I'= unit inflow; 'O'=outflow at time shown
      ---------------------------------------------------------------------
       Time   Inflow  Outflow    Storage                                  Depth
      (Hours)  (CFS)   (CFS)     (Ac.Ft) .0       0.3    0.50    0.75    1.00 (Ft.)
       0.083    0.03    0.00      0.000  O       |       |       |       |     0.00
       0.167    0.05    0.00      0.000  OI      |       |       |       |     0.00
       0.250    0.06    0.00      0.001  OI      |       |       |       |     0.01
       0.333    0.07    0.00      0.001  O I     |       |       |       |     0.01
       0.417    0.09    0.00      0.002  O I     |       |       |       |     0.02
       0.500    0.09    0.00      0.002  O I     |       |       |       |     0.03
       0.583    0.09    0.00      0.003  O I     |       |       |       |     0.04
       0.667    0.09    0.00      0.004  O I     |       |       |       |     0.04
       0.750    0.09    0.00      0.004  O I     |       |       |       |     0.05
       0.833    0.10    0.00      0.005  O  I    |       |       |       |     0.06
       0.917    0.12    0.00      0.006  O  I    |       |       |       |     0.07
       1.000    0.12    0.00      0.006  O  I    |       |       |       |     0.08
       1.083    0.10    0.00      0.007  O  I    |       |       |       |     0.08
       1.167    0.09    0.00      0.008  O I     |       |       |       |     0.09
       1.250    0.09    0.00      0.008  O I     |       |       |       |     0.10
       1.333    0.09    0.00      0.009  O I     |       |       |       |     0.11
       1.417    0.09    0.00      0.010  O I     |       |       |       |     0.11
```

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1.500    0.09    0.00      0.010  o I     |       |       |       |     0.12
1.583    0.09    0.00      0.011  o I     |       |       |       |     0.13
1.667    0.09    0.00      0.012  o I     |       |       |       |     0.14
1.750    0.09    0.00      0.012  o I     |       |       |       |     0.14
1.833    0.10    0.00      0.013  o  I    |       |       |       |     0.15
1.917    0.12    0.00      0.014  o  I    |       |       |       |     0.16
2.000    0.12    0.00      0.014  o  I    |       |       |       |     0.17
2.083    0.12    0.00      0.015  o  I    |       |       |       |     0.18
2.167    0.12    0.00      0.016  o  I    |       |       |       |     0.19
2.250    0.12    0.00      0.017  o  I    |       |       |       |     0.20
2.333    0.12    0.00      0.018  o  I    |       |       |       |     0.21
2.417    0.12    0.00      0.018  o  I    |       |       |       |     0.22
2.500    0.12    0.00      0.019  o  I    |       |       |       |     0.23
2.583    0.13    0.00      0.020  o   I   |       |       |       |     0.24
2.667    0.15    0.00      0.021  o   I   |       |       |       |     0.25
2.750    0.15    0.00      0.022  o   I   |       |       |       |     0.26
2.833    0.15    0.00      0.023  o   I   |       |       |       |     0.27
2.917    0.15    0.00      0.024  o   I   |       |       |       |     0.28
3.000    0.15    0.00      0.025  o   I   |       |       |       |     0.30
3.083    0.15    0.00      0.026  o   I   |       |       |       |     0.31
3.167    0.15    0.00      0.027  o   I   |       |       |       |     0.32
3.250    0.15    0.00      0.028  o   I   |       |       |       |     0.33
3.333    0.15    0.00      0.029  o   I   |       |       |       |     0.34
3.417    0.15    0.00      0.030  o   I   |       |       |       |     0.36
3.500    0.15    0.00      0.031  o   I   |       |       |       |     0.37
3.583    0.15    0.00      0.032  o   I   |       |       |       |     0.38
3.667    0.15    0.00      0.033  o   I   |       |       |       |     0.39
3.750    0.15    0.00      0.034  o   I   |       |       |       |     0.40
3.833    0.16    0.00      0.035  o    I  |       |       |       |     0.42
3.917    0.17    0.00      0.036  o    I  |       |       |       |     0.43
4.000    0.18    0.00      0.038  o    I  |       |       |       |     0.44
4.083    0.18    0.00      0.039  o    I  |       |       |       |     0.46
4.167    0.18    0.00      0.040  o    I  |       |       |       |     0.47
4.250    0.18    0.00      0.041  o    I  |       |       |       |     0.49
4.333    0.19    0.00      0.043  o     I |       |       |       |     0.50
4.417    0.20    0.00      0.044  o     I |       |       |       |     0.52
4.500    0.21    0.00      0.045  o     I |       |       |       |     0.53
4.583    0.21    0.00      0.047  o     I |       |       |       |     0.55
4.667    0.21    0.00      0.048  o     I |       |       |       |     0.57
4.750    0.21    0.00      0.050  o     I |       |       |       |     0.58
4.833    0.22    0.00      0.051  o      I|       |       |       |     0.60
4.917    0.23    0.00      0.053  o      I|       |       |       |     0.62
5.000    0.24    0.00      0.054  o      I|       |       |       |     0.64
5.083    0.21    0.00      0.056  o     I |       |       |       |     0.66
5.167    0.18    0.00      0.057  o    I  |       |       |       |     0.67
5.250    0.18    0.00      0.058  o    I  |       |       |       |     0.69
5.333    0.19    0.00      0.060  o     I |       |       |       |     0.70
5.417    0.20    0.00      0.061  o     I |       |       |       |     0.72
5.500    0.21    0.00      0.062  o     I |       |       |       |     0.73
5.583    0.22    0.00      0.064  o      I|       |       |       |     0.75
5.667    0.23    0.00      0.065  o      I|       |       |       |     0.77
5.750    0.24    0.00      0.067  o      I|       |       |       |     0.79
5.833    0.24    0.00      0.069  o      I|       |       |       |     0.81
5.917    0.24    0.00      0.070  o      I|       |       |       |     0.83
6.000    0.24    0.00      0.072  o      I|       |       |       |     0.85
6.083    0.25    0.00      0.074  o       I       |       |       |     0.87
6.167    0.26    0.00      0.075  o       I       |       |       |     0.89
6.250    0.27    0.00      0.077  o       I       |       |       |     0.91
6.333    0.27    0.00      0.079  o       I       |       |       |     0.93
6.417    0.27    0.00      0.081  o       I       |       |       |     0.95
6.500    0.27    0.00      0.083  o       I       |       |       |     0.97
6.583    0.28    0.00      0.085  o       I       |       |       |     1.00
6.667    0.29    0.00      0.087  o       |I      |       |       |     1.01
6.750    0.30    0.00      0.089  o       |I      |       |       |     1.03
6.833    0.30    0.00      0.091  o       |I      |       |       |     1.04
6.917    0.30    0.00      0.093  o       |I      |       |       |     1.06
7.000    0.30    0.00      0.095  o       |I      |       |       |     1.08
7.083    0.30    0.00      0.097  o       |I      |       |       |     1.09
7.167    0.30    0.00      0.099  o       |I      |       |       |     1.11
7.250    0.30    0.00      0.101  o       |I      |       |       |     1.12
7.333    0.31    0.00      0.103  o       |I      |       |       |     1.14
7.417    0.32    0.00      0.105  o       | I     |       |       |     1.16
7.500    0.32    0.00      0.107  o       | I     |       |       |     1.18
7.583    0.34    0.00      0.109  o       | I     |       |       |     1.19
7.667    0.35    0.00      0.112  o       |  I    |       |       |     1.21
7.750    0.35    0.00      0.114  o       |  I    |       |       |     1.23
7.833    0.37    0.00      0.117  o       |  I    |       |       |     1.25
7.917    0.38    0.00      0.119  o       |   I   |       |       |     1.27
8.000    0.38    0.00      0.122  o       |   I   |       |       |     1.29
8.083    0.42    0.00      0.125  o       |    I  |       |       |     1.32
8.167    0.44    0.00      0.128  o       |    I  |       |       |     1.34
8.250    0.44    0.00      0.131  o       |     I |       |       |     1.36
8.333    0.44    0.00      0.134  o       |     I |       |       |     1.39
8.417    0.44    0.00      0.137  o       |     I |       |       |     1.41
8.500    0.44    0.00      0.140  o       |     I |       |       |     1.43
8.583    0.46    0.00      0.143  o       |     I |       |       |     1.46
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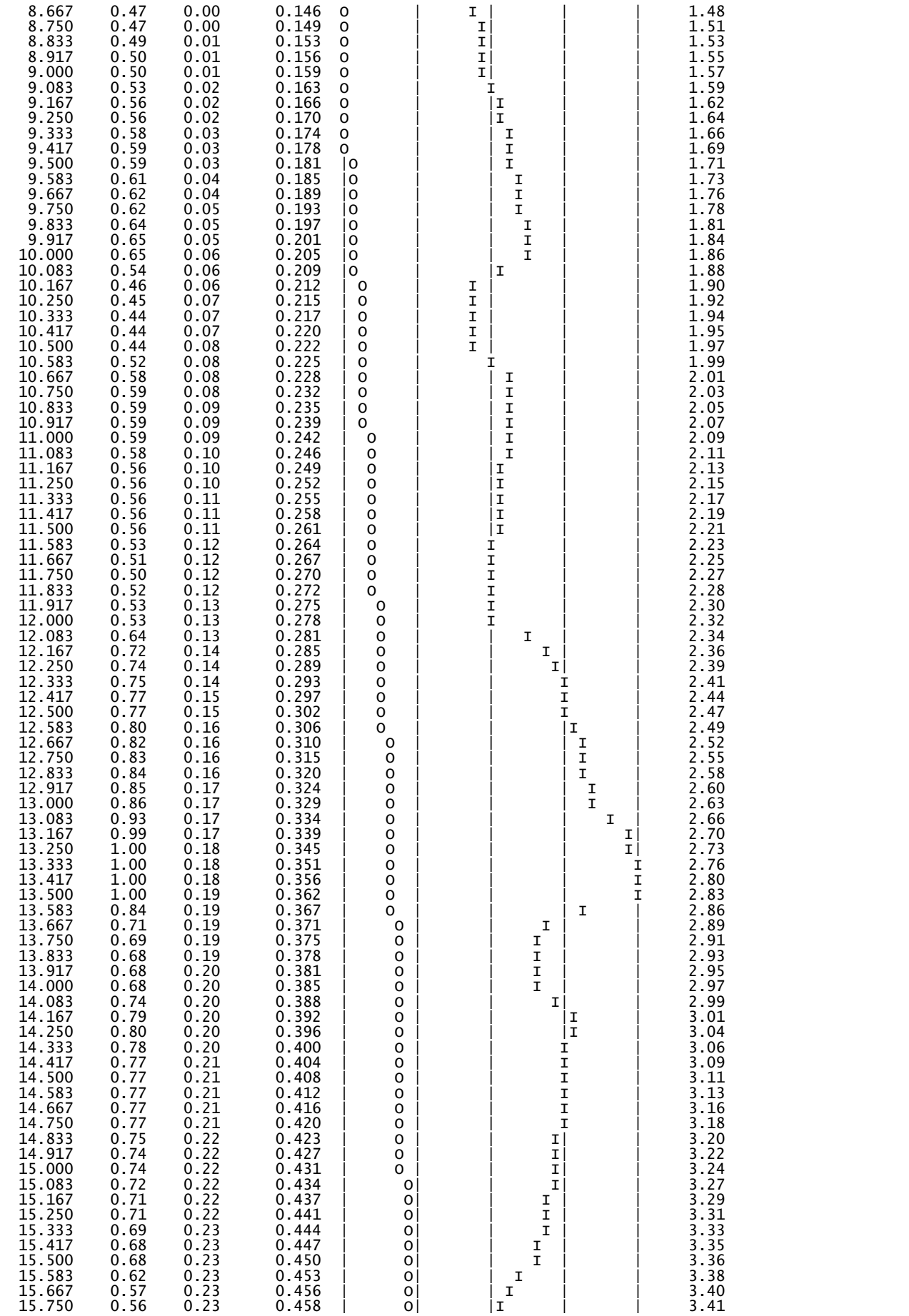

8.667	0.47	0.00	0.146	o	I			1.48
8.750	0.47	0.00	0.149	o	I			1.51
8.833	0.49	0.01	0.153	o	I			1.53
8.917	0.50	0.01	0.156	o	I			1.55
9.000	0.50	0.01	0.159	o	I			1.57
9.083	0.53	0.02	0.163	o	I			1.59
9.167	0.56	0.02	0.166	o	I			1.62
9.250	0.56	0.02	0.170	o	I			1.64
9.333	0.58	0.03	0.174	o	I			1.66
9.417	0.59	0.03	0.178	o	I			1.69
9.500	0.59	0.03	0.181	o	I			1.71
9.583	0.61	0.04	0.185	o	I			1.73
9.667	0.62	0.04	0.189	o	I			1.76
9.750	0.62	0.05	0.193	o	I			1.78
9.833	0.64	0.05	0.197	o	I			1.81
9.917	0.65	0.05	0.201	o	I			1.84
10.000	0.65	0.06	0.205	o	I			1.86
10.083	0.54	0.06	0.209	o	I			1.88
10.167	0.46	0.06	0.212	o	I			1.90
10.250	0.45	0.07	0.215	o	I			1.92
10.333	0.44	0.07	0.217	o	I			1.94
10.417	0.44	0.07	0.220	o	I			1.95
10.500	0.44	0.08	0.222	o	I			1.97
10.583	0.52	0.08	0.225	o	I			1.99
10.667	0.58	0.08	0.228	o	I			2.01
10.750	0.59	0.08	0.232	o	I			2.03
10.833	0.59	0.09	0.235	o	I			2.05
10.917	0.59	0.09	0.239	o	I			2.07
11.000	0.59	0.09	0.242	o	I			2.09
11.083	0.58	0.10	0.246	o	I			2.11
11.167	0.56	0.10	0.249	o	I			2.13
11.250	0.56	0.10	0.252	o	I			2.15
11.333	0.56	0.11	0.255	o	I			2.17
11.417	0.56	0.11	0.258	o	I			2.19
11.500	0.56	0.11	0.261	o	I			2.21
11.583	0.53	0.12	0.264	o	I			2.23
11.667	0.51	0.12	0.267	o	I			2.25
11.750	0.50	0.12	0.270	o	I			2.27
11.833	0.52	0.12	0.272	o	I			2.28
11.917	0.53	0.13	0.275	o	I			2.30
12.000	0.53	0.13	0.278	o	I			2.32
12.083	0.64	0.13	0.281	o	I			2.34
12.167	0.72	0.14	0.285	o	I			2.36
12.250	0.74	0.14	0.289	o	I			2.39
12.333	0.75	0.14	0.293	o	I			2.41
12.417	0.77	0.15	0.297	o	I			2.44
12.500	0.77	0.15	0.302	o	I			2.47
12.583	0.80	0.16	0.306	o	I			2.49
12.667	0.82	0.16	0.310	o	I			2.52
12.750	0.83	0.16	0.315	o	I			2.55
12.833	0.84	0.16	0.320	o	I			2.58
12.917	0.85	0.17	0.324	o	I			2.60
13.000	0.86	0.17	0.329	o	I			2.63
13.083	0.93	0.17	0.334	o	I			2.66
13.167	0.99	0.17	0.339	o	I			2.70
13.250	1.00	0.18	0.345	o	I			2.73
13.333	1.00	0.18	0.351	o	I			2.76
13.417	1.00	0.18	0.356	o	I			2.80
13.500	1.00	0.19	0.362	o	I			2.83
13.583	0.84	0.19	0.367	o	I			2.86
13.667	0.71	0.19	0.371	o	I			2.89
13.750	0.69	0.19	0.375	o	I			2.91
13.833	0.68	0.19	0.378	o	I			2.93
13.917	0.68	0.20	0.381	o	I			2.95
14.000	0.68	0.20	0.385	o	I			2.97
14.083	0.74	0.20	0.388	o	I			2.99
14.167	0.79	0.20	0.392	o	I			3.01
14.250	0.80	0.20	0.396	o	I			3.04
14.333	0.78	0.20	0.400	o	I			3.06
14.417	0.77	0.21	0.404	o	I			3.09
14.500	0.77	0.21	0.408	o	I			3.11
14.583	0.77	0.21	0.412	o	I			3.13
14.667	0.77	0.21	0.416	o	I			3.16
14.750	0.77	0.21	0.420	o	I			3.18
14.833	0.75	0.22	0.423	o	I			3.20
14.917	0.74	0.22	0.427	o	I			3.22
15.000	0.74	0.22	0.431	o	I			3.24
15.083	0.72	0.22	0.434	o	I			3.27
15.167	0.71	0.22	0.437	o	I			3.29
15.250	0.71	0.22	0.441	o	I			3.31
15.333	0.69	0.23	0.444	o	I			3.33
15.417	0.68	0.23	0.447	o	I			3.35
15.500	0.68	0.23	0.450	o	I			3.36
15.583	0.62	0.23	0.453	o	I			3.38
15.667	0.57	0.23	0.456	o	I			3.40
15.750	0.56	0.23	0.458	o	I			3.41

15.833	0.56	0.23	0.460	| O|	|I	|	|	3.42
15.917	0.56	0.24	0.463	| O|	|I	|	|	3.44
16.000	0.56	0.24	0.465	| O|	|I	|	|	3.45
16.083	0.33	0.24	0.466	| O| I	|	|	|	3.46
16.167	0.16	0.24	0.466	| I O|	|	|	|	3.46
16.250	0.13	0.24	0.466	| I O|	|	|	|	3.46
16.333	0.12	0.24	0.465	| I O|	|	|	|	3.45
16.417	0.12	0.24	0.464	| I O|	|	|	|	3.45
16.500	0.12	0.24	0.463	| I O|	|	|	|	3.44
16.583	0.10	0.24	0.462	| I O|	|	|	|	3.44
16.667	0.09	0.24	0.461	|I O|	|	|	|	3.43
16.750	0.09	0.23	0.460	|I O|	|	|	|	3.42
16.833	0.09	0.23	0.459	|I O|	|	|	|	3.42
16.917	0.09	0.23	0.458	|I O|	|	|	|	3.41
17.000	0.09	0.23	0.457	|I O|	|	|	|	3.41
17.083	0.12	0.23	0.457	| I O|	|	|	|	3.40
17.167	0.14	0.23	0.456	| I O|	|	|	|	3.40
17.250	0.15	0.23	0.455	| I O|	|	|	|	3.39
17.333	0.15	0.23	0.455	| I O|	|	|	|	3.39
17.417	0.15	0.23	0.454	| I O|	|	|	|	3.39
17.500	0.15	0.23	0.454	| I O|	|	|	|	3.38
17.583	0.15	0.23	0.453	| I O|	|	|	|	3.38
17.667	0.15	0.23	0.452	| I O|	|	|	|	3.38
17.750	0.15	0.23	0.452	| I O|	|	|	|	3.37
17.833	0.13	0.23	0.451	| I O|	|	|	|	3.37
17.917	0.12	0.23	0.450	| I O|	|	|	|	3.36
18.000	0.12	0.23	0.450	| I O|	|	|	|	3.36
18.083	0.12	0.23	0.449	| I O|	|	|	|	3.36
18.167	0.12	0.23	0.448	| I O|	|	|	|	3.35
18.250	0.12	0.23	0.447	| I O|	|	|	|	3.35
18.333	0.12	0.23	0.447	| I O|	|	|	|	3.34
18.417	0.12	0.23	0.446	| I O|	|	|	|	3.34
18.500	0.12	0.23	0.445	| I O|	|	|	|	3.33
18.583	0.10	0.23	0.444	| I O|	|	|	|	3.33
18.667	0.09	0.23	0.443	|I O|	|	|	|	3.32
18.750	0.09	0.23	0.443	|I O|	|	|	|	3.32
18.833	0.07	0.23	0.442	|I O|	|	|	|	3.31
18.917	0.06	0.22	0.440	|I O|	|	|	|	3.30
19.000	0.06	0.22	0.439	|I O|	|	|	|	3.30
19.083	0.07	0.22	0.438	|I O|	|	|	|	3.29
19.167	0.09	0.22	0.437	|I O|	|	|	|	3.28
19.250	0.09	0.22	0.436	|I O|	|	|	|	3.28
19.333	0.10	0.22	0.435	| I O|	|	|	|	3.27
19.417	0.12	0.22	0.435	| I O|	|	|	|	3.27
19.500	0.12	0.22	0.434	| I O|	|	|	|	3.26
19.583	0.10	0.22	0.433	| I O|	|	|	|	3.26
19.667	0.09	0.22	0.432	|I O|	|	|	|	3.26
19.750	0.09	0.22	0.431	|I O|	|	|	|	3.25
19.833	0.07	0.22	0.430	|I O |	|	|	|	3.24
19.917	0.06	0.22	0.429	|I O |	|	|	|	3.24
20.000	0.06	0.22	0.428	|I O |	|	|	|	3.23
20.083	0.07	0.22	0.427	|I O |	|	|	|	3.22
20.167	0.09	0.22	0.426	|I O |	|	|	|	3.22
20.250	0.09	0.22	0.425	|I O |	|	|	|	3.21
20.333	0.09	0.22	0.425	|I O |	|	|	|	3.21
20.417	0.09	0.22	0.424	|I O |	|	|	|	3.20
20.500	0.09	0.22	0.423	|I O |	|	|	|	3.20
20.583	0.09	0.22	0.422	|I O |	|	|	|	3.19
20.667	0.09	0.22	0.421	|I O |	|	|	|	3.19
20.750	0.09	0.21	0.420	|I O |	|	|	|	3.18
20.833	0.07	0.21	0.419	|I O |	|	|	|	3.18
20.917	0.06	0.21	0.418	|I O |	|	|	|	3.17
21.000	0.06	0.21	0.417	|I O |	|	|	|	3.16
21.083	0.07	0.21	0.416	|I O |	|	|	|	3.16
21.167	0.09	0.21	0.415	|I O |	|	|	|	3.15
21.250	0.09	0.21	0.414	|I O |	|	|	|	3.15
21.333	0.07	0.21	0.414	|I O |	|	|	|	3.14
21.417	0.06	0.21	0.413	|I O |	|	|	|	3.14
21.500	0.06	0.21	0.412	|I O |	|	|	|	3.13
21.583	0.07	0.21	0.411	|I O |	|	|	|	3.12
21.667	0.09	0.21	0.410	|I O |	|	|	|	3.12
21.750	0.09	0.21	0.409	|I O |	|	|	|	3.11
21.833	0.07	0.21	0.408	|I O |	|	|	|	3.11
21.917	0.06	0.21	0.407	|I O |	|	|	|	3.10
22.000	0.06	0.21	0.406	|I O |	|	|	|	3.10
22.083	0.07	0.21	0.405	|I O |	|	|	|	3.09
22.167	0.09	0.21	0.404	|I O |	|	|	|	3.09
22.250	0.09	0.21	0.403	|I O |	|	|	|	3.08
22.333	0.07	0.21	0.402	|I O |	|	|	|	3.07
22.417	0.06	0.21	0.401	|I O |	|	|	|	3.07
22.500	0.06	0.20	0.400	|I O |	|	|	|	3.06
22.583	0.06	0.20	0.399	|I O |	|	|	|	3.06
22.667	0.06	0.20	0.398	|I O |	|	|	|	3.05
22.750	0.06	0.20	0.397	|I O |	|	|	|	3.05
22.833	0.06	0.20	0.397	|I O |	|	|	|	3.04
22.917	0.06	0.20	0.396	|I O |	|	|	|	3.03

23.000	0.06	0.20	0.395	I	o				3.03
23.083	0.06	0.20	0.394	I	o				3.02
23.167	0.06	0.20	0.393	I	o				3.02
23.250	0.06	0.20	0.392	I	o				3.01
23.333	0.06	0.20	0.391	I	o				3.00
23.417	0.06	0.20	0.390	I	o				3.00
23.500	0.06	0.20	0.389	I	o				2.99
23.583	0.06	0.20	0.388	I	o				2.99
23.667	0.06	0.20	0.387	I	o				2.98
23.750	0.06	0.20	0.386	I	o				2.97
23.833	0.06	0.20	0.385	I	o				2.97
23.917	0.06	0.20	0.384	I	o				2.96
24.000	0.06	0.20	0.383	I	o				2.96
24.083	0.03	0.20	0.382	I	o				2.95
24.167	0.00	0.19	0.381	I	o				2.94
24.250	0.00	0.19	0.379	I	o				2.94
24.333	0.00	0.19	0.378	I	o				2.93
24.417	0.00	0.19	0.377	I	o				2.92
24.500	0.00	0.19	0.375	I	o				2.91
24.583	0.00	0.19	0.374	I	o				2.90
24.667	0.00	0.19	0.373	I	o				2.90
24.750	0.00	0.19	0.371	I	o				2.89
24.833	0.00	0.19	0.370	I	o				2.88
24.917	0.00	0.19	0.369	I	o				2.87
25.000	0.00	0.19	0.368	I	o				2.86
25.083	0.00	0.19	0.366	I	o				2.86
25.167	0.00	0.19	0.365	I	o				2.85
25.250	0.00	0.19	0.364	I	o				2.84
25.333	0.00	0.19	0.362	I	o				2.83
25.417	0.00	0.19	0.361	I	o				2.83
25.500	0.00	0.18	0.360	I	o				2.82
25.583	0.00	0.18	0.359	I	o				2.81
25.667	0.00	0.18	0.357	I	o				2.80
25.750	0.00	0.18	0.356	I	o				2.80
25.833	0.00	0.18	0.355	I	o				2.79
25.917	0.00	0.18	0.354	I	o				2.78
26.000	0.00	0.18	0.352	I	o				2.77
26.083	0.00	0.18	0.351	I	o				2.77
26.167	0.00	0.18	0.350	I	o				2.76
26.250	0.00	0.18	0.349	I	o				2.75
26.333	0.00	0.18	0.347	I	o				2.74
26.417	0.00	0.18	0.346	I	o				2.74
26.500	0.00	0.18	0.345	I	o				2.73
26.583	0.00	0.18	0.344	I	o				2.72
26.667	0.00	0.18	0.342	I	o				2.71
26.750	0.00	0.18	0.341	I	o				2.71
26.833	0.00	0.17	0.340	I	o				2.70
26.917	0.00	0.17	0.339	I	o				2.69
27.000	0.00	0.17	0.338	I	o				2.68
27.083	0.00	0.17	0.336	I	o				2.68
27.167	0.00	0.17	0.335	I	o				2.67
27.250	0.00	0.17	0.334	I	o				2.66
27.333	0.00	0.17	0.333	I	o				2.66
27.417	0.00	0.17	0.332	I	o				2.65
27.500	0.00	0.17	0.331	I	o				2.64
27.583	0.00	0.17	0.329	I	o				2.64
27.667	0.00	0.17	0.328	I	o				2.63
27.750	0.00	0.17	0.327	I	o				2.62
27.833	0.00	0.17	0.326	I	o				2.61
27.917	0.00	0.17	0.325	I	o				2.61
28.000	0.00	0.17	0.324	I	o				2.60
28.083	0.00	0.17	0.322	I	o				2.59
28.167	0.00	0.17	0.321	I	o				2.59
28.250	0.00	0.16	0.320	I	o				2.58
28.333	0.00	0.16	0.319	I	o				2.57
28.417	0.00	0.16	0.318	I	o				2.57
28.500	0.00	0.16	0.317	I	o				2.56
28.583	0.00	0.16	0.316	I	o				2.55
28.667	0.00	0.16	0.315	I	o				2.55
28.750	0.00	0.16	0.313	I	o				2.54
28.833	0.00	0.16	0.312	I	o				2.53
28.917	0.00	0.16	0.311	I	o				2.53
29.000	0.00	0.16	0.310	I	o				2.52
29.083	0.00	0.16	0.309	I	o				2.51
29.167	0.00	0.16	0.308	I	o				2.51
29.250	0.00	0.16	0.307	I	o				2.50
29.333	0.00	0.16	0.306	I	o				2.49
29.417	0.00	0.16	0.305	I	o				2.49
29.500	0.00	0.15	0.304	I	o				2.48
29.583	0.00	0.15	0.303	I	o				2.47
29.667	0.00	0.15	0.302	I	o				2.47
29.750	0.00	0.15	0.301	I	o				2.46
29.833	0.00	0.15	0.299	I	o				2.45
29.917	0.00	0.15	0.298	I	o				2.45
30.000	0.00	0.15	0.297	I	o				2.44
30.083	0.00	0.15	0.296	I	o				2.43

30.167	0.00	0.15	0.295	I	O	|	|	|	2.43
30.250	0.00	0.15	0.294	I	O	|	|	|	2.42
30.333	0.00	0.14	0.293	I	O	|	|	|	2.41
30.417	0.00	0.14	0.292	I	O	|	|	|	2.41
30.500	0.00	0.14	0.291	I	O	|	|	|	2.40
30.583	0.00	0.14	0.290	I	O	|	|	|	2.40
30.667	0.00	0.14	0.289	I	O	|	|	|	2.39
30.750	0.00	0.14	0.288	I	O	|	|	|	2.38
30.833	0.00	0.14	0.288	I	O	|	|	|	2.38
30.917	0.00	0.14	0.287	I	O	|	|	|	2.37
31.000	0.00	0.14	0.286	I	O	|	|	|	2.37
31.083	0.00	0.14	0.285	I	O	|	|	|	2.36
31.167	0.00	0.14	0.284	I	O	|	|	|	2.35
31.250	0.00	0.13	0.283	I	O	|	|	|	2.35
31.333	0.00	0.13	0.282	I	O	|	|	|	2.34
31.417	0.00	0.13	0.281	I	O	|	|	|	2.34
31.500	0.00	0.13	0.280	I	O	|	|	|	2.33
31.583	0.00	0.13	0.279	I	O	|	|	|	2.32
31.667	0.00	0.13	0.278	I	O	|	|	|	2.32
31.750	0.00	0.13	0.277	I	O	|	|	|	2.31
31.833	0.00	0.13	0.276	I	O	|	|	|	2.31
31.917	0.00	0.13	0.276	I	O	|	|	|	2.30
32.000	0.00	0.13	0.275	I	O	|	|	|	2.30
32.083	0.00	0.13	0.274	I	O	|	|	|	2.29
32.167	0.00	0.12	0.273	I	O	|	|	|	2.29
32.250	0.00	0.12	0.272	I	O	|	|	|	2.28
32.333	0.00	0.12	0.271	I	O	|	|	|	2.28
32.417	0.00	0.12	0.270	I	O	|	|	|	2.27
32.500	0.00	0.12	0.270	I	O	|	|	|	2.26
32.583	0.00	0.12	0.269	I	O	|	|	|	2.26
32.667	0.00	0.12	0.268	I	O	|	|	|	2.25
32.750	0.00	0.12	0.267	I	O	|	|	|	2.25
32.833	0.00	0.12	0.266	I	O	|	|	|	2.24
32.917	0.00	0.12	0.266	I	O	|	|	|	2.24
33.000	0.00	0.12	0.265	I	O	|	|	|	2.23
33.083	0.00	0.12	0.264	I	O	|	|	|	2.23
33.167	0.00	0.11	0.263	I	O	|	|	|	2.22
33.250	0.00	0.11	0.262	I	O	|	|	|	2.22
33.333	0.00	0.11	0.262	I	O	|	|	|	2.21
33.417	0.00	0.11	0.261	I	O	|	|	|	2.21
33.500	0.00	0.11	0.260	I	O	|	|	|	2.20
33.583	0.00	0.11	0.259	I	O	|	|	|	2.20
33.667	0.00	0.11	0.258	I	O	|	|	|	2.19
33.750	0.00	0.11	0.258	I	O	|	|	|	2.19
33.833	0.00	0.11	0.257	I	O	|	|	|	2.19
33.917	0.00	0.11	0.256	I	O	|	|	|	2.18
34.000	0.00	0.11	0.255	I	O	|	|	|	2.18
34.083	0.00	0.11	0.255	I	O	|	|	|	2.17
34.167	0.00	0.11	0.254	I	O	|	|	|	2.17
34.250	0.00	0.11	0.253	I	O	|	|	|	2.16
34.333	0.00	0.10	0.253	I	O	|	|	|	2.16
34.417	0.00	0.10	0.252	I	O	|	|	|	2.15
34.500	0.00	0.10	0.251	I	O	|	|	|	2.15
34.583	0.00	0.10	0.250	I	O	|	|	|	2.14
34.667	0.00	0.10	0.250	I	O	|	|	|	2.14
34.750	0.00	0.10	0.249	I	O	|	|	|	2.14
34.833	0.00	0.10	0.248	I	O	|	|	|	2.13
34.917	0.00	0.10	0.248	I	O	|	|	|	2.13

Remaining water in basin = 0.25 (Ac.Ft)

**********HYDROGRAPH DATA**********

Number of intervals = 419
Time interval = 5.0 (Min.)
Maximum/Peak flow rate = 0.238 (CFS)
Total volume = 0.363 (Ac.Ft)

Status of hydrographs being held in storage

	Stream 1	Stream 2	Stream 3	Stream 4	Stream 5
Peak (CFS)	0.000	0.000	0.000	0.000	0.000
Vol (Ac.Ft)	0.000	0.000	0.000	0.000	0.000

****

Bioretention Size and Flow Calculations

BIO B

	BASIN PARAMETERS					OUTLET								
Basin Elevation	Depth	Area S.F.	Volume C.F.	Volume AC-FT	Effective Volume AC-FT	Q1 Orifice Plate (cfs)	Q2 Orifice Plate (cfs)	Q3 Orifice Plate (cfs)	Q4 Orifice Plate (cfs)	Q_5Orifice Plate (cfs)	Q6 Orifice Plate (cfs)	Q_7Orifice Plate (cfs)	Q Weir 1 (cfs)	Q Total (cfs)
1538.00	0.00	111.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1539.00	1.00	111.00	111.00	0.003	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1540.00	2.00	111.00	222.00	0.005	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1541.00	3.00	370.00	721.50	0.017	0.017	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1541.50	3.50	437.50	959.88	0.022	0.022	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1542.00	4.00	505.00	1,232.00	0.028	0.028	0.000	0.000	0.000	0.000	0.000	0.000	0.000	4.709	4.709

Orifice Coefficient	0.66	Dia of Orifice	0.00							
Gravimetric Constant	32.2 ft/s^2	Eff Dia of Orifice	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Number of Rows		Area of Orifice	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Minimum Orifice Plate Height		Number of Orifeces	1	1	1	1	1	1	1	
Minimum Orifice Plate Width		Elev	1538.2							

Weir	Sharp Crest Weir Coefficient	3.33
	Length of Weir	4.00
	Elev. at Crest of Weir	1541.50

Q100 Elevation Weir Calc		
100yr Weir Calc		
Crest Wier Elev.	1541.50	
Q100	0.76	cfs
Weir Length	4	
Weir Coeff.	3.33	
H Weir	0.148208	
Q100 Elevation	**1541.65**	

Ponding Volume

Soil Media 30%

Q100 Elevation Weir Calc		
100yr Emergency Weir Calc		
Crest Wier Elev.	1541.65	
Q100	0.76	cfs
Weir Length	2	
Weir Coeff.	3.33	
H Weir	0.235266	
Q100 Elevation	**1541.89**	

FLOOD HYDROGRAPH ROUTING PROGRAM
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Study date: 10/11/24

Program License Serial Number 5006

********** HYDROGRAPH INFORMATION **********

From study/file name: PROB2242.rte
**********HYDROGRAPH DATA**********
Number of intervals = 288
Time interval = 5.0 (Min.)
Maximum/Peak flow rate = 0.054 (CFS)
Total volume = 0.033 (Ac.Ft)
Status of hydrographs being held in storage
Stream 1 Stream 2 Stream 3 Stream 4 Stream 5
Peak (CFS) 0.000 0.000 0.000 0.000 0.000
Vol (Ac.Ft) 0.000 0.000 0.000 0.000 0.000
****

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Process from Point/Station 1.000 to Point/Station 2.000
**** RETARDING BASIN ROUTING ****
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User entry of depth-outflow-storage data

Total number of inflow hydrograph intervals = 288
Hydrograph time unit = 5.000 (Min.)
Initial depth in storage basin = 0.00(Ft.)

Initial basin depth = 0.00 (Ft.)
Initial basin storage = 0.00 (Ac.Ft)
Initial basin outflow = 0.00 (CFS)

Depth vs. Storage and Depth vs. Discharge data:

Basin Depth (Ft.)	Storage (Ac.Ft)	Outflow (CFS)	(S-O*dt/2) (Ac.Ft)	(S+O*dt/2) (Ac.Ft)
0.000	0.000	0.000	0.000	0.000
1.000	0.003	0.001	0.003	0.003
2.000	0.005	0.002	0.005	0.005
3.000	0.017	0.003	0.017	0.017
3.500	0.022	0.004	0.022	0.022
4.000	0.028	4.709	0.012	0.044

Hydrograph Detention Basin Routing

Graph values: 'I'= unit inflow; 'O'=outflow at time shown

Time (Hours)	Inflow (CFS)	Outflow (CFS)	Storage (Ac.Ft)	.0	0.0	0.03	0.04	0.05	Depth (Ft.)
0.083	0.00	0.00	0.000	OI	|	|	|	|	0.00
0.167	0.00	0.00	0.000	OI	|	|	|	|	0.01
0.250	0.00	0.00	0.000	OI	|	|	|	|	0.02
0.333	0.00	0.00	0.000	O I	|	|	|	|	0.03
0.417	0.00	0.00	0.000	O I	|	|	|	|	0.04
0.500	0.00	0.00	0.000	O I	|	|	|	|	0.05
0.583	0.00	0.00	0.000	O I	|	|	|	|	0.06
0.667	0.00	0.00	0.000	O I	|	|	|	|	0.07
0.750	0.00	0.00	0.000	O I	|	|	|	|	0.08
0.833	0.01	0.00	0.000	O I	|	|	|	|	0.09
0.917	0.01	0.00	0.000	O I	|	|	|	|	0.11
1.000	0.01	0.00	0.000	O I	|	|	|	|	0.12
1.083	0.00	0.00	0.000	O I	|	|	|	|	0.14
1.167	0.00	0.00	0.000	O I	|	|	|	|	0.15
1.250	0.00	0.00	0.000	O I	|	|	|	|	0.16
1.333	0.00	0.00	0.001	O I	|	|	|	|	0.17
1.417	0.00	0.00	0.001	O I	|	|	|	|	0.18
1.500	0.00	0.00	0.001	O I	|	|	|	|	0.19
1.583	0.00	0.00	0.001	O I	|	|	|	|	0.20
1.667	0.00	0.00	0.001	O I	|	|	|	|	0.21
1.750	0.00	0.00	0.001	O I	|	|	|	|	0.22

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1.833    0.01    0.00      0.001  o  I    |        |        |        |     0.23
1.917    0.01    0.00      0.001  o  I    |        |        |        |     0.25
2.000    0.01    0.00      0.001  o  I    |        |        |        |     0.26
2.083    0.01    0.00      0.001  o  I    |        |        |        |     0.28
2.167    0.01    0.00      0.001  o  I    |        |        |        |     0.29
2.250    0.01    0.00      0.001  o  I    |        |        |        |     0.30
2.333    0.01    0.00      0.001  o  I    |        |        |        |     0.32
2.417    0.01    0.00      0.001  o  I    |        |        |        |     0.33
2.500    0.01    0.00      0.001  o  I    |        |        |        |     0.35
2.583    0.01    0.00      0.001  o   I   |        |        |        |     0.36
2.667    0.01    0.00      0.001  o   I   |        |        |        |     0.38
2.750    0.01    0.00      0.001  o   I   |        |        |        |     0.40
2.833    0.01    0.00      0.001  o   I   |        |        |        |     0.41
2.917    0.01    0.00      0.001  o   I   |        |        |        |     0.43
3.000    0.01    0.00      0.001  o   I   |        |        |        |     0.45
3.083    0.01    0.00      0.001  o   I   |        |        |        |     0.47
3.167    0.01    0.00      0.001  o   I   |        |        |        |     0.48
3.250    0.01    0.00      0.002  o   I   |        |        |        |     0.50
3.333    0.01    0.00      0.002  o   I   |        |        |        |     0.52
3.417    0.01    0.00      0.002  o   I   |        |        |        |     0.53
3.500    0.01    0.00      0.002  o   I   |        |        |        |     0.55
3.583    0.01    0.00      0.002  o   I   |        |        |        |     0.57
3.667    0.01    0.00      0.002  o   I   |        |        |        |     0.59
3.750    0.01    0.00      0.002  o   I   |        |        |        |     0.60
3.833    0.01    0.00      0.002  o    I  |        |        |        |     0.62
3.917    0.01    0.00      0.002  o    I  |        |        |        |     0.64
4.000    0.01    0.00      0.002  o    I  |        |        |        |     0.66
4.083    0.01    0.00      0.002  o    I  |        |        |        |     0.68
4.167    0.01    0.00      0.002  o    I  |        |        |        |     0.70
4.250    0.01    0.00      0.002  o    I  |        |        |        |     0.72
4.333    0.01    0.00      0.002  o     I |        |        |        |     0.75
4.417    0.01    0.00      0.002  o     I |        |        |        |     0.77
4.500    0.01    0.00      0.002  o     I |        |        |        |     0.79
4.583    0.01    0.00      0.002  o     I |        |        |        |     0.82
4.667    0.01    0.00      0.003  o     I |        |        |        |     0.84
4.750    0.01    0.00      0.003  o     I |        |        |        |     0.87
4.833    0.01    0.00      0.003  o      I|        |        |        |     0.89
4.917    0.01    0.00      0.003  o      I|        |        |        |     0.92
5.000    0.01    0.00      0.003  o      I|        |        |        |     0.95
5.083    0.01    0.00      0.003  o    I  |        |        |        |     0.97
5.167    0.01    0.00      0.003  o    I  |        |        |        |     0.99
5.250    0.01    0.00      0.003  o    I  |        |        |        |     1.01
5.333    0.01    0.00      0.003  o     I |        |        |        |     1.05
5.417    0.01    0.00      0.003  o     I |        |        |        |     1.08
5.500    0.01    0.00      0.003  o     I |        |        |        |     1.12
5.583    0.01    0.00      0.003  o      I|        |        |        |     1.15
5.667    0.01    0.00      0.003  o      I|        |        |        |     1.19
5.750    0.01    0.00      0.003  o      I|        |        |        |     1.23
5.833    0.01    0.00      0.004  o      I|        |        |        |     1.27
5.917    0.01    0.00      0.004  o      I|        |        |        |     1.31
6.000    0.01    0.00      0.004  o      I|        |        |        |     1.35
6.083    0.01    0.00      0.004  o       I        |        |        |     1.39
6.167    0.01    0.00      0.004  o       I        |        |        |     1.44
6.250    0.01    0.00      0.004  o       I        |        |        |     1.48
6.333    0.01    0.00      0.004  o       I        |        |        |     1.53
6.417    0.01    0.00      0.004  o       I        |        |        |     1.57
6.500    0.01    0.00      0.004  o       I        |        |        |     1.62
6.583    0.02    0.00      0.004  o       |I       |        |        |     1.66
6.667    0.02    0.00      0.004  |o      |I       |        |        |     1.71
6.750    0.02    0.00      0.005  |o      |I       |        |        |     1.76
6.833    0.02    0.00      0.005  |o      |I       |        |        |     1.81
6.917    0.02    0.00      0.005  |o      |I       |        |        |     1.86
7.000    0.02    0.00      0.005  |o      |I       |        |        |     1.91
7.083    0.02    0.00      0.005  |o      |I       |        |        |     1.96
7.167    0.02    0.00      0.005  |o      |I       |        |        |     2.00
7.250    0.02    0.00      0.005  |o      |I       |        |        |     2.01
7.333    0.02    0.00      0.005  |o      | I      |        |        |     2.02
7.417    0.02    0.00      0.005  |o      | I      |        |        |     2.03
7.500    0.02    0.00      0.005  |o      | I      |        |        |     2.04
7.583    0.02    0.00      0.006  |o      |  I     |        |        |     2.04
7.667    0.02    0.00      0.006  |o      |  I     |        |        |     2.05
7.750    0.02    0.00      0.006  |o      |  I     |        |        |     2.06
7.833    0.02    0.00      0.006  |o      |   I    |        |        |     2.07
7.917    0.02    0.00      0.006  |o      |   I    |        |        |     2.09
8.000    0.02    0.00      0.006  |o      |   I    |        |        |     2.10
8.083    0.02    0.00      0.006  |o      |     I  |        |        |     2.11
8.167    0.02    0.00      0.006  |o      |     I  |        |        |     2.12
8.250    0.02    0.00      0.007  |o      |     I  |        |        |     2.13
8.333    0.02    0.00      0.007  |o      |     I  |        |        |     2.15
8.417    0.02    0.00      0.007  |o      |     I  |        |        |     2.16
8.500    0.02    0.00      0.007  |o      |     I  |        |        |     2.17
8.583    0.03    0.00      0.007  |o      |      I |        |        |     2.18
8.667    0.03    0.00      0.007  |o      |      I |        |        |     2.20
8.750    0.03    0.00      0.008  |o      |      I |        |        |     2.21
8.833    0.03    0.00      0.008  |o      |      I |        |        |     2.22
8.917    0.03    0.00      0.008  |o      |      I |        |        |     2.24
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 9.000    0.03    0.00      0.008  |O       |       I|        |        |     2.25
 9.083    0.03    0.00      0.008  |O       |        |I       |        |     2.27
 9.167    0.03    0.00      0.008  |O       |        |I       |        |     2.28
 9.250    0.03    0.00      0.009  |O       |        |I       |        |     2.30
 9.333    0.03    0.00      0.009  |O       |        | I      |        |     2.32
 9.417    0.03    0.00      0.009  |O       |        | I      |        |     2.33
 9.500    0.03    0.00      0.009  |O       |        | I      |        |     2.35
 9.583    0.03    0.00      0.009  |O       |        |  I     |        |     2.37
 9.667    0.03    0.00      0.010  |O       |        |  I     |        |     2.39
 9.750    0.03    0.00      0.010  |O       |        |  I     |        |     2.40
 9.833    0.04    0.00      0.010  |O       |        |   I    |        |     2.42
 9.917    0.04    0.00      0.010  |O       |        |   I    |        |     2.44
10.000    0.04    0.00      0.011  |O       |        |   I    |        |     2.46
10.083    0.02    0.00      0.011  |O       |     I  |        |        |     2.48
10.167    0.02    0.00      0.011  |O       |     I  |        |        |     2.49
10.250    0.02    0.00      0.011  |O       |     I  |        |        |     2.50
10.333    0.02    0.00      0.011  |O       |     I  |        |        |     2.51
10.417    0.02    0.00      0.011  |O       |     I  |        |        |     2.53
10.500    0.02    0.00      0.011  |O       |     I  |        |        |     2.54
10.583    0.03    0.00      0.012  |O       |        | I      |        |     2.55
10.667    0.03    0.00      0.012  |O       |        | I      |        |     2.57
10.750    0.03    0.00      0.012  |O       |        | I      |        |     2.59
10.833    0.03    0.00      0.012  |O       |        | I      |        |     2.60
10.917    0.03    0.00      0.012  |O       |        | I      |        |     2.62
11.000    0.03    0.00      0.013  |O       |        | I      |        |     2.64
11.083    0.03    0.00      0.013  |O       |        |I       |        |     2.65
11.167    0.03    0.00      0.013  |O       |        |I       |        |     2.67
11.250    0.03    0.00      0.013  |O       |        |I       |        |     2.68
11.333    0.03    0.00      0.013  |O       |        |I       |        |     2.70
11.417    0.03    0.00      0.014  |O       |        |I       |        |     2.72
11.500    0.03    0.00      0.014  |O       |        |I       |        |     2.73
11.583    0.03    0.00      0.014  |O       |      I |        |        |     2.75
11.667    0.03    0.00      0.014  |O       |      I |        |        |     2.76
11.750    0.03    0.00      0.014  |O       |      I |        |        |     2.78
11.833    0.03    0.00      0.014  |O       |       I|        |        |     2.79
11.917    0.03    0.00      0.015  |O       |       I|        |        |     2.80
12.000    0.03    0.00      0.015  |O       |       I|        |        |     2.82
12.083    0.04    0.00      0.015  |O       |        |      I |        |     2.84
12.167    0.04    0.00      0.015  |O       |        |      I |        |     2.86
12.250    0.04    0.00      0.016  |O       |        |      I |        |     2.88
12.333    0.04    0.00      0.016  |O       |        |       I|        |     2.90
12.417    0.04    0.00      0.016  |O       |        |       I|        |     2.92
12.500    0.04    0.00      0.016  |O       |        |       I|        |     2.95
12.583    0.04    0.00      0.017  |O       |        |        | I      |     2.97
12.667    0.04    0.00      0.017  |O       |        |        | I      |     2.99
12.750    0.04    0.00      0.017  |O       |        |        | I      |     3.02
12.833    0.05    0.00      0.018  |O       |        |        |  I     |     3.05
12.917    0.05    0.00      0.018  |O       |        |        |  I     |     3.08
13.000    0.05    0.00      0.018  |O       |        |        |  I     |     3.11
13.083    0.05    0.00      0.018  |O       |        |        |      I |     3.14
13.167    0.05    0.00      0.019  |O       |        |        |      I |     3.18
13.250    0.05    0.00      0.019  | O      |        |        |      I |     3.21
13.333    0.05    0.00      0.019  | O      |        |        |      I |     3.25
13.417    0.05    0.00      0.020  | O      |        |        |      I |     3.28
13.500    0.05    0.00      0.020  | O      |        |        |      I |     3.32
13.583    0.04    0.00      0.020  | O      |        |    I   |        |     3.35
13.667    0.04    0.00      0.021  | O      |        |    I   |        |     3.37
13.750    0.04    0.00      0.021  | O      |        |    I   |        |     3.39
13.833    0.04    0.00      0.021  | O      |        |    I   |        |     3.42
13.917    0.04    0.00      0.021  | O      |        |    I   |        |     3.44
14.000    0.04    0.00      0.022  | O      |        |    I   |        |     3.46
14.083    0.04    0.00      0.022  | O      |        |      I |        |     3.49
14.167    0.04    0.03      0.022  |        |        | O    I |        |     3.50
14.250    0.04    0.05      0.022  |        |        |      I  O      |     3.50
14.333    0.04    0.04      0.022  |        |        |     OI         |     3.50
14.417    0.04    0.04      0.022  |        |        |      IO        |     3.50
14.500    0.04    0.04      0.022  |        |        |       O        |     3.50
14.583    0.04    0.04      0.022  |        |        |       O        |     3.50
14.667    0.04    0.04      0.022  |        |        |       O        |     3.50
14.750    0.04    0.04      0.022  |        |        |       O        |     3.50
14.833    0.04    0.04      0.022  |        |        |      O|        |     3.50
14.917    0.04    0.04      0.022  |        |        |      O|        |     3.50
15.000    0.04    0.04      0.022  |        |        |      O|        |     3.50
15.083    0.04    0.04      0.022  |        |        |     O |        |     3.50
15.167    0.04    0.04      0.022  |        |        |     O |        |     3.50
15.250    0.04    0.04      0.022  |        |        |     O |        |     3.50
15.333    0.04    0.04      0.022  |        |        |    O  |        |     3.50
15.417    0.04    0.04      0.022  |        |        |    O  |        |     3.50
15.500    0.04    0.04      0.022  |        |        |    O  |        |     3.50
15.583    0.03    0.03      0.022  |        |        |IO     |        |     3.50
15.667    0.03    0.03      0.022  |        |        |O      |        |     3.50
15.750    0.03    0.03      0.022  |        |        |IO     |        |     3.50
15.833    0.03    0.03      0.022  |        |        |O      |        |     3.50
15.917    0.03    0.03      0.022  |        |        |O      |        |     3.50
16.000    0.03    0.03      0.022  |        |        |O      |        |     3.50
16.083    0.01    0.01      0.022  |  I   O |        |       |        |     3.50
```

16.167	0.01	0.00	0.022	OI				3.50
16.250	0.01	0.01	0.022	IO				3.50
16.333	0.01	0.01	0.022	O				3.50
16.417	0.01	0.01	0.022	O				3.50
16.500	0.01	0.01	0.022	O				3.50
16.583	0.00	0.01	0.022	IO				3.50
16.667	0.00	0.00	0.022	O				3.50
16.750	0.00	0.00	0.022	O				3.50
16.833	0.00	0.00	0.022	O				3.50
16.917	0.00	0.00	0.022	O				3.50
17.000	0.00	0.00	0.022	O				3.50
17.083	0.01	0.01	0.022	O				3.50
17.167	0.01	0.01	0.022	O				3.50
17.250	0.01	0.01	0.022	O				3.50
17.333	0.01	0.01	0.022	O				3.50
17.417	0.01	0.01	0.022	O				3.50
17.500	0.01	0.01	0.022	O				3.50
17.583	0.01	0.01	0.022	O				3.50
17.667	0.01	0.01	0.022	O				3.50
17.750	0.01	0.01	0.022	O				3.50
17.833	0.01	0.01	0.022	IO				3.50
17.917	0.01	0.01	0.022	O				3.50
18.000	0.01	0.01	0.022	O				3.50
18.083	0.01	0.01	0.022	O				3.50
18.167	0.01	0.01	0.022	O				3.50
18.250	0.01	0.01	0.022	O				3.50
18.333	0.01	0.01	0.022	O				3.50
18.417	0.01	0.01	0.022	O				3.50
18.500	0.01	0.01	0.022	O				3.50
18.583	0.00	0.01	0.022	IO				3.50
18.667	0.00	0.00	0.022	O				3.50
18.750	0.00	0.00	0.022	O				3.50
18.833	0.00	0.00	0.022	IO				3.50
18.917	0.00	0.00	0.022	IO				3.50
19.000	0.00	0.00	0.022	IO				3.50
19.083	0.00	0.00	0.022	O				3.50
19.167	0.00	0.00	0.022	O				3.50
19.250	0.00	0.00	0.022	O				3.50
19.333	0.01	0.01	0.022	O				3.50
19.417	0.01	0.01	0.022	O				3.50
19.500	0.01	0.01	0.022	O				3.50
19.583	0.00	0.01	0.022	IO				3.50
19.667	0.00	0.00	0.022	O				3.50
19.750	0.00	0.00	0.022	O				3.50
19.833	0.00	0.00	0.022	IO				3.50
19.917	0.00	0.00	0.022	IO				3.50
20.000	0.00	0.00	0.022	IO				3.50
20.083	0.00	0.00	0.022	O				3.50
20.167	0.00	0.00	0.022	O				3.50
20.250	0.00	0.00	0.022	O				3.50
20.333	0.00	0.00	0.022	O				3.50
20.417	0.00	0.00	0.022	O				3.50
20.500	0.00	0.00	0.022	O				3.50
20.583	0.00	0.00	0.022	O				3.50
20.667	0.00	0.00	0.022	O				3.50
20.750	0.00	0.00	0.022	O				3.50
20.833	0.00	0.00	0.022	IO				3.50
20.917	0.00	0.00	0.022	IO				3.50
21.000	0.00	0.00	0.022	IO				3.50
21.083	0.00	0.00	0.022	O				3.50
21.167	0.00	0.00	0.022	O				3.50
21.250	0.00	0.00	0.022	O				3.50
21.333	0.00	0.00	0.022	IO				3.50
21.417	0.00	0.00	0.022	IO				3.50
21.500	0.00	0.00	0.022	IO				3.50
21.583	0.00	0.00	0.022	O				3.50
21.667	0.00	0.00	0.022	O				3.50
21.750	0.00	0.00	0.022	O				3.50
21.833	0.00	0.00	0.022	IO				3.50
21.917	0.00	0.00	0.022	IO				3.50
22.000	0.00	0.00	0.022	IO				3.50
22.083	0.00	0.00	0.022	O				3.50
22.167	0.00	0.00	0.022	O				3.50
22.250	0.00	0.00	0.022	O				3.50
22.333	0.00	0.00	0.022	IO				3.50
22.417	0.00	0.00	0.022	IO				3.50
22.500	0.00	0.00	0.022	IO				3.50
22.583	0.00	0.00	0.022	IO				3.50
22.667	0.00	0.00	0.022	IO				3.50
22.750	0.00	0.00	0.022	IO				3.50
22.833	0.00	0.00	0.022	IO				3.50
22.917	0.00	0.00	0.022	IO				3.50
23.000	0.00	0.00	0.022	IO				3.50
23.083	0.00	0.00	0.022	IO				3.49
23.167	0.00	0.00	0.022	IO				3.49
23.250	0.00	0.00	0.022	IO				3.49

```
23.333    0.00    0.00      0.022  |IO     |       |       |       |     3.49
23.417    0.00    0.00      0.022  |IO     |       |       |       |     3.49
23.500    0.00    0.00      0.022  |IO     |       |       |       |     3.49
23.583    0.00    0.00      0.022  |IO     |       |       |       |     3.49
23.667    0.00    0.00      0.022  |IO     |       |       |       |     3.49
23.750    0.00    0.00      0.022  |IO     |       |       |       |     3.49
23.833    0.00    0.00      0.022  |IO     |       |       |       |     3.49
23.917    0.00    0.00      0.022  |IO     |       |       |       |     3.49
24.000    0.00    0.00      0.022  |IO     |       |       |       |     3.49
24.083    0.00    0.00      0.022  I O     |       |       |       |     3.49

Remaining water in basin =    0.02 (Ac.Ft)

****************************HYDROGRAPH DATA****************************
               Number of intervals =   289
               Time interval =    5.0 (Min.)
               Maximum/Peak flow rate =         0.049 (CFS)
               Total volume =       0.011 (Ac.Ft)
       Status of hydrographs being held in storage
                  Stream 1  Stream 2  Stream 3  Stream 4  Stream 5
       Peak (CFS)      0.000     0.000     0.000     0.000     0.000
       Vol (Ac.Ft)     0.000     0.000     0.000     0.000     0.000
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Bioretention Size and Flow Calculations

BIO C

	BASIN PARAMETERS					OUTLET								
Basin Elevation	Depth	Area S.F.	Volume C.F.	Volume AC-FT	Effective Volume AC-FT	Q1 Orifice Plate (cfs)	Q2 Orifice Plate (cfs)	Q3 Orifice Plate (cfs)	Q4 Orifice Plate (cfs)	Q_5Orifice Plate (cfs)	Q6 Orifice Plate (cfs)	Q_7Orifice Plate (cfs)	Q Weir 1 (cfs)	Q Total (cfs)
1542.00	0.00	390.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1543.00	1.00	390.00	390.00	0.009	0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1544.00	2.00	390.00	780.00	0.018	0.018	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1545.00	3.00	1,300.00	2,535.00	0.058	0.058	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1545.50	3.50	1,481.00	3,274.25	0.075	0.075	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1546.00	4.00	1,662.00	4,104.00	0.094	0.094	0.000	0.000	0.000	0.000	0.000	0.000	0.000	14.128	14.128

Orifice Coefficient	0.66		Dia of Orifice	0.00							
Gravimetric Constant	32.2	ft/s^2	Eff Dia of Orifice	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Number of Rows			Area of Orifice	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
n Orifice Plate Height			Number of Orifeces	1	1	1	1	1	1	1	
m Orifice Plate Width			Elev	1542							

Weir	Sharp Crest Weir Coefficient	3.33	
	Length of Weir	12.00	
	Elev. at Crest of Weir	1545.50	

Q100 Elevation Weir Calc		
100yr Weir Calc		
Crest Wier	1545.50	
Q100	3.86	cfs
Weir Leng	12	
Weir Coeff	3.33	
H Weir	0.210527	
Q100 Elev	**1545.71**	

Ponding Volume

Soil Media 30%

Q100 Elevation Weir Calc		
100yr Emergency Weir Calc		
Crest Wier	1545.75	
Q100	3.86	cfs
Weir Leng	20	
Weir Coeff	3.33	
H Weir	0.149764	
Q100 Elev	**1545.90**	

FLOOD HYDROGRAPH ROUTING PROGRAM
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Study date: 10/11/24

Program License Serial Number 5006

********** HYDROGRAPH INFORMATION **********

From study/file name: PROC2242.rte
**********HYDROGRAPH DATA**********
Number of intervals = 289
Time interval = 5.0 (Min.)
Maximum/Peak flow rate = 0.177 (CFS)
Total volume = 0.107 (Ac.Ft)
Status of hydrographs being held in storage
Stream 1 Stream 2 Stream 3 Stream 4 Stream 5
Peak (CFS) 0.000 0.000 0.000 0.000 0.000
Vol (Ac.Ft) 0.000 0.000 0.000 0.000 0.000
****

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Process from Point/Station 1.000 to Point/Station 2.000
**** RETARDING BASIN ROUTING ****
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User entry of depth-outflow-storage data

Total number of inflow hydrograph intervals = 289
Hydrograph time unit = 5.000 (Min.)
Initial depth in storage basin = 0.00(Ft.)

Initial basin depth = 0.00 (Ft.)
Initial basin storage = 0.00 (Ac.Ft)
Initial basin outflow = 0.00 (CFS)

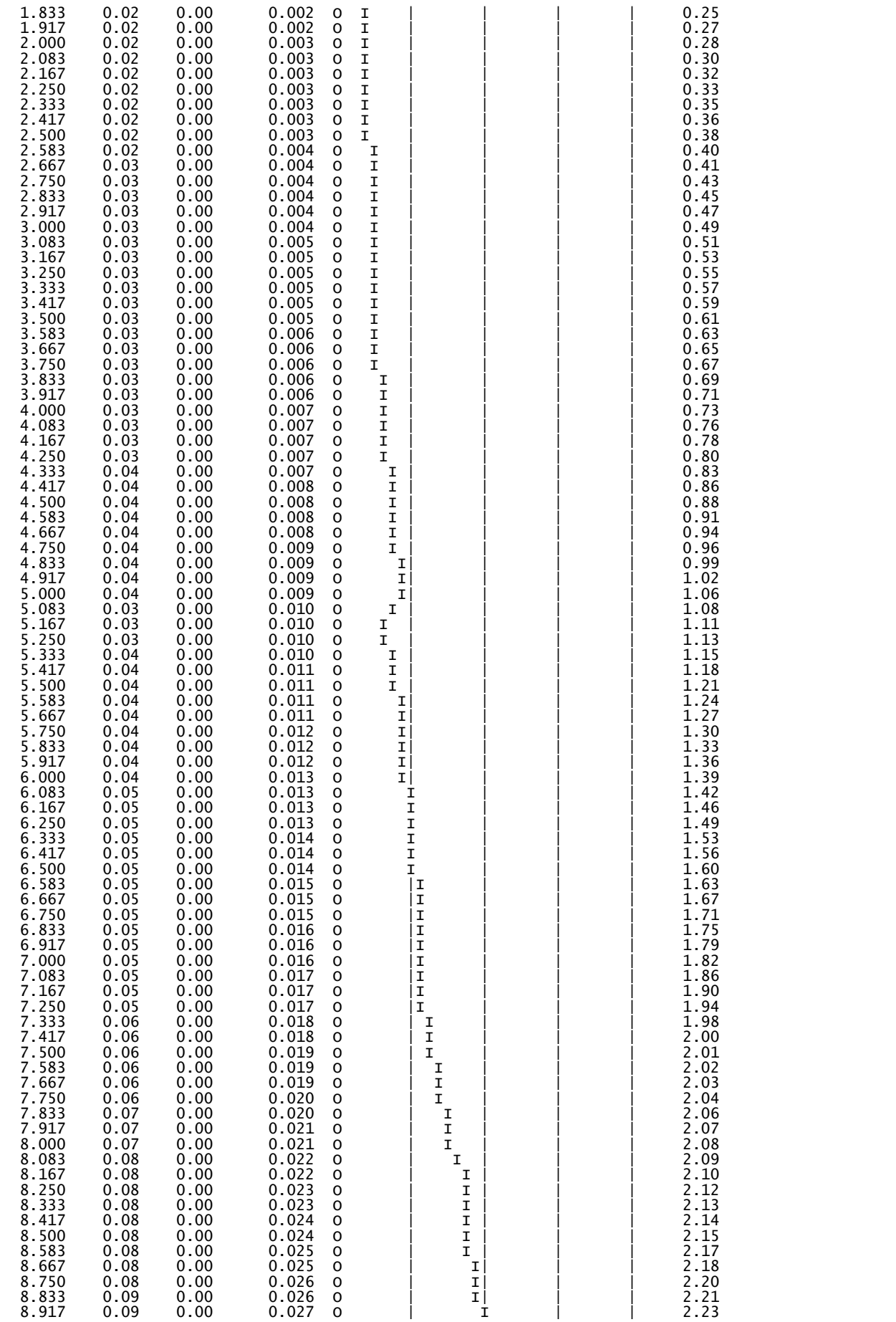
Depth vs. Storage and Depth vs. Discharge data:

Basin Depth (Ft.)	Storage (Ac.Ft)	Outflow (CFS)	(S-O*dt/2) (Ac.Ft)	(S+O*dt/2) (Ac.Ft)
0.000	0.000	0.000	0.000	0.000
1.000	0.009	0.001	0.009	0.009
2.000	0.018	0.002	0.018	0.018
3.000	0.058	0.003	0.058	0.058
3.500	0.075	0.004	0.075	0.075
4.000	0.094	14.128	0.045	0.143

Hydrograph Detention Basin Routing

Graph values: 'I'= unit inflow; 'O'=outflow at time shown

Time (Hours)	Inflow (CFS)	Outflow (CFS)	Storage (Ac.Ft)	.0	0.0	0.09	0.13	0.18	Depth (Ft.)
0.083	0.01	0.00	0.000	OI	|	|	|	|	0.00
0.167	0.01	0.00	0.000	OI	|	|	|	|	0.01
0.250	0.01	0.00	0.000	OI	|	|	|	|	0.02
0.333	0.01	0.00	0.000	O I	|	|	|	|	0.03
0.417	0.02	0.00	0.000	O I	|	|	|	|	0.04
0.500	0.02	0.00	0.000	O I	|	|	|	|	0.05
0.583	0.02	0.00	0.001	O I	|	|	|	|	0.06
0.667	0.02	0.00	0.001	O I	|	|	|	|	0.07
0.750	0.02	0.00	0.001	O I	|	|	|	|	0.09
0.833	0.02	0.00	0.001	O I	|	|	|	|	0.10
0.917	0.02	0.00	0.001	O I	|	|	|	|	0.12
1.000	0.02	0.00	0.001	O I	|	|	|	|	0.13
1.083	0.02	0.00	0.001	O I	|	|	|	|	0.15
1.167	0.02	0.00	0.001	O I	|	|	|	|	0.16
1.250	0.02	0.00	0.002	O I	|	|	|	|	0.17
1.333	0.02	0.00	0.002	O I	|	|	|	|	0.18
1.417	0.02	0.00	0.002	O I	|	|	|	|	0.19
1.500	0.02	0.00	0.002	O I	|	|	|	|	0.20
1.583	0.02	0.00	0.002	O I	|	|	|	|	0.22
1.667	0.02	0.00	0.002	O I	|	|	|	|	0.23
1.750	0.02	0.00	0.002	O I	|	|	|	|	0.24



1.833	0.02	0.00	0.002	o	I	|	|	|	|	0.25
1.917	0.02	0.00	0.002	o	I	|	|	|	|	0.27
2.000	0.02	0.00	0.003	o	I	|	|	|	|	0.28
2.083	0.02	0.00	0.003	o	I	|	|	|	|	0.30
2.167	0.02	0.00	0.003	o	I	|	|	|	|	0.32
2.250	0.02	0.00	0.003	o	I	|	|	|	|	0.33
2.333	0.02	0.00	0.003	o	I	|	|	|	|	0.35
2.417	0.02	0.00	0.003	o	I	|	|	|	|	0.36
2.500	0.02	0.00	0.003	o	I	|	|	|	|	0.38
2.583	0.02	0.00	0.004	o	I	|	|	|	|	0.40
2.667	0.03	0.00	0.004	o	I	|	|	|	|	0.41
2.750	0.03	0.00	0.004	o	I	|	|	|	|	0.43
2.833	0.03	0.00	0.004	o	I	|	|	|	|	0.45
2.917	0.03	0.00	0.004	o	I	|	|	|	|	0.47
3.000	0.03	0.00	0.004	o	I	|	|	|	|	0.49
3.083	0.03	0.00	0.005	o	I	|	|	|	|	0.51
3.167	0.03	0.00	0.005	o	I	|	|	|	|	0.53
3.250	0.03	0.00	0.005	o	I	|	|	|	|	0.55
3.333	0.03	0.00	0.005	o	I	|	|	|	|	0.57
3.417	0.03	0.00	0.005	o	I	|	|	|	|	0.59
3.500	0.03	0.00	0.005	o	I	|	|	|	|	0.61
3.583	0.03	0.00	0.006	o	I	|	|	|	|	0.63
3.667	0.03	0.00	0.006	o	I	|	|	|	|	0.65
3.750	0.03	0.00	0.006	o	I	|	|	|	|	0.67
3.833	0.03	0.00	0.006	o	I	|	|	|	|	0.69
3.917	0.03	0.00	0.006	o	I	|	|	|	|	0.71
4.000	0.03	0.00	0.007	o	I	|	|	|	|	0.73
4.083	0.03	0.00	0.007	o	I	|	|	|	|	0.76
4.167	0.03	0.00	0.007	o	I	|	|	|	|	0.78
4.250	0.03	0.00	0.007	o	I	|	|	|	|	0.80
4.333	0.04	0.00	0.007	o	I	|	|	|	|	0.83
4.417	0.04	0.00	0.008	o	I	|	|	|	|	0.86
4.500	0.04	0.00	0.008	o	I	|	|	|	|	0.88
4.583	0.04	0.00	0.008	o	I	|	|	|	|	0.91
4.667	0.04	0.00	0.008	o	I	|	|	|	|	0.94
4.750	0.04	0.00	0.009	o	I	|	|	|	|	0.96
4.833	0.04	0.00	0.009	o	I	|	|	|	|	0.99
4.917	0.04	0.00	0.009	o	I	|	|	|	|	1.02
5.000	0.04	0.00	0.009	o	I	|	|	|	|	1.06
5.083	0.03	0.00	0.010	o	I	|	|	|	|	1.08
5.167	0.03	0.00	0.010	o	I	|	|	|	|	1.11
5.250	0.03	0.00	0.010	o	I	|	|	|	|	1.13
5.333	0.04	0.00	0.010	o	I	|	|	|	|	1.15
5.417	0.04	0.00	0.011	o	I	|	|	|	|	1.18
5.500	0.04	0.00	0.011	o	I	|	|	|	|	1.21
5.583	0.04	0.00	0.011	o	I	|	|	|	|	1.24
5.667	0.04	0.00	0.011	o	I	|	|	|	|	1.27
5.750	0.04	0.00	0.012	o	I	|	|	|	|	1.30
5.833	0.04	0.00	0.012	o	I	|	|	|	|	1.33
5.917	0.04	0.00	0.012	o	I	|	|	|	|	1.36
6.000	0.04	0.00	0.013	o	I	|	|	|	|	1.39
6.083	0.05	0.00	0.013	o	I	|	|	|	|	1.42
6.167	0.05	0.00	0.013	o	I	|	|	|	|	1.46
6.250	0.05	0.00	0.013	o	I	|	|	|	|	1.49
6.333	0.05	0.00	0.014	o	I	|	|	|	|	1.53
6.417	0.05	0.00	0.014	o	I	|	|	|	|	1.56
6.500	0.05	0.00	0.014	o	I	|	|	|	|	1.60
6.583	0.05	0.00	0.015	o	I	|	|	|	|	1.63
6.667	0.05	0.00	0.015	o	I	|	|	|	|	1.67
6.750	0.05	0.00	0.015	o	I	|	|	|	|	1.71
6.833	0.05	0.00	0.016	o	I	|	|	|	|	1.75
6.917	0.05	0.00	0.016	o	I	|	|	|	|	1.79
7.000	0.05	0.00	0.016	o	I	|	|	|	|	1.82
7.083	0.05	0.00	0.017	o	I	|	|	|	|	1.86
7.167	0.05	0.00	0.017	o	I	|	|	|	|	1.90
7.250	0.05	0.00	0.017	o	I	|	|	|	|	1.94
7.333	0.06	0.00	0.018	o	I	|	|	|	|	1.98
7.417	0.06	0.00	0.018	o	I	|	|	|	|	2.00
7.500	0.06	0.00	0.019	o	I	|	|	|	|	2.01
7.583	0.06	0.00	0.019	o	I	|	|	|	|	2.02
7.667	0.06	0.00	0.019	o	I	|	|	|	|	2.03
7.750	0.06	0.00	0.020	o	I	|	|	|	|	2.04
7.833	0.07	0.00	0.020	o	I	|	|	|	|	2.06
7.917	0.07	0.00	0.021	o	I	|	|	|	|	2.07
8.000	0.07	0.00	0.021	o	I	|	|	|	|	2.08
8.083	0.08	0.00	0.022	o	I	|	|	|	|	2.09
8.167	0.08	0.00	0.022	o	I	|	|	|	|	2.10
8.250	0.08	0.00	0.023	o	I	|	|	|	|	2.12
8.333	0.08	0.00	0.023	o	I	|	|	|	|	2.13
8.417	0.08	0.00	0.024	o	I	|	|	|	|	2.14
8.500	0.08	0.00	0.024	o	I	|	|	|	|	2.15
8.583	0.08	0.00	0.025	o	I	|	|	|	|	2.17
8.667	0.08	0.00	0.025	o	I	|	|	|	|	2.18
8.750	0.08	0.00	0.026	o	I	|	|	|	|	2.20
8.833	0.09	0.00	0.026	o	I	|	|	|	|	2.21
8.917	0.09	0.00	0.027	o	I	|	|	|	|	2.23

```
 9.000    0.09    0.00      0.028  o       |       I       |       |     2.24
 9.083    0.10    0.00      0.028  o       |       |I      |       |     2.26
 9.167    0.10    0.00      0.029  o       |       |I      |       |     2.27
 9.250    0.10    0.00      0.030  o       |       |I      |       |     2.29
 9.333    0.10    0.00      0.030  o       |       | I     |       |     2.31
 9.417    0.10    0.00      0.031  o       |       | I     |       |     2.32
 9.500    0.10    0.00      0.032  o       |       | I     |       |     2.34
 9.583    0.11    0.00      0.032  o       |       |  I    |       |     2.36
 9.667    0.11    0.00      0.033  o       |       |  I    |       |     2.38
 9.750    0.11    0.00      0.034  o       |       |  I    |       |     2.39
 9.833    0.11    0.00      0.035  o       |       |   I   |       |     2.41
 9.917    0.11    0.00      0.035  o       |       |   I   |       |     2.43
10.000    0.11    0.00      0.036  o       |       |   I   |       |     2.45
10.083    0.09    0.00      0.037  o       |      I|       |       |     2.47
10.167    0.08    0.00      0.037  o       |     I |       |       |     2.48
10.250    0.08    0.00      0.038  o       |     I |       |       |     2.50
10.333    0.08    0.00      0.038  o       |     I |       |       |     2.51
10.417    0.08    0.00      0.039  o       |     I |       |       |     2.52
10.500    0.08    0.00      0.039  o       |     I |       |       |     2.53
10.583    0.10    0.00      0.040  o       |       |I      |       |     2.55
10.667    0.10    0.00      0.041  o       |       | I     |       |     2.57
10.750    0.10    0.00      0.041  o       |       | I     |       |     2.58
10.833    0.10    0.00      0.042  o       |       | I     |       |     2.60
10.917    0.10    0.00      0.043  o       |       | I     |       |     2.62
11.000    0.10    0.00      0.043  o       |       | I     |       |     2.64
11.083    0.10    0.00      0.044  o       |       | I     |       |     2.65
11.167    0.10    0.00      0.045  o       |       |I      |       |     2.67
11.250    0.10    0.00      0.045  o       |       |I      |       |     2.69
11.333    0.10    0.00      0.046  o       |       |I      |       |     2.70
11.417    0.10    0.00      0.047  o       |       |I      |       |     2.72
11.500    0.10    0.00      0.047  o       |       |I      |       |     2.74
11.583    0.09    0.00      0.048  o       |       I       |       |     2.75
11.667    0.09    0.00      0.049  o       |       I       |       |     2.77
11.750    0.09    0.00      0.049  o       |       I       |       |     2.78
11.833    0.09    0.00      0.050  o       |       I       |       |     2.80
11.917    0.09    0.00      0.050  o       |       I       |       |     2.81
12.000    0.09    0.00      0.051  o       |       I       |       |     2.83
12.083    0.12    0.00      0.052  o       |       |    I  |       |     2.85
12.167    0.13    0.00      0.053  o       |       |      I|       |     2.87
12.250    0.13    0.00      0.054  o       |       |      I|       |     2.89
12.333    0.13    0.00      0.054  o       |       |       I       |     2.91
12.417    0.14    0.00      0.055  o       |       |       I       |     2.93
12.500    0.14    0.00      0.056  o       |       |       I       |     2.96
12.583    0.14    0.00      0.057  o       |       |       |I      |     2.98
12.667    0.15    0.00      0.058  o       |       |       | I     |     3.01
12.750    0.15    0.00      0.059  o       |       |       | I     |     3.03
12.833    0.15    0.00      0.060  o       |       |       |  I    |     3.06
12.917    0.15    0.00      0.061  o       |       |       |  I    |     3.09
13.000    0.15    0.00      0.062  o       |       |       |  I    |     3.12
13.083    0.17    0.00      0.063  o       |       |       |     I |     3.16
13.167    0.18    0.00      0.064  o       |       |       |       I     3.19
13.250    0.18    0.00      0.066  o       |       |       |       I     3.22
13.333    0.18    0.00      0.067  o       |       |       |       I     3.26
13.417    0.18    0.00      0.068  o       |       |       |       I     3.29
13.500    0.18    0.00      0.069  o       |       |       |       I     3.33
13.583    0.13    0.00      0.070  o       |       |       I       |     3.36
13.667    0.12    0.00      0.071  o       |       |    I  |       |     3.39
13.750    0.12    0.00      0.072  o       |       |    I  |       |     3.41
13.833    0.12    0.00      0.073  o       |       |    I  |       |     3.43
13.917    0.12    0.00      0.074  o       |       |    I  |       |     3.46
14.000    0.12    0.00      0.074  o       |       |    I  |       |     3.48
14.083    0.14    0.03      0.075  |     O |       |       I       |     3.50
14.167    0.14    0.18      0.075  |       |       |       |I      O     3.51
14.250    0.14    0.12      0.075  |       |       |     O |I      |     3.50
14.333    0.14    0.15      0.075  |       |       |       I O     |     3.51
14.417    0.14    0.13      0.075  |       |       |      OI       |     3.50
14.500    0.14    0.14      0.075  |       |       |       O       |     3.50
14.583    0.14    0.13      0.075  |       |       |       O       |     3.50
14.667    0.14    0.14      0.075  |       |       |       O       |     3.50
14.750    0.14    0.14      0.075  |       |       |       O       |     3.50
14.833    0.13    0.13      0.075  |       |       |      O|       |     3.50
14.917    0.13    0.13      0.075  |       |       |      O|       |     3.50
15.000    0.13    0.13      0.075  |       |       |      O|       |     3.50
15.083    0.13    0.13      0.075  |       |       |     IO|       |     3.50
15.167    0.12    0.12      0.075  |       |       |     O |       |     3.50
15.250    0.12    0.12      0.075  |       |       |     O |       |     3.50
15.333    0.12    0.12      0.075  |       |       |    IO |       |     3.50
15.417    0.12    0.12      0.075  |       |       |    O  |       |     3.50
15.500    0.12    0.12      0.075  |       |       |    O  |       |     3.50
15.583    0.10    0.11      0.075  |       |       |  IO   |       |     3.50
15.667    0.10    0.10      0.075  |       |       |O      |       |     3.50
15.750    0.10    0.10      0.075  |       |       |O      |       |     3.50
15.833    0.10    0.10      0.075  |       |       |O      |       |     3.50
15.917    0.10    0.10      0.075  |       |       |O      |       |     3.50
16.000    0.10    0.10      0.075  |       |       |O      |       |     3.50
16.083    0.04    0.06      0.075  |      I| O     |       |       |     3.50
```

16.167	0.02	0.02	0.075	O				3.50
16.250	0.02	0.02	0.075	O				3.50
16.333	0.02	0.02	0.075	O				3.50
16.417	0.02	0.02	0.075	O				3.50
16.500	0.02	0.02	0.075	O				3.50
16.583	0.02	0.02	0.075	O				3.50
16.667	0.02	0.02	0.075	O				3.50
16.750	0.02	0.02	0.075	O				3.50
16.833	0.02	0.02	0.075	O				3.50
16.917	0.02	0.02	0.075	O				3.50
17.000	0.02	0.02	0.075	O				3.50
17.083	0.02	0.02	0.075	OI				3.50
17.167	0.03	0.03	0.075	O				3.50
17.250	0.03	0.03	0.075	O				3.50
17.333	0.03	0.03	0.075	O				3.50
17.417	0.03	0.03	0.075	O				3.50
17.500	0.03	0.03	0.075	O				3.50
17.583	0.03	0.03	0.075	O				3.50
17.667	0.03	0.03	0.075	O				3.50
17.750	0.03	0.03	0.075	O				3.50
17.833	0.02	0.02	0.075	IO				3.50
17.917	0.02	0.02	0.075	O				3.50
18.000	0.02	0.02	0.075	O				3.50
18.083	0.02	0.02	0.075	O				3.50
18.167	0.02	0.02	0.075	O				3.50
18.250	0.02	0.02	0.075	O				3.50
18.333	0.02	0.02	0.075	O				3.50
18.417	0.02	0.02	0.075	O				3.50
18.500	0.02	0.02	0.075	O				3.50
18.583	0.02	0.02	0.075	O				3.50
18.667	0.02	0.02	0.075	O				3.50
18.750	0.02	0.02	0.075	O				3.50
18.833	0.01	0.01	0.075	O				3.50
18.917	0.01	0.01	0.075	O				3.50
19.000	0.01	0.01	0.075	O				3.50
19.083	0.01	0.01	0.075	O				3.50
19.167	0.02	0.02	0.075	O				3.50
19.250	0.02	0.02	0.075	O				3.50
19.333	0.02	0.02	0.075	O				3.50
19.417	0.02	0.02	0.075	O				3.50
19.500	0.02	0.02	0.075	O				3.50
19.583	0.02	0.02	0.075	O				3.50
19.667	0.02	0.02	0.075	O				3.50
19.750	0.02	0.02	0.075	O				3.50
19.833	0.01	0.01	0.075	O				3.50
19.917	0.01	0.01	0.075	O				3.50
20.000	0.01	0.01	0.075	O				3.50
20.083	0.01	0.01	0.075	O				3.50
20.167	0.02	0.02	0.075	O				3.50
20.250	0.02	0.02	0.075	O				3.50
20.333	0.02	0.02	0.075	O				3.50
20.417	0.02	0.02	0.075	O				3.50
20.500	0.02	0.02	0.075	O				3.50
20.583	0.02	0.02	0.075	O				3.50
20.667	0.02	0.02	0.075	O				3.50
20.750	0.02	0.02	0.075	O				3.50
20.833	0.01	0.01	0.075	O				3.50
20.917	0.01	0.01	0.075	O				3.50
21.000	0.01	0.01	0.075	O				3.50
21.083	0.01	0.01	0.075	O				3.50
21.167	0.02	0.02	0.075	O				3.50
21.250	0.02	0.02	0.075	O				3.50
21.333	0.01	0.01	0.075	O				3.50
21.417	0.01	0.01	0.075	O				3.50
21.500	0.01	0.01	0.075	O				3.50
21.583	0.01	0.01	0.075	O				3.50
21.667	0.02	0.02	0.075	O				3.50
21.750	0.02	0.02	0.075	O				3.50
21.833	0.01	0.01	0.075	O				3.50
21.917	0.01	0.01	0.075	O				3.50
22.000	0.01	0.01	0.075	O				3.50
22.083	0.01	0.01	0.075	O				3.50
22.167	0.02	0.02	0.075	O				3.50
22.250	0.02	0.02	0.075	O				3.50
22.333	0.01	0.01	0.075	O				3.50
22.417	0.01	0.01	0.075	O				3.50
22.500	0.01	0.01	0.075	O				3.50
22.583	0.01	0.01	0.075	O				3.50
22.667	0.01	0.01	0.075	O				3.50
22.750	0.01	0.01	0.075	O				3.50
22.833	0.01	0.01	0.075	O				3.50
22.917	0.01	0.01	0.075	O				3.50
23.000	0.01	0.01	0.075	O				3.50
23.083	0.01	0.01	0.075	O				3.50
23.167	0.01	0.01	0.075	O				3.50
23.250	0.01	0.01	0.075	O				3.50

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23.333    0.01    0.01      0.075  |O      |       |       |       |     3.50
23.417    0.01    0.01      0.075  |O      |       |       |       |     3.50
23.500    0.01    0.01      0.075  |O      |       |       |       |     3.50
23.583    0.01    0.01      0.075  |O      |       |       |       |     3.50
23.667    0.01    0.01      0.075  |O      |       |       |       |     3.50
23.750    0.01    0.01      0.075  |O      |       |       |       |     3.50
23.833    0.01    0.01      0.075  |O      |       |       |       |     3.50
23.917    0.01    0.01      0.075  |O      |       |       |       |     3.50
24.000    0.01    0.01      0.075  |O      |       |       |       |     3.50
24.083    0.00    0.00      0.075  O       |       |       |       |     3.50
24.167    0.00    0.00      0.075  O       |       |       |       |     3.50

Remaining water in basin =    0.07 (Ac.Ft)

*****************************HYDROGRAPH DATA*****************************
               Number of intervals =   290
               Time interval =    5.0 (Min.)
               Maximum/Peak flow rate =        0.183 (CFS)
               Total volume =       0.033 (Ac.Ft)
       Status of hydrographs being held in storage
                    Stream 1  Stream 2  Stream 3  Stream 4  Stream 5
       Peak (CFS)      0.000     0.000     0.000     0.000     0.000
       Vol (Ac.Ft)      0.000     0.000     0.000     0.000     0.000
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Bioretention Size and Flow Calculations

BIO D

	BASIN PARAMETERS					OUTLET								
Basin Elevation	Depth	Area S.F.	Volume C.F.	Volume AC-FT	Effective Volume AC-FT	Q_1 Orrifice Plate (cfs)	Q_2 Orrifice Plate (cfs)	Q_3 Orrifice Plate (cfs)	Q_4 Orrifice Plate (cfs)	Q_5Orrifice Plate (cfs)	Q_6 Orrifice Plate (cfs)	Q_7Orrifice Plate (cfs)	Q Weir 1 (cfs)	Q Total (cfs)
1546.00	0.00	606.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1547.00	1.00	606.00	606.00	0.014	0.014	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1548.00	2.00	606.00	1,212.00	0.028	0.028	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1549.00	3.00	2,020.00	3,939.00	0.090	0.090	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1549.50	3.50	2,516.50	5,464.38	0.125	0.125	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1550.00	4.00	3,013.00	7,238.00	0.166	0.166	0.000	0.000	0.000	0.000	0.000	0.000	0.000	18.837	18.837

Orifice Coefficient	0.66		Dia of Orrifice	0.00							
Gravimetric Constant	32.2	ft/s^2	Eff Dia of Orrifice	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Number of Rows			Area of Orrifice	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
Minimum Orrifice Plate Height			Number of Orrifeces	1	1	1	1	1	1	1	
Minimum Orrifice Plate Width			Elev	1546							
							Weir	Sharp Crest Weir Coefficient		3.33	
								Length of Weir		16.00	
								Elev. at Crest of Weir		1549.50	

Q100 Elevation Weir Calc		
100yr Weir Calc		
Crest Wier Elev.	1549.50	
Q100	4.03	cfs
Weir Length	16	
Weir Coeff.	3.33	
H Weir	0.178852	
Q100 Elevation	**1549.68**	

Ponding Volume

Soil Media 30%

Q100 Elevation Weir Calc		
100yr Emergency Weir Calc		
Crest Wier Elev.	1549.70	
Q100	4.03	cfs
Weir Length	20	
Weir Coeff.	3.33	
H Weir	0.15413	
Q100 Elevation	**1549.85**	

FLOOD HYDROGRAPH ROUTING PROGRAM
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Study date: 10/11/24

Program License Serial Number 5006

********** HYDROGRAPH INFORMATION **********

From study/file name: PROD2242.rte
**********HYDROGRAPH DATA**********
Number of intervals = 289
Time interval = 5.0 (Min.)
Maximum/Peak flow rate = 0.219 (CFS)
Total volume = 0.133 (Ac.Ft)
Status of hydrographs being held in storage
Stream 1 Stream 2 Stream 3 Stream 4 Stream 5
Peak (CFS) 0.000 0.000 0.000 0.000 0.000
Vol (Ac.Ft) 0.000 0.000 0.000 0.000 0.000
****

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Process from Point/Station 1.000 to Point/Station 2.000
**** RETARDING BASIN ROUTING ****

User entry of depth-outflow-storage data

Total number of inflow hydrograph intervals = 289
Hydrograph time unit = 5.000 (Min.)
Initial depth in storage basin = 0.00(Ft.)

Initial basin depth = 0.00 (Ft.)
Initial basin storage = 0.00 (Ac.Ft)
Initial basin outflow = 0.00 (CFS)

Depth vs. Storage and Depth vs. Discharge data:

Basin Depth (Ft.)	Storage (Ac.Ft)	Outflow (CFS)	(S-O*dt/2) (Ac.Ft)	(S+O*dt/2) (Ac.Ft)
0.000	0.000	0.000	0.000	0.000
1.000	0.014	0.001	0.014	0.014
2.000	0.028	0.002	0.028	0.028
3.000	0.090	0.003	0.090	0.090
3.500	0.125	0.004	0.125	0.125
4.000	0.166	18.837	0.101	0.231

Hydrograph Detention Basin Routing

Graph values: 'I'= unit inflow; 'O'=outflow at time shown

Time (Hours)	Inflow (CFS)	Outflow (CFS)	Storage (Ac.Ft)	.0	0.1	0.11	0.16	0.22	Depth (Ft.)
0.083	0.01	0.00	0.000	OI	|	|	|	|	0.00
0.167	0.01	0.00	0.000	OI	|	|	|	|	0.01
0.250	0.01	0.00	0.000	OI	|	|	|	|	0.01
0.333	0.02	0.00	0.000	O I	|	|	|	|	0.02
0.417	0.02	0.00	0.000	O I	|	|	|	|	0.03
0.500	0.02	0.00	0.001	O I	|	|	|	|	0.04
0.583	0.02	0.00	0.001	O I	|	|	|	|	0.05
0.667	0.02	0.00	0.001	O I	|	|	|	|	0.06
0.750	0.02	0.00	0.001	O I	|	|	|	|	0.07
0.833	0.02	0.00	0.001	O I	|	|	|	|	0.08
0.917	0.03	0.00	0.001	O I	|	|	|	|	0.09
1.000	0.03	0.00	0.001	O I	|	|	|	|	0.10
1.083	0.02	0.00	0.002	O I	|	|	|	|	0.12
1.167	0.02	0.00	0.002	O I	|	|	|	|	0.13
1.250	0.02	0.00	0.002	O I	|	|	|	|	0.14
1.333	0.02	0.00	0.002	O I	|	|	|	|	0.14
1.417	0.02	0.00	0.002	O I	|	|	|	|	0.15
1.500	0.02	0.00	0.002	O I	|	|	|	|	0.16
1.583	0.02	0.00	0.002	O I	|	|	|	|	0.17
1.667	0.02	0.00	0.003	O I	|	|	|	|	0.18
1.750	0.02	0.00	0.003	O I	|	|	|	|	0.19

1.833	0.02	0.00	0.003	o	I	|	|	|	|	0.20
1.917	0.03	0.00	0.003	o	I	|	|	|	|	0.21
2.000	0.03	0.00	0.003	o	I	|	|	|	|	0.23
2.083	0.03	0.00	0.003	o	I	|	|	|	|	0.24
2.167	0.03	0.00	0.004	o	I	|	|	|	|	0.25
2.250	0.03	0.00	0.004	o	I	|	|	|	|	0.27
2.333	0.03	0.00	0.004	o	I	|	|	|	|	0.28
2.417	0.03	0.00	0.004	o	I	|	|	|	|	0.29
2.500	0.03	0.00	0.004	o	I	|	|	|	|	0.30
2.583	0.03	0.00	0.004	o	I	|	|	|	|	0.32
2.667	0.03	0.00	0.005	o	I	|	|	|	|	0.33
2.750	0.03	0.00	0.005	o	I	|	|	|	|	0.35
2.833	0.03	0.00	0.005	o	I	|	|	|	|	0.36
2.917	0.03	0.00	0.005	o	I	|	|	|	|	0.38
3.000	0.03	0.00	0.006	o	I	|	|	|	|	0.39
3.083	0.03	0.00	0.006	o	I	|	|	|	|	0.41
3.167	0.03	0.00	0.006	o	I	|	|	|	|	0.43
3.250	0.03	0.00	0.006	o	I	|	|	|	|	0.44
3.333	0.03	0.00	0.006	o	I	|	|	|	|	0.46
3.417	0.03	0.00	0.007	o	I	|	|	|	|	0.47
3.500	0.03	0.00	0.007	o	I	|	|	|	|	0.49
3.583	0.03	0.00	0.007	o	I	|	|	|	|	0.50
3.667	0.03	0.00	0.007	o	I	|	|	|	|	0.52
3.750	0.03	0.00	0.007	o	I	|	|	|	|	0.54
3.833	0.04	0.00	0.008	o	I	|	|	|	|	0.55
3.917	0.04	0.00	0.008	o	I	|	|	|	|	0.57
4.000	0.04	0.00	0.008	o	I	|	|	|	|	0.59
4.083	0.04	0.00	0.009	o	I	|	|	|	|	0.61
4.167	0.04	0.00	0.009	o	I	|	|	|	|	0.63
4.250	0.04	0.00	0.009	o	I	|	|	|	|	0.65
4.333	0.04	0.00	0.009	o	I	|	|	|	|	0.67
4.417	0.05	0.00	0.010	o	I	|	|	|	|	0.69
4.500	0.05	0.00	0.010	o	I	|	|	|	|	0.71
4.583	0.05	0.00	0.010	o	I	|	|	|	|	0.73
4.667	0.05	0.00	0.011	o	I	|	|	|	|	0.75
4.750	0.05	0.00	0.011	o	I	|	|	|	|	0.77
4.833	0.05	0.00	0.011	o	I	|	|	|	|	0.80
4.917	0.05	0.00	0.012	o	I	|	|	|	|	0.82
5.000	0.05	0.00	0.012	o	I	|	|	|	|	0.85
5.083	0.04	0.00	0.012	o	I	|	|	|	|	0.87
5.167	0.04	0.00	0.012	o	I	|	|	|	|	0.89
5.250	0.04	0.00	0.013	o	I	|	|	|	|	0.91
5.333	0.04	0.00	0.013	o	I	|	|	|	|	0.93
5.417	0.05	0.00	0.013	o	I	|	|	|	|	0.95
5.500	0.05	0.00	0.014	o	I	|	|	|	|	0.97
5.583	0.05	0.00	0.014	o	I	|	|	|	|	0.99
5.667	0.05	0.00	0.014	o	I	|	|	|	|	1.02
5.750	0.05	0.00	0.015	o	I	|	|	|	|	1.04
5.833	0.05	0.00	0.015	o	I	|	|	|	|	1.07
5.917	0.05	0.00	0.015	o	I	|	|	|	|	1.09
6.000	0.05	0.00	0.016	o	I	|	|	|	|	1.12
6.083	0.06	0.00	0.016	o	I	|	|	|	|	1.14
6.167	0.06	0.00	0.016	o	I	|	|	|	|	1.17
6.250	0.06	0.00	0.017	o	I	|	|	|	|	1.20
6.333	0.06	0.00	0.017	o	I	|	|	|	|	1.23
6.417	0.06	0.00	0.018	o	I	|	|	|	|	1.25
6.500	0.06	0.00	0.018	o	I	|	|	|	|	1.28
6.583	0.06	0.00	0.018	o	I	|	|	|	|	1.31
6.667	0.06	0.00	0.019	o	I	|	|	|	|	1.34
6.750	0.06	0.00	0.019	o	I	|	|	|	|	1.37
6.833	0.06	0.00	0.020	o	I	|	|	|	|	1.40
6.917	0.06	0.00	0.020	o	I	|	|	|	|	1.44
7.000	0.06	0.00	0.021	o	I	|	|	|	|	1.47
7.083	0.06	0.00	0.021	o	I	|	|	|	|	1.50
7.167	0.06	0.00	0.021	o	I	|	|	|	|	1.53
7.250	0.06	0.00	0.022	o	I	|	|	|	|	1.56
7.333	0.07	0.00	0.022	o	I	|	|	|	|	1.59
7.417	0.07	0.00	0.023	o	I	|	|	|	|	1.63
7.500	0.07	0.00	0.023	o	I	|	|	|	|	1.66
7.583	0.08	0.00	0.024	o	I	|	|	|	|	1.69
7.667	0.08	0.00	0.024	o	I	|	|	|	|	1.73
7.750	0.08	0.00	0.025	o	I	|	|	|	|	1.77
7.833	0.08	0.00	0.025	o	I	|	|	|	|	1.81
7.917	0.08	0.00	0.026	o	I	|	|	|	|	1.85
8.000	0.08	0.00	0.026	o	I	|	|	|	|	1.89
8.083	0.09	0.00	0.027	o	I	|	|	|	|	1.93
8.167	0.10	0.00	0.028	o	I	|	|	|	|	1.98
8.250	0.10	0.00	0.028	o	I	|	|	|	|	2.01
8.333	0.10	0.00	0.029	o	I	|	|	|	|	2.02
8.417	0.10	0.00	0.030	o	I	|	|	|	|	2.03
8.500	0.10	0.00	0.030	o	I	|	|	|	|	2.04
8.583	0.10	0.00	0.031	o	I	|	|	|	|	2.05
8.667	0.10	0.00	0.032	o	I	|	|	|	|	2.06
8.750	0.10	0.00	0.032	o	I	|	|	|	|	2.07
8.833	0.11	0.00	0.033	o	I	|	|	|	|	2.08
8.917	0.11	0.00	0.034	o	I	|	|	|	|	2.09

9.000	0.11	0.00	0.035	o	|	I|	|	|	2.11
9.083	0.12	0.00	0.035	o	|	|I	|	|	2.12
9.167	0.12	0.00	0.036	o	|	|I	|	|	2.13
9.250	0.12	0.00	0.037	o	|	|I	|	|	2.14
9.333	0.13	0.00	0.038	o	|	| I	|	|	2.16
9.417	0.13	0.00	0.039	o	|	| I	|	|	2.17
9.500	0.13	0.00	0.040	o	|	| I	|	|	2.19
9.583	0.13	0.00	0.040	o	|	| I	|	|	2.20
9.667	0.14	0.00	0.041	o	|	| I	|	|	2.22
9.750	0.14	0.00	0.042	o	|	| I	|	|	2.23
9.833	0.14	0.00	0.043	o	|	| I	|	|	2.25
9.917	0.14	0.00	0.044	o	|	| I	|	|	2.26
10.000	0.14	0.00	0.045	o	|	| I	|	|	2.28
10.083	0.11	0.00	0.046	o	|	I|	|	|	2.29
10.167	0.10	0.00	0.047	o	|	I |	|	|	2.30
10.250	0.10	0.00	0.047	o	|	I |	|	|	2.31
10.333	0.10	0.00	0.048	o	|	I |	|	|	2.32
10.417	0.10	0.00	0.049	o	|	I |	|	|	2.33
10.500	0.10	0.00	0.049	o	|	I |	|	|	2.34
10.583	0.12	0.00	0.050	o	|	|I	|	|	2.35
10.667	0.13	0.00	0.051	o	|	| I	|	|	2.37
10.750	0.13	0.00	0.052	o	|	| I	|	|	2.38
10.833	0.13	0.00	0.053	o	|	| I	|	|	2.40
10.917	0.13	0.00	0.053	o	|	| I	|	|	2.41
11.000	0.13	0.00	0.054	o	|	| I	|	|	2.42
11.083	0.12	0.00	0.055	o	|	| I	|	|	2.44
11.167	0.12	0.00	0.056	o	|	|I	|	|	2.45
11.250	0.12	0.00	0.057	o	|	|I	|	|	2.46
11.333	0.12	0.00	0.058	o	|	|I	|	|	2.48
11.417	0.12	0.00	0.058	o	|	|I	|	|	2.49
11.500	0.12	0.00	0.059	o	|	|I	|	|	2.50
11.583	0.11	0.00	0.060	o	|	I	|	|	2.52
11.667	0.11	0.00	0.061	o	|	I|	|	|	2.53
11.750	0.11	0.00	0.062	o	|	I|	|	|	2.54
11.833	0.11	0.00	0.062	o	|	I	|	|	2.55
11.917	0.12	0.00	0.063	o	|	I	|	|	2.57
12.000	0.12	0.00	0.064	o	|	I	|	|	2.58
12.083	0.15	0.00	0.065	o	|	| I	|	|	2.59
12.167	0.16	0.00	0.066	o	|	| I|	|	|	2.61
12.250	0.16	0.00	0.067	o	|	| I|	|	|	2.63
12.333	0.17	0.00	0.068	o	|	| I	|	|	2.65
12.417	0.17	0.00	0.069	o	|	| I	|	|	2.66
12.500	0.17	0.00	0.070	o	|	| I	|	|	2.68
12.583	0.18	0.00	0.071	o	|	| |I	|	|	2.70
12.667	0.18	0.00	0.073	o	|	| | I	|	|	2.72
12.750	0.18	0.00	0.074	o	|	| | I	|	|	2.74
12.833	0.19	0.00	0.075	o	|	| | I	|	|	2.76
12.917	0.19	0.00	0.076	o	|	| | I	|	|	2.78
13.000	0.19	0.00	0.078	o	|	| | I	|	|	2.80
13.083	0.21	0.00	0.079	o	|	| | | I	|	|	2.82
13.167	0.22	0.00	0.081	o	|	| | | I|	|	|	2.85
13.250	0.22	0.00	0.082	o	|	| | | I|	|	|	2.87
13.333	0.22	0.00	0.084	o	|	| | | I|	|	|	2.90
13.417	0.22	0.00	0.085	o	|	| | | I|	|	|	2.92
13.500	0.22	0.00	0.086	o	|	| | | I|	|	|	2.94
13.583	0.17	0.00	0.088	o	|	| | I	|	|	2.96
13.667	0.15	0.00	0.089	o	|	| I |	|	|	2.98
13.750	0.15	0.00	0.090	o	|	| I |	|	|	3.00
13.833	0.15	0.00	0.091	o	|	| I |	|	|	3.01
13.917	0.15	0.00	0.092	o	|	| I |	|	|	3.03
14.000	0.15	0.00	0.093	o	|	| I |	|	|	3.04
14.083	0.17	0.00	0.094	o	|	| | I	|	|	3.06
14.167	0.17	0.00	0.095	o	|	| | |I	|	|	3.07
14.250	0.17	0.00	0.096	o	|	| | |I	|	|	3.09
14.333	0.17	0.00	0.097	o	|	| | I	|	|	3.11
14.417	0.17	0.00	0.099	o	|	| | I	|	|	3.12
14.500	0.17	0.00	0.100	o	|	| | I	|	|	3.14
14.583	0.17	0.00	0.101	o	|	| | I	|	|	3.15
14.667	0.17	0.00	0.102	o	|	| | I	|	|	3.17
14.750	0.17	0.00	0.103	o	|	| | I	|	|	3.19
14.833	0.16	0.00	0.104	o	|	| | I|	|	|	3.20
14.917	0.16	0.00	0.105	o	|	| | I|	|	|	3.22
15.000	0.16	0.00	0.106	o	|	| | I|	|	|	3.23
15.083	0.16	0.00	0.107	o	|	| | I |	|	|	3.25
15.167	0.15	0.00	0.109	o	|	| | I |	|	|	3.26
15.250	0.15	0.00	0.110	o	|	| | I |	|	|	3.28
15.333	0.15	0.00	0.111	o	|	| | I |	|	|	3.29
15.417	0.15	0.00	0.112	o	|	| | I |	|	|	3.31
15.500	0.15	0.00	0.113	o	|	| | I |	|	|	3.32
15.583	0.13	0.00	0.114	o	|	| I	|	|	3.34
15.667	0.12	0.00	0.114	o	|	|I	|	|	3.35
15.750	0.12	0.00	0.115	o	|	|I	|	|	3.36
15.833	0.12	0.00	0.116	o	|	|I	|	|	3.37
15.917	0.12	0.00	0.117	o	|	|I	|	|	3.38
16.000	0.12	0.00	0.118	o	|	|I	|	|	3.39
16.083	0.05	0.00	0.118	o	I|	|	|	|	3.40

16.167	0.03	0.00	0.118	O I				3.41
16.250	0.03	0.00	0.119	O I				3.41
16.333	0.03	0.00	0.119	O I				3.41
16.417	0.03	0.00	0.119	O I				3.41
16.500	0.03	0.00	0.119	O I				3.41
16.583	0.02	0.00	0.119	O I				3.42
16.667	0.02	0.00	0.119	O I				3.42
16.750	0.02	0.00	0.119	O I				3.42
16.833	0.02	0.00	0.119	O I				3.42
16.917	0.02	0.00	0.120	O I				3.42
17.000	0.02	0.00	0.120	O I				3.42
17.083	0.03	0.00	0.120	O I				3.43
17.167	0.03	0.00	0.120	O I				3.43
17.250	0.03	0.00	0.120	O I				3.43
17.333	0.03	0.00	0.120	O I				3.43
17.417	0.03	0.00	0.121	O I				3.44
17.500	0.03	0.00	0.121	O I				3.44
17.583	0.03	0.00	0.121	O I				3.44
17.667	0.03	0.00	0.121	O I				3.45
17.750	0.03	0.00	0.121	O I				3.45
17.833	0.03	0.00	0.122	O I				3.45
17.917	0.03	0.00	0.122	O I				3.45
18.000	0.03	0.00	0.122	O I				3.46
18.083	0.03	0.00	0.122	O I				3.46
18.167	0.03	0.00	0.122	O I				3.46
18.250	0.03	0.00	0.122	O I				3.46
18.333	0.03	0.00	0.122	O I				3.46
18.417	0.03	0.00	0.123	O I				3.47
18.500	0.03	0.00	0.123	O I				3.47
18.583	0.02	0.00	0.123	O I				3.47
18.667	0.02	0.00	0.123	O I				3.47
18.750	0.02	0.00	0.123	O I				3.47
18.833	0.01	0.00	0.123	O I				3.47
18.917	0.01	0.00	0.123	OI				3.48
19.000	0.01	0.00	0.123	OI				3.48
19.083	0.02	0.00	0.123	O I				3.48
19.167	0.02	0.00	0.124	O I				3.48
19.250	0.02	0.00	0.124	O I				3.48
19.333	0.02	0.00	0.124	O I				3.48
19.417	0.03	0.00	0.124	O I				3.48
19.500	0.03	0.00	0.124	O I				3.49
19.583	0.02	0.00	0.124	O I				3.49
19.667	0.02	0.00	0.124	O I				3.49
19.750	0.02	0.00	0.124	O I				3.49
19.833	0.01	0.00	0.124	O I				3.49
19.917	0.01	0.00	0.125	OI				3.49
20.000	0.01	0.00	0.125	OI				3.49
20.083	0.02	0.00	0.125	O I				3.50
20.167	0.02	0.00	0.125	O I				3.50
20.250	0.02	0.00	0.125	O I				3.50
20.333	0.02	0.01	0.125	O I				3.50
20.417	0.02	0.02	0.125	IO				3.50
20.500	0.02	0.02	0.125	O				3.50
20.583	0.02	0.02	0.125	O				3.50
20.667	0.02	0.02	0.125	O				3.50
20.750	0.02	0.02	0.125	O				3.50
20.833	0.01	0.02	0.125	O				3.50
20.917	0.01	0.01	0.125	O				3.50
21.000	0.01	0.01	0.125	O				3.50
21.083	0.02	0.02	0.125	O				3.50
21.167	0.02	0.02	0.125	O				3.50
21.250	0.02	0.02	0.125	O				3.50
21.333	0.01	0.02	0.125	O				3.50
21.417	0.01	0.01	0.125	O				3.50
21.500	0.01	0.01	0.125	O				3.50
21.583	0.02	0.02	0.125	O				3.50
21.667	0.02	0.02	0.125	O				3.50
21.750	0.02	0.02	0.125	O				3.50
21.833	0.01	0.02	0.125	O				3.50
21.917	0.01	0.01	0.125	O				3.50
22.000	0.01	0.01	0.125	O				3.50
22.083	0.02	0.02	0.125	O				3.50
22.167	0.02	0.02	0.125	O				3.50
22.250	0.02	0.02	0.125	O				3.50
22.333	0.01	0.02	0.125	O				3.50
22.417	0.01	0.01	0.125	O				3.50
22.500	0.01	0.01	0.125	O				3.50
22.583	0.01	0.01	0.125	O				3.50
22.667	0.01	0.01	0.125	O				3.50
22.750	0.01	0.01	0.125	O				3.50
22.833	0.01	0.01	0.125	O				3.50
22.917	0.01	0.01	0.125	O				3.50
23.000	0.01	0.01	0.125	O				3.50
23.083	0.01	0.01	0.125	O				3.50
23.167	0.01	0.01	0.125	O				3.50
23.250	0.01	0.01	0.125	O				3.50

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23.333    0.01    0.01      0.125  |O      |       |       |       |     3.50
23.417    0.01    0.01      0.125  |O      |       |       |       |     3.50
23.500    0.01    0.01      0.125  |O      |       |       |       |     3.50
23.583    0.01    0.01      0.125  |O      |       |       |       |     3.50
23.667    0.01    0.01      0.125  |O      |       |       |       |     3.50
23.750    0.01    0.01      0.125  |O      |       |       |       |     3.50
23.833    0.01    0.01      0.125  |O      |       |       |       |     3.50
23.917    0.01    0.01      0.125  |O      |       |       |       |     3.50
24.000    0.01    0.01      0.125  |O      |       |       |       |     3.50
24.083    0.00    0.01      0.125  IO      |       |       |       |     3.50
24.167    0.00    0.00      0.125  O       |       |       |       |     3.50

       Remaining water in basin =    0.12 (Ac.Ft)

       ****************************HYDROGRAPH DATA****************************
                     Number of intervals =   290
                     Time interval =    5.0 (Min.)
                     Maximum/Peak flow rate =        0.022 (CFS)
                     Total volume =       0.008 (Ac.Ft)
              Status of hydrographs being held in storage
                        Stream 1  Stream 2  Stream 3  Stream 4  Stream 5
              Peak (CFS)      0.000     0.000     0.000     0.000     0.000
              Vol (Ac.Ft)      0.000     0.000     0.000     0.000     0.000
       ***********************************************************************

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Appendix 8: Source Control

Pollutant Sources/Source Control Checklist

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

How to use this worksheet (also see instructions in Section G of the WQMP Template):

1. Review Column 1 and identify which of these potential sources of stormwater pollutants apply to your site. Check each box that applies.
2. Review Column 2 and incorporate all of the corresponding applicable BMPs in your WQMP Exhibit.
3. Review Columns 3 and 4 and incorporate all of the corresponding applicable permanent controls and operational BMPs in your WQMP. Use the format shown in Table G.1on page 23 of this WQMP Template. Describe your specific BMPs in an accompanying narrative, and explain any special conditions or situations that required omitting BMPs or substituting alternative BMPs for those shown here.

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
☑ A. **On-site storm drain inlets**	☑ **Locations of inlets.**	☑ **Mark all inlets with the words "Only Rain Down the Storm Drain" or similar. Catch Basin Markers may be available from the Riverside County Flood Control and Water Conservation District, call 951.955.1200 to verify.**	☑ **Maintain and periodically repaint or replace inlet markings.** ☑ **Provide stormwater pollution prevention information to new site owners, lessees, or operators.** ☑ **See applicable operational BMPs in Fact Sheet SC-44, "Drainage System Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com** ☑ **Include the following in lease agreements: "Tenant shall not allow anyone to discharge anything to storm drains or to store or deposit materials so as to create a potential discharge to storm drains."**
☐ B. **Interior floor drains and elevator shaft sump pumps**		☐ **State that interior floor drains and elevator shaft sump pumps will be plumbed to sanitary sewer.**	☐ **Inspect and maintain drains to prevent blockages and overflow.**
☐ C. **Interior parking garages**		☐ **State that parking garage floor drains will be plumbed to the sanitary sewer.**	☐ **Inspect and maintain drains to prevent blockages and overflow.**

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
☐ D1. **Need for future indoor & structural pest control**		☐ **Note building design features that discourage entry of pests.**	☐ **Provide Integrated Pest Management information to owners, lessees, and operators.**
☑ D2. **Landscape/ Outdoor Pesticide Use**	☐ **Show locations of native trees or areas of shrubs and ground cover to be undisturbed and retained.** ☑ **Show self-retaining landscape areas, if any.** ☑ **Show stormwater treatment and hydrograph modification management BMPs. (See instructions in Chapter 3, Step 5 and guidance in Chapter 5.)**	**State that final landscape plans will accomplish all of the following.** ☐ **Preserve existing native trees, shrubs, and ground cover to the maximum extent possible.** ☑ **Design landscaping to minimize irrigation and runoff, to promote surface infiltration where appropriate, and to minimize the use of fertilizers and pesticides that can contribute to stormwater pollution.** **Where landscaped areas are used to retain or detain stormwater, specify plants that are tolerant of saturated soil conditions.** ☑ **Consider using pest-resistant plants, especially adjacent to hardscape.** **To insure successful establishment, select plants appropriate to site soils, slopes, climate, sun, wind, rain, land use, air movement, ecological consistency, and plant interactions.**	☑ **Maintain landscaping using minimum or no pesticides.** ☑ **See applicable operational BMPs in "What you should know for…..Landscape and Gardening"** at http://rcflood.org/stormwater/**Error! Hyperlink reference not valid.** ☑ **Provide IPM information to new owners, lessees and operators.**

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
☑ E. **Pools, spas, ponds, decorative fountains, and other water features.**	☑ **Show location of water feature and a sanitary sewer cleanout in an accessible area within 10 feet. (Exception: Public pools must be plumbed according to County Department of Environmental Health Guidelines.)**	**If the Co-Permittee requires pools to be plumbed to the sanitary sewer, place a note on the plans and state in the narrative that this connection will be made according to local requirements.**	☑ **See applicable operational BMPs in** "Guidelines for Maintaining Your Swimming Pool, Jacuzzi and Garden Fountain" at http://rcflood.org/stormwater/
☐ F. **Food service**	☐ **For restaurants, grocery stores, and other food service operations, show location (indoors or in a covered area outdoors) of a floor sink or other area for cleaning floor mats, containers, and equipment.** ☐ **On the drawing, show a note that this drain will be connected to a grease interceptor before discharging to the sanitary sewer.**	☐ **Describe the location and features of the designated cleaning area.** ☐ **Describe the items to be cleaned in this facility and how it has been sized to insure that the largest items can be accommodated.**	☐ **See the brochure, "**The Food Service Industry Best Management Practices for: Restaurants, Grocery Stores, Delicatessens and Bakeries" at http://rcflood.org/stormwater/ **Provide this brochure to new site owners, lessees, and operators.**
☑ G. **Refuse areas**	☑ **Show where site refuse and recycled materials will be handled and stored for pickup. See local municipal requirements for sizes and other details of refuse areas.** ☐ **If dumpsters or other receptacles are outdoors, show how the designated area will be covered, graded, and paved to prevent run-on and show locations of berms to prevent runoff from the area.** ☐ **Any drains from dumpsters, compactors, and tallow bin areas shall be connected to a grease removal device before discharge to sanitary sewer.**	☑ **State how site refuse will be handled and provide supporting detail to what is shown on plans.** ☐ **State that signs will be posted on or near dumpsters with the words "Do not dump hazardous materials here" or similar.**	☑ **State how the following will be implemented:** **Provide adequate number of receptacles. Inspect receptacles regularly; repair or replace leaky receptacles. Keep receptacles covered. Prohibit/prevent dumping of liquid or hazardous wastes. Post "no hazardous materials" signs. Inspect and pick up litter daily and clean up spills immediately. Keep spill control materials available on-site. See Fact Sheet SC-34, "Waste Handling and Disposal" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com**

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
❑ H. **Industrial processes.**	❑ **Show process area.**	❑ **If industrial processes are to be located on site, state: "All process activities to be performed indoors. No processes to drain to exterior or to storm drain system."**	❑ **See Fact Sheet SC-10, "Non-Stormwater Discharges" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com** See the brochure "Industrial & Commercial Facilities Best Management Practices for: Industrial, Commercial Facilities" at http://rcflood.org/stormwater/

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
❑ I. **Outdoor storage of equipment or materials. (See rows J and K for source control measures for vehicle cleaning, repair, and maintenance.)**	❑ **Show any outdoor storage areas, including how materials will be covered. Show how areas will be graded and bermed to prevent run-on or run-off from area.** ❑ **Storage of non-hazardous liquids shall be covered by a roof and/or drain to the sanitary sewer system, and be contained by berms, dikes, liners, or vaults.** ❑ **Storage of hazardous materials and wastes must be in compliance with the local hazardous materials ordinance and a Hazardous Materials Management Plan for the site.**	**Include a detailed description of materials to be stored, storage areas, and structural features to prevent pollutants from entering storm drains.** **Where appropriate, reference documentation of compliance with the requirements of Hazardous Materials Programs for:** ▪ **Hazardous Waste Generation** ▪ **Hazardous Materials Release Response and Inventory** ▪ **California Accidental Release (CalARP)** ▪ **Aboveground Storage Tank** ▪ **Uniform Fire Code Article 80 Section 103(b) & (c) 1991** ▪ **Underground Storage Tank** **www.cchealth.org/groups/hazmat/**	❑ **See the Fact Sheets SC-31, "Outdoor Liquid Container Storage" and SC-33, "Outdoor Storage of Raw Materials " in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com**

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
❑ J. **Vehicle and Equipment Cleaning**	❑ **Show on drawings as appropriate:** **(1) Commercial/industrial facilities having vehicle/equipment cleaning needs shall either provide a covered, bermed area for washing activities or discourage vehicle/equipment washing by removing hose bibs and installing signs prohibiting such uses.** **(2) Multi-dwelling complexes shall have a paved, bermed, and covered car wash area (unless car washing is prohibited on-site and hoses are provided with an automatic shut-off to discourage such use).** **(3) Washing areas for cars, vehicles, and equipment shall be paved, designed to prevent run-on to or runoff from the area, and plumbed to drain to the sanitary sewer.** **(4) Commercial car wash facilities shall be designed such that no runoff from the facility is discharged to the storm drain system. Wastewater from the facility shall discharge to the sanitary sewer, or a wastewater reclamation system shall be installed.**	❑ **If a car wash area is not provided, describe any measures taken to discourage on-site car washing and explain how these will be enforced.**	**Describe operational measures to implement the following (if applicable):** ❑ **Washwater from vehicle and equipment washing operations shall not be discharged to the storm drain system.** Refer to "Outdoor Cleaning Activities and Professional Mobile Service Providers" for many of the Potential Sources of Runoff Pollutants categories below. Brochure can be found at http://rcflood.org/stormwater/ ❑**Car dealerships and similar may rinse cars with water only.**

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
☑ K. **Vehicle/Equipment Repair and Maintenance**	❑ **Accommodate all vehicle equipment repair and maintenance indoors. Or designate an outdoor work area and design the area to prevent run-on and runoff of stormwater.** ❑ **Show secondary containment for exterior work areas where motor oil, brake fluid, gasoline, diesel fuel, radiator fluid, acid-containing batteries or other hazardous materials or hazardous wastes are used or stored. Drains shall not be installed within the secondary containment areas.** ❑ **Add a note on the plans that states either (1) there are no floor drains, or (2) floor drains are connected to wastewater pretreatment systems prior to discharge to the sanitary sewer and an industrial waste discharge permit will be obtained.**	❑ **State that no vehicle repair or maintenance will be done outdoors, or else describe the required features of the outdoor work area.** ❑ **State that there are no floor drains or if there are floor drains, note the agency from which an industrial waste discharge permit will be obtained and that the design meets that agency's requirements.** ❑ **State that there are no tanks, containers or sinks to be used for parts cleaning or rinsing or, if there are, note the agency from which an industrial waste discharge permit will be obtained and that the design meets that agency's requirements.**	**In the Stormwater Control Plan, note that all of the following restrictions apply to use the site:** ☑ **No person shall dispose of, nor permit the disposal, directly or indirectly of vehicle fluids, hazardous materials, or rinsewater from parts cleaning into storm drains.** ☑ **No vehicle fluid removal shall be performed outside a building, nor on asphalt or ground surfaces, whether inside or outside a building, except in such a manner as to ensure that any spilled fluid will be in an area of secondary containment. Leaking vehicle fluids shall be contained or drained from the vehicle immediately.** ☑ **No person shall leave unattended drip parts or other open containers containing vehicle fluid, unless such containers are in use or in an area of secondary containment.** Refer to "Automotive Maintenance & Car Care Best Management Practices for Auto Body Shops, Auto Repair Shops, Car Dealerships, Gas Stations and Fleet Service Operations". Brochure can be found at http://rcflood.org/stormwater/ Refer to Outdoor Cleaning Activities and Professional Mobile Service Providers for many of the Potential Sources of Runoff Pollutants categories below. Brochure can be found at http://rcflood.org/stormwater/

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
❑ L. **Fuel Dispensing Areas**	❑ **Fueling areas[6] shall have impermeable floors (i.e., portland cement concrete or equivalent smooth impervious surface) that are: a) graded at the minimum slope necessary to prevent ponding; and b) separated from the rest of the site by a grade break that prevents run-on of stormwater to the maximum extent practicable.** ❑ **Fueling areas shall be covered by a canopy that extends a minimum of ten feet in each direction from each pump. [Alternative: The fueling area must be covered and the cover's minimum dimensions must be equal to or greater than the area within the grade break or fuel dispensing area[1].] The canopy [or cover] shall not drain onto the fueling area.**		❑ **The property owner shall dry sweep the fueling area routinely.** ❑ **See the Fact Sheet SD-30 , "Fueling Areas" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com**

[6] **The fueling area shall be defined as the area extending a minimum of 6.5 feet from the corner of each fuel dispenser or the length at which the hose and nozzle assembly may be operated plus a minimum of one foot, whichever is greater.**

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
❑ M. **Loading Docks**	❑ **Show a preliminary design for the loading dock area, including roofing and drainage. Loading docks shall be covered and/or graded to minimize run-on to and runoff from the loading area. Roof downspouts shall be positioned to direct stormwater away from the loading area. Water from loading dock areas shall be drained to the sanitary sewer, or diverted and collected for ultimate discharge to the sanitary sewer.** ❑ **Loading dock areas draining directly to the sanitary sewer shall be equipped with a spill control valve or equivalent device, which shall be kept closed during periods of operation.** ❑ **Provide a roof overhang over the loading area or install door skirts (cowling) at each bay that enclose the end of the trailer.**		❑ **Move loaded and unloaded items indoors as soon as possible.** ❑ **See Fact Sheet SC-30, "Outdoor Loading and Unloading," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com**

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
☑ N. **Fire Sprinkler Test Water**		☑ **Provide a means to drain fire sprinkler test water to the sanitary sewer.**	☑ **See the note in Fact Sheet SC-41, "Building and Grounds Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com**
O. **Miscellaneous Drain or Wash Water or Other Sources** ☐ **Boiler drain lines** ☑ **Condensate drain lines** ☐ **Rooftop equipment** ☐ **Drainage sumps** ☑ **Roofing, gutters, and trim.** ☐ **Other sources**		☐ **Boiler drain lines shall be directly or indirectly connected to the sanitary sewer system and may not discharge to the storm drain system.** ☑ **Condensate drain lines may discharge to landscaped areas if the flow is small enough that runoff will not occur. Condensate drain lines may not discharge to the storm drain system.** ☐ **Rooftop equipment with potential to produce pollutants shall be roofed and/or have secondary containment.** ☐ **Any drainage sumps on-site shall feature a sediment sump to reduce the quantity of sediment in pumped water.** ☑ **Avoid roofing, gutters, and trim made of copper or other unprotected metals that may leach into runoff.** **Include controls for other sources as specified by local reviewer.**	

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
☑ P. **Plazas, sidewalks, and parking lots.**			☑ **Sweep plazas, sidewalks, and parking lots regularly to prevent accumulation of litter and debris. Collect debris from pressure washing to prevent entry into the storm drain system. Collect washwater containing any cleaning agent or degreaser and discharge to the sanitary sewer not to a storm drain.**

Appendix 9: O&M

Operation and Maintenance Plan and Documentation of Finance, Maintenance and Recording Mechanisms

Operations & Maintenance Responsibility for Treatment Control BMP's

BMP Required Maintenance	Frequency	Maintenance Requirements	Responsibility
Trash	Weekly	Empty Dumpsters	Property Owner
Roof Drains/ Gutters	Before wet season, or significant rain event, or when needed	Roof Gutters shall be visually inspected for defects and possible leakage. Damage or defects found shall be corrected as soon as possible. Owners should avoid use of gutters, roofing, and trim made of copper so as to prevent the metal from leaching into runoff.	Property Owner
Bioretention Basins/Trenches	Bi-Weekly Semi-Annual Annually As Needed	Mow, weed, trim and remove accumulation of trash debris and/or sediment. Routine inspections for areas of standing water within the BMP and corrective measures to restore proper infiltration rates are necessary. Trim Vegetation at the beginning and end of the wet season to prevent establishment of woody vegetation. Replant eroded or barren spots to prevent erosion and accumulation of sediment. Per Condition of Approval 90.FLOODRI all BMPs are to be inspected, and if required, cleaned no later than October 15 each year Stabilize eroded banks, repair undercut and eroded areas at inflow and outflow areas, maintain access to the basin for regular maintenance, mow as appropriate for vegetative cover species, monitor health of vegetation and replace as necessary, control mosquitos as necessary, remove liter and debris. Mulch replacement may be necessary on an occasional basis to fill in voids, mulching should be done prior to the wet season. Unclog underdrain, and regulate soil pH. **For additional maintenance information please see Appendix 10 of the WQMP** **Grading Plans and BMP Map provided in WQMP document provide additional information on location of Bio-retention facility and tributary areas.**	Home Owners Association
Self-Retaining/ Landscape Areas	Bi-Weekly	Mow, weed, trim and remove accumulation of trash debris and/or sediment. Retaining areas should be mowed at 4-6 inches in height if grass is proposed. **Maintain landscaping using minimal pesticides**	Home Owners Association
Catch basins	Semi-Annually	Visually inspect and remove liter and debris. Storm drain inlets to be marked with "only rain down the storm drain"- lettering to be repainted or replaced as needed.	Home Owners Association

CMP Underground Detention	Semi-annually	Inspections of the system should be completed before and after the wet season to ensure system is in working order. If the evidence of salting/de-icing agents are observed in the system, rinsing of the system should be completed. System should be unclogged when inspection finds that accumulated sediment or trash is clogging the discharge	Home Owners Association
Pools/Spas	As Needed	Pools/spas to be maintained and cleaned on a regular basis. Sweeping around pool areas and cleaning within to remove debris and pollutants.	Home Owners Association
Refuse Areas	As Needed	Refuse bins to be kept in individual unit garages when not out for collection. Receptacles to be inspected to insure they are in clean working order.	Individual residents/HOA
Plazas/Sidewalks/ Parking lots	Weekly	Sidewalks and parking areas to be sweep clean of debris and trash. Litter to be disposed of in an appropriate receptacle.	Home Owners Association

BMP's should start and be inspected prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.

Funding

Funding for Ongoing Maintenance will be provided by the Home Owner's Association.

Basin Site Maintenance Summary Form

Date:	**Inspector Name:**	**Basin:**
Maintenance Performed:		
Date:	**Inspector Name:**	**Basin:**
Maintenance Performed:		
Date:	**Inspector Name:**	**Basin:**
Maintenance Performed:		
Date:	**Inspector Name:**	**Basin:**
Maintenance Performed:		
Date:	**Inspector Name:**	**Basin:**
Maintenance Performed:		
Date:	**Inspector Name:**	**Basin:**
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Maintenance Performed:		
Date:	**Inspector Name:**	**Basin:**
Maintenance Performed:		
Date:	**Inspector Name:**	**Basin:**
Maintenance Performed:		
Date:	**Inspector Name:**	**Basin:**
Maintenance Performed:		

RECORDING REQUESTED BY
AND WHEN RECORDED MAIL TO:

LAND DEVELOPMENT DIV.
CITY OF MORENO VALLEY
PO BOX 88005
14177 FREDERICK STREET
MORENO VALLEY, CA 92552-0805

EXEMPT FROM FEE PER G.C. Section 6103

SPACE ABOVE THIS LINE FOR RECORDER'S USE

APN:
PEN (LGL)

STORMWATER TREATMENT DEVICE AND CONTROL MEASURE ACCESS AND MAINTENANCE COVENANT

THIS INSTRUMENT is made and entered into this _____ day of _____, by and between _____, hereinafter referred to as "Owner," and the City of Moreno Valley, a municipal corporation, hereinafter referred to as "City."

RECITALS

WHEREAS, the Owner owns real property ("Property") in the City specifically described in Exhibit "A," which is attached hereto and incorporated herein by this reference; and

WHEREAS, at the time of approval of the development project known as _____ (the "Project") for the Property, the City required the Project to employ on-site stormwater and non-stormwater control measures to mitigate the Project impacts to water quality and minimize pollutants in urban stormwater runoff; and

WHEREAS, the City and Owner, its successors, and assigns, agree that the health, safety and welfare of the residents of the City, require that on-site stormwater and non-stormwater management control measures be constructed and implemented and adequately maintained on the Property; and

WHEREAS, the Owner has chosen to install BMPs, hereinafter referred to as the "Device" and other control measures all as described in the Final Water Quality Management Plan (WQMP) to minimize pollutants in urban stormwater and non-stormwater runoff; and

WHEREAS, the Device and other control measures have been installed and/or implemented in accordance with the WQMP, project plans and specifications approved by the City; and

WHEREAS, the Device and other control measures, being installed on private property and draining only private property are private facilities with all maintenance or replacement therefore being the sole responsibility of the Owner; and

WHEREAS, the Owner is aware that periodic and continuous maintenance including, but not necessarily limited to, filter material replacement and sediment removal is required to assure discharges from the Device, other control measures and the Project are in compliance with the City's Municipal Code for stormwater and non-stormwater discharges and that such maintenance activity will require compliance with all Federal, State and local laws and regulations, including

those pertaining to confined space and waste disposal methods in effect at the time such maintenance occurs;

NOW, THEREFORE, in consideration of City's approval of the Project and the foregoing premises, the mutual covenants contained herein, and the following terms and conditions, the City and Owner agree as follows:

1. The Owner hereby provides the City and its designees with full right of access to the Device and other control measures and the immediate vicinity of the property at any time, upon reasonable notice; or in the event of emergency, as determined by City's Public Works Director/City Engineer or designees, no advance notice; for the purpose of inspection, sampling and testing of the Device and other control measures, and in cases of emergency, where the public health, safety, or welfare is compromised, such emergency shall be declared a "nuisance" as defined in the Municipal Code. Such conditions that created the emergency shall be abated as provided for in the Municipal Code and at the Owner's expense as provided for in Section 3, below.

2. The Owner shall diligently maintain the Device and other control measures in a manner assuring all discharges from the Device, other control measures and the Project are in compliance with the Municipal Code for stormwater and non-stormwater discharges at all times. All reasonable precautions shall be exercised by the Owner and the Owner's representatives in the removal and extraction of

materials from the Device and other control measures, and the ultimate disposal of the materials in a manner consistent with all applicable laws. As may be requested from time to time by the City, the Owner shall provide the City with documentation identifying the materials removed, the quantity and the recycle of disposal destinations, as appropriate.

3. In the event the Owner fails to perform the necessary maintenance contemplated by this Instrument, within five (5) days of being given written notice by the City, the lack of maintenance shall be considered a public health and safety concern and declared a "nuisance", the City shall take all necessary actions as provided in the Municipal Code, to abate the nuisance and charge the entire cost and expense to the Owner, including administrative costs, attorneys' fees and interest thereon at the maximum rate authorized by law from the date of the notice of expense until paid in full. Additionally, any discharge as a result from the lack of maintenance prescribed herein from the Device to the City's maintained Municipal Separate Storm Sewer System shall be considered an illegal discharge and considered a violation of the Municipal Code and shall cease immediately. Such cessation may include a yellow or red tag issued to the Project.

4. This Instrument shall be recorded in the Official Records of the County of Riverside at the expense of the Owner and shall constitute notice to all successors and assigns to the title to the Property of the obligations herein set forth. This Instrument shall also constitute a lien against the Property in such amount as will

fully reimburse the City, including interest as herein above set forth, subject to foreclosure in event of default in payment.

5. It is the intent of the Owner that the burdens and benefits herein undertaken shall constitute covenants that run with the Property and shall constitute a lien against the Property.

6. This covenant imposes no liability of any kind whatsoever on the City and the Owner agrees to hold the City harmless from any liability in the event the Device and other control measures fail to operate in accordance with the plans and specification submitted to the City.

7. The obligations herein undertaken shall be binding upon the heirs, successors, executors, administrators and assigns of the Owner hereto. The term "Owner" shall include not only the Owner, but also its heirs, successors, executors, administrators, lessees and assigns. The Owner shall notify any successor to title of all or part of the Property about the existence of this Instrument. The Owner shall provide such notice prior to such successor obtaining an interest in all or part of the Property. The Owner shall provide a copy of such notice to the City at the same time such notice is provided to the successor.

8. Time is of the essence in the performance of this Instrument.

9. Any notice to a party required or called for in this Instrument shall be served in person, or by deposit in the U.S. Mail, first class postage prepaid, to the address set forth below. Notice(s) shall be deemed effective upon receipt, or seventy-two (72) hours after deposit in the U.S. Mail, whichever is earlier. A party may change notice address only by providing written notice thereof to the other party.

CITY:	OWNER:
Public Works Director/City Engineer	Name: _____
City of Moreno Valley	Company: _____
PO Box 88005	Address: _____
14177 Frederick Street	City/State/ZIP: _____
Moreno Valley, CA 92552-0805	

10. This Instrument represents the entire Covenant of the parties hereto as to the matters contained herein and supersedes any and all prior written or verbal agreements between the parties as to the subject matter hereof.

11. This Instrument shall be governed by and construed in accordance with the laws of the State of California.

12. No amendment to this Instrument shall be made without prior written approval by the City.

OWNER:

_____

(Name, Title)

_____

(Name of company/partnership/corp./entity)

CITY:

CITY OF MORENO VALLEY

APPROVED AS TO FORM:

_____
City Attorney

By: _____ Date: _____
Mike Lee, City Manager

Attest:

By: _____ Date: _____
City Clerk

EXHIBIT “A”

Legal Description

EXHIBIT "A-1"

(Include 8.5x11 project site map and show location(s) of treatment control BMPs)

Appendix 10: Educational Materials

BMP Fact Sheets, Maintenance Guidelines and Other End-User BMP Information



Design Considerations

- Soil for Infiltration
- Tributary Area
- Slope
- Aesthetics
- Environmental Side-effects

Targeted Constituent	Removal
Sediment	High
Nutrients	Med
Trash	High
Metals	High
Bacteria	High
Oil and Grease	High
Organics	High
Flow Control	High

Description

The bioretention cell functions as a soil and plant-based filtration device that removes pollutants, including trash, through a variety of physical, biological, and chemical treatment processes. These facilities normally consist of a grass buffer strip, ponding area, organic layer or mulch layer, planting soil, and native vegetation. Runoff velocity is reduced by passing over or through a buffer strip, which can increase sedimentation and debris capture in heavily trafficked areas. Stormwater is infiltrated through engineered media to the native soils or can be directed to an underdrain.

California Experience

Bioretention areas have been widely implemented across California in a variety of configurations to meet a full suite of regulatory requirements in Los Angeles, San Diego, San Francisco, and many of the surrounding areas. Bioretention areas have been implemented in the right-of-way as a green street, in medians in parking lots, and incorporated into landscaped areas. Figure 1 and Figure 2 show how bioretention areas have been implemented around the state.

Bioretention areas have been shown to be effective at reducing many of the pollutants regulated by the State and Regional Water



Figure 1. Bioretention incorporated in a green street in San Diego, CA.

Boards. Additionally, the Water Boards have determined that bioretention can qualify as a "Full Capture System (FCS)[1]" for trash. Accordingly, in addition to providing general specifications, this fact sheet includes trash-specific information to assist with upgrading either an existing BMP or the design of a planned BMP to meet the FCS definition. See the "**Full Trash Capture Compliance**" section and "***Trash FCS***" subsections in this fact sheet for more information.



Figure 2. Bioretention in the parking lot of the LA Zoo.

Advantages

- Bioretention provides stormwater treatment and can be designed to meet hydromodification management requirements and the full capture system definition for trash control.
- The vegetation provides shade and wind breaks, absorbs noise, and improves an area's landscape and aesthetic.
- Can be used in any soil type. When infiltration rates are too low, underdrains are installed.

Limitations

- Not recommended for areas with slopes greater than 20%.
- Bioretention is not suitable where the water table is within 3 feet of the ground surface.
- Creates an attractive habitat for mosquitoes and other vectors if drainage is insufficient.

Performance

Bioretention removes stormwater pollutants through numerous processes, including adsorption, filtration, plant uptake, microbial activity, decomposition, sedimentation and volatilization. Adequate contact time between the surface and pollutant must be provided for in the design of the system for this removal process to occur. Media depth can have an impact on the removal of certain pollutants, particularly nitrogen and phosphorus (Hunt et al. 2012, Hunt et al. 2006; Hunt and Lord 2006). Table 1 below details expected effluent concentrations and removal processes for each pollutant constituent.

[1] Full Capture System (FCS): A treatment control, or series of treatment controls, including but not limited to, a multi-benefit project or a low impact development control that traps all particles that are 5 mm or greater, and has a design treatment capacity that is either: a) of not less than the peak flow rate, Q, resulting from a one-year, one-hour, storm in the subdrainage area, or b) appropriately sized to, and designed to carry at least the same flows as, the corresponding storm drain.

Table 1. Typical pollutant removal for constituents and removal processes

Pollutant	Typical Removal	Median Effluent Concentration[1]	Removal Processes	Treatment Depth	References
Sediment	High	9.9 mg/L	Settling in pretreatment and mulch layer, filtration and sedimentation in top 2 to 8 inches of media.	1.5 feet of media	Hatt et al. 2008; Hunt et al. 2012; Li and Davis 2008; Geosyntec Consultants and Wright Water Engineering 2012; Stander and Borst 2010
Metals	High	TCd: 0.07 µg/L, TCr: 0.35 µg/L, TCu: 5.33 µg/L, *TFe: 1027 µg/L,* TPb: 0.19 µg/L, *TNi: 4.53 µg/L,* TZn: 12.0 µg/L	Removal with sediment and sorption to organic matter and clay in media.	2 feet of media	Hsieh and Davis 2005; Geosyntec Consultants and Wright Water Engineering 2012; Hunt et al. 2012
Hydrocarbons	High	N/A	Removal and biodegradation in mulch.	3 inches of mulch	Hong et al. 2006; Hunt et al. 2012
Total phosphorus	Medium -240% - 99%	*0.240 mg/L*	Settling with sediment, sorption to organic matter and clay in media, and plant uptake. Poor removal can result from media containing high organic matter or high background concentrations of phosphorus.	2 feet of media	Clark and Pitt 2009; Davis 2007; Geosyntec Consultants and Wright Water Engineering 2012; Hsieh and Davis 2005; Hunt et al. 2006; Hunt and Lord 2006; ; Li et al. 2010
Total nitrogen	Medium TKN: -5% - 64%, Nitrate: 1% - 80%	TN: 0.92 mg/L, TKN: 1.34 mg/L, $NO_{2,3}$-N: 0.37 mg/L	Sorption and settling (TKN), denitrification in IWS (nitrate), and plant uptake. Poor removal efficiency can result from media containing high organic matter.	3 feet of media	Barrett et al. 2013; Clark and Pitt 2009; Geosyntec Consultants and Wright Water Engineering 2012; Hunt et al. 2006, 2012; Kim et al. 2003; Li et al. 2010; Passeport et al. 2009
Bacteria	High	*Enterococcus*: 235 MPN/ 100 mL, *E.coli*: 101 MPN/100 mL	Sedimentation, filtration, sorption, desiccation, predation, and photolysis in mulch layer and media.	2 feet of media	Hathaway et al. 2009, 2011; Hunt and Lord 2006; Hunt et al. 2008, 2012; Jones and Hunt 2010; Geosyntec Consultants and Wright Water Engineering 2012
Trash	High	*N/A*	Filtration	1.5 feet of media	Barrett et al. 2013

[1] Underlined effluent concentrations were (statistically) significantly lower than influent concentrations, as determined by statistical hypothesis testing on the available sampled data. Effluent concentrations displayed in *italics* were (statistically) significantly higher than influent concentrations.

Performance Considerations

Bioretention areas provide relatively consistent and high pollutant removal for sediment, metals, and organic pollutants (e.g., hydrocarbons). Most sediment removal occurs in pretreatment practices, in the mulch layer, and in the top 2 to 8 inches of soil media (Hatt et al. 2008; Li and Davis 2008; Stander and Borst 2010). Metals are commonly sediment-bound and are removed in the top 8 inches of media (Hsieh and Davis 2005; Hunt et al. 2012).

Nitrogen and phosphorus removal is less consistent. Total phosphorus percent removal has been found to vary between a 240 percent increase (production) and a 99 percent decrease (removal). The significant increase is suspected to be the result of excessive phosphorus levels in the furnished soil media (Hsieh and Davis 2005; Hunt et al. 2006; Davis 2007). Greater total phosphorus removal can be achieved by using soil media with total phosphorus concentrations below 15 parts per million (ppm) (Hunt and Lord 2006). A study in Texas indicated that nutrient export can also occur when bioretention soils are amended with excessive compost (Li et al. 2010). Nitrate removal has been found to vary between a 1 and 80 percent decrease (Kim et al. 2003; Hunt et al. 2006). Total Kjeldahl nitrogen (TKN) has been found to vary between a 5 percent increase and 64 percent decrease (Kim et al. 2003; Hunt and Lord 2006). Greater nitrate and TKN removal can be achieved by reducing the infiltration rate in the planting soil to 1–2 in/hr and ensuring that the soil media is at least 3 feet deep (Hunt and Lord 2006). Nitrate removal can be improved by incorporating a saturated layer in the soil media to promote anaerobic conditions for denitrification (Kim et al. 2003; Hunt and Lord 2006; Passeport et al. 2009).

Bioretention represents a technology to mitigate pathogens from urban watersheds (especially when volume reduction is considered), although limited data exist for bacteria, virus, and protozoa removal. Most scientists and engineers agree that bacteria die-off occurs at the surface where organisms are exposed to solar radiation and dry (desiccating) conditions; dense vegetation in the bioretention area can limit the penetration of sunlight, but it can provide habitat for bacterivores and other beneficial pathogen predators (Hunt and Lord 2006; Hunt et al. 2008; Hathaway et al. 2009). Microbes are also sequestered by sedimentation and sorption; therefore, 2 feet minimum media depth and slower infiltration rates (1–2 in/hr) are recommended to enhance pathogen removal (Hathaway et al. 2011; Hunt et al. 2012).

In addition to chemical and biological pollutant removal, bioretention can be designed to reduce thermal loading to waterways. Thermally enriched runoff can increase stream temperatures and have adverse impacts on stream biota and dissolved oxygen (Booth et al. 2013; USEPA 1986). Research suggests that deep media beds (generally four feet or greater) can buffer extreme temperatures and that infiltration of stormwater can decrease overall thermal loading (Hunt et al. 2012; Jones and Hunt 2009; Winston et al. 2011; Wardynski et al. 2013). Thermal mitigation can likely be enhanced by shading bioretention areas with tree canopy cover and including IWS (Hunt et al. 2012; Jones et al. 2012).

Trash FCS

The Trash Amendments adopted by the State Water Board in April 2015 provide a performance standard for treatment of stormwater for trash in the form of the definition of FCS, which bioretention meets (see Section 5.6.1 for FCS details).

It is worth noting that the numerous treatment processes provided by bioretention, particularly filtration, means bioretention performance far exceeds the 5 mm or greater FCS definition for particle trapping. So bioretention systems are not only trapping all particles of 5 mm or greater but effectively all particles less than 5 mm, including microplastics and "nurdles" (pre-production plastics).

Suitability and Design

Figure 1 and Figure 2 illustrate the flexibility of bioretention design in new or existing infrastructure. The constraints of each site dictate the appropriate siting and footprint. Fundamental bioretention design components are as follows:

- A fully stabilized drainage area of less than 20% slope.
- 2.5 to 3.5 inch minimum elevation difference in head between inlet and outlet.
- Typical ponding depth of 3 to 12 inches or more with 9 inches recommended.
- 10-ft setback from foundations, 100-ft from septic fields and water supply wells, and 50-ft from steep slopes.
- Geotechnical investigation required to identify soil infiltration rate. If known soil contamination is present, line restricting infiltration is not allowed.

Bioretention design is highly dependent on the constraints of the considered site. Costs will vary in accordance with the design. Table 2 details a number of core construction components and corresponding design considerations. Retrofitting can increase costs because of demolition of existing pervious surfaces.

Table 2. Cost of design components and associated considerations

Component	Cost	Design Consideration
Excavation		Underdrain required if subsoil infiltration rate < 0.5 in/hr or when contamination present. When infiltrating ensure that subgrade compaction is minimized.
Without underdrains (unlined)	$2.75–$5.00/ft^2	
With underdrains (lined)	$3.90–$6.15/ft^2	
Soil Media		1.5–4 feet (deeper for better pollutant removal, hydrologic benefits, and rooting depths) at minimum 5 in/hr infiltration. Total phosphorus < 15 ppm, pH 6–8, CEC > 5 meq/100 g soil. Organic Matter Content < 5% by weight. 65% sand, 20% sandy loam, and 15% compost (from vegetation-based feedstock) by volume.
Recommended mix	$2.40–$4.75/ft^2	
With engineered media	$3.40–$6.80/ft^2	
Soil Media Barrier		When utilizing an underdrain, separate media from underdrain with 2 to 4 inches of washed sand (ASTM C-
Geotextile	$0.45/ft^2	

Component	Cost	Design Consideration
Washed sand (2-inch layer) No. 8 aggregate (min 2 inches thick) No. 57 stone (1.5 + feet)	$0.20/ft^2 $0.28/ft^2 $2.49/ft^2	33), followed by 2 inches of choking stone (ASTM No. 8) over a 1.5 ft envelope of ASTM No. 57 stone.
Underdrain Pipe (includes drainage stone, with 5-foot spacing)	$3.60/ft^2	4-inch diameter minimum, schedule 40 PVC pipe with perforations (slots or holes) every 6 inches at 0.5% slope. Provide cleanout ports/observation wells for each underdrain pipe.
Curb and Gutter	$18/ft	When installed adjacent to road, provide stabilized inlets at least 12 inches wide
Mulch Native hardwood	$0.24–$0.39/ft^2	Dimensional chipped hardwood or triple shredded, well-aged hardwood mulch 3-inches-deep.
Hydraulic Restriction Layer Filter fabric Clay 30-mil liner Concrete barrier	$0.45/ft^2 $0.65/ft^2 $0.35/ft^2 $12.00/ft^2	If non-infiltrating, use hydraulic restriction layer. If infiltrating may use on vertical surfaces to restrict lateral flows to adjacent subgrades, foundations, or utilities.
Vegetation	$0.20–$3.50/ft^2	Native, deep rooting, drought tolerant plants. Apply one-time spot fertilization upon planting. Water until plants are established.

Vegetation



Figure 3. Bioretention in a landscaped area in San Diego, CA.

Vegetation is an integral component of bioretention and has been shown to provide some increase in metals reduction (Sun and Davis 2007, Li, et al. 2011) and a significant increase in nutrient reduction (Glaister, et al., 2014; Henderson, et al., 2007; Barrett, et al., 2013; Limouzin, et al., 2011; Li, et al., 2011; Houdeshel, et al., 2015). Three species each of trees, shrubs, and perennials are recommended to be planted at a rate of 2500 trees and shrubs per hectare (1000 per acre). For instance, a 15 foot (4.6 meter) by 40 foot (12.2 meter) bioretention area (600 square feet or 55.75 square meters) would require 14 trees and shrubs. The shrub-to-tree ratio should be 2:1 to 3:1.

Drought tolerant native species are recommended and should be planted when conditions are most favorable. Vegetation should be watered at the end of each day for fourteen days following planting. Plant species tolerant of pollutant loads and varying wet and dry conditions should be used in the bioretention area. The designer should assess aesthetics, site layout, and maintenance requirements when selecting plant species. Adjacent non-native invasive species

should be identified and the designer should take measures, such as providing a soil breach to eliminate the threat of these species invading the bioretention area. Regional landscaping manuals should be consulted to ensure that the planting of the bioretention area meets the landscaping requirements established by the local authorities.



Figure 4 Bioretention in San Francisco, CA. Source: Jim Hook

The designers should evaluate the best placement of vegetation within the bioretention area. Trees should be placed on the perimeter of the area to provide shade and shelter from the wind. Trees and shrubs can be sheltered from damaging flows if they are placed away from the path of the incoming runoff. In cold climates, species that are more tolerant to cold winds, such as evergreens, should be placed in windier areas of the site. Following placement of the trees and shrubs, the ground cover and/or mulch should be established. Ground cover such as grasses or legumes can be planted at the beginning of the growing season. Mulch should be placed immediately after trees and shrubs are planted. Two to 3 inches (5 to 7.6 cm) of commercially available fine shredded hardwood mulch or shredded hardwood chips should be applied to the bioretention area to protect from erosion.

Full Trash Capture Compliance

This section provides trash-specific information to assist with upgrading either an existing BMP or the design of a planned BMP to meet the FCS definition. In addition to developing and adopting the Trash Amendments, the State Water Board provides implementation information on its Trash Implementation web page: https://www.waterboards.ca.gov/water_issues/programs/stormwater/trash_implementation.html.

The web page includes information on best management practices or Full Capture Systems, including lists of State-certified Multi-Benefit Trash Treatment Systems. So, when selecting BMPs for trash control, fact sheet users should refer to both this BMP fact sheet and the State Water Board's Trash Implementation web page.

Design Modifications to Prevent Trash Migration, Sustain Capacity, and Prevent Reduced Functionality

The bioretention area must be configured to allow trash to enter the system and for trash to remain in the bioretention area until it can be collected and removed. To meet the requirement, inlets must be designed to pass the peak flow produced by the one-year, one-hour design storm or the same flows as the capacity of the inlet storm drain and solids that would be retained by a 5 mm screen or mesh, must remain in the system.

Inlets

There are a multitude of inlet configurations that will allow trash to enter and be captured in a bioretention area. An open curb cut is recommended for high traffic areas (Figure 5). A minimum 2 inch drop from the gutter line of the curb to the inlet is recommended as demonstrated in Figure 6 to ensure that flow is routed into the bioretention area and trash will not clog the inlet.



Figure 5. Example of an open curb cut.

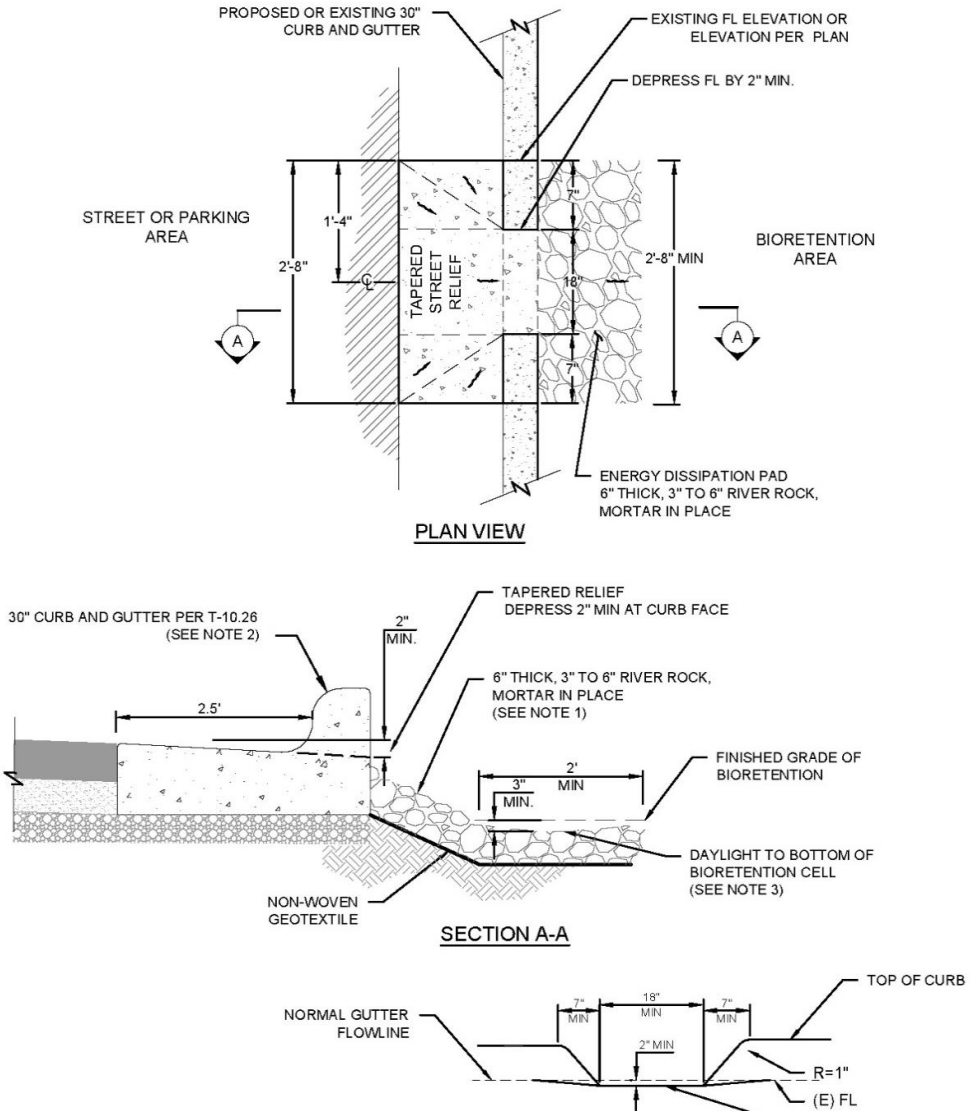

Figure 6. Example Inlet Detail

Pretreatment

Pretreatment is beneficial to increase and consolidate trash capture while managing maintenance requirements. A forebay (Figure 7), filter strip (Figure 8), or mortared cobble inside the curb cut (Figure 9) can slow flow and allow trash and gross solids to settle out while consolidating at the edge of the bioretention area to make it easier for maintenance crews to collect and remove.



Figure 7. Example of a forebay as pretreatment for a bioretention area.



Figure 8. Example of filter strip as pretreatment for a bioretention area.



Figure 9. Example of mortared cobble for pretreatment in a bioretention inlet with a curb cut.

Trash Containment

Once trash has been captured in the bioretention area it must be contained so trash does not escape the bioretention area. Containment may be provided by one or more of these features:

- an external design feature or up-gradient structure designed to bypass flows exceeding the region-specific one-year, one-hour storm event; or
- the BMP having sufficient capacity to trap particles from flows exceeding those generated by the one-year, one-hour storm event; or



Figure 10. Example of an outlet with 5 mm screen.

- the BMP having sufficient capacity to treat either the design flows or volumes through media filtration or infiltration into native or amended soils; or
- use of a maximum 5 mm mesh screen on all outlets.

Figure 10 shows an example of an outlet with a screen to contain trash.

Maintenance

The primary maintenance requirement for bioretention areas is inspection and repair or replacement of the treatment area's components. Appropriately selected plants will aid in reducing fertilizer, pesticide, water, and overall maintenance requirements. Bioretention system components should blend over time through plant and root growth, organic decomposition, and the development of a natural soil horizon. These processes will lengthen the facility's life and reduce the need for extensive maintenance. Maintaining soil porosity and basic housekeeping practices such as removal of debris accumulations and vegetation management are necessary to ensure that the system dewaters completely (recommended 72-hour or less residence time) to prevent creating mosquito and other vector habitats. If a bioretention cell has an underdrain, the functionality of the underdrain needs to be maintained to ensure that the drainage and drawdown of stormwater is not hindered. Bioretention requires monthly landscaping maintenance, including measures to ensure that the area is functioning properly, and irrigation during dry periods. In many cases, bioretention areas initially require intense maintenance, but less maintenance over time. Maintenance tasks can be conducted by a landscaping contractor, who might already be hired at the site. Additionally, a bioretention cell's efficacy to reduce pollutant loads and provide hydrologic benefits is severely diminished when frequent and complete maintenance is not conducted. For typical maintenance activities, Table 3 provides recommended frequencies and associated costs.

Table 3. Typical maintenance activities and associated costs and frequency

Frequency	Cost	Activity
As needed		• Irrigate area during dry periods. Make structural changes or repairs as needed to eliminate pools of water, particularly during the warmer months of the year. Coordinate with the local mosquito and vector control agency to control mosquitoes.
Biweekly, at project completion		Water plants daily for 2 weeks.
Routine Maintenance (required monthly to every 2 years)		Remove excess sediment, trash, and debris across the surface, inlet, and outlet. Check for and stabilize erosion. Pruning and mowing overgrown vegetation that interferes with access, or safety. Remove and replant dead or dying plants. Replace tree stakes and wires. If there is an underdrain, unclog drainage structure.
Routine (small)	$7.62/ft^2	
Routine (medium)	$1.91/ft^2	
Routine (large)	$1.91/ft^2	
Intermediate Maintenance (required every 6 to 10 years)		Remove and replace mulch upon decomposition. Replace soil media for areas receiving especially
Intermediate (small)	$5.62/ft^2	

Frequency	Cost	Activity
Intermediate (medium) Intermediate (large)	$2.94/ft^2 $2.50/ft^2	high pollutant loads. Repair erosion at inflow points and outflow structures.
End of Life Replacement (service life of 20 years)		Excavate to the depth of soil media. Test soil for excessive soil contamination of common stormwater pollutants (e.g. metals, nutrients). Continue to remove underlying soil if pollutants exceed standard for contaminated soil. Replace with clean soil.
Replacement (small) Replacement (medium) Replacement (large)	$10.52/ft^2 $10.17/ft^2 $10.11/ft^2	
Note: Small System = 500 ft^2; Medium System = 2000 ft^2; Large System = 4000 ft^2 Underlined statement indicates that the activity may be required more frequently than shown in the table to meet the State Water Board maintenance criteria for Multi-Benefit Treatment Systems to be qualified as Full Capture Systems.		

Trash FCS

Maintenance to Prevent Trash Migration, Sustain Capacity, and Prevent Reduced Functionality

For Multi-Benefit Treatment Systems to be qualified as Full Capture Systems, the State Water Board requires regular maintenance to maintain adequate trash capture capacity and to ensure that trapped trash does not migrate offsite. Additionally, the State Water Board requires the BMP owner to establish a maintenance schedule based on site-specific factors, including the design trash capacity of the Bioretention Multi-Benefit Trash Treatment System, storm frequency, and estimated or measured trash loading from the drainage area. To meet those criteria, it is likely that the frequency of trash and debris removal will have to be increased above the recommended monthly interval during the wet season to prevent trash from being blown from the BMP or being washed out of the bioretention area in the subsequent rain events (see Table 3). Depending on the frequency and size of storms, and upstream pollutant characteristics, trash and debris removal can be as frequent as before and after every wet weather event. The optimum maintenance interval is best determined by observing the BMP in operation for a wet season.

Trash maintenance not only plays a role in the functionality of the bioretention area but also in the aesthetics and public perception of the bioretention area (and of all BMPs). Part of maintaining positive perception among the public is the visibility of a well-maintained BMP. This positive perception can self-perpetuate further support for integrated stormwater management practices and therefore further investment in regular maintenance.

Schematic

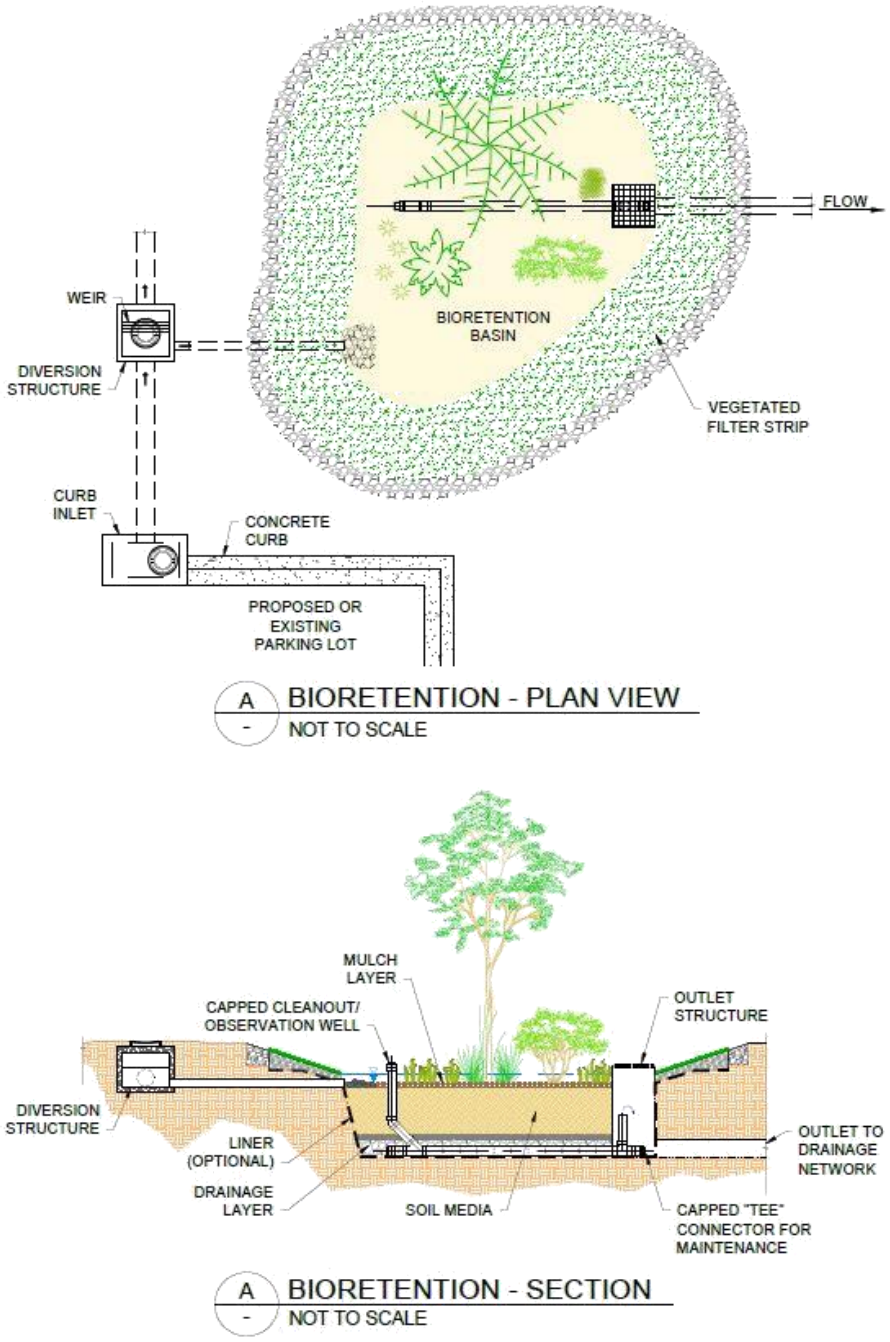

Figure 11. Schematic of a Bioretention Area.

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Site Design & Landscape Planning SD-10



Design Objectives

- ☑ Maximize Infiltration
- ☑ Provide Retention
- ☑ Slow Runoff
- ☑ Minimize Impervious Land Coverage
- Prohibit Dumping of Improper Materials
- Contain Pollutants
- Collect and Convey

Description

Each project site possesses unique topographic, hydrologic, and vegetative features, some of which are more suitable for development than others. Integrating and incorporating appropriate landscape planning methodologies into the project design is the most effective action that can be done to minimize surface and groundwater contamination from stormwater.

Approach

Landscape planning should couple consideration of land suitability for urban uses with consideration of community goals and projected growth. Project plan designs should conserve natural areas to the extent possible, maximize natural water storage and infiltration opportunities, and protect slopes and channels.

Suitable Applications

Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment.

Design Considerations

Design requirements for site design and landscapes planning should conform to applicable standards and specifications of agencies with jurisdiction and be consistent with applicable General Plan and Local Area Plan policies.

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Designing New Installations

Begin the development of a plan for the landscape unit with attention to the following general principles:

- Formulate the plan on the basis of clearly articulated community goals. Carefully identify conflicts and choices between retaining and protecting desired resources and community growth.
- Map and assess land suitability for urban uses. Include the following landscape features in the assessment: wooded land, open unwooded land, steep slopes, erosion-prone soils, foundation suitability, soil suitability for waste disposal, aquifers, aquifer recharge areas, wetlands, floodplains, surface waters, agricultural lands, and various categories of urban land use. When appropriate, the assessment can highlight outstanding local or regional resources that the community determines should be protected (e.g., a scenic area, recreational area, threatened species habitat, farmland, fish run). Mapping and assessment should recognize not only these resources but also additional areas needed for their sustenance.

Project plan designs should conserve natural areas to the extent possible, maximize natural water storage and infiltration opportunities, and protect slopes and channels.

Conserve Natural Areas during Landscape Planning

If applicable, the following items are required and must be implemented in the site layout during the subdivision design and approval process, consistent with applicable General Plan and Local Area Plan policies:

- Cluster development on least-sensitive portions of a site while leaving the remaining land in a natural undisturbed condition.
- Limit clearing and grading of native vegetation at a site to the minimum amount needed to build lots, allow access, and provide fire protection.
- Maximize trees and other vegetation at each site by planting additional vegetation, clustering tree areas, and promoting the use of native and/or drought tolerant plants.
- Promote natural vegetation by using parking lot islands and other landscaped areas.
- Preserve riparian areas and wetlands.

Maximize Natural Water Storage and Infiltration Opportunities Within the Landscape Unit

- Promote the conservation of forest cover. Building on land that is already deforested affects basin hydrology to a lesser extent than converting forested land. Loss of forest cover reduces interception storage, detention in the organic forest floor layer, and water losses by evapotranspiration, resulting in large peak runoff increases and either their negative effects or the expense of countering them with structural solutions.
- Maintain natural storage reservoirs and drainage corridors, including depressions, areas of permeable soils, swales, and intermittent streams. Develop and implement policies and

regulations to discourage the clearing, filling, and channelization of these features. Utilize them in drainage networks in preference to pipes, culverts, and engineered ditches.

- Evaluating infiltration opportunities by referring to the stormwater management manual for the jurisdiction and pay particular attention to the selection criteria for avoiding groundwater contamination, poor soils, and hydrogeological conditions that cause these facilities to fail. If necessary, locate developments with large amounts of impervious surfaces or a potential to produce relatively contaminated runoff away from groundwater recharge areas.

Protection of Slopes and Channels during Landscape Design

- Convey runoff safely from the tops of slopes.
- Avoid disturbing steep or unstable slopes.
- Avoid disturbing natural channels.
- Stabilize disturbed slopes as quickly as possible.
- Vegetate slopes with native or drought tolerant vegetation.
- Control and treat flows in landscaping and/or other controls prior to reaching existing natural drainage systems.
- Stabilize temporary and permanent channel crossings as quickly as possible, and ensure that increases in run-off velocity and frequency caused by the project do not erode the channel.
- Install energy dissipaters, such as riprap, at the outlets of new storm drains, culverts, conduits, or channels that enter unlined channels in accordance with applicable specifications to minimize erosion. Energy dissipaters shall be installed in such a way as to minimize impacts to receiving waters.
- Line on-site conveyance channels where appropriate, to reduce erosion caused by increased flow velocity due to increases in tributary impervious area. The first choice for linings should be grass or some other vegetative surface, since these materials not only reduce runoff velocities, but also provide water quality benefits from filtration and infiltration. If velocities in the channel are high enough to erode grass or other vegetative linings, riprap, concrete, soil cement, or geo-grid stabilization are other alternatives.
- Consider other design principles that are comparable and equally effective.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define “redevelopment” in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of “ redevelopment” must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under “designing new installations” above should be followed.

Redevelopment may present significant opportunity to add features which had not previously been implemented. Examples include incorporation of depressions, areas of permeable soils, and swales in newly redeveloped areas. While some site constraints may exist due to the status of already existing infrastructure, opportunities should not be missed to maximize infiltration, slow runoff, reduce impervious areas, disconnect directly connected impervious areas.

Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Stormwater Management Manual for Western Washington, Washington State Department of Ecology, August 2001.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

Roof Runoff Controls SD-11



Rain Garden

Design Objectives

- ☑ Maximize Infiltration
- ☑ Provide Retention
- ☑ Slow Runoff
- Minimize Impervious Land Coverage
- Prohibit Dumping of Improper Materials
- ☑ Contain Pollutants
- Collect and Convey

Description

Various roof runoff controls are available to address stormwater that drains off rooftops. The objective is to reduce the total volume and rate of runoff from individual lots, and retain the pollutants on site that may be picked up from roofing materials and atmospheric deposition. Roof runoff controls consist of directing the roof runoff away from paved areas and mitigating flow to the storm drain system through one of several general approaches: cisterns or rain barrels; dry wells or infiltration trenches; pop-up emitters, and foundation planting. The first three approaches require the roof runoff to be contained in a gutter and downspout system. Foundation planting provides a vegetated strip under the drip line of the roof.

Approach

Design of individual lots for single-family homes as well as lots for higher density residential and commercial structures should consider site design provisions for containing and infiltrating roof runoff or directing roof runoff to vegetative swales or buffer areas. Retained water can be reused for watering gardens, lawns, and trees. Benefits to the environment include reduced demand for potable water used for irrigation, improved stormwater quality, increased groundwater recharge, decreased runoff volume and peak flows, and decreased flooding potential.

Suitable Applications

Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment.

Design Considerations

Designing New Installations

Cisterns or Rain Barrels

One method of addressing roof runoff is to direct roof downspouts to cisterns or rain barrels. A cistern is an above ground storage vessel with either a manually operated valve or a permanently open outlet. Roof runoff is temporarily stored and then released for irrigation or infiltration between storms. The number of rain

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barrels needed is a function of the rooftop area. Some low impact developers recommend that every house have at least 2 rain barrels, with a minimum storage capacity of 1000 liters. Roof barrels serve several purposes including mitigating the first flush from the roof which has a high volume, amount of contaminants, and thermal load. Several types of rain barrels are commercially available. Consideration must be given to selecting rain barrels that are vector proof and childproof. In addition, some barrels are designed with a bypass valve that filters out grit and other contaminants and routes overflow to a soak-away pit or rain garden.

If the cistern has an operable valve, the valve can be closed to store stormwater for irrigation or infiltration between storms. This system requires continual monitoring by the resident or grounds crews, but provides greater flexibility in water storage and metering. If a cistern is provided with an operable valve and water is stored inside for long periods, the cistern must be covered to prevent mosquitoes from breeding.

A cistern system with a permanently open outlet can also provide for metering stormwater runoff. If the cistern outlet is significantly smaller than the size of the downspout inlet (say ¼ to ½ inch diameter), runoff will build up inside the cistern during storms, and will empty out slowly after peak intensities subside. This is a feasible way to mitigate the peak flow increases caused by rooftop impervious land coverage, especially for the frequent, small storms.

Dry wells and Infiltration Trenches

Roof downspouts can be directed to dry wells or infiltration trenches. A dry well is constructed by excavating a hole in the ground and filling it with an open graded aggregate, and allowing the water to fill the dry well and infiltrate after the storm event. An underground connection from the downspout conveys water into the dry well, allowing it to be stored in the voids. To minimize sedimentation from lateral soil movement, the sides and top of the stone storage matrix can be wrapped in a permeable filter fabric, though the bottom may remain open. A perforated observation pipe can be inserted vertically into the dry well to allow for inspection and maintenance.

In practice, dry wells receiving runoff from single roof downspouts have been successful over long periods because they contain very little sediment. They must be sized according to the amount of rooftop runoff received, but are typically 4 to 5 feet square, and 2 to 3 feet deep, with a minimum of 1-foot soil cover over the top (maximum depth of 10 feet).

To protect the foundation, dry wells must be set away from the building at least 10 feet. They must be installed in solids that accommodate infiltration. In poorly drained soils, dry wells have very limited feasibility.

Infiltration trenches function in a similar manner and would be particularly effective for larger roof areas. An infiltration trench is a long, narrow, rock-filled trench with no outlet that receives stormwater runoff. These are described under Treatment Controls.

Pop-up Drainage Emitter

Roof downspouts can be directed to an underground pipe that daylights some distance from the building foundation, releasing the roof runoff through a pop-up emitter. Similar to a pop-up irrigation head, the emitter only opens when there is flow from the roof. The emitter remains flush to the ground during dry periods, for ease of lawn or landscape maintenance.

Foundation Planting

Landscape planting can be provided around the base to allow increased opportunities for stormwater infiltration and protect the soil from erosion caused by concentrated sheet flow coming off the roof. Foundation plantings can reduce the physical impact of water on the soil and provide a subsurface matrix of roots that encourage infiltration. These plantings must be sturdy enough to tolerate the heavy runoff sheet flows, and periodic soil saturation.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of " redevelopment" must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under "designing new installations" above should be followed.

Supplemental Information

Examples

- City of Ottawa's Water Links Surface –Water Quality Protection Program
- City of Toronto Downspout Disconnection Program
- City of Boston, MA, Rain Barrel Demonstration Program

Other Resources

Hager, Marty Catherine, Stormwater, "Low-Impact Development", January/February 2003. www.stormh2o.com

Low Impact Urban Design Tools, Low Impact Development Design Center, Beltsville, MD. www.lid-stormwater.net

Start at the Source, Bay Area Stormwater Management Agencies Association, 1999 Edition

Efficient Irrigation SD-12



Design Objectives

- ☑ Maximize Infiltration
- ☑ Provide Retention
- ☑ Slow Runoff
- Minimize Impervious Land Coverage
- Prohibit Dumping of Improper Materials
- Contain Pollutants
- Collect and Convey

Description

Irrigation water provided to landscaped areas may result in excess irrigation water being conveyed into stormwater drainage systems.

Approach

Project plan designs for development and redevelopment should include application methods of irrigation water that minimize runoff of excess irrigation water into the stormwater conveyance system.

Suitable Applications

Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment. (Detached residential single-family homes are typically excluded from this requirement.)

Design Considerations

Designing New Installations

The following methods to reduce excessive irrigation runoff should be considered, and incorporated and implemented where determined applicable and feasible by the Permittee:

- Employ rain-triggered shutoff devices to prevent irrigation after precipitation.
- Design irrigation systems to each landscape area's specific water requirements.
- Include design featuring flow reducers or shutoff valves triggered by a pressure drop to control water loss in the event of broken sprinkler heads or lines.
- Implement landscape plans consistent with County or City water conservation resolutions, which may include provision of water sensors, programmable irrigation times (for short cycles), etc.

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- Design timing and application methods of irrigation water to minimize the runoff of excess irrigation water into the storm water drainage system.
- Group plants with similar water requirements in order to reduce excess irrigation runoff and promote surface filtration. Choose plants with low irrigation requirements (for example, native or drought tolerant species). Consider design features such as:
  - Using mulches (such as wood chips or bar) in planter areas without ground cover to minimize sediment in runoff
  - Installing appropriate plant materials for the location, in accordance with amount of sunlight and climate, and use native plant materials where possible and/or as recommended by the landscape architect
  - Leaving a vegetative barrier along the property boundary and interior watercourses, to act as a pollutant filter, where appropriate and feasible
  - Choosing plants that minimize or eliminate the use of fertilizer or pesticides to sustain growth
- Employ other comparable, equally effective methods to reduce irrigation water runoff.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of " redevelopment" must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under "designing new installations" above should be followed.

Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

Storm Drain Signage SD-13



Design Objectives

- Maximize Infiltration
- Provide Retention
- Slow Runoff
- Minimize Impervious Land Coverage
- ☑ Prohibit Dumping of Improper Materials
- Contain Pollutants
- Collect and Convey

Description

Waste materials dumped into storm drain inlets can have severe impacts on receiving and ground waters. Posting notices regarding discharge prohibitions at storm drain inlets can prevent waste dumping. Storm drain signs and stencils are highly visible source controls that are typically placed directly adjacent to storm drain inlets.

Approach

The stencil or affixed sign contains a brief statement that prohibits dumping of improper materials into the urban runoff conveyance system. Storm drain messages have become a popular method of alerting the public about the effects of and the prohibitions against waste disposal.

Suitable Applications

Stencils and signs alert the public to the destination of pollutants discharged to the storm drain. Signs are appropriate in residential, commercial, and industrial areas, as well as any other area where contributions or dumping to storm drains is likely.

Design Considerations

Storm drain message markers or placards are recommended at all storm drain inlets within the boundary of a development project. The marker should be placed in clear sight facing toward anyone approaching the inlet from either side. All storm drain inlet locations should be identified on the development site map.

Designing New Installations

The following methods should be considered for inclusion in the project design and show on project plans:

- Provide stenciling or labeling of all storm drain inlets and catch basins, constructed or modified, within the project area with prohibitive language. Examples include “NO DUMPING

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– DRAINS TO OCEAN" and/or other graphical icons to discourage illegal dumping.

- Post signs with prohibitive language and/or graphical icons, which prohibit illegal dumping at public access points along channels and creeks within the project area.

Note - Some local agencies have approved specific signage and/or storm drain message placards for use. Consult local agency stormwater staff to determine specific requirements for placard types and methods of application.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. If the project meets the definition of "redevelopment", then the requirements stated under " designing new installations" above should be included in all project design plans.

Additional Information

Maintenance Considerations

- Legibility of markers and signs should be maintained. If required by the agency with jurisdiction over the project, the owner/operator or homeowner's association should enter into a maintenance agreement with the agency or record a deed restriction upon the property title to maintain the legibility of placards or signs.

Placement

- Signage on top of curbs tends to weather and fade.

- Signage on face of curbs tends to be worn by contact with vehicle tires and sweeper brooms.

Supplemental Information

Examples

- Most MS4 programs have storm drain signage programs. Some MS4 programs will provide stencils, or arrange for volunteers to stencil storm drains as part of their outreach program.

Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

Building & Grounds Maintenance SD-40


Photo Credit: City of Vancouver, WA

Design Objectives

- ☑ Cover
- ☑ Contain
- ☑ Reduce/Minimize
- ☑ Prohibit Dumping
- ☑ Collect & Convey

Targeted Constituents

- Sediment
- ☑ Nutrients
- ☑ Trash
- Metals
- Bacteria
- Oil & Grease
- ☑ Synthetic Organics
- ☑ Pesticides

Description

Stormwater runoff from building and grounds maintenance activities can be contaminated with toxic hydrocarbons in solvents, fertilizers and pesticides, suspended solids, heavy metals, abnormal pH, and oils and greases. Utilizing the protocols in this fact sheet will prevent or reduce the potential for exposure of stormwater to pollutants from building and grounds maintenance activities by washing and cleaning up with as little water as possible, following good landscape management practices, preventing and cleaning up spills immediately, and keeping debris from entering the storm drains.

Approach

Proper design of building and grounds maintenance facilities reduces the opportunity for pollutants to enter the stormwater conveyance system. Preventative measures including containment, source control pollution prevention, and effective employee training should be used to reduce the likelihood of contaminated discharge.

Applicability

Appropriate applications include building and grounds maintenance areas for new development and redevelopment of residential, commercial, and industrial areas.

Design considerations provided are applicable to new development and redevelopment as defined by various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.). These plans define “redevelopment” in terms of amounts of additional

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impervious area, increases in gross floor area and/or exterior construction, and land distributing activities with structural or impervious surfaces.



Figure 1. Maintenance of bioretention facility.

Design Considerations

Waste Management

- Provide pet waste collection dispensers, where applicable.
- Provide trash receptacles in areas of high pedestrian traffic.

Landscape/Outdoor Pesticide Use

See SD-10 Site Design and Landscaping.

Additional Information

Designing for Operation and Maintenance Considerations

Landscaping Activities

Provide an area for stockpiling materials temporarily that is located away from watercourses and drain inlets. Ideally, a permanently covered area would be provided although temporary covers can be used during operation.

Building Repair, Remodeling, and Construction

Provide containment devices for work areas to prevent dust, grit, wash water, or other pollutants entering catch basins which may include a storm drain cover, filter fabric, or similarly effective runoff control mechanism.

Material Handling and Waste Management

- Follow all federal, state, and local laws and regulations governing the design for use, storage, and disposal of fertilizers and pesticides and training of applicators and pest control advisors.
- Implement storage requirements for pesticide products with guidance from the local fire department and County Agricultural Commissioner. Provide secondary containment for pesticides.

Spill Response and Prevention Procedures

Refer to Fact Sheet SD-22 – Spill Prevention, Control, and Cleanup for information on spill cleanup.

Fire Sprinkler Line Flushing

Site fire sprinkler line flushing may be a source of non-stormwater runoff pollution. The water entering the system is usually potable water, though in some areas it may be non-potable reclaimed wastewater. There are subsequent factors that may drastically reduce the quality of the water in such systems. Black iron pipe is usually used since it is cheaper than potable piping,

but it is subject to rusting and results in lower quality water. Initially, the black iron pipe has an oil coating to protect it from the rusting between manufacturer and installation; this will contaminate the water from the first flush but not from subsequent flushes. Nitrates, polyphosphates, and other corrosion inhibitors, as well as fire suppressants and antifreeze may be added to the sprinkler water system. Water generally remains in the sprinkler system a long time (typically a year) and between flushes may accumulate iron, manganese, lead, copper, nickel, and zinc. The water generally becomes anoxic and contains living and dead bacteria and breakdown products from chlorination. This may result in a significant BOD problem and the water often smells. Consequently, dispose fire sprinkler line flush water into the sanitary sewer. Do not allow discharge to storm drain or infiltration due to potential high levels of pollutants in the fire sprinkler line water.

Other Resources

Bay Area Stormwater Management Agencies Association, 2014. *BASMAA Post Construction Manual.*

CASQA Stormwater Best Management Practice Handbook Portal: Industrial and Commercial, 2014.

CASQA Stormwater Best Management Practice Handbook: Municipal, 2003.

City of Seattle, Seattle Public Utilities Department of Planning and Development, 2009. *Stormwater Manual Vol. 1 Source Control Technical Requirements Manual.*

Kennedy/Jenks Consultants, 2007. *The Truckee Meadows Industrial and Commercial Storm Water Best Management Practices Handbook.*

Orange County Stormwater Program, Best Management Practices for Industrial/Commercial Business Activities.

Sacramento Stormwater Management Program. *Best Management Practices for Industrial Storm Water Pollution Control.*

San Francisco Public Utilities Commission, 2016. *Technical Report Templates - Section 7: Source Control Checklist.*

US EPA, 1997. *Best Management Practices Handbook for Hazardous Waste Containers.*

Ventura Countywide Stormwater Management Program Clean Business Fact Sheets.

Parking/Storage Area Maintenance SC-43



Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize
- Product Substitution

Targeted Constituents

Sediment	✓
Nutrients	
Trash	✓
Metals	✓
Bacteria	
Oil and Grease	✓
Organics	✓

Description

Parking lots and storage areas can contribute a number of substances, such as trash, suspended solids, hydrocarbons, oil and grease, and heavy metals that can enter receiving waters through stormwater runoff or non-stormwater discharges. The protocols in this fact sheet are intended to prevent or reduce the discharge of pollutants from parking/storage areas and include using good housekeeping practices, following appropriate cleaning BMPs, and training employees.

Approach

The goal of this program is to ensure stormwater pollution prevention practices are considered when conducting activities on or around parking areas and storage areas to reduce potential for pollutant discharge to receiving waters. Successful implementation depends on effective training of employees on applicable BMPs and general pollution prevention strategies and objectives.

Pollution Prevention

- Encourage alternative designs and maintenance strategies for impervious parking lots. (See New Development and Redevelopment BMP Handbook)
- Keep accurate maintenance logs to evaluate BMP implementation.

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SC-43 Parking/Storage Area Maintenance

Suggested Protocols

General

- Keep the parking and storage areas clean and orderly. Remove debris in a timely fashion.
- Allow sheet runoff to flow into biofilters (vegetated strip and swale) and/or infiltration devices.
- Utilize sand filters or oleophilic collectors for oily waste in low quantities.
- Arrange rooftop drains to prevent drainage directly onto paved surfaces.
- Design lot to include semi-permeable hardscape.
- Discharge soapy water remaining in mop or wash buckets to the sanitary sewer through a sink, toilet, clean-out, or wash area with drain.

Controlling Litter

- Post "No Littering" signs and enforce anti-litter laws.
- Provide an adequate number of litter receptacles.
- Clean out and cover litter receptacles frequently to prevent spillage.
- Provide trash receptacles in parking lots to discourage litter.
- Routinely sweep, shovel, and dispose of litter in the trash.

Surface Cleaning

- Use dry cleaning methods (e.g., sweeping, vacuuming) to prevent the discharge of pollutants into the stormwater conveyance system if possible.
- Establish frequency of public parking lot sweeping based on usage and field observations of waste accumulation.
- Sweep all parking lots at least once before the onset of the wet season.
- Follow the procedures below if water is used to clean surfaces:
  - Block the storm drain or contain runoff.
  - Collect and pump wash water to the sanitary sewer or discharge to a pervious surface. Do not allow wash water to enter storm drains.
  - Dispose of parking lot sweeping debris and dirt at a landfill.
- Follow the procedures below when cleaning heavy oily deposits:
  - Clean oily spots with absorbent materials.
  - Use a screen or filter fabric over inlet, then wash surfaces.

- Do not allow discharges to the storm drain.
- Vacuum/pump discharges to a tank or discharge to sanitary sewer.
- Appropriately dispose of spilled materials and absorbents.

Surface Repair

- Preheat, transfer or load hot bituminous material away from storm drain inlets.
- Apply concrete, asphalt, and seal coat during dry weather to prevent contamination from contacting stormwater runoff.
- Cover and seal nearby storm drain inlets where applicable (with waterproof material or mesh) and manholes before applying seal coat, slurry seal, etc. Leave covers in place until job is complete and all water from emulsified oil sealants has drained or evaporated. Clean any debris from these covered manholes and drains for proper disposal.
- Use only as much water as necessary for dust control, to avoid runoff.
- Catch drips from paving equipment that is not in use with pans or absorbent material placed under the machines. Dispose of collected material and absorbents properly.

Inspection

- Have designated personnel conduct inspections of parking facilities and stormwater conveyance systems associated with parking facilities on a regular basis.
- Inspect cleaning equipment/sweepers for leaks on a regular basis.

Training

- Provide regular training to field employees and/or contractors regarding cleaning of paved areas and proper operation of equipment.
- Train employees and contractors in proper techniques for spill containment and cleanup.

Spill Response and Prevention

- Keep your Spill Prevention Control and Countermeasure (SPCC) Plan up-to-date.
- Place a stockpile of spill cleanup materials where it will be readily accessible or at a central location.
- Clean up fluid spills immediately with absorbent rags or material.
- Dispose of spilled material and absorbents properly.

Other Considerations

Limitations related to sweeping activities at large parking facilities may include high equipment costs, the need for sweeper operator training, and the inability of current sweeper technology to remove oil and grease.

SC-43 Parking/Storage Area Maintenance

Requirements

Costs

Cleaning/sweeping costs can be quite large. Construction and maintenance of stormwater structural controls can be quite expensive as well.

Maintenance

- Sweep parking lot regularly to minimize cleaning with water.
- Clean out oil/water/sand separators regularly, especially after heavy storms.
- Clean parking facilities regularly to prevent accumulated wastes and pollutants from being discharged into conveyance systems during rainy conditions.

Supplemental Information

Further Detail of the BMP

Surface Repair

Apply concrete, asphalt, and seal coat during dry weather to prevent contamination from contacting stormwater runoff. Where applicable, cover and seal nearby storm drain inlets (with waterproof material or mesh) and manholes before applying seal coat, slurry seal, etc. Leave covers in place until job is complete and all water from emulsified oil sealants has drained or evaporated. Clean any debris from these covered manholes and drains for proper disposal. Only use only as much water as is necessary for dust control to avoid runoff.

References and Resources

California's Nonpoint Source Program Plan http://www.swrcb.ca.gov/nps/index.html

Clark County Storm Water Pollution Control Manual
http://www.co.clark.wa.us/pubworks/bmpman.pdf

King County Storm Water Pollution Control Manual http://dnr.metrokc.gov/wlr/dss/spcm.htm

Pollution from Surface Cleaning Folder. 1996. Bay Area Stormwater Management Agencies Association (BASMAA). http://www.basmaa.org/

Oregon Association of Clean Water Agencies. Oregon Municipal Stormwater Toolbox for Maintenance Practices. June 1998.

Santa Clara Valley Urban Runoff Pollution Prevention Program http://www.scvurppp.org

The Storm Water Managers Resource Center http://www.stormwatercenter.net/

Drainage System Maintenance SC-44



Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize

Description

As a consequence of its function, the stormwater conveyance system collects and transports urban runoff and stormwater that may contain certain pollutants. The protocols in this fact sheet are intended to reduce pollutants reaching receiving waters through proper conveyance system operation and maintenance.

Targeted Constituents

Sediment	✓
Nutrients	
Trash	✓
Metals	
Bacteria	✓
Oil and Grease	
Organics	

Approach

Pollution Prevention

Maintain catch basins, stormwater inlets, and other stormwater conveyance structures on a regular basis to remove pollutants, reduce high pollutant concentrations during the first flush of storms, prevent clogging of the downstream conveyance system, restore catch basins' sediment trapping capacity, and ensure the system functions properly hydraulically to avoid flooding.

Suggested Protocols

Catch Basins/Inlet Structures

- Staff should regularly inspect facilities to ensure compliance with the following:
  - Immediate repair of any deterioration threatening structural integrity.
  - Cleaning before the sump is 40% full. Catch basins should be cleaned as frequently as needed to meet this standard.
  - Stenciling of catch basins and inlets (see SC34 Waste Handling and Disposal).

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- Clean catch basins, storm drain inlets, and other conveyance structures before the wet season to remove sediments and debris accumulated during the summer.
- Conduct inspections more frequently during the wet season for problem areas where sediment or trash accumulates more often. Clean and repair as needed.
- Keep accurate logs of the number of catch basins cleaned.
- Store wastes collected from cleaning activities of the drainage system in appropriate containers or temporary storage sites in a manner that prevents discharge to the storm drain.
- Dewater the wastes if necessary with outflow into the sanitary sewer if permitted. Water should be treated with an appropriate filtering device prior to discharge to the sanitary sewer. If discharge to the sanitary sewer is not allowed, water should be pumped or vacuumed to a tank and properly disposed. Do not dewater near a storm drain or stream.

Storm Drain Conveyance System

- Locate reaches of storm drain with deposit problems and develop a flushing schedule that keeps the pipe clear of excessive buildup.
- Collect and pump flushed effluent to the sanitary sewer for treatment whenever possible.

Pump Stations

- Clean all storm drain pump stations prior to the wet season to remove silt and trash.
- Do not allow discharge to reach the storm drain system when cleaning a storm drain pump station or other facility.
- Conduct routine maintenance at each pump station.
- Inspect, clean, and repair as necessary all outlet structures prior to the wet season.

Open Channel

- Modify storm channel characteristics to improve channel hydraulics, increase pollutant removals, and enhance channel/creek aesthetic and habitat value.
- Conduct channel modification/improvement in accordance with existing laws. Any person, government agency, or public utility proposing an activity that will change the natural (emphasis added) state of any river, stream, or lake in California, must enter into a Steam or Lake Alteration Agreement with the Department of Fish and Game. The developer-applicant should also contact local governments (city, county, special districts), other state agencies (SWRCB, RWQCB, Department of Forestry, Department of Water Resources), and Federal Corps of Engineers and USFWS.

Illicit Connections and Discharges

- Look for evidence of illegal discharges or illicit connections during routine maintenance of conveyance system and drainage structures:
  - Is there evidence of spills such as paints, discoloring, etc?

- Are there any odors associated with the drainage system?
- Record locations of apparent illegal discharges/illicit connections?
- Track flows back to potential dischargers and conduct aboveground inspections. This can be done through visual inspection of upgradient manholes or alternate techniques including zinc chloride smoke testing, fluorometric dye testing, physical inspection testing, or television camera inspection.
- Eliminate the discharge once the origin of flow is established.

- Stencil or demarcate storm drains, where applicable, to prevent illegal disposal of pollutants. Storm drain inlets should have messages such as "Dump No Waste Drains to Stream" stenciled next to them to warn against ignorant or intentional dumping of pollutants into the storm drainage system.
- Refer to fact sheet SC-10 Non-Stormwater Discharges.

Illegal Dumping

- Inspect and clean up hot spots and other storm drainage areas regularly where illegal dumping and disposal occurs.
- Establish a system for tracking incidents. The system should be designed to identify the following:
  - Illegal dumping hot spots
  - Types and quantities (in some cases) of wastes
  - Patterns in time of occurrence (time of day/night, month, or year)
  - Mode of dumping (abandoned containers, "midnight dumping" from moving vehicles, direct dumping of materials, accidents/spills)
  - Responsible parties
- Post "No Dumping" signs in problem areas with a phone number for reporting dumping and disposal. Signs should also indicate fines and penalties for illegal dumping.
- Refer to fact sheet SC-10 Non-Stormwater Discharges.

Training

- Train crews in proper maintenance activities, including record keeping and disposal.
- Allow only properly trained individuals to handle hazardous materials/wastes.
- Have staff involved in detection and removal of illicit connections trained in the following:
  - OSHA-required Health and Safety Training (29 CFR 1910.120) plus annual refresher training (as needed).

- OSHA Confined Space Entry training (Cal-OSHA Confined Space, Title 8 and Federal OSHA 29 CFR 1910.146).

- Procedural training (field screening, sampling, smoke/dye testing, TV inspection).

Spill Response and Prevention

- Investigate all reports of spills, leaks, and/or illegal dumping promptly.
- Clean up all spills and leaks using "dry" methods (with absorbent materials and/or rags) or dig up, remove, and properly dispose of contaminated soil.
- Refer to fact sheet SC-11 Spill Prevention, Control, and Cleanup.

Other Considerations (Limitations and Regulations)

- Clean-up activities may create a slight disturbance for local aquatic species. Access to items and material on private property may be limited. Trade-offs may exist between channel hydraulics and water quality/riparian habitat. If storm channels or basins are recognized as wetlands, many activities, including maintenance, may be subject to regulation and permitting.
- Storm drain flushing is most effective in small diameter pipes (36-inch diameter pipe or less, depending on water supply and sediment collection capacity). Other considerations associated with storm drain flushing may include the availability of a water source, finding a downstream area to collect sediments, liquid/sediment disposal, and prohibition against disposal of flushed effluent to sanitary sewer in some areas.
- Regulations may include adoption of substantial penalties for illegal dumping and disposal.
- Local municipal codes may include sections prohibiting discharge of soil, debris, refuse, hazardous wastes, and other pollutants into the storm drain system.

Requirements

Costs

- An aggressive catch basin cleaning program could require a significant capital and O&M budget.
- The elimination of illegal dumping is dependent on the availability, convenience, and cost of alternative means of disposal. The primary cost is for staff time. Cost depends on how aggressively a program is implemented. Other cost considerations for an illegal dumping program include:

  - Purchase and installation of signs.

  - Rental of vehicle(s) to haul illegally-disposed items and material to landfills.

  - Rental of heavy equipment to remove larger items (e.g., car bodies) from channels.

  - Purchase of landfill space to dispose of illegally-dumped items and material.

- Methods used for illicit connection detection (smoke testing, dye testing, visual inspection, and flow monitoring) can be costly and time-consuming. Site-specific factors, such as the level of impervious area, the density and ages of buildings, and type of land use will determine the level of investigation necessary.

Maintenance

- Two-person teams may be required to clean catch basins with vactor trucks.
- Teams of at least two people plus administrative personnel are required to identify illicit discharges, depending on the complexity of the storm sewer system.
- Arrangements must be made for proper disposal of collected wastes.
- Technical staff are required to detect and investigate illegal dumping violations.

Supplemental Information

Further Detail of the BMP

Storm Drain Flushing

Flushing is a common maintenance activity used to improve pipe hydraulics and to remove pollutants in storm drainage systems. Flushing may be designed to hydraulically convey accumulated material to strategic locations, such as an open channel, another point where flushing will be initiated, or the sanitary sewer and the treatment facilities, thus preventing resuspension and overflow of a portion of the solids during storm events. Flushing prevents "plug flow" discharges of concentrated pollutant loadings and sediments. Deposits can hinder the designed conveyance capacity of the storm drain system and potentially cause backwater conditions in severe cases of clogging.

Storm drain flushing usually takes place along segments of pipe with grades that are too flat to maintain adequate velocity to keep particles in suspension. An upstream manhole is selected to place an inflatable device that temporarily plugs the pipe. Further upstream, water is pumped into the line to create a flushing wave. When the upstream reach of pipe is sufficiently full to cause a flushing wave, the inflated device is rapidly deflated with the assistance of a vacuum pump, thereby releasing the backed up water and resulting in the cleaning of the storm drain segment.

To further reduce impacts of stormwater pollution, a second inflatable device placed well downstream may be used to recollect the water after the force of the flushing wave has dissipated. A pump may then be used to transfer the water and accumulated material to the sanitary sewer for treatment. In some cases, an interceptor structure may be more practical or required to recollect the flushed waters.

It has been found that cleansing efficiency of periodic flush waves is dependent upon flush volume, flush discharge rate, sewer slope, sewer length, sewer flow rate, sewer diameter, and population density. As a rule of thumb, the length of line to be flushed should not exceed 700 feet. At this maximum recommended length, the percent removal efficiency ranges between 65-75% for organics and 55-65% for dry weather grit/inorganic material. The percent removal efficiency drops rapidly beyond that. Water is commonly supplied by a water truck, but fire hydrants can also supply water. To make the best use of water, it is recommended that reclaimed water be used or that fire hydrant line flushing coincide with storm sewer flushing.

References and Resources

California's Nonpoint Source Program Plan http://www.swrcb.ca.gov/nps/index.html

Clark County Storm Water Pollution Control Manual
http://www.co.clark.wa.us/pubworks/bmpman.pdf

Ferguson, B.K. 1991. Urban Stream Reclamation, p. 324-322, Journal of Soil and Water Conservation.

King County Storm Water Pollution Control Manual http://dnr.metrokc.gov/wlr/dss/spcm.htm

Oregon Association of Clean Water Agencies. Oregon Municipal Stormwater Toolbox for Maintenance Practices. June 1998.

Santa Clara Valley Urban Runoff Pollution Prevention Program http://www.scvurppp.org

The Storm Water Managers Resource Center http://www.stormwatercenter.net

United States Environmental Protection Agency (USEPA). 2002. Pollution Prevention/Good Housekeeping for Municipal Operations Storm Drain System Cleaning. On line:
http://www.epa.gov/npdes/menuofbmps/poll_16.htm

Drain Inserts MP-52

Description

Drain inserts are manufactured filters or fabric placed in a drop inlet to remove sediment and debris. There are a multitude of inserts of various shapes and configurations, typically falling into one of three different groups: socks, boxes, and trays. The sock consists of a fabric, usually constructed of polypropylene. The fabric may be attached to a frame or the grate of the inlet holds the sock. Socks are meant for vertical (drop) inlets. Boxes are constructed of plastic or wire mesh. Typically a polypropylene "bag" is placed in the wire mesh box. The bag takes the form of the box. Most box products are one box; that is, the setting area and filtration through media occur in the same box. Some products consist of one or more trays or mesh grates. The trays may hold different types of media. Filtration media vary by manufacturer. Types include polypropylene, porous polymer, treated cellulose, and activated carbon.

California Experience

The number of installations is unknown but likely exceeds a thousand. Some users have reported that these systems require considerable maintenance to prevent plugging and bypass.

Advantages

- Does not require additional space as inserts as the drain inlets are already a component of the standard drainage systems.
- Easy access for inspection and maintenance.
- As there is no standing water, there is little concern for mosquito breeding.
- A relatively inexpensive retrofit option.

Limitations

Performance is likely significantly less than treatment systems that are located at the end of the drainage system such as ponds and vaults. Usually not suitable for large areas or areas with trash or leaves than can plug the insert.

Design and Sizing Guidelines

Refer to manufacturer's guidelines. Drain inserts come any many configurations but can be placed into three general groups: socks, boxes, and trays. The sock consists of a fabric, usually constructed of polypropylene. The fabric may be attached to a frame or the grate of the inlet holds the sock. Socks are meant for vertical (drop) inlets. Boxes are constructed of plastic or wire mesh. Typically a polypropylene "bag" is placed in the wire mesh box. The bag takes the form of the box. Most box products are

Design Considerations

- Use with other BMPs
- Fit and Seal Capacity within Inlet

Targeted Constituents

- ✓ Sediment
- ✓ Nutrients
- ✓ Trash
- ✓ Metals
- Bacteria
- ✓ Oil and Grease
- ✓ Organics

Removal Effectiveness

See New Development and Redevelopment Handbook-Section 5.

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one box; that is, the setting area and filtration through media occurs in the same box. One manufacturer has a double-box. Stormwater enters the first box where setting occurs. The stormwater flows into the second box where the filter media is located. Some products consist of one or more trays or mesh grates. The trays can hold different types of media. Filtration media vary with the manufacturer: types include polypropylene, porous polymer, treated cellulose, and activated carbon.

Construction/Inspection Considerations

Be certain that installation is done in a manner that makes certain that the stormwater enters the unit and does not leak around the perimeter. Leakage between the frame of the insert and the frame of the drain inlet can easily occur with vertical (drop) inlets.

Performance

Few products have performance data collected under field conditions.

Siting Criteria

It is recommended that inserts be used only for retrofit situations or as pretreatment where other treatment BMPs presented in this section area used.

Additional Design Guidelines

Follow guidelines provided by individual manufacturers.

Maintenance

Likely require frequent maintenance, on the order of several times per year.

Cost

- The initial cost of individual inserts ranges from less than $100 to about $2,000. The cost of using multiple units in curb inlet drains varies with the size of the inlet.
- The low cost of inserts may tend to favor the use of these systems over other, more effective treatment BMPs. However, the low cost of each unit may be offset by the number of units that are required, more frequent maintenance, and the shorter structural life (and therefore replacement).

References and Sources of Additional Information

Hrachovec, R., and G. Minton, 2001, Field testing of a sock-type catch basin insert, Planet CPR, Seattle, Washington

Interagency Catch Basin Insert Committee, Evaluation of Commercially-Available Catch Basin Inserts for the Treatment of Stormwater Runoff from Developed Sites, 1995

Larry Walker Associates, June 1998, NDMP Inlet/In-Line Control Measure Study Report

Manufacturers literature

Santa Monica (City), Santa Monica Bay Municipal Stormwater/Urban Runoff Project - Evaluation of Potential Catch basin Retrofits, Woodward Clyde, September 24, 1998

Woodward Clyde, June 11, 1996, Parking Lot Monitoring Report, Santa Clara Valley Nonpoint Source Pollution Control Program.