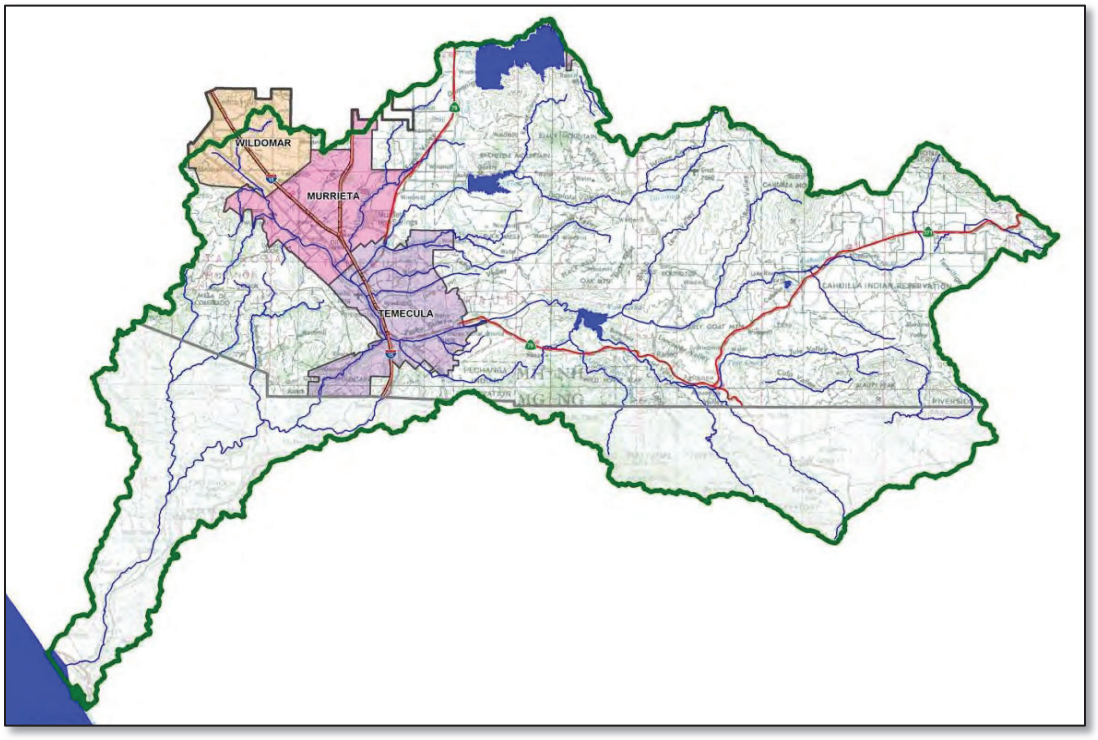
County Project Specific Water Quality Management Plan

A Template for preparing Project Specific WQMPs for Priority Development Projects only for use in the ***unincorporated portions of Riverside County*** *located within the* ***Santa Margarita Region***.

Project Title: Temecula Valley Self-Storage
Development No: XXXX
Design Review/Case No: CUP 190012
BMP$_i$ (Latitude, Longitude): 33° 37' 35.97" N 117° 05" 42.69" W



☒ **Preliminary**
☐ **Final**

Original Date Prepared: September 28, 2020

Revision Date(s): January 7, 2022, June 15, 2022

Contact Information
Prepared for: Chakrabarty, LLC
1003 E. Florida Ave. Suite 101
Hemet, CA 92543
(951) 652-2252
Prepared by: The Prizm Group
310 N. Cota St. Suite I
Corona, CA 92878
951-737-4406
vkleppe@the-prizm-group.com

Based on 2018 WQMP, prepared for Compliance with Regional Board Order No. **R9-2013-0001** *as amended by Order No.* **R9-2015-0001** *and Order No.* **R9-2015-0100**

OWNER'S CERTIFICATION

This Project-Specific WQMP has been prepared for Dr. Milan Chakrabarty by The Prizm Group for the Keller Road Storage project.

This WQMP is intended to comply with the requirements of Riverside County for County Ordinance No. 754 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 Best Management Practices 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 Riverside County Water Quality Ordinance (No. 754).

"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."

Owner's Signature	Date
Dr. Milan Chakrabarty	Owner
Owner's Printed Name	Owner's Title/Position

PREPARER'S CERTIFICATION

"The selection, sizing and design of stormwater treatment and other stormwater quality and quantity control Best Management Practices in this plan meet the requirements of Regional Water Quality Control Board Order No. **R9-2013-0001** as amended by Order Nos. **R9-2015-0001 and R9-2015-0100**."

Vincent Kleppe	4-4-22
Preparer's Signature	Date
Vincent Kleppe	Project Engineer
Preparer's Printed Name	Preparer's Title/Position

Preparer's Licensure:



Table of Contents

Section A: Project and Site Information 6
A.1 Maps and Site Plans 7
A.2 Identify Receiving Waters 7
A.3 Drainage System Susceptibility to Hydromodification 7
A.4 Additional Permits/Approvals required for the Project: 8
Optimize Site Utilization (LID Principles) 9
Section B: Delineate Drainage Management Areas (DMAs) 14
Section C: Implement LID BMPs 17
C.1 Full Infiltration Applicability 17
C.2 Biofiltration Applicability 19
C.3 Feasibility Assessment Summaries 22
C.4 LID BMP Sizing 23
Section D: Implement Hydrologic Control BMPs and Sediment Supply BMPs 25
D.1 Hydrologic Control BMP Selection 25
D2 Hydrologic Control BMP Sizing 26
D.3 Implement Sediment Supply BMPs 26
Section E: Alternative Compliance 31
F.1 Identify Pollutants of Concern 31
F.2 Treatment Control BMP Selection 34
F.3 Sizing Criteria 34
F.4 Hydrologic Performance Standard – Alternative Compliance Approach 35
Section F: Implement Trash Capture BMPs 36
Section G: Source Control BMPs 38
Section H: Coordinate Submittal with Other Site Plans 39
Section I: Operation, Maintenance and Funding 41
Section J: Acronyms, Abbreviations and Definitions 42

List of Tables

Table A-1 Identification of Receiving Waters 7
Table A-2 Identification of Susceptibility to Hydromodification 8
Table A-3 Other Applicable Permits 8
Table B-1 DMA Identification 14
Table B-2 Type 'A', Self-Treating Areas 15
Table B-3 Type 'B', Self-Retaining Areas 166
Table B-4 Type 'C', Areas that Drain to Self-Retaining Areas 16
Table B-5 Type 'D', Areas Draining to BMPs 17
Table C-1 Infiltration Feasibility 19
Table C-2 Geotechnical Concerns for Onsite Infiltration 20
Table C-3 Evaluation of Biofiltration BMP Feasibility 21
Table C-4 Proprietary BMP Approval Requirement Summary 21
Table C-5 LID Prioritization Summary Matrix 22
Table C-6 Summary of Infeasibility Documentation 22
Table C-7 DCV Calculations for LID BMPs 24
Table C-8 LID BMP Sizing 24
Table D-1 Hydrologic Control BMP Sizing 26
Table D-2 Triad Assessment Summary 29
Table E-1 Summary of Approved 2010 303(d) listed waterbodies and associated pollutants of concern for the Riverside County SMR Region and downstream waterbodies. 32
Table E-2 Potential Pollutants by Land Use Type 33
Table E-3 Treatment Control BMP Selection 34
Table E-4 Treatment Control BMP Sizing 34
Table E-5 Offsite Hydrologic Control BMP Sizing 35
Table F-1 Sizing Trash Capture BMPs 37
Table F-2 Approximate precipitation depth/intensity values for calculation of the Trash Capture Design Storm 37
Table F-3 Trash Capture BMPs 37
Table G-1 Construction Plan Cross-reference 39
Table G-2 Other Applicable Permits 40

List of Appendices

Appendix 1: Maps and Site Plans 49
Appendix 2: Construction Plans 50
Appendix 3: Soils Information 51
Appendix 4: Historical Site Conditions 52

Appendix 5: LID Feasibility Supplemental Information 53
Appendix 6: LID BMP Design Details 60
Appendix 7: Hydromodification & Critical Coarse Sediment 61
Appendix 8: Source Control 63
Appendix 9: O&M 74
Appendix 10: Educational Materials 80

Section A: Project and Site Information

Use the table below to compile and summarize basic site information that will be important for completing subsequent steps. Subsections A.1 through A.4 provide additional detail on documentation of additional project and site information. The Regional MS4 Permit has effectively removed the ability for a project to be grandfathered from WQMP requirements. Even if a project were able to meet all the requirements stated in Section 1.2 of the WQMP, the 2014 WQMP requirements would apply.

PROJECT INFORMATION		
Type of PDP:	New Development	
Type of Project:	Public Storage Center	
Planning Case Number:	CUP 190012	
Rough Grade Permit No.:	XXXX	
Development Name:	Temecula Valley Self Storage	
PROJECT LOCATION		
Latitude & Longitude (DMS):	33° 37' 35.97" N 117° 05" 42.69" W	
Project Watershed and Sub-Watershed:	Warm Springs Creek, Santa Margarita River, Santa Margarita Estuary	
24-Hour 85th Percentile Storm Depth (inches):	.80 in	
Is project subject to Hydromodification requirements?	☒ Y ☐ N (Select based on Section A.3)	
APN(s):	476-010-060	
Map Book and Page No.:	PM 70/53	
PROJECT CHARACTERISTICS		
Proposed or Potential Land Use(s)	Storage Facility	
Proposed or Potential SIC Code(s)	N/A	
Existing Impervious Area of Project Footprint (SF)	0 sf	
Total area of proposed Impervious Surfaces within the Project Limits (SF)/or Replacement	234,926 sf	
Total Project Area (ac)	4.18 acres	
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
Has preparation of Project-Specific WQMP included coordination with other site plans?	☐ Y	☒ N
EXISTING SITE CHARACTERISTICS		
Is the project located within any Multi-Species Habitat Conservation Plan area (MSHCP Criteria Cell?)	☐ Y	☒ N
Is a Geotechnical Report attached?	☒ Y	☐ N
If no Geotech. Report, list the Natural Resources Conservation Service (NRCS) soils type(s) present on the site (A, B, C and/or D)		

Provide a brief description of the project:

Project is a privately owned public storage facility located at the southwest corner of Keller Rd. and HWY 79. Stormwater will be filtered through the BioClean treatment device, routed through the underground detention chambers and ultimately released offsite into the existing drainage course on the west side of the site.

Site improvements include constructing 9 storage buildings, vehicle storage area, and street improvements on both Keller Road and Highway 79. Keller Road improvements will be mitigated by installing pipe inlets in the curb to internet low flows and direct them into self-retaining landscape areas behind the sidewalk.

Paver and dirt roads are considered pervious for determining WQMP applicability.

A.1 Maps and Site Plans

When completing your Project-Specific WQMP, include a map of the Project 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:

- Vicinity and location maps
- Parcel Boundary and Project Footprint
- Existing and Proposed Topography
- Drainage Management Areas (DMAs)
- Proposed Structural Best Management Practices (BMPs)
- Drainage Paths
- Drainage infrastructure, inlets, overflows
- Source Control BMPs
- Site Design BMPs
- Buildings, Roof Lines, Downspouts
- Impervious Surfaces
- Pervious Surfaces (i.e. Landscaping)
- Standard Labeling
- Cross Section and Outlet details

Use your discretion on whether or not you may need to create multiple sheets or can appropriately accommodate these features on one or two sheets. Keep in mind that the Copermittee plan reviewer must be able to easily analyze your Project utilizing this template and its associated site plans and maps. Complete the checklists in Appendix 1 to verify that all exhibits and components are included.

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. This map should identify the path of the stormwater discharged from the site all the way to the outlet of the Santa Margarita River to the Pacific Ocean. Use the most recent 303(d) list available from the State Water Resources Control Board Website.
(http://www.waterboards.ca.gov/sandiego/water_issues/programs/basin_plan/)

Table A-1 Identification of Receiving Waters

Receiving Waters	USEPA Approved 303(d) List Impairments	Designated Beneficial Uses	Proximity to RARE Beneficial Use
Warm Springs Creek	N/A	N/A	N/A
Santa Margarita River Upper & Lower	N/A	N/A	N/A
Santa Margarita Estuary	N/A	N/A	N/A

A.3 Drainage System Susceptibility to Hydromodification

Using Table A-2 below, list in order of the point of discharge at the project site down to the Santa Margarita River[1], each drainage system or receiving water that the project site is tributary to. Continue to fill each row with the

[1] Refer to Exhibit G of the WQMP for a map of exempt and potentially exempt areas. These maps are from the Draft SMR WMAA as of January 5, 2018 and will be replaced upon acceptance of the SMR WMAA.

material of the drainage system, and any exemption (if applicable). Based on the results, summarize the applicable hydromodification performance standards that will be documented in Section E. Exempted categories of receiving waters include:

- Existing storm drains that discharge directly to water storage reservoirs, lakes, or enclosed embayments, or
- Conveyance channels whose bed and bank are concrete lined all the way from the point of discharge to water storage reservoirs, lakes, enclosed embayments, or the Pacific Ocean.
- Other water bodies identified in an approved WMAA (See Exhibit G to the WQMP)

Include a map exhibiting each drainage system and the associated susceptibility in Appendix 1.

Table A-2 Identification of Susceptibility to Hydromodification

Drainage System	Drainage System Material	Hydromodification Exemption	Hydromodification Exempt
Unnamed Course	Bed and Bank	NONE	☐ Y ☒ N
Warm Creek	Bed and Bank	NONE	☐ Y ☒ N
Santa Margarita River	Bed and Bank	NONE	☐ Y ☒ N
Summary of Performance Standards			
☐ **Hydromodification Exempt** – Select if "Y" is selected in the Hydromodification Exempt column above, project is exempt from hydromodification requirements. ☒ **Not Exempt**-Select if "N" is selected in any row of the Hydromodification Exempt column above. Project is subject to hydrologic control requirements and may be subject to sediment supply requirements.			

A.4 Additional Permits/Approvals required for the Project:

Table A-3 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 Section 401 Water Quality Certification	☐ Y	☒ N
US Army Corps of Engineers, Clean Water Act 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)*	☐ Y	☒ N

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

Optimize Site Utilization (LID Principles)

Review of the information collected in Section 'A' will aid in identifying the principal constraints on site design and selection of LID BMPs as well as opportunities to reduce imperviousness and incorporate LID Principles into the site and landscape design. For example, **constraints** might include impermeable soils, high groundwater, groundwater pollution or contaminated soils, steep slopes, geotechnical instability, high-intensity land use, heavy pedestrian or vehicular traffic, utility locations or safety concerns. **Opportunities** might include existing natural areas, low areas, oddly configured or otherwise unbuildable parcels, easements and landscape amenities including open space and buffers (which can double as locations for LID Bioretention BMPs), and differences in elevation (which can provide hydraulic head). Prepare a brief narrative for each of the site optimization strategies described below. This narrative will help you as you proceed with your Low Impact Development (LID) design and explain your design decisions to others.

Apply the following LID Principles to the layout of the PDP to the extent they are applicable and feasible. Putting thought upfront about how best to organize the various elements of a site can help to significantly reduce the PDP's potential impact on the environment and reduce the number and size of Structural LID BMPs that must be implemented. Integrate opportunities to accommodate the following LID Principles within the preliminary PDP site layout to maximize implementation of LID Principles.

Site Optimization

Complete checklist below to determine applicable Site Design BMPs for your site.

Project- Specific WQMP Site Design BMP Checklist

The following questions below are based upon Section 3.2 of the SMR WQMP will help you determine how to best optimize your site and subsequently identify opportunities and/or constraints, and document compliance.

SITE DESIGN REQUIREMENTS

Answer the following questions below by indicating "Yes," "No," or "N/A" (Not Applicable). Justify all "No" and "N/A" answers by inserting a narrative at the end of the section. The narrative should include identification and justification of any constraints that would prevent the use of those categories of LID BMPs. Upon identifying Site Design BMP opportunities, include these on your WQMP Site plan in Appendix 1.

☒ Yes ☐ No ☐ N/A

Did you identify and preserve existing drainage patterns?

Integrating existing drainage patterns into the site plan helps to maintain the time of concentration and infiltration rates of runoff, decreasing peak flows, and may also help preserve the contribution of Critical Coarse Sediment (i.e., Bed Sediment Supply) from the PDP to the Receiving Water. Preserve existing drainage patterns by:

- Minimizing unnecessary site grading that would eliminate small depressions, where appropriate add additional "micro" storage throughout the site landscaping.
- Where possible conform the PDP site layout along natural landforms, avoid excessive grading and disturbance of vegetation and soils, preserve or replicate the sites natural drainage features and patterns.
- Set back PDP improvements from creeks, wetlands, riparian habitats and any other natural water bodies.
- Use existing and proposed site drainage patterns as a natural design element, rather than using expensive impervious conveyance systems. Use depressed landscaped areas, vegetated buffers, and bioretention areas as amenities and focal points within the site and landscape design.

Discuss how this was included or provide a discussion/justification for "No" or "N/A" answer.
Existing water course will be piped under project sitekeeping the original course.

☐ Yes ☒ No ☐ N/A

Did you identify and protect existing vegetation?

Identify any areas containing dense native vegetation or well-established trees, and try to avoid disturbing these areas. Soils with thick, undisturbed vegetation have a much higher capacity to store and infiltrate runoff than do disturbed soils. Reestablishment of a mature vegetative community may take decades. Sensitive areas, such as streams and floodplains should also be avoided.

- Define the development envelope and protected areas, identifying areas that are most suitable for development and areas that should be left undisturbed.
- Establish setbacks and buffer zones surrounding sensitive areas.
- Preserve significant trees and other natural vegetation where possible.

Discuss how this was included or provide a discussion/justification for "No" or "N/A" answer.
Project is a self-storage facility comprised of storage buildings and parking.

Project- Specific WQMP Site Design BMP Checklist	
☐ Yes ☐ No ☒ N/A	**Did you identify and preserve natural infiltration capacity?** A key component of LID is taking advantage of a site's natural infiltration and storage capacity. A site survey and geotechnical investigation can help define areas with high potential for infiltration and surface storage. • Identify opportunities to locate LID Principles and Structural BMPs in highly pervious areas. Doing so will maximize infiltration and limit the amount of runoff generated. • Concentrate development on portions of the site with less permeable soils, and preserve areas that can promote infiltration.
Discuss how this was included or provide a discussion/justification for "No" or "N/A" answer. *To be determined*	
☐ Yes ☒ No ☐ N/A	**Did you minimize impervious area?** Look for opportunities to limit impervious cover through identification of the smallest possible land area that can be practically impacted or disturbed during site development. • Limit overall coverage of paving and roofs. This can be accomplished by designing compact, taller structures, narrower and shorter streets and sidewalks, clustering buildings and sharing driveways, smaller parking lots (fewer stalls, smaller stalls, and more efficient lanes), and indoor or underground parking. • Inventory planned impervious areas on your preliminary site plan. Identify where permeable pavements, or other permeable materials, such as crushed aggregate, turf block, permeable modular blocks, pervious concrete or pervious asphalt could be substituted for impervious concrete or asphalt paving. This will help reduce the amount of Runoff that may need to be addressed through Structural BMPs. • Examine site layout and circulation patterns and identify areas where landscaping can be substituted for pavement, such as for overflow parking. • Consider green roofs. Green roofs are roofing systems that provide a layer of soil/vegetative cover over a waterproofing membrane. A green roof mimics pre-development conditions by filtering, absorbing, and evapotranspiring precipitation to help manage the effects of an otherwise impervious rooftop.
Discuss how this was included or provide a discussion/justification for "No" or "N/A" answer. *Project is a self-storage facility comprised of storage buildings and parking.*	

Project- Specific WQMP Site Design BMP Checklist	
☒ Yes ☐ No ☐ N/A	**Did you identify and disperse runoff to adjacent pervious areas or small collection areas?** Look for opportunities to direct runoff from impervious areas to adjacent landscaping, other pervious areas, or small collection areas where such runoff may be retained. This is sometimes referred to as reducing Directly Connected Impervious Areas. • Direct roof runoff into landscaped areas such as medians, parking islands, planter boxes, etc., and/or areas of pervious paving. Instead of having landscaped areas raised above the surrounding impervious areas, design them as depressed areas that can receive Runoff from adjacent impervious pavement. For example, a lawn or garden depressed 3"-4" below surrounding walkways or driveways provides a simple but quite functional landscape design element. • Detain and retain runoff throughout the site. On flatter sites, smaller Structural BMPs may be interspersed in landscaped areas among the buildings and paving. • On hillside sites, drainage from upper areas may be collected in conventional catch basins and piped to landscaped areas and LID BMPs and/or Hydrologic Control BMPs in lower areas. Low retaining walls may also be used to create terraces that can accommodate LID BMPs. Wherever possible, direct drainage from landscaped slopes offsite and not to impervious surfaces like parking lots. • Reduce curb maintenance and provide for allowances for curb cuts. • Design landscaped areas or other pervious areas to receive and infiltrate runoff from nearby impervious areas. • Use Tree Wells to intercept, infiltrate, and evapotranspire precipitation and runoff before it reaches structural BMPs. Tree wells can be used to limit the size of Drainage Management Areas that must be treated by structural BMPs. Guidelines for Tree Wells are included in the Tree Well Fact Sheet in the LID BMP Design Handbook.
Discuss how this was included or provide a discussion/justification for "No" or "N/A" answer. *Roof runoff will drain into landscaped areas.*	
☒ Yes ☐ No ☐ N/A	**Did you utilize native or drought tolerant species in site landscaping?** Wherever possible, use native or drought tolerant species within site landscaping instead of alternatives. These plants are uniquely suited to local soils and climate and can reduce the overall demands for potable water use associated with irrigation.
Discuss how this was included or provide a discussion/justification for "No" or "N/A" answer. *Landscape plan will include native species.*	

Project- Specific WQMP Site Design BMP Checklist	
☐ Yes ☐ No ☒ N/A	**Did implement harvest and use of runoff?** Under the Regional MS4 Permit, Harvest and Use BMPs must be employed to reduce runoff on any site where they are applicable and feasible. However, Harvest and Use BMPs are effective for retention of stormwater runoff only when there is adequate demand for non-potable water during the wet season. If demand for non-potable water is not sufficiently large, the actual retention of stormwater runoff will be diminished during larger storms or during back-to-back storms. For the purposes of planning level Harvest and Use BMP feasibility screening, Harvest and Use is only considered to be a feasible if the total average wet season demand for non-potable water is sufficiently large to use the entire DCV within 72 hours. If the average wet season demand for non-potable water is not sufficiently large to use the entire DCV within 72 hours, then Harvest and Use is not considered to be feasible and need not be considered further. The general feasibility and applicability of Harvest and Use BMPs should consider: • Any downstream impacts related to water rights that could arise from capturing stormwater (not common). • Conflicts with recycled water used – where the project is conditioned to use recycled water for irrigation, this should be given priority over stormwater capture as it is a year-round supply of water. • Code Compliance - If a particular use of captured stormwater, and/or available methods for storage of captured stormwater would be contrary to building codes in effect at the time of approval of the preliminary Project-Specific WQMP, then an evaluation of harvesting and use for that use would not be required. • Wet season demand – the applicant shall demonstrate, to the acceptance of the County of Riverside, that there is adequate demand for harvested water during the wet season to drain the system in a reasonable amount of time.
Discuss how this was included or provide a discussion/justification for “No” or “N/A” answer.	
☐ Yes ☒ No ☐ N/A	**Did you keep the runoff from sediment producing pervious area hydrologically separate from developed areas that require treatment?** Pervious area that qualify as self-treating areas or off-site open space should be kept separate from drainage to structural BMPs whenever possible. This helps limit the required size of structural BMPs, helps avoid impacts to sediment supply, and helps reduce clogging risk to BMPs.
Discuss how this was included or provide a discussion/justification for “No” or “N/A” answer. *Project is a self-storage facility comprised of storage buildings and parking.*	

Section B: Delineate Drainage Management Areas (DMAs) & Green Streets

This section provides streamlined guidance and documentation of the DMA delineation and categorization process, for additional information refer to the procedure in Section 3.3 of the SMR WQMP which discusses the methods of delineating and mapping your project site into individual DMAs. Complete Steps 1 to 4 to successfully delineate and categorize DMAs.

Step 1: Identify Surface Types and Drainage Pathways

Carefully delineate pervious areas and impervious areas (including roofs) throughout site and identify overland flow paths and above ground and below ground conveyances. Also identify common points (such as BMPs) that these areas drain to.

Step 2: DMA Delineation

Use the information in Step 1 to divide the entire PDP site into individual, discrete DMAs. Typically, lines delineating DMAs follow grade breaks and roof ridge lines. Where possible, establish separate DMAs for each surface type (e.g., landscaping, pervious paving, or roofs). Assign each DMA a unique code and determine its size in square feet. The total area of your site should total the sum of all of your DMAs (unless water from outside the project limits comingles with water from inside the project limits, i.e. run-on). Complete Table B-1

Table B-1 DMA Identification

DMA Name or Identification	Surface Type(s)[1]	Area (Sq. Ft.)	DMA Type
DMA D-1	Impervious	163,490	To be Determined in Step 3
DMA B-2	Pervious	14,394	
DMA C-2	Pervious	16,007	
DMA D-3	Mixed	81,712	
DMA A-4	Mixed	8,956	

Add Columns as Needed. Consider a separate DMA for Tree Wells or other LID principals like Self-Retaining areas are used for mitigation.

Step 3: DMA Classification

Determine how drainage from each DMA will be handled by using information from Steps 1 and 2 and by completing Steps 3.A to 3.C. Each DMA will be classified as one of the following four types:

- Type 'A': Self-Treating Areas:
- Type 'B': Self-Retaining Areas
- Type 'C': Areas Draining to Self-Retaining Areas
- Type 'D': Areas Draining to BMPs

Tree wells are considered Type 'B' areas, and their tributary areas limited to a 10:1 ratio are considered Type 'C' areas. If Tree wells are proposed, consider grading or other features to minimize the pervious runoff to the tree wells, to avoid overwhelming the trees. Type 'A', 'B', and 'C' are considered LID Principals that can be used to minimize or potentially eliminate structural LID BMPs.

If Tree wells are proposed, a landscape architect shall be consulted on the tree selection, since compliance will be determined based on the survival of the tree. The tree type should be noted on the WQMP site map.

Step 3.A – Identify Type 'A' Self-Treating Area

Indicate if the DMAs meet the following criteria by answering "Yes" or "No".

☒ Yes ☐ No	Area is undisturbed from their natural condition OR restored with Native and/or California Friendly vegetative covers.
☒ Yes ☐ No	Area is irrigated, if at all, with appropriate low water use irrigation systems to prevent irrigation runoff.
☐ Yes ☒ No	Runoff from the area will not comingle with runoff from the developed portion of the site, or across other landscaped areas that do not meet the above criteria.

If all answers indicate "Yes," complete Table B-2 to document the DMAs that are classified as Self-Treating Areas.

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

DMA Name or Identification	Area (Sq. Ft.)	Stabilization Type	Irrigation Type (if any)
DMA A-4	8,956 Sq. Ft.	Native Plants & Rock Mulch	Drip

Step 3.B – Identify Type 'B' Self-Retaining Area and Type 'C' Areas Draining to Self-Retaining Areas

Type 'B' Self-Retaining Area: A Self-Retaining Area is shallowly depressed 'micro infiltration' areas designed to retain the Design Storm rainfall that reaches the area, without producing any Runoff.

Indicate if the DMAs meet the following criteria by answering "Yes," "No," or "N/A".

☒ Yes ☐ No ☐ N/A	Inlet elevations of area/overflow drains, if any, should be clearly specified to be three inches or more above the low point to promote ponding.
☒ Yes ☐ No ☐ N/A	Soils will be freely draining to not create vector or nuisance conditions.
☐ Yes ☐ No ☒ N/A	Pervious pavements (e.g., crushed stone, porous asphalt, pervious concrete, or permeable pavers) can be self-retaining when constructed with a gravel base course four or more inches deep below any underdrain discharge elevation.

If all answers indicate "Yes," DMAs may be categorized as Type 'B', proceed to identify Type 'C' Areas Draining to Self-Retaining Areas.

Type 'C' Areas Draining to Self-Retaining Areas: Runoff from impervious or partially pervious areas can be managed by routing it to Self-Retaining Areas consistent with the LID Principle discussed in SMR WQMP Section 3.2.5 for 'Dispersing Runoff to Adjacent Pervious Areas'.
Indicate if the DMAs meet the following criteria by answering "Yes" or "No".

☒ Yes ☐ No	The drainage from the tributary area must be directed to and dispersed within the Self-Retaining Area.
☒ Yes ☐ No	The maximum ratio of Tributary Area to Self-Retaining area is (2 ÷ Impervious Fraction): 1

If all answers indicate "Yes," DMAs may be categorized as Type 'C'.

Complete Table B-3 and Table B-4 to identify Type 'B' Self-Retaining Areas and Type 'C' Areas Draining to Self-Retaining Areas.

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 B-4= [C]	Required Retention Depth (inches) [D] = $[B] + \frac{[B]\cdot[C]}{[A]}$
DMA B-2	Planter	14,394	0.8	DMA C-2	16,007	1.69

Note: Tree well areas can extend well beyond the drip line. The Tree Well area for open top types would include the shallow depressed area at the soil surface. The Tree Well area for Structural Soil Tree Wells or Suspended Pavement Tree Wells includes the area with open-graded gravel or void space over the structural soil or structural cells. Please specify type in this table and WQMP site map. See LID handbook Tree Well factsheet for additional details.

$$\left(\frac{2}{\boldsymbol{Impervious\ Fraction}}\right) : 1$$

(Tributary Area: Self-Retaining Area)

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

DMA					Receiving Self-Retaining DMA		
DMA Name/ ID	Area (square feet) [A]	Post-project surface type	Runoff factor [B]	Product [C] = [A] x [B]	DMA name /ID	Area (square feet) [D]	Ratio [C]/[D]
DMA C-2	16,007	Asphalt & Concrete	1.0	16,007	DMA B-2	14,394	1.11

Note: (See Section 3.3 of SMR WQMP) Ensure that partially pervious areas draining to a Self-Retaining area do not exceed the following ratio:

Step 3.B.1 – Document the use of Green Street Exemption (see Section 3.11 of the WQMP Guidance)

The Regional MS4 Permit specifies that projects that consist of **retrofitting or redevelopment of existing paved alleys, streets, or roads** may be exempted from classification as PDPs if they are designed and constructed in accordance with USEPA Green Streets Guidance. This does not apply for interior roads for PDP

projects. For projects with road frontage improvements, Green Street standards can be used in the frontage road right-of-way. The remainder of the project is subject to full WQMP and Hydromodification requirements. See excerpt from Section 3.11 of the WQMP Guidance below:

3.11.4 BMP Sizing Targets for Applicable Green Streets Projects

Applicable green street projects are not required to meet the same sizing requirements for BMPs as other projects, but should attempt to meet a sizing target to the MEP. The following steps are used to size BMPs for applicable Green Streets projects:

1. Delineate drainage areas tributary to BMP locations and compute imperviousness.
2. Determine sizing goal by referring to sizing criteria presented in Section 2.3.2 (V_{BMP}).
3. Attempt to provide the target BMP sizing according to Step 2.
4. If the target criteria cannot be achieved, document the constraints that override the application of BMPs, and provide the largest portion of the sizing criteria that can be reasonably provided given constraints.

Even if BMPs cannot be sized to meet the target sizing criteria, it is still important to design the BMP inlet, energy dissipation, and overflow capacity for the full tributary area to ensure that flooding and scour is avoided. It is strongly recommended that BMPs which are designed to less than their target design volume be designed to bypass peak flows.

Table B-4.1 – Green Streets

DMA Name or ID	Street Name	BMP Sizing Targets Calculations and documenting constraints included in Appendix 6*
N/A		☐ Yes ☐ No
		☐ Yes ☐ No
*WQMP shall not be approved without calculations or documenting constraints for Green Street Exemption.		

Step 3.C – Identify Type 'D' Areas Draining to BMPs

Areas draining to BMPs are those that could not be fully managed through LID Principles (DMA Types A through C) and will instead drain to an LID BMP and/or a Conventional Treatment BMP designed to manage water quality impacts from that area, and Hydromodification where necessary.

Complete Table B-5 to document which DMAs are classified as Areas Draining to BMPs

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

DMA Name or ID	BMP Name or ID Receiving Runoff from DMA
DMA 1	BMP 1 – BioClean Biofiltration System
DMA 3	BMP 1 – BioClean Biofiltration System

Note: More than one DMA may drain to a single LID BMP; however, one DMA may not drain to

more than one BMP.

Section C: Implement LID BMPs

The Regional MS4 Permit requires the use of LID BMPs to provide retention or treatment of the DCV and includes a BMP hierarchy which requires Full Retention BMPs (Priority 1) to be considered before Biofiltration BMPs (Priority 2) and Flow-Through Treatment BMPs and Alternative Compliance BMPs (Priority 3). LID BMP selection must be based on technical feasibility and should be considered early in the site planning and design process. Use this section to document the selection of LID BMPs for each DMA. Note that feasibility is based on the DMA scale and may vary between DMAs based on site conditions.

C.1 Full Infiltration Applicability

An assessment of the feasibility of utilizing full infiltration BMPs is required for all projects, *except where it can be shown that site design LID principles fully retain the DCV (i.e., all DMAs are Type A, B, or C), or where Harvest and Use BMPs fully retain the DCV. Check the following box if applicable:*

☐ Site design LID principles or Tree Wells fully retain the DCV (i.e., all DMAs are Type A, B, or C), (Proceed to Section E).

If the above box remains unchecked, perform a site-specific evaluation of the feasibility of Infiltration BMPs using each of the applicable criteria identified in Chapter 2.3.3 of the SMR WQMP and complete the remainder of Section D.1.

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 Copermittee, at their discretion, may not require a geotechnical report for small projects as described in Chapter 2 of the SMR WQMP. 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.

Infiltration Feasibility

Table C-1 below is meant to provide a simple means of assessing which DMAs on your site support Infiltration BMPs and is discussed in the SMR WQMP in Chapter 2.3.3. 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

Downstream Impacts (SMR WQMP Section 2.3.3.a)		
Does the project site…	**YES**	**NO**
…have any DMAs where infiltration would negatively impact downstream water rights or other Beneficial Uses[2]?		X
If Yes, list affected DMAs:		
Groundwater Protection (SMR WQMP Section 2.3.3.b)		
Does the project site…	**YES**	**NO**
…have any DMAs with industrial, and other land uses that pose a high threat to water quality, which cannot be treated by Bioretention BMPs? Or have DMAs with active industrial process areas?		X
If Yes, list affected DMAs:		
…have any DMAs with a seasonal high groundwater mark shallower than 10 feet?		X
If Yes, list affected DMAs:		
…have any DMAs located within 100 feet horizontally of a water supply well?		X
If Yes, list affected DMAs:		
…have any DMAs that would restrict BMP locations to within a 2:1 (horizontal: vertical) influence line extending from any septic leach line?		X
If Yes, list affected DMAs:		
…have any DMAs been evaluated by a licensed Geotechnical Engineer, or Environmental Engineer, who has concluded that the soils do not have adequate physical and chemical characteristics for the protection of groundwater, and has treatment provided by amended media layers in Bioretention BMPs been considered in evaluating this factor?		X
If Yes, list affected DMAs:		
Public Safety and Offsite Improvements (SMR WQMP Section 2.3.3.c)		
Does the project site…	**YES**	**NO**
…have any areas identified by the geotechnical report as posing a public safety risk where infiltration of stormwater could have a negative impact, such as potential seepage through fill conditions?		X
If Yes, list affected DMAs:		
Infiltration Characteristics For LID BMPs (SMR WQMP Section 2.3.3.d)		
Does the project site…	**YES**	**NO**
…have measured infiltration rates of less than 2.4 inches / hour? Riverside County may allow measure rates as low as 0.8in/hr to support infiltration BMPs, if the Engineer believes infiltration is appropriate and sustainable. Mark no, if this is the case.	X	
If Yes, list affected DMAs: All DMAs		
Cut/Fill Conditions (SMR WQMP Section 2.3.3.e)		
Does the project site…	**YES**	**NO**
…have significant cut and/or fill conditions that would preclude in-situ testing of infiltration rates at the final infiltration surface?		X
If Yes, list affected DMAs:		
Other Site-Specific Factors (SMR WQMP Section 2.3.3.f)		
Does the project site…	**YES**	**NO**
…have DMAs where the geotechnical investigation discovered other site-specific factors that would preclude effective and/or safe infiltration?		X
Describe here:		

If you answered "Yes" to any of the questions above for any DMA, Infiltration BMPs that rely solely on infiltration should not be used for those DMAs and you should proceed to the assessment for Biofiltration BMPs below. Biofiltration BMPs that provide partial infiltration may still be feasible and should be assessed in Section D.2. Summarize concerns identified in the Geotechnical Report, if any, that resulted in a "YES" response above in the table below.

[2] Such a condition must be substantiated by sufficient modeling to demonstrate an impact and would be subject to County of Riverside discretion. There is not a standardized method for assessing this criterion. Water rights evaluations should be site-specific.

Table C-2 Geotechnical Concerns for Onsite Infiltration

Type of Geotechnical Concern	DMAs Feasible (By Name or ID)	DMAs Infeasible (By Name or ID)
Collapsible Soil	N/A	
Expansive Soil	N/A	
Slopes	N/A	
Liquefaction	N/A	
Low Infiltration Rate	N/A	
Other	N/A	

C.2 Biofiltration Applicability

This section should document the applicability of biofiltration BMPs for Type D DMAs that are not feasible for full infiltration BMPs. The key decisions to be documented in this section include:

1. Are biofiltration BMPs with partial infiltration feasible?
    a. Biofiltration BMPs must be designed to maximize incidental infiltration via a partial infiltration design unless it is demonstrated that this design is not feasible.
    b. These designs can be used at sites with low infiltration rates where other feasibility factors do not preclude incidental infiltration.

    Document summary in Table C-3.
2. If not, what are the factors that require the use of biofiltration with no infiltration? This may include:
    a. Geotechnical hazards
    b. Water rights issues
    c. Water balance issues
    d. Soil contamination or groundwater quality issues
    e. Very low infiltration rates (factored rates < 0.1 in/hr)
    f. Other factors, demonstrated to the acceptance of the local jurisdiction

    If this applies to any DMAs, then rationale must be documented in Table C-3.
3. Are biofiltration BMPs infeasible?
    a. If yes, then provide 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 with jurisdiction over the Project site to discuss this option. Proceed below.

Table C-3 Evaluation of Biofiltration BMP Feasibility

DMA ID	Is Partial/ Incidental Infiltration Allowable? (Y/N)	Basis for Infeasibility of Partial Infiltration (provide summary and include supporting basis if partial infiltration not feasible)
DMA 1	N	Project Site is Impervious
DMA 3	N	Cal Trans Right of Way/Directing Water Onsite

Proprietary Biofiltration BMP Approval Criteria

Does the Co-Permittee allow Proprietary BMPs as an equivalent to Biofiltration, if specific criteria is met?

☒ Yes or ☐ No, if no skip to Section F to document your alternative compliance measures.

If the project will use proprietary BMPs as biofiltration BMPs, then this section and Appendix 5 shall be completed to document that the proprietary BMPs are selected in accordance with Section 2.3.6 of the SMR WQMP and County requirements. Proprietary Biofiltration BMPs must meet both of the following approval criteria:

1. Demonstrate equivalency to Biofiltration by completing the BMP Design worksheet and Proprietary Biofiltration Criteria, which is found in Appendix 5, including all supporting documentation, and
2. Obtain Co-Permittee concurrence for the long term Operation and Maintenance Plan for the proprietary BMP. The Co-Permittee has the sole discretion to allow or reject Proprietary BMPs, especially if they will be maintained publically through a CFD, CSA, or L&LMD.

Add additional rows to Table D-4 to document approval criteria are met for each type of BMP proposed.

Table C-4 Proprietary BMP Approval Requirement Summary

Proposed Proprietary Biofiltration BMP	Approval Criteria	Notes/Comments
BioClean Modular Wetland MWS-L-8-20	BMP Design worksheets and Proprietary Biofiltration Criteria are completed in Appendix 5	☒ Yes or ☐ No
	Proposed BMP has an active TAPE GULD Certification for the project pollutants of concern[3] or equivalent 3rd party demonstrated performance.	☒ Yes or ☐ No
	Is there any media or cartridge required to maintain the function of the BMP sole-sourced or proprietary in any way? If yes, obtain explicit approval by the Agency. Potentially full replacement costs to a non-proprietary BMP needs to be considered.	☐ Yes or ☒ No If yes, provide the date of concurrence from the Co-Permittee.
	☒ The BMP includes biological features including vegetation supported by engineered or other growing media.	

[3] Use Table F-1, F-2, and F-3 to identify and document the pollutants of concern and include these tables in Appendix 5.

C.3 Feasibility Assessment Summaries

From the Infiltration, Biofiltration with Partial Infiltration and Biofiltration with No Infiltration Sections above, complete Table C-5 below to summarize which LID BMPs are technically feasible, and which are not, based upon the established hierarchy.

Table C-5 LID Prioritization Summary Matrix

DMA Name/ID	LID Principles or Tree Wells	LID BMP Hierarchy			No LID (Alternative Compliance)
		1. Infiltration	2. Biofiltration with Partial Infiltration*	3. Biofiltration with No Infiltration*	
DMA 1	☐	☐	☐	☒	☐
DMA 3	☐	☐	☐	☒	☐
	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐

*Includes Proprietary Biofiltration, if accepted by the Co-Permittee.

For those DMAs where LID BMPs are not feasible, provide a narrative in Table C-6 below summarizing why they are not feasible, include your technical infeasibility criteria in Appendix 5, and proceed to Section F 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.

This is based on the clarification letter titled "San Diego Water Board's Expectations of Documentation to Support a Determination of Priority Development Project Infiltration Infeasibility" (April 28, 2017, Via email from San Diego Regional Water Quality Control Board to San Diego County Municipal Storm Water Copermittees[4]).

Table C-6 Summary of Infeasibility Documentation

Question	Narrative Summary (include reference to applicable appendix/attachment/report, as applicable)
a) When in the entitlement process did a geotechnical engineer analyze the site for infiltration feasibility?	November 3, 2021
b) When in the entitlement process were other investigations conducted (e.g., groundwater quality, water rights) to evaluate infiltration feasibility?	None
c) What was the scope and results of testing, if conducted, or rationale for why testing was not needed to reach findings?	Double Ring Infiltrometer Test 4 Test Pits All Resulting in 0.0 Infiltration Rate
d) What public health and safety	None

[4] http://www.projectcleanwater.org/download/pdp-infiltration-infeasibility/

	requirements affected infiltration locations?	
e)	What were the conclusions and recommendations of the geotechnical engineer and/or other professional responsible for other investigations?	0.0 Infiltration Rate No Infiltration for Project Site
f)	What was the history of design discussions between the permittee and applicant for the proposed project, resulting in the final design determination related locations feasible for infiltration?	Unknown
g)	What site design alternatives were considered to achieve infiltration or partial infiltration on site?	None
h)	What physical impairments (i.e., fire road egress, public safety considerations, utilities) and public safety concerns influenced site layout and infiltration feasibility?	None
i)	What LID Principles (site design BMPs) were included in the project site design?	Draining to Landscaped Areas

C.4 LID BMP Sizing

Each LID BMP must be designed to ensure that the DCV will be captured by the selected BMPs with no discharge to the storm drain or surface waters during the DCV size storm. Infiltration BMPs must at minimum be sized to capture the DCV to achieve pollutant control requirements.

Biofiltration BMPs must at a minimum be sized to:

- Treat 1.5 times the DCV not reliably retained on site using a volume-base or flow-based sizing method, or
- Include static storage volume, including pore spaces and pre-filter detention volume, at least 0.75 times the portion of the DCV not reliably retained on site.

First**,** calculate the DCV 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 the methods included in Section 3 of the LID BMP Design Handbook. Utilize the worksheets found in the LID BMP Design Handbook or consult with the Copermittee to assist you in correctly sizing your LID BMPs. Use Table C-7 below to document the DCV 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-7 DCV Calculations for LID BMPs

DMA Type/ID	DMA (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*BMP 3- To Be Determined*		
	[A]		[B]	[C]	[A] x [C]			
DMA 1	*71,730*	*Asphalt*	*1.0*	*.89*	*63,840*	*Design Storm Depth (in)*	*DCV, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
DMA 1	*90,154*	*Roofs*	*1.0*	*.89*	*80,417*			
DMA 1	*1,607*	*Landscape*	*0.1*	*.11*	*177*			
DMA 3	*55,634*	*Asphalt*	*1.0*	*.89*	*49,514*			
DMA 3	*26,078*	*Landscape*	*0.1*	*.11*	*2,869*			
	245,202				196,817	.2	3,280 ft^3	TBD

[B], [C] is obtained as described in Section 2.6.1.b of the SMR WQMP
[E] is obtained from Exhibit A in the SMR WQMP
[G] is obtained from a design procedure sheet, such as in LID BMP Design Handbook and placed in Appendix 6.

Complete Table C-8 below to document the Design Capture Volume and the Proposed Volume for each LID BMP. You can add rows to the table as needed. Alternatively, the Santa Margarita Hydrology Model (SMRHM) can be used to size LID BMPs to address the DCV and, if applicable, to size Hydrologic Control BMPs to meet the Hydrologic Performance Standard described in the SMR WQMP, as identified in Section E.

Table C-8 LID BMP Sizing

BMP Name / ID	DMA No.	BMP Type / Description	Design Capture Volume (ft^3)	Proposed Volume (ft^3)
BMP 1	DMA 1 & 3	Biofiltration System	3,280 ft^3	TBD

If bioretention will include a capped underdrain, then include sizing calculations demonstrating that the BMP will meet infiltration sizing requirements with the underdrain capped and also meet biofiltration sizing requirements if the underdrain is uncapped.

Section D: Implement Hydrologic Control BMPs and Sediment Supply BMPs

See Appendix 7 for additional required information.

If a completed Table 1.2 demonstrates that the project is exempt from Hydromodification Performance Standards, specify N/A and proceed to Section G.

☐ N/A Project is Exempt from Hydromodification Performance Standards.

If a PDP is not exempt from hydromodification requirements than the PDP must satisfy the requirements of the performance standards for hydrologic control BMPs and Sediment Supply BMPs. The PDP may choose to satisfy hydrologic control requirements using onsite or offsite BMPs (i.e. Alternative Compliance). Sediment supply requirements cannot be met via alternative compliance. If N/A is not selected above, select one of the two options below and complete the applicable sections.

☒ Project is Not Hydromodification Exempt and chooses to implement Hydrologic Control and Sediment Supply BMPs Onsite (complete Section E).

☐ Project is Not Hydromodification Exempt and chooses to implement Hydrologic Control Requirements using Alternative Compliance (complete Section F). Selection of this option must be approved by the Copermittee.

D.1 Hydrologic Control BMP Selection

Capture of the DCV and achievement of the Hydrologic Performance Standard may be met by combined and/or separate structural BMPs. The user should consider the full suite of Hydrologic Control BMPs to manage runoff from the post-development condition and meet the Hydrologic Performance Standard identified in this section.

For the Preliminary WQMP, in lieu of preparing detailed routing calculations, the basin size may be estimated as the difference in volume between the pre-development and post-development hydrograph for the 10-year 24-hour storm event plus the Vbmp. This does not relieve the engineer of the responsibility for meeting the full Hydrologic Control requirements during final design.

The Hydrologic Performance Standard consists of matching or reducing the flow duration curve of post-development conditions to that of pre-existing, naturally occurring conditions, for the range of geomorphically significant flows (the low flow threshold runoff event up to the 10-year runoff event). 10% of the 2-year runoff event can be used for the low flow threshold without any justification. Higher low flow thresholds can be used with site-specific analysis, see Section 2.6.2.b of the WQMP guidance document. Select each of the hydrologic control BMP types that are applied to meet the above performance standard on the site.

☐ LID principles as defined in Section 3.2 of the SMR WQMP, including Tree Wells.

☐ Structural LID BMPs that may be modified or enlarged, if necessary, beyond the DCV.

☒ Structural Hydrologic Control BMPs that are distinct from the LID BMPs above. The LID BMP Design Handbook provides information not only on Hydrologic Control BMP design, but also on BMP design to meet the combined LID requirement and Hydrologic Performance Standard. The Handbook specifies the type of BMPs that can be used to meet the Hydrologic Performance Standard.

D.2 Hydrologic Control BMP Sizing

Hydrologic Control BMPs must be designed to ensure that the flow duration curve of the post-development DMA will not exceed that of the pre-existing, naturally occurring, DMA for the range of geomorphically significant flows. Using SMRHM, (or another acceptable continuous simulation model if approved by the Copermittee) the applicant shall demonstrate that the performance of the Hydrologic Control BMPs complies with the Hydrologic Performance Standard. Complete Table D-1 below and identify, for each DMA, the type of Hydrologic Control BMP, if the SMRHM model confirmed the management (Identified as "passed" in SMRHM), the total volume capacity of the Hydrologic Control BMP, the Hydrologic Control BMP footprint at top floor elevation, and the drawdown time of the Hydrologic Control BMP. SMRHM summary reports should be documented in Appendix 7. Refer to the SMRHM Guidance Document for additional information on SMRHM. You can add rows to the table as needed.

Table D-1 Hydrologic Control BMP Sizing

BMP Name / ID	DMA No.	BMP Type / Description	SMRHM* Passed	BMP Volume (ac-ft)	BMP Footprint (ac)	Drawdown time (hr)
BMP 2	DMA 1	Underground Storage	☒	0.6105	0.28	72
			☐			
			☐			
			☐			

**Or other continuous simulation model, compliant with the WQMP and Permit. If Tree Wells are proposed for some or all of the project, check the box for Tree Wells in Section E.1 and enter each Tree Well DMA in Table E-1 above for the BMP Name/ID, DMA No. and BMP Type/Description. For Tree Wells, leave SMRHM* Passed Column and the columns to the left blank.*

*The Santa Margarita Region – County HydroMod Iterative Spreadsheet Model was used for this project.

D.3 Implement Sediment Supply BMPs

The sediment supply performance standard applies to PDPs for which hydromodification applied that have the potential to impact Potential Critical Coarse Sediment Yield Areas. Refer to Exhibit G-1 of the WQMP Guidance Document to determine if there are onsite Potential Critical Coarse Sediment Yield Areas (based on on-going WMAA analysis) or Potential Sediment Source Areas (sites added through the Regional Board review process). Select one of the two options below and include the Potential Critical Coarse Sediment Yield Area Exhibit showing your project location in Appendix 7.

☒ There are no mapped Potential Critical Coarse Sediment Yield Areas or Potential Sediment Source Areas on the site. Include a copy of Exhibit G - CCSY & PSS Areas in Appendix 7,

with the project location marked. If the project is outside of the "Potential Critical Coarse Sediment Yield Areas and Potential Sediment Source Areas" then check this box. The Sediment Supply Performance Standard is met with no further action is needed.

☐ There are mapped Potential Critical Coarse Sediment Yield Areas or Potential Sediment Source Areas on the site, the Sediment Supply Performance Standard will be met through Option 1 (E.3.1) or Option 2 (E.3.2) below.

☐ **E.3.1 Option 1: Avoid Potential Critical Coarse Sediment Yield Areas and Potential Sediment Source Areas**

The simplest approach for complying with the Sediment Supply Performance Standard is to avoid impacts to areas identified as Potential Critical Coarse Sediment Yield Areas or Potential Sediment Supply Areas. If a portion of PDP is identified as a Potential Critical Coarse Sediment Yield Area or a Potential Sediment Source Area, that PDP may still achieve compliance with the Sediment Supply Performance Standards if Potential Critical Coarse Sediment Yield Areas and Potential Sediment Supply Areas are avoided, i.e. areas are not developed and thereby delivery of Critical Coarse Sediment to the receiving waters is not impeded by site developments.

Provide a narrative describing how the PDP has avoided impacts to Potential Critical Coarse Sediment Yield Areas and/or Potential Sediment Source Areas below.

If it is not feasible to avoid these areas, proceed to Option 2 to complete a Site-Specific Critical Coarse Sediment Analysis.

☐ **E.3.2 Option 2: Site-Specific Critical Coarse Sediment Analysis**

Perform a stepwise assessment to ensure the pre-project source(s) of Critical Coarse Sediment (i.e., Bed Sediment Supply) is maintained:

Step 1: Identify if the site is an actual verified Critical Coarse Sediment Yield Area supplying Bed Sediment Supply to the receiving channel

☐ **Step 1.A –** Is the Bed Sediment of onsite streams similar to that of receiving streams?

Rate the similarity: ☐ High
☐ Medium
☐ Low

Results from the geotechnical and sieve analysis to be performed both onsite and in the receiving channel should be documented in Appendix 7. Of particular interest, the results of the sieve analysis, the soil erodibility factor, a description of the topographic relief of the project area, and the lithology of onsite soils should be reported in Appendix 7.

☐ **Step 1.B** – Are onsite streams capable of delivering Bed Sediment Supply from the site, if any, to the receiving channel?

Rate the potential:
- ☐ High
- ☐ Medium
- ☐ Low

Results from the analyses of the sediment delivery potential to the receiving channel should be documented in Appendix 7 and identify, at a minimum, the Sediment Source, the distance to the receiving channel, the onsite channel density, the project watershed area, the slope, length, land use, and rainfall intensity.

☐ **Step 1.C** – Will the receiving channel adversely respond to a change in Bed Sediment Load?

Rate the need for bed sediment supply:
- ☐ High
- ☐ Medium
- ☐ Low

Results from the in-stream analysis to be performed both onsite should be documented in Appendix 7. The analysis should, at a minimum, quantify the bank stability and the degree of incision, provide a gradation of the Bed Sediment within the receiving channel, and identify if the channel is sediment supply-limited.

☐ **Step 1.D** – Summary of Step 1

Summarize in Table E.3 the findings of Step 1 and associate a score (in parenthesis) to each step. The sum of the three individual scores determines if a stream is a significant contributor to the receiving stream.

- Sum is equal to or greater than eight - Site is a significant source of sediment bed material – all on-site streams must be preserved or by-passed within the site plan. The applicant shall proceed to Step 2 for all onsite streams.
- Sum is greater than five but lower than eight. Site is a source of sediment bed material – some of the on-site streams must be preserved (with identified streams noted). The applicant shall proceed to Step 2 for the identified streams only.
- Sum is equal to or lower than five. Site is not a significant source of sediment bed material. The applicant may advance to Section F.

Table D-2 Triad Assessment Summary

Step	Rating			Total Score
1.A	☐ High (3)	☐ Medium (2)	☐ Low (1)	
1.B	☐ High (3)	☐ Medium (2)	☐ Low (1)	
1.C	☐ High (3)	☐ Medium (2)	☐ Low (1)	
Significant Source Rating of Bed Sediment to the receiving channel(s)				

Step 2: Avoid Development of Critical Coarse Sediment Yield Areas, Potential Sediment Sources Areas, and Preserve Pathways for Transport of Bed Sediment Supply to Receiving Waters

Onsite streams identified as a actual verified Critical Coarse Sediment Yield Areas should be avoided in the site design and transport pathways for Critical Coarse Sediment should be preserved

Check those that apply:

☐ The site design does avoid all onsite channels identified as actual verified Critical Coarse Sediment Yield Areas ***AND***

☐ The drainage design bypasses flow and sediment from onsite upstream drainages identified as actual verified Critical Coarse Sediment Yield Areas to maintain Critical Coarse Sediment supply to receiving waters

(If both are yes, the applicant may disregard subsequent steps of Section E.3 and directly advance directly to Section G)

Or -

Provide in Appendix 7 a site map that identifies all onsite channels and highlights those onsite channels that were identified as a Significant Source of Bed Sediment. The site map shall demonstrate, if feasible, that the site design avoids those onsite channels identified as a Significant Source of Bed Sediment. In addition, the applicant shall describe the characteristics of each onsite channel identified as a Significant Source of Bed Sediment. If the design plan cannot avoid the onsite channels, please provide a rationale for each channel individually.

The site map shall demonstrate that the drainage design bypasses those onsite channels that supply Critical Coarse Sediment to the receiving channel(s). In addition, the applicant shall describe the characteristics of each onsite channel identified as an actual verified Critical Coarse Sediment Yield Area.

☐ The site design **does NOT avoid** all onsite channels identified as actual verified Critical Coarse Sediment Yield Areas

OR

☐ The project blocks the potential for Critical Coarse Sediment from migrating to receiving waters.

(If either of these are the case, the applicant shall continue completing this section).

E.3.3 Sediment Supply BMPs to Result in No Net Impact to Downstream Receiving Waters

If impacts to Critical Coarse Sediment Yield Areas cannot be avoided, sediment supply BMPs must be implemented such there is no net impact to receiving waters. Sediment supply BMPs may consist of approaches that permit flux of bed sediment supply from Critical Coarse Sediment Yield Areas within the project boundary. This approach is subject to acceptance by the County of Riverside. It may require extensive documentation and analysis by qualified professionals to support this demonstration.

Appendix H of the San Diego Model BMP Design Manual provides additional information on site-specific investigation of Critical Coarse Sediment Supply areas.

http://www.projectcleanwater.org/download/2018-model-bmp-design-manual/

Documentation of sediment supply BMPs should be detailed in Appendix 7.

Section E: Alternative Compliance

Alternative Compliance may be used to achieve compliance with pollutant control and/or hydromodification requirements for a given PDP. Alternative Compliance may be used under two scenarios, check the applicable box if the PDP is proposing to use Alternative Compliance to satisfy all or a portion of the Pollutant Control and/or Hydrologic Control requirements (but not sediment supply requirements)

☐ If it is not feasible to fully implement Infiltration or Biofiltration BMPs at a PDP site, Flow-Through Treatment Control BMPs may be used to treat pollutants contained in the portion of DCV not reliably retained on site and Alternative Compliance measures must also be implemented to mitigate for those pollutants in the DCV that are not retained or removed on site prior to discharging to a receiving water.

☐ Alternative Compliance is selected to comply with either pollutant control or hydromodification flow control requirements even if complying with these requirements is potentially feasible on-site. If such voluntary Alternative Compliance is implemented, Flow-Through Treatment Control BMPs must still be used to treat those pollutants in the portion of the DCV not reliably retained on site prior to discharging to a receiving water.

Refer to Section 2.7 of the SMR WQMP and consult the Local Jurisdiction for currently available Alternative Compliance pathways. Coordinate with the Copermittee if electing to participate in Alternative Compliance and complete the sections below to document implementation of the Flow-Through BMP component of the program.

E.1 Identify Pollutants of Concern

The purpose of this section is to help you appropriately plan for mitigating your Pollutants of Concern in lieu of implementing LID BMPs and to document compliance and.

Utilize Table A-1 from Section A, which noted your project's Receiving Waters, to identify impairments for Receiving Waters (including downstream receiving waters) by completing Table E-1. Table E-1 includes the watersheds identified as impaired in the Approved 2010 303(d) list; check box corresponding with the PDP's receiving water. The most recent 303(d) lists are available from the State Water Resources Control Board website: https://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtml).https://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtml.

Table E-1 Summary of Approved 2010 303(d) listed waterbodies and associated pollutants of concern for the Riverside County SMR Region and downstream waterbodies.

	Water Body	Nutrients[1]	Metals[2]	Toxicity	Bacteria and Pathogens	Pesticides and Herbicides	Sulfate	Total Dissolved Solids
☐	De Luz Creek	X	X				X	
☐	Long Canyon Creek		X		X	X		
☐	Murrieta Creek	X	X	X		X		
☐	Redhawk Channel	X	X		X	X		X
☐	Santa Gertudis Creek	X	X		X	X		
☐	Santa Margarita Estuary	X						
☒	Santa Margarita River (Lower)	X			X			
☒	Santa Margarita River (Upper)	X		X				
☐	Temecula Creek	X	X	X		X		X
☒	Warm Springs Creek	X	X		X	X		

[1] Nutrients include nitrogen, phosphorus and eutrophic conditions caused by excess nutrients.

[2] Metals includes copper, iron, and manganese.

Use Table E-2 to identify the pollutants identified with the project site. Indicate the applicable PDP Categories and/or Project Features by checking the boxes that apply. If the identified General Pollutant Categories are the same as those listed for your Receiving Waters, then these will be your Pollutants of Concern; check the appropriate box or boxes in the last row.

Table E-2 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	Total Dissolved Solids	Sulfate
☐	Detached Residential Development	P	N	P	P	N	P	P	P	N	N
☐	Attached Residential Development	P	N	P	P	N	P	P	P[(2)]	N	N
☒	Commercial/Industrial Development	P[(3)]	P[(7)]	P[(1)]	P[(1)]	P	P[(1)]	P	P	N	N
☐	Automotive Repair Shops	N	P	N	N	P[(4, 5)]	N	P	P	N	N
☐	Restaurants (>5,000 ft^2)	P	N	N	P[(1)]	N	N	P	P	N	N
☐	Hillside Development (>5,000 ft^2)	P	N	P	P	N	P	P	P	N	N
☐	Parking Lots (>5,000 ft^2)	P[(6)]	P[(7)]	P[(1)]	P[(1)]	P[(4)]	P	P	P	N	N
☐	Streets, Highways, and Freeways	P[(6)]	P[(7)]	P[(1)]	P[(1)]	P[(4)]	P	P	P	N	N
☐	Retail Gasoline Outlets	N	P[(7)]	N	N	P[(4)]	N	P	P	N	N
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 products; otherwise not expected

(4) Including petroleum hydrocarbons

(5) Including solvents

(6) Bacterial indicators are routinely detected in pavement runoff

(7) A potential source of metals, primarily copper and zinc. Iron, magnesium, and aluminum are commonly found in the environment and are commonly associated with soils, but are not primarily of anthropogenic stormwater origin in the municipal environment.

E.2 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 be selected to address the Project Priority Pollutants of Concern (identified above) and meet the acceptance criteria described in Section 2.3.7 of the SMR WQMP. Documentation of acceptance criteria 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 E-3 Treatment Control BMP Selection

Selected Treatment Control BMP Name or ID[1]	Priority Pollutant(s) of Concern to Mitigate[2]	Removal Efficiency Percentage[3]
BMP 1	Nutrients, Pesticides, Organics, Sediments, Trash & Debris, Oil & Grease	85%

[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 Copermittee Approved Study and provided in Appendix 6.*

E.3 Sizing Criteria

Utilize Table E-4 below to appropriately size flow-through BMPs to the DCV, or Design Flow Rate, as applicable. Please reference Chapter 3.5.1 of the SMR WQMP for further information.

Table E-4 Treatment Control BMP Sizing

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*BMP 1 Biofiltration*	
	[A]		[B]	[C]	[A] x [C]		
DMA 1	*71,730*	*Asphalt*	*1.0*	*.89*	*63,840*		
DMA 1	*90,154*	*Roofs*	*1.0*	*0.89*	*80,417*		
DMA 1	*1,607*	*Landscape*	*0.1*	*0.11*	*177*		
DMA 3	*55,634*	*Asphalt*	*1.0*	*.89*	*49,514*		
DMA 3	*26,078*	*Landscape*	*0.1*	*.11*	*2,869*	*Design Storm (in)*	*Design Flow Rate (cfs)*
	245,202				196,817	.2	. 90

[B], [C] is obtained as described in Section 2.6.1.b from the SMR WQMP
[E] either 0.2 inches or 2 times the 85th percentile hourly rainfall intensity
[G] = 43,560,.

E.4 Hydrologic Performance Standard – Alternative Compliance Approach

Alternative compliance options are only available if the governing Copermittee has acknowledged the infeasibility of onsite Hydrologic Control BMPs and approved an alternative compliance approach. See Section 3.5 and 3.6 of the SMR WQMP.

Select the pursued alternative and describe the specifics of the alternative:

☐ Offsite Hydrologic Control Management within the same channel system

Insert narrative description here

☐ In-Stream Restoration Project

Insert narrative description here

For Offsite Hydrologic Control BMP Option

Each Hydrologic Control BMP must be designed to ensure that the flow duration curve of the post-development DMA will not exceed that of the pre-existing, naturally occurring, DMA by more than ten percent over a one-year period. Using SMRHM, the applicant shall demonstrate that the performance of each designed Hydrologic Control BMP is equivalent with the Hydrologic Performance Standard for onsite conditions. Complete Table E-5 below and identify, for each Hydrologic Control BMP, the equivalent DMA the Hydrologic Control BMP mitigates, that the SMRHM model passed, the total volume capacity of the BMP, the BMP footprint at top floor elevation, and the drawdown time of the BMP. SMRHM summary reports for the alternative approach should be documented in Appendix 7. Refer to the SMRHM Guidance Document for additional information on SMRHM. You can add rows to the table as needed.

Table E-5 Offsite Hydrologic Control BMP Sizing

BMP Name / Type	Equivalent DMA (ac)	SMRHM Passed	BMP Volume (ac-ft)	BMP Footprint (ac)	Drawdown time (hr)
		☐			
		☐			
		☐			
		☐			

For Instream Restoration Option

Attach to Appendix 7 the technical report detailing the condition of the receiving channel subject to the proposed hydrologic and sediment regimes. Provide the full design plans for the in-stream restoration project that have been approved by the Copermittee. Utilize the San Diego Regional Water Quality Equivalency Guidance Document.

Section F: Implement Trash Capture BMPs

The Santa Margarita Regional Board has required Full Trash Capture compliance thru Order No. R9-2017-007. For the Santa Margarita Watershed, the County is requiring Track 1 full trash capture compliance for projects proposing the following uses as part of their development after **December 3, 2018**.

- High-density residential: all land uses with at least ten (10) developed dwelling units/acre.
- Industrial: land uses where the primary activities on the developed parcels involve product manufacture, storage, or distribution (e.g., manufacturing businesses, warehouses, equipment storage lots, junkyards, wholesale businesses, distribution centers, or building material sales yards).
- Commercial: land uses where the primary activities on the developed parcels involve the sale or transfer of goods or services to consumers (e.g., business or professional buildings, shops, restaurants, theaters, vehicle repair shops, etc.).
- Mixed urban: land uses where high-density residential, industrial, and/or commercial land uses predominate collectively (i.e., are intermixed).
- Public transportation stations: facilities or sites where public transit agencies' vehicles load or unload passengers or goods (e.g., bus stations and stops).

Riverside County Maintenance is generally supportive of United Storm Water – Connector Pipe Screens or equivalent. Equivalent systems or alternative designs shall be on the State of California Approved Trash Capture Device List and requires approval by the Transportation Department for maintenance. Riverside County is developing Trash Capture Device Standards, which are expected to be added to the Transportation Plan Check Policies and Guidelines when available. Design calculations are not expected to be required if the project uses standard sizes per the County's Trash Capture Device Standards. Until the Trash Capture Device Standards are available and the project uses standard sizes, the project shall complete the following tables and furnish hydraulic analysis calculating the flowrate in the catch basin does not exceed the flowrate capacity of the trash capture device in a fully clogged condition.

Trash Capture BMPs may be applicable to Type 'D' DMAs, as defined in Section 2.3.4 of the SMR WQMP. Trash Capture BMPs are designed to treat Q_{TRASH}, the runoff flow rate generated during the 1-year 1-hour precipitation depth. Utilize Table F-1 to size Trash Capture BMP. Refer to Table F-2 to determine the Trash Capture Design Storm Intensity (E).

Table F-1 Sizing Trash Capture 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	*Enter BMP Name / Identifier Here*	
	[A]		[B]	[C]	[A] x [C]		
						Trash Capture Design Storm Intensity (in)	*Trash Capture Design Flow Rate (cubic feet or cfs)*
	$A_T = \Sigma[A]$				$\Sigma = [D]$	[E]	$[F] = \frac{[D]x[E]}{[G]}$

[B], [C] is obtained as described in Section 2.6.1.b from the SMR WQMP
[G] = 43,560

Table F-2 Approximate precipitation depth/intensity values for calculation of the Trash Capture Design Storm

City	1-year 1-hour Precipitation Depth/Intensity (inches/hr)
Murrieta	0.47
Temecula	0.50
Wildomar	0.37

Use Table F-3 to summarize and document the selection and sizing of Trash Capture BMPs.

Table F-3 Trash Capture BMPs

BMP Name / ID	DMA No(s)	BMP Type / Description	Required Trash Capture Flowrate (cfs)	Provided Trash Capture Flowrate (cfs)[1]

[1] For connector pipe screens, the Trash Capture Flowrate shall be based on a fully clogged condition for the screen, where the water level is at the top of the screen. Then determined the Flowrate based on weir equation (Qweir = C x L x H^(2/3), where C = 3.4). The height used to calculate the weir flow rate shall maintain a 6" freeboard to the invert of the catch basin opening at the road. This analysis is meant to replicate the hydraulic analysis used in the County's Full Trash Capture Device Standards.

Section G: Source Control BMPs

Section H need only be completed at the Preliminary WQMP phase if source control is critical to the project successfully handling the anticipated pollutants.

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 Maximum Extent Practicable (MEP) standard typically requires both types of BMPs. In general, Operational Source Control BMPs cannot be substituted for a feasible and effective Structural Source Control BMP. Complete checklist below to determine applicable Source Control BMPs for your site.

Project-Specific WQMP Source Control BMP Checklist

All development projects must implement Source Control BMPs. Source Control BMPs are used to minimize pollutants that may discharge to the MS4. Refer to Chapter 3 (Section 3.8) of the SMR WQMP for additional information. Complete Steps 1 and 2 below to identify Source Control BMPs for the project site.

STEP 1: IDENTIFY POLLUTANT SOURCES

Review project site plans and identify the applicable pollutant sources. "Yes" indicates that the pollutant source is applicable to project site. "No" indicates that the pollutant source is not applicable to project site.

☒ Yes ☐ No	Storm Drain Inlets		☐ Yes ☒ No	Outdoor storage areas	
☐ Yes ☒ No	Floor Drains		☐ Yes ☒ No	Material storage areas	
☐ Yes ☒ No	Sump Pumps		☐ Yes ☒ No	Fueling areas	
☒ Yes ☐ No	Pets Control/Herbicide Application		☐ Yes ☒ No	Loading Docks	
☐ Yes ☒ No	Food Service Areas		☒ Yes ☐ No	Fire Sprinkler Test/Maintenance water	
☒ Yes ☐ No	Trash Storage Areas		☒ Yes ☐ No	Plazas, Sidewalks and Parking Lots	
☐ Yes ☒ No	Industrial Processes		☐ Yes ☒ No	Pools, Spas, Fountains and other water features	
☐ Yes ☒ No	Vehicle and Equipment Cleaning and Maintenance/Repair Areas				

STEP 2: REQUIRED SOURCE CONTROL BMPS

List each Pollutant source identified above in column 1 and fill in the corresponding Structural Source Control BMPs and Operational Control BMPs by referring to the Stormwater Pollutant Sources/Source Control Checklist included in Appendix 8. The resulting list of structural and operational source control BMPs must be implemented as long as the associated sources are present on the project site. Add additional rows as needed.

Pollutant Source	Structural Source Control BMP	Operational Source Control BMP
Storm Drain Inlets	Drain Inlet Marking "Only Rain Down the Storm Drain"	Maintain & Periodically Repaint or replace Inlet Markings
Pest Control/Herbicide Application	Minimize the Use of Pesticides Consider Using Pest-Resistant Plants	Provide Integrated Pest Management to New Lessees & Operators
Trash Storage	Trash Storage Area with Signs Stating No Dumping Hazardous Materials	Cover Trash Areas and Inspect Regularly, Repair or Replace

Fire Sprinkler Test/ Maintenance	Provide a Means to Drain Fire Sprinkler Test Water to the Sanitary Sewer	Maintain and Inspect Annually Perform Test as Required
Sidewalks and Parking Lot		Sweep Sidewalks & Parking Lot Regularly to Prevent the Accumulation of Litter & Debris

Section H: Coordinate Submittal with Other Site Plans

For Final WQMPs, populate Table H-1 below to assist the plan checker in an expeditious review of your project. During construction and at completion, County of Riverside inspectors will verify the installation of BMPs against the approved plans. 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 H-1 Construction Plan Cross-reference

BMP No. or ID	BMP Identifier and Description	Corresponding Plan Sheet(s)
Biofiltration Facility	BioClean Modular Wetland System	C.U.P. Exhibit Sheet 1 of 2
Biofiltration Facility	BioClean Modular Wetland System	Preliminary Grading Plan Sheet 2 0f 2
Biofiltration Facility	BioClean Modular Wetland System	Post-Construction BMP Site Plan

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. The Copermittee with jurisdiction over the Project site can advise you regarding the process required to propose changes to the approved Project-Specific WQMP.

Use Table H-2 to identify other applicable permits that may impact design of the site. If yes is answered to any of the items below, the Copermittee may require proof of approval/coverage from those agencies as applicable including documentation of any associated requirements that may affect this Project-Specific WQMP.

Table H-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 Section 401 Water Quality Certification	☐ Y	☒ N
US Army Corps of Engineers, Clean Water Act 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)*	☐ Y	☒ N

Section I: Operation, Maintenance and Funding

Applicant is required to state the intended responsible party for BMP Operation, Maintenance and Funding at the Preliminary WQMP phase. The remaining requirements as outlined above are required for Final WQMP only.

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

1. A means to finance and implement maintenance of BMPs 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 Operations and Maintenance or inspections but will require typical landscape maintenance as noted in Chapter 5, in the SMR WQMP. Include a brief description of typical landscape maintenance for these areas.

The Co-permittee with jurisdiction over the Project site will also require that you prepare and submit a detailed BMP Operation and Maintenance Plan that sets forth a maintenance schedule for each of the 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 BMP Operation and Maintenance Plan are in Chapter 5 of the SMR WQMP.

Maintenance Mechanism: TBD

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

☐ Y ☒ N

Include your Operation and Maintenance Plan and Maintenance Mechanism in Appendix 9, **see Appendix 9 for additional instructions.** 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.

Section J: Acronyms, Abbreviations and Definitions

Regional MS4 Permit	Order No. R9-2013-0001 as amended by Order No. R9-2015-0001 and Order No. R9-2015-0100 an NPDES Permit issued by the San Diego Regional Water Quality Control Board.
Applicant	Public or private entity seeking the discretionary approval of new or replaced improvements from the Copermittee with jurisdiction over the project site. The Applicant has overall responsibility for the implementation and the approval of a Priority Development Project. The WQMP uses consistently the term "user" to refer to the applicant such as developer or project proponent. The WQMP employs also the designation "user" to identify the Registered Professional Civil Engineer responsible for submitting the Project-Specific WQMP, and designing the required BMPs.
Best Management Practice (BMP)	Defined in 40 CFR 122.2 as schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the pollution of waters of the United States. BMPs also include treatment requirements, operating procedures and practices to control plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage. In the case of municipal storm water permits, BMPs are typically used in place of numeric effluent limits.
BMP Fact Sheets	BMP Fact Sheets are available in the LID BMP Design Handbook. Individual BMP Fact Sheets include sitting considerations, and design and sizing guidelines for seven types of structural BMPs (infiltration basin, infiltration trench, permeable pavement, harvest-and-use, bioretention, extended detention basin, and sand filter).
California Stormwater Quality Association (CASQA)	Publisher of the California Stormwater Best Management Practices Handbooks, available at www.cabmphandbooks.com.
Conventional Treatment Control BMP	A type of BMP that provides treatment of stormwater runoff. Conventional treatment control BMPs, while designed to treat particular Pollutants, typically do not provide the same level of volume reduction as LID BMPs, and commonly require more specialized maintenance than LID BMPs. As such, the Regional MS4 Permit and this WQMP require the use of LID BMPs wherever feasible, before Conventional Treatment BMPs can be considered or implemented.
Copermittees	The Regional MS4 Permit identifies the Cities of Murrieta, Temecula, and Wildomar, the County, and the District, as Copermittees for the SMR.
County	The abbreviation refers to the County of Riverside in this document.

CEQA	California Environmental Quality Act - a statute that requires state and local agencies to identify the significant environmental impacts of their actions and to avoid or mitigate those impacts, if feasible.
CIMIS	California Irrigation Management Information System - an integrated network of 118 automated active weather stations all over California managed by the California Department of Water Resources.
CWA	Clean Water Act - is the primary federal law governing water pollution. Passed in 1972, the CWA established the goals of eliminating releases of high amounts of toxic substances into water, eliminating additional water pollution by 1985, and ensuring that surface waters would meet standards necessary for human sports and recreation by 1983. CWA Section 402(p) is the federal statute requiring NPDES permits for discharges from MS4s.
CWA Section 303(d) Waterbody	Impaired water in which water quality does not meet applicable water quality standards and/or is not expected to meet water quality standards, even after the application of technology based pollution controls required by the CWA. The discharge of urban runoff to these water bodies by the Copermittees is significant because these discharges can cause or contribute to violations of applicable water quality standards.
Design Storm	The Regional MS4 Permit has established the 85th percentile, 24-hour storm event as the "Design Storm". The applicant may refer to Exhibit A to identify the applicable Design Storm Depth (D85) to the project.
DCV	Design Capture Volume (DCV) is the volume of runoff produced from the Design Storm to be mitigated through LID Retention BMPs, Other LID BMPs and Volume Based Conventional Treatment BMPs, as appropriate.
Design Flow Rate	The design flow rate represents the minimum flow rate capacity that flow-based conventional treatment control BMPs should treat to the MEP, when considered.
DCIA	Directly Connected Impervious Areas - those impervious areas that are hydraulically connected to the MS4 (i.e. street curbs, catch basins, storm drains, etc.) and thence to the structural BMP without flowing over pervious areas.
Discretionary Approval	A decision in which a Copermittee uses its judgment in deciding whether and how to carry out or approve a project.
District	Riverside County Flood Control and Water Conservation District.
DMA	A Drainage Management Area - a delineated portion of a project site that is hydraulically connected to a common structural BMP or conveyance point. The Applicant may refer to Section 3.3 for further guidelines on how to delineate DMAs.

Drawdown Time	Refers to the amount of time the design volume takes to pass through the BMP. The specified or incorporated drawdown times are to ensure that adequate contact or detention time has occurred for treatment, while not creating vector or other nuisance issues. It is important to abide by the drawdown time requirements stated in the fact sheet for each specific BMP.
Effective Area	Area which 1) is suitable for a BMP (for example, if infiltration is potentially feasible for the site based on infeasibility criteria, infiltration must be allowed over this area) and 2) receives runoff from impervious areas.
ESA	An Environmental Sensitive Area (ESA) designates an area "in which plants or animals life or their habitats are either rare or especially valuable because of their special nature or role in an ecosystem and which would be easily disturbed or degraded by human activities and developments". (Reference: California Public Resources Code § 30107.5).
ET	Evapotranspiration (ET) is the loss of water to the atmosphere by the combined processes of evaporation (from soil and plant surfaces) and transpiration (from plant tissues). It is also an indicator of how much water crops, lawn, garden, and trees need for healthy growth and productivity
FAR	The Floor Area Ratio (FAR) is the total square feet of a building divided by the total square feet of the lot the building is located on.
Flow-Based BMP	Flow-based BMPs are conventional treatment control BMPs that are sized to treat the design flow rate.
FPPP	Facility Pollution Prevention Plan
HCOC	Hydrologic Condition of Concern - Exists when the alteration of a site's hydrologic regime caused by development would cause significant impacts on downstream channels and aquatic habitats, alone or in conjunction with impacts of other projects.
HMP	Hydromodification Management Plan – Plan defining Performance Standards for PDPs to manage increases in runoff discharge rates and durations.
Hydrologic Control BMP	BMP to mitigate the increases in runoff discharge rates and durations and meet the Performance Standards set forth in the HMP.
HSG	Hydrologic Soil Groups – soil classification to indicate the minimum rate of infiltration obtained for bare soil after prolonged wetting. The HSGs are A (very low runoff potential/high infiltration rate), B, C, and D (high runoff potential/very low infiltration rate)
Hydromodification	The Regional MS4 Permit identifies that increased volume, velocity, frequency and discharge duration of storm water runoff from developed areas has the potential to greatly accelerate downstream erosion, impair stream habitat in natural drainages, and negatively impact beneficial uses.

JRMP	A separate Jurisdictional Runoff Management Plan (JRMP) has been developed by each Copermittee and identifies the local programs and activities that the Copermittee is implementing to meet the Regional MS4 Permit requirements.
LID	Low Impact Development (LID) is a site design strategy with a goal of maintaining or replicating the pre-development hydrologic regime through the use of design techniques. LID site design BMPs help preserve and restore the natural hydrologic cycle of the site, allowing for filtration and infiltration which can greatly reduce the volume, peak flow rate, velocity, and pollutant loads of storm water runoff.
LID BMP	A type of stormwater BMP that is based upon Low Impact Development concepts. LID BMPs not only provide highly effective treatment of stormwater runoff, but also yield potentially significant reductions in runoff volume – helping to mimic the pre-project hydrologic regime, and also require less ongoing maintenance than Treatment Control BMPs. The applicant may refer to Chapter 2.
LID BMP Design Handbook	The LID BMP Design Handbook was developed by the Copermittees to provide guidance for the planning, design and maintenance of LID BMPs which may be used to mitigate the water quality impacts of PDPs within the County.
LID Bioretention BMP	LID Bioretention BMPs are bioretention areas are vegetated (i.e., landscaped) shallow depressions that provide storage, infiltration, and evapotranspiration, and provide for pollutant removal (e.g., filtration, adsorption, nutrient uptake) by filtering stormwater through the vegetation and soils. In bioretention areas, pore spaces and organic material in the soils help to retain water in the form of soil moisture and to promote the adsorption of pollutants (e.g., dissolved metals and petroleum hydrocarbons) into the soil matrix. Plants use soil moisture and promote the drying of the soil through transpiration. The Regional MS4 Permit defines "retain" as to keep or hold in a particular place, condition, or position without discharge to surface waters.
LID Biofiltration BMP	BMPs that reduce stormwater pollutant discharges by intercepting rainfall on vegetative canopy, and through incidental infiltration and/or evapotranspiration, and filtration, and other biological and chemical processes. As stormwater passes down through the planting soil, pollutants are filtered, adsorbed, biodegraded, and sequestered by the soil and plants, and collected through an underdrain.
LID Harvest and Reuse BMP	BMPs used to facilitate capturing Stormwater Runoff for later use without negatively impacting downstream water rights or other Beneficial Uses.

LID Infiltration BMP	BMPs to reduce stormwater runoff by capturing and infiltrating the runoff into in-situ soils or amended onsite soils. Typical LID Infiltration BMPs include infiltration basins, infiltration trenches and pervious pavements.
LID Retention BMP	BMPs to ensure full onsite retention without runoff of the DCV such as infiltration basins, bioretention, chambers, trenches, permeable pavement and pavers, harvest and reuse.
LID Principles	Site design concepts that prevent or minimize the causes (or drivers) of post-construction impacts, and help mimic the pre-development hydrologic regime.
MEP	Maximum Extent Practicable - standard established by the 1987 amendments to the CWA for the reduction of Pollutant discharges from MS4s. Refer to Attachment C of the Regional MS4 Permit for a complete definition of MEP.
MF	Multi-family – zoning classification for parcels having 2 or more living residential units.
MS4	Municipal Separate Storm Sewer System (MS4) is a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains): (i) Owned or operated by a State, city, town, borough, county, parish, district, association, or other public body (created by or pursuant to State law) having jurisdiction over disposal of sewage, industrial wastes, storm water, or other wastes, including special districts under State law such as a sewer district, flood control district or drainage district, or similar entity, or an Indian tribe or an authorized Indian tribal organization, or designated and approved management agency under section 208 of the CWA that discharges to waters of the United States; (ii) Designated or used for collecting or conveying storm water; (iii) Which is not a combined sewer; (iv) Which is not part of the Publicly Owned Treatment Works (POTW) as defined at 40 CFR 122.26.
New Development Project	Defined by the Regional MS4 Permit as 'Priority Development Projects' if the project, or a component of the project meets the categories and thresholds described in Section 1.1.1.
NPDES	National Pollution Discharge Elimination System - Federal program for issuing, modifying, revoking and reissuing, terminating, monitoring and enforcing permits, and imposing and enforcing pretreatment requirements, under Sections 307, 318, 402, and 405 of the CWA.
NRCS	Natural Resources Conservation Service
PDP	Priority Development Project - Includes New Development and Redevelopment project categories listed in Provision E.3.b of the Regional MS4 Permit.

Priority Pollutants of Concern	Pollutants expected to be present on the project site and for which a downstream water body is also listed as Impaired under the CWA Section 303(d) list or by a TMDL.
Project-Specific WQMP	A plan specifying and documenting permanent LID Principles and Stormwater BMPs to control post-construction Pollutants and stormwater runoff for the life of the PDP, and the plans for operation and maintenance of those BMPs for the life of the project.
Receiving Waters	Waters of the United States.
Redevelopment Project	The creation, addition, and or replacement of impervious surface on an already developed site. Examples include the expansion of a building footprint, road widening, the addition to or replacement of a structure, and creation or addition of impervious surfaces. Replacement of impervious surfaces includes any activity that is not part of a routine maintenance activity where impervious material(s) are removed, exposing underlying soil during construction. Redevelopment does not include trenching and resurfacing associated with utility work; resurfacing existing roadways; new sidewalk construction, pedestrian ramps, or bike lane on existing roads; and routine replacement of damaged pavement, such as pothole repair. Project that meets the criteria described in Section 1.
Runoff Fund	Runoff Funds have not been established by the Copermittees and are not available to the Applicant. If established, a Runoff Fund will develop regional mitigation projects where PDPs will be able to buy mitigation credits if it is determined that implementing onsite controls is infeasible.
San Diego Regional Board	San Diego Regional Water Quality Control Board - The term "Regional Board", as defined in Water Code section 13050(b), is intended to refer to the California Regional Water Quality Control Board for the San Diego Region as specified in Water Code Section 13200. State agency responsible for managing and regulating water quality in the SMR.
SCCWRP	Southern California Coastal Water Research Project
Site Design BMP	Site design BMPs prevent or minimize the causes (or drivers) of post-construction impacts, and help mimic the pre-development hydrologic regime.
SF	Parcels with a zoning classification for a single residential unit.
SMC	Southern California Stormwater Monitoring Coalition
SMR	The Santa Margarita Region (SMR) represents the portion of the Santa Margarita Watershed that is included within the County of Riverside.

Source Control BMP	Source Control BMPs land use or site planning practices, or structural or nonstructural measures that aim to prevent runoff pollution by reducing the potential for contamination at the source of pollution. Source control BMPs minimize the contact between Pollutants and runoff.
Structural BMP	Structures designed to remove pollutants from stormwater runoff and mitigate hydromodification impacts.
SWPPP	Storm Water Pollution Prevention Plan
Tentative Tract Map	Tentative Tract Maps are required for all subdivision creating five (5) or more parcels, five (5) or more condominiums as defined in Section 783 of the California Civil Code, a community apartment project containing five (5) or more parcels, or for the conversion of a dwelling to a stock cooperative containing five (5) or more dwelling units.
TMDL	Total Maximum Daily Load - the maximum amount of a Pollutant that can be discharged into a waterbody from all sources (point and non-point) and still maintain Water Quality Standards. Under CWA Section 303(d), TMDLs must be developed for all waterbodies that do not meet Water Quality Standards after application of technology-based controls.
USEPA	United States Environmental Protection Agency
Volume-Based BMP	Volume-Based BMPs applies to BMPs where the primary mode of pollutant removal depends upon the volumetric capacity such as detention, retention, and infiltration systems.
WQMP	Water Quality Management Plan
Wet Season	The Regional MS4 Permit defines the wet season from October 1 through April 30.

Appendix 1: Maps and Site Plans

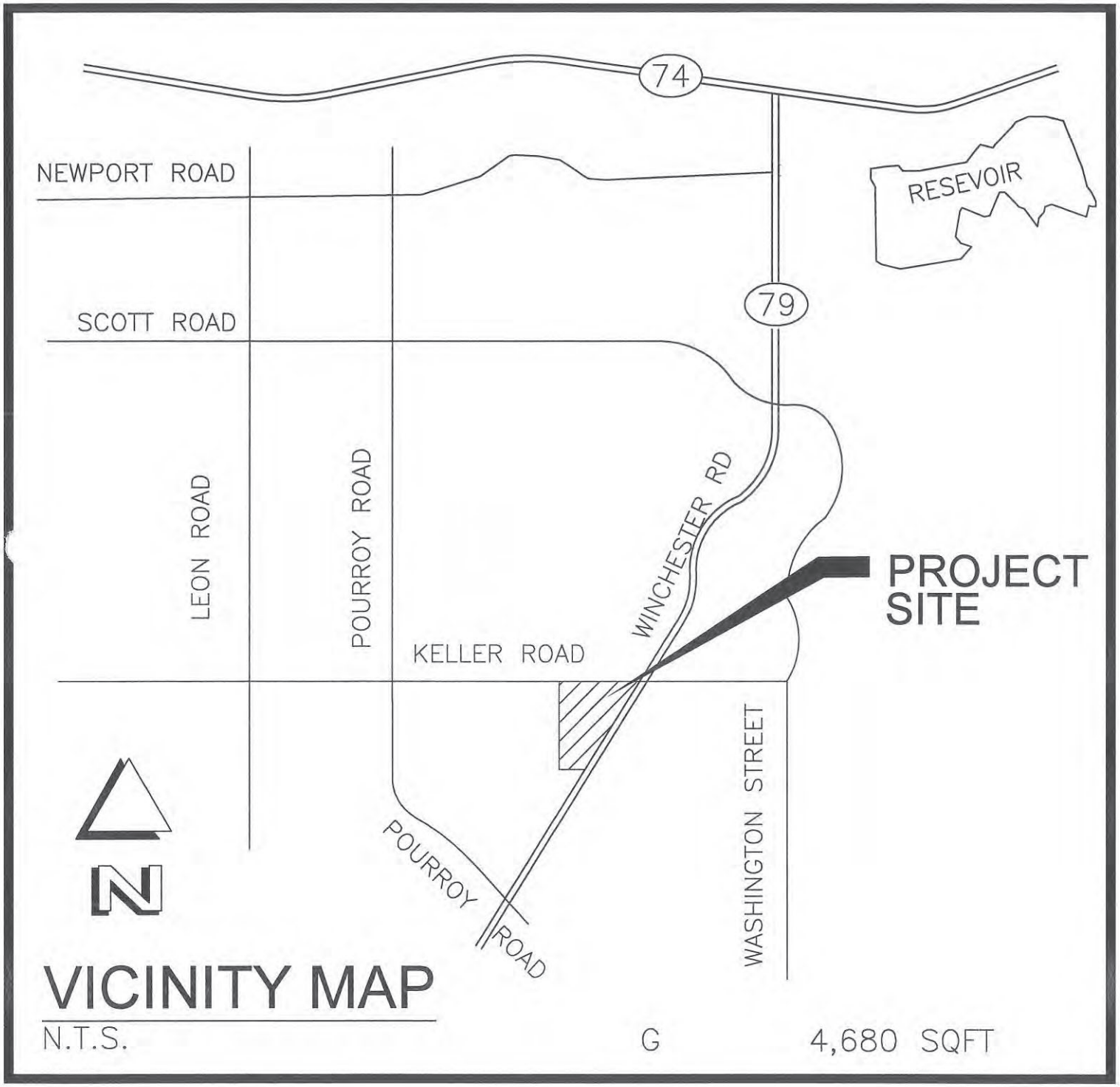
Location Map, WQMP Site Plan and Receiving Waters Map

Complete the checklist below to verify all exhibits and components are included in the Project-Specific WQMP. Refer Section 4 of the SMR WQMP and Section D of this Template.

Map and Site Plan Checklist

Indicate all Maps and Site Plans are included in your Project-Specific WQMP by checking the boxes below.

- ☒ Vicinity and Location Map
- ☒ Existing Site Map (unless exiting conditions are included in WQMP Site Plan)
- ☒ WQMP Site Plan
  - ☒ Parcel Boundary and Project Footprint
  - ☒ Existing and Proposed Topography & Drainage Management Areas (DMAs)
  - ☐ Proposed Structural Best Management Practices (BMPs), with cross sections
  - ☒ Drainage Paths
  - ☒ Drainage infrastructure, inlets, overflows
  - ☒ Source Control & Site Design BMPs (notes can be used for BMPs that can't be depicted)
  - ☒ Buildings, Roof Lines, Downspouts
  - ☒ Impervious Surfaces
  - ☒ Pervious Surfaces (i.e. Landscaping)
  - ☒ Standardized Labeling
  - ☐ Use Riverside County Flood Control CB-110 for outlet structure with block outs for a trash screen out the outside, and an orifice/weir plate(s) on the inside of the structure or other design that is as easy to maintain. The screen should be as large as possible to minimize clogging.
  - ☐ If BMPs are in the road R/W (only with CFD/CSA maintenance or LID Principals) add "BMP" paddle markers at the start and end of each BMPs and LID principals
  - ☐ When underdrain are proposed, gravel shall be clean washed gravel, AASHTO #57 stone preferred. Underdrains shall be Schedule 40 PVC, with a minimum slope of 0.005, with cleanouts equal in diameter of the subdrain that extends 6 inches above the media with a lockable screw cap, spaced every 50 feet, at the collector drain line connection, and at any bends.
  - ☐ When BSM is proposed, BSM shall consist of 60-80% clean sand, up to 20% clean topsoil, and 20% of a nutrient-stabilized organic amendment. BSM shall be placed on top of 3-inches of Choker Sand placed on top of 3-inches of ASTM No. 8 stone (1/4 to 1/2-inch pea gravel), and placed on top of 12 to 24-inches of a clean, open-graded drain rock layer.
  - ☐ For Tracts, the Regional Board requires fully functioning WQMP BMPs for opening model home complexes, sales offices, or use of roads (i.e. prior to occupancy or intended use of any portion of the project). The County encourages phasing post-construction BMPs, small structural BMPs (e.g. specifically for sales offices), or self-retaining areas. This phasing can be shown on the WQMP site map and sequencing shall be included on the Grading plans, so that a fully functioning WQMP BMP is addressing any portion of the project that has been granted occupancy or granted the intended use.



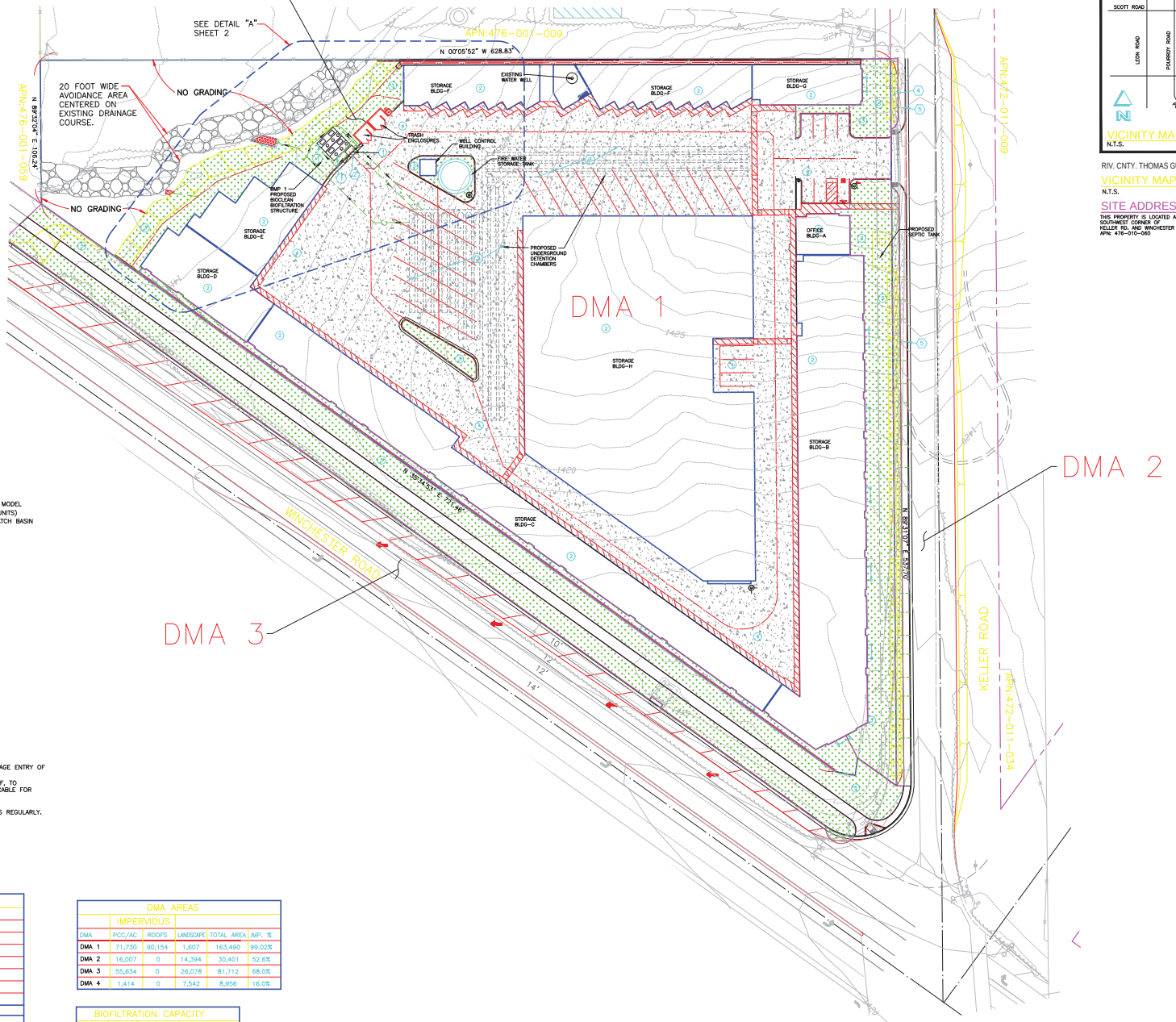
VICINITY MAP

N.T.S.

G

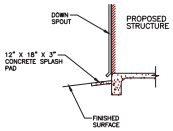
4,680 SQFT

TEMECULA VALLEY SELF STORAGE



LEGEND

- DENOTES LANDSCAPE AREAS
- PROPERTY BOUNDARY
- STREET CENTERLINE
- DMA BOUNDARY
- DENOTES CONCRETE AREAS



ROOF DRAIN DOWN SPOUT DETAIL
N.T.S.

CONSTRUCTION NOTES:

1. CONSTRUCT BIO CLEAN STORMWATER BIO FILTRATION SYSEM MODEL MWS-L-8-16-3'-11"-V-UG PER DETAIL ON SHEET 2 (2 UNITS)
2. CONSTRUCT MODULAR TROUGH DIVERSION SYSTEM INSIDE CATCH BASIN PER DETAIL ON SHEET 2
3. UNERGROUND DETENTION CHAMBERS PER GRADING PLAN
4. SELF RETAINING LANDSCAPE AREA (TYPICAL OF 13)
5. 2" PVC INLET TO RETAINING AREA

PERMANENT SOURCE CONTROL BMPs

1. STENCIL INLET STRUCTURES "ONLY RAIN IN THE DRAIN".
2. INCORPORATE BUILDING DESIGN FEATURES THAT DISCOURAGE ENTRY OF PESTS. APPLICABLE FOR ALL BUILDINGS
3. DESIGN LANDSCAPING TO MINIMIZE IRRIGATION AND RUNOFF, TO MINIMIZE THE USE OF FERTILIZER AND PESTICIDES. APPLICABLE FOR ALL LANDSCAPE AREAS.
4. PROHIBITIVE LANGUAGE, SWEEP SIDEWALKS, PARKING LOTS, AND PRIVATE STREETS REGULARLY.
5. OUTSIDE TRACT LANDSCAPE PARKWAY AREA

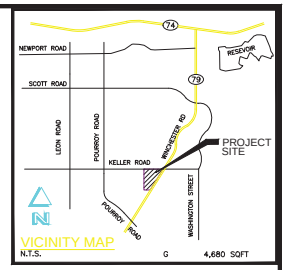
SOURCE CONTROL BMP's	
No.	DESCRIPTION
SC-34	WASTE HANDLING AND DISPOSAL
SC-71	PLAZA AND SIDEWALK CLEANING
SC-73	LANDSCAPE MAINTENANCE
SC-74	DRAINAGE SYSTEM MAINTENANCE
SD-10	SITE DESIGN AND LANDSCAPE PLANNING
SD-12	EFFICIENT IRRIGATION

LID BMP's	
No.	DESCRIPTION
TC-32	BIORETENTION FACILITY

DMA AREAS					
	IMPERVIOUS				
DMA	PCC/AC	ROOFS	LANDSCAPE	TOTAL AREA	IMP. %
DMA 1	71,730	90,154	1,607	163,490	99.02%
DMA 2	16,007	0	14,394	30,401	52.6%
DMA 3	55,634	0	26,078	81,712	68.0%
DMA 4	1,414	0	7,542	8,956	16.0%

BIOFILTRATION CAPACITY			
DMA	QBMP	STRUCTURE	FLOW RATE
DMA 1&3	0.9 CFS	BMP 1	TBD

NOTE: DMA 2 & 4 ARE SELF-TREATING



VICINITY MAP
N.T.S.
G 4,680 SQFT

RIV. CNTY. THOMAS GUIDE PAGE 899, GRID E03, 2013 EDITION

VICINITY MAP
N.T.S.

SITE ADDRESS
THIS PROPERTY IS LOCATED AT THE SOUTHWEST CORNER OF KELLER RD. AND WINCHESTER RD. APN: 476-010-060

30 0 30 60
Scale 1" = 30

PROFESSIONAL ENGINEER No. 55750 Exp. 12-31-14 CIVIL STATE OF CALIFORNIA

REVISIONS:			
REMARK	DESCRIPTION:	APR.:	DATE:

DESIGNED: VGK DRAWN: VGK CHECKED: VGK

THE PRIZM GROUP
330 N. COTA ST. SUITE I, CORONA, CA 92880
PHONE: (951) 737-6400 ■ tpg@the-prism-group.com
■ LEICA HDS LASER SCANNING
■ GPS & ROBOTIC SURVEYING
■ GEOMATIC ENGINEERING
■ CIVIL ENGINEERING
■ LAND PLANNING

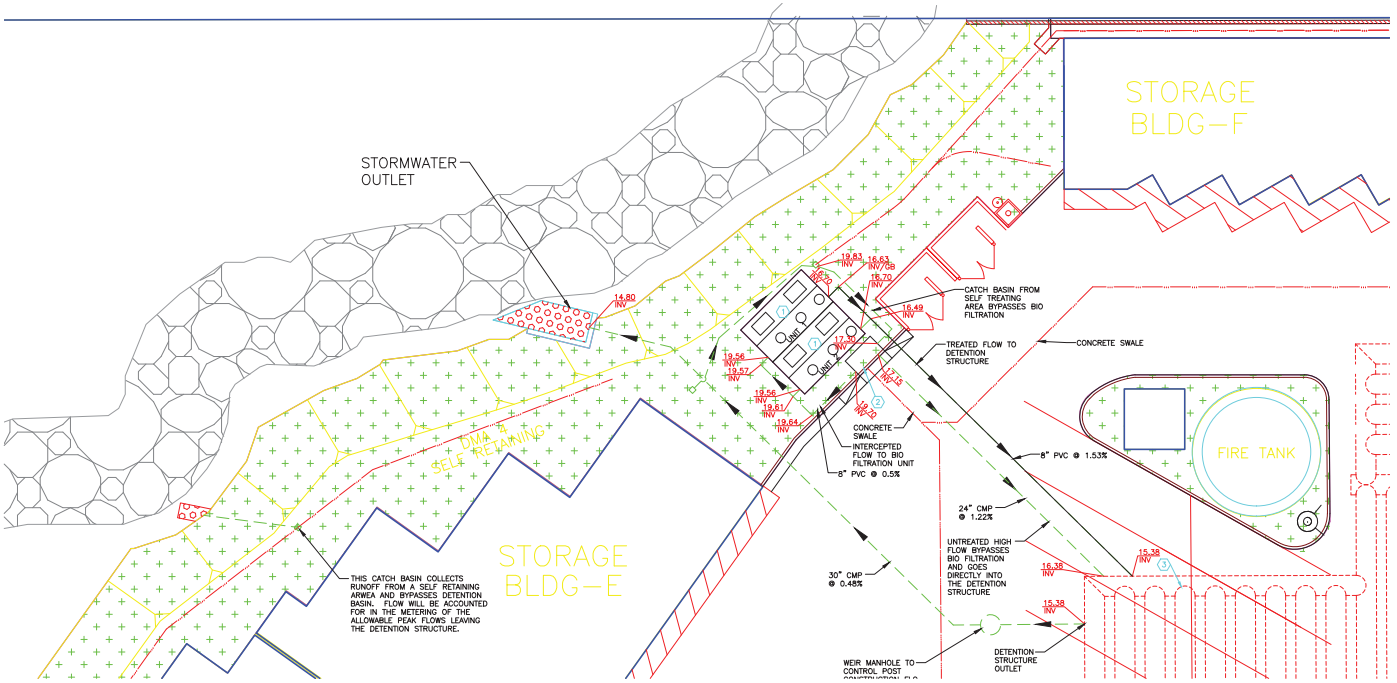
Scale: NA
Bench Mark: NA
Date: 6-15-22

POST-CONSTRUCTION BMP SITE PLAN
TEMECULA VALLEY SELF STORAGE

Sheet No. 1 OF 2 SHEETS
FILE NO. 19-004

File name: P:\TPG\19\19-004\WQMP\19-004 WQMP01.dwg

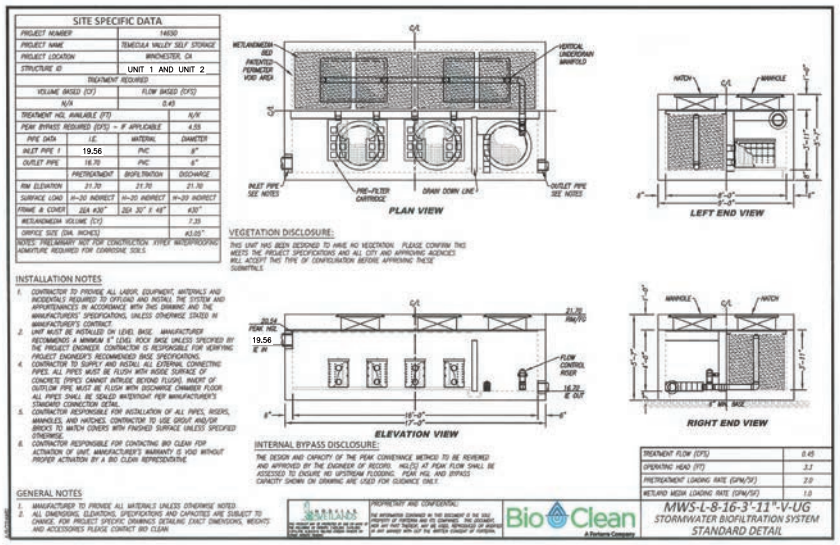
TEMECULA VALLEY SELF STORAGE



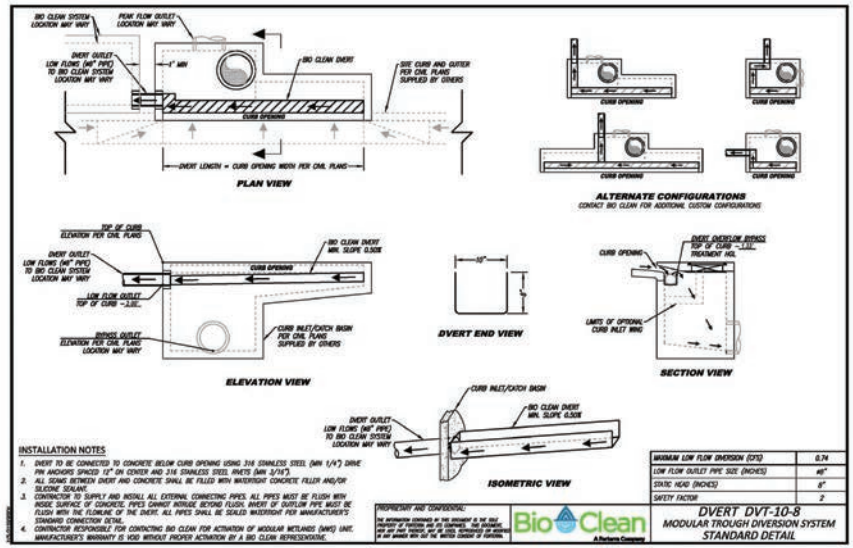
DETAIL "A"
1" = 10'

CONSTRUCTION NOTES:

1 CONSTRUCT BIO CLEAN STORMWATER BIO FILTRATION SYSEM MODEL MWS-L-8-16-3'-11"-V-UG (2 UNITS)
2 CONSTRUCT MODULAR TROUGH DIVERSION SYSTEM INSIDE CATCH BASIN PER DETAIL ON SHEET 2
3 UNERGROUND DETENTION CHAMBERS PER GRADING PLAN



1 BIOFILTRATION SYSTEM
N.T.S. UNIT 1 AND UNIT 2



2 DIVERSION TROUGH
N.T.S.

30 0 30 60
Scale 1" = 30

REVISIONS:
REMARK | DESCRIPTION: | APR. | DATE:

THE PRIZM GROUP
130 N. COTA ST. SUITE I, CORONA, CA 92880
PHONE: (951) 737-4436 • tpg@the-prizm-group.com
• LEICA HDS LASER SCANNING
• GPS & ROBOTIC SURVEYING
• GEOMATIC ENGINEERING
• CIVIL ENGINEERING
• LAND PLANNING

Scale: NA
Bench Mark: SEE THIS SHEET
Date: 6-15-22
DESIGNED: VGK DRAWN: VGK CHECKED: VGK

POST-CONSTRUCTION BMP SITE PLAN
TEMECULA VALLEY SELF STORAGE

Sheet No. 2 OF 2 SHEETS
FILE NO. 19-004

File name: P:\TPG\19\19-004\WQMP\19-004 WQMP02.dwg

Appendix 2: Construction Plans

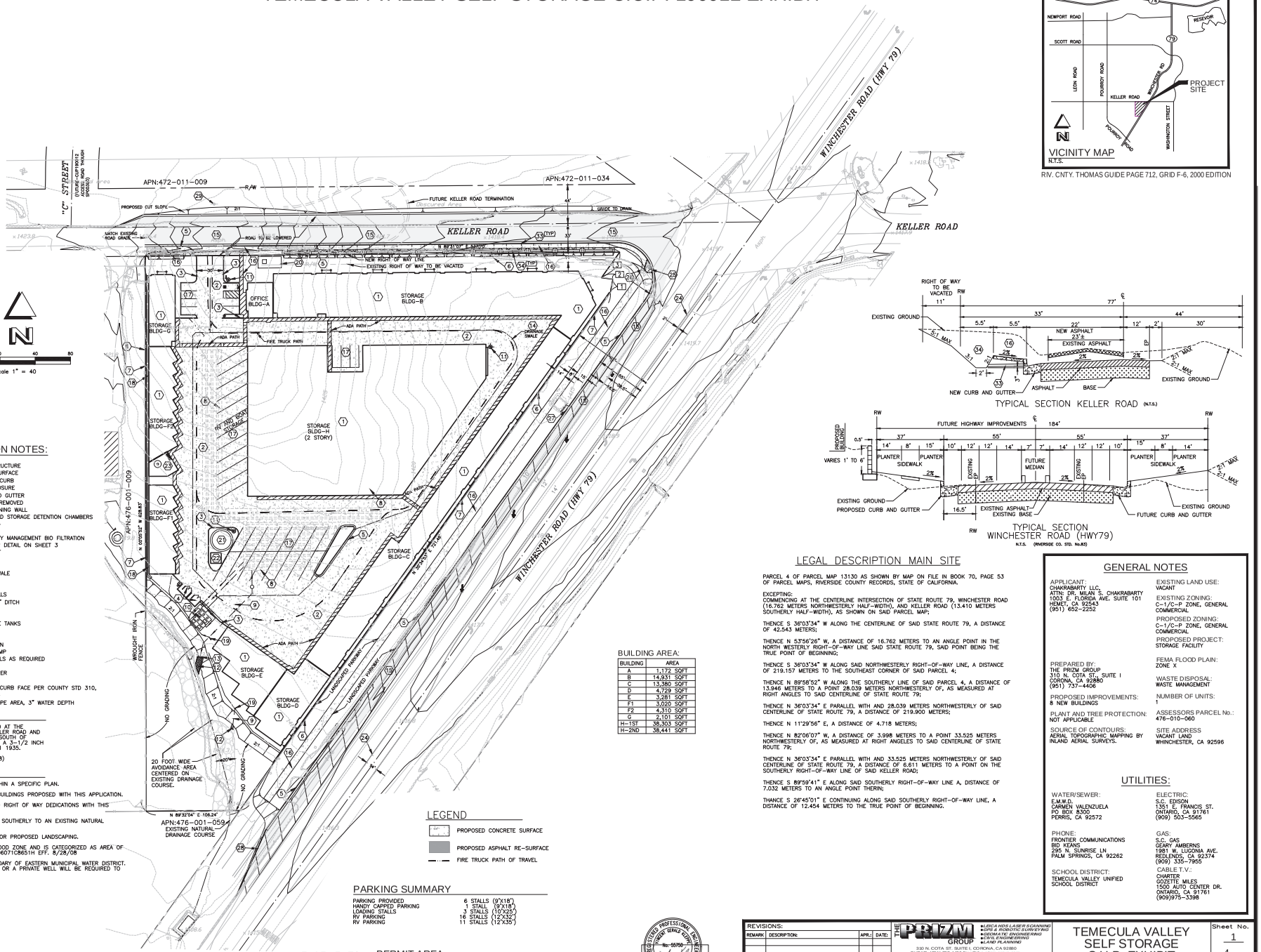
*The latest set of Grading, Drainage Plans, and Street Improvement plans **shall be included***

Bioretention/Biofiltration BMPs construction notes (Santa Margarita Region only). For Bioretention and Biofiltration facilities, the **following construction notes shall be shown on the Grading and/or Drainage plans:**

1. *The Engineer shall furnish to the County a copy of the source testing and a signed certification that the fully blended Bioretention/Biofiltration Soil Media (BSM) material meets all of the WQMP requirements before material is imported or if the material is mixed onsite prior to installation.*
2. *As BSM material is being installed, Quality Assurance (QA) tests shall be conducted or for every 1,200 tons or 800 cubic yards mixed on-site from a completely mixed stockpile or windrow, with a minimum of three tests. For imported material from a supplier with a quality control program the QA tests shall be conducted 2,400 tons or 1,600 cubic yards from the supplier.*
3. *The Engineer conducting the Quality Control testing shall furnish to the County copy of the QA testing and a certification that the BSM for the project meets all of the following requirements. Certified mitigation plans can be used for exceedances, as long as all requirements are designed to be met.*
    a. *BSM shall not be compacted. BSM shall consist of 60-80% clean sand, up to 20% clean topsoil, and 20% of a nutrient-stabilized organic amendment. The initial infiltration rate shall be greater than 8 inches per hour per laboratory test.*
    b. *pH: 6.0 – 8.5; Salinity: 0.5 to 3.0 mmho/cm as electrical conductivity; Sodium absorption ratio: < 6.0; Chloride: < 800 ppm in saturated extract; Cation Exchange Capacity (CEC): > 10 meq/100 g; Organic Matter: 2 to 5-percent on a dry weight basis; Carbon: Nitrogen Ratio: 12 to 40, preferably 15 to 40; Gravel larger than 2mm: 0 to 25-percent of the total sample; Clay smaller than 0.005mm: 0 to 5 percent of the non-gravel fraction.*
    c. *BSM shall be tested to limit the leaching of potential inherent pollutants. BSM used in Biofiltration BMPs shall conform to the following limits for pollutant concentrations in saturated extract: Phosphorus: < 1 mg/L; Nitrate < 3 mg/L, Copper < 0.025 mg/L. These pollutant limits are for the amount that is leached from the sample, not from the soil sample itself. Testing may be performed after laboratory rinsing of media with up to 15 pore volumes of water. Equivalent test results will be accepted if certified by a laboratory or appropriate testing facility.*
    d. *Low nutrient compost used in BSM shall be sourced from a facility permitted through CalRecycle, preferably through USCC STA program. Compost shall conform to the following requirements: Physical contaminants <1% by dry weight; Carbon:Nitrogen ratio: 12:1 to 40:1; Maturity/Stability shall conform to either: Solvita Maturity Index: ≥ 5.5, CO2 Evolution: < 2.5 mg CO2-C per g compost organic matter per day, or < 5 mg CO2-C per g compost C per day; Select Pathogens and Trace metals shall pass US EPA Class A Standard. Testing shall be no more than 6 months old and representative of current stockpiles.*
    e. *Coconut coir pith used in BSM shall be thoroughly rinsed with freshwater and screened to remove coarse fibers as part of production and aged > 6 months. Peat used in BSM shall be sphagnum peat.*

Please notify the County if additional sources and laboratories can be added to this list. The Potential Sources and Laboratories are not part of the construction note - **Potential BSM sources may include**: Gail Materials (Temescal Valley), Agriservice (Oceanside), and Greatsoils (Escondido). Earthworks (Riverside); **Potential Laboratories may include**: Fruit Growers Laboratory, Inc. (Santa Paula, http://www.fglinc.com/) Wallace Laboratories (El Segundo, http://us.wlabs.com/). Control Labs (Watsonville, http://www.controllabs.com) and A&L Western Laboratories (Modesto, http://www.al-labs-west.com/).

TEMECULA VALLEY SELF STORAGE C.U.P. 190012 EXHIBIT



RIV. CNTY. THOMAS GUIDE PAGE 712, GRID F-6, 2000 EDITION

TYPICAL SECTION KELLER ROAD (N.T.S.)

TYPICAL SECTION
WINCHESTER ROAD (HWY79)
N.T.S. (RIVERSIDE CO. STD. No.83)

CONSTRUCTION NOTES:

1 PROPOSED STORAGE STRUCTURE
2 PROPOSED CONCRETE SURFACE
3 PROPOSED 6" PLANTER CURB
4 PROPOSED TRASH ENCLOSURE
5 PROPOSED 6" CURB AND GUTTER
6 EXISTING FENCE TO BE REMOVED
7 PROPOSED BLOCK RETAINING WALL
8 PROPOSED UNDERGROUND STORAGE DETENTION CHAMBERS PER DETAIL ON SHEET 4
9 PROPOSED STORM DRAIN
10 PROPOSED WATER QUALITY MANAGEMENT BIO FILTRATION CHAMBER 1 AND 2, PER DETAIL ON SHEET 3
11 PROPOSED FIRE HYDRANT
12 PROPOSED RIP RAP PAD
13 PROPOSED HEAD WALL
14 PROPOSED CONCRETE SWALE
15 NEW ASPHALT SURFACE
16 PROPOSED SIDEWALK
17 PROPOSED PARKING STALLS
18 PROPOSED CONCRETE "V" DITCH
19 CATCH BASIN
20 PROPOSED SEPTIC TANK
21 PROPOSED FIRE STORAGE TANKS
22 PROPOSED PUMP HOUSE
23 WATER WELL
24 PROPOSED RAISED MEDIAN
25 PROPOSED HANDICAP RAMP
26 RELOCATE TRAFFIC SIGNALS AS REQUIRED
27 PROPOSED CATCH BASIN
28 PROPOSED AC BERM TAPER
29 PROTECT IN PLACE
33 2" PVC INLET THROUGH CURB FACE PER COUNTY STD 310, AND DETAIL ON SHEET 3
34 SELF RETAINING LANDSCAPE AREA, 3" WATER DEPTH

BENCHMARK

NGS CONTROL POINT DX1680 AT THE NORTHWEST CORNER OF KELLER ROAD AND WASHINGTON STREET, 8.8FT SOUTH OF POWER POLE No. 20758606, A 3-1/2 INCH BRASS DISK, STAMPED X 311 1935.

ELEVATION: 1433.58' (NAVD88)

NOTES

1. THIS PROJECT IS NOT WITHIN A SPECIFIC PLAN.
2. THERE ARE 8 NEW NEW BUILDINGS PROPOSED WITH THIS APPLICATION.
3. THERE ARE NO PROPOSED RIGHT OF WAY DEDICATIONS WITH THIS APPLICATION.
4. ALL STORM WATER FLOWS SOUTHERLY TO AN EXISTING NATURAL DRAINAGE PATH.
5. SEE LANDSCAPING PLAN FOR PROPOSED LANDSCAPING.
6. THE SITE IS IN THE X FLOOD ZONE AND IS CATEGORIZED AS AREA OF MINIMAL FLOOD HAZARD. 06071C8651H EFF. 8/28/08
7. SITE IS WITHIN THE BOUNDARY OF EASTERN MUNICIPAL WATER DISTRICT. A WATER MAIN EXTENSION OR A PRIVATE WELL WILL BE REQUIRED TO SERVE THE SITE.

BUILDING AREA:

BUILDING	AREA
A	1,172 SQFT
B	14,931 SQFT
C	13,380 SQFT
D	4,729 SQFT
E	3,281 SQFT
F1	3,020 SQFT
F2	4,310 SQFT
G	2,101 SQFT
H-1ST	38,303 SQFT
H-2ND	38,441 SQFT

LEGEND

PROPOSED CONCRETE SURFACE
PROPOSED ASPHALT RE-SURFACE
FIRE TRUCK PATH OF TRAVEL

PARKING SUMMARY

PARKING PROVIDED	6 STALLS (9'X18')
HANDY CAPPED PARKING	1 STALL (9'X18')
LOADING STALLS	3 STALLS (10'X25')
RV PARKING	16 STALLS (12'X32')
RV PARKING	11 STALLS (12'X35')

EASEMENTS

NONE

PERMIT AREA

THE PROPOSED PERMIT AREA COVERS APPROXIMATELY 4.6 ACRES.

LEGAL DESCRIPTION MAIN SITE

PARCEL 4 OF PARCEL MAP 13130 AS SHOWN BY MAP ON FILE IN BOOK 70, PAGE 53 OF PARCEL MAPS, RIVERSIDE COUNTY RECORDS, STATE OF CALIFORNIA.

EXCEPTING:
COMMENCING AT THE CENTERLINE INTERSECTION OF STATE ROUTE 79, WINCHESTER ROAD (16.762 METERS NORTHWESTERLY HALF-WIDTH), AND KELLER ROAD (13.410 METERS SOUTHERLY HALF-WIDTH), AS SHOWN ON SAID PARCEL MAP;

THENCE S 36°03'34" W ALONG THE CENTERLINE OF SAID STATE ROUTE 79, A DISTANCE OF 42.543 METERS;

THENCE N 53°56'26" W, A DISTANCE OF 16.762 METERS TO AN ANGLE POINT IN THE NORTH WESTERLY RIGHT-OF-WAY LINE SAID STATE ROUTE 79, SAID POINT BEING THE TRUE POINT OF BEGINNING;

THENCE S 36°03'34" W ALONG SAID NORTHWESTERLY RIGHT-OF-WAY LINE, A DISTANCE OF 219.157 METERS TO THE SOUTHEAST CORNER OF SAID PARCEL 4;

THENCE N 89°58'52" W ALONG THE SOUTHERLY LINE OF SAID PARCEL 4, A DISTANCE OF 13.946 METERS TO A POINT 28.039 METERS NORTHWESTERLY OF, AS MEASURED AT RIGHT ANGLES TO SAID CENTERLINE OF STATE ROUTE 79;

THENCE N 36°03'34" E PARALLEL WITH AND 28.039 METERS NORTHWESTERLY OF SAID CENTERLINE OF STATE ROUTE 79, A DISTANCE OF 219.900 METERS;

THENCE N 11°29'56" E, A DISTANCE OF 4.718 METERS;

THENCE N 82°06'07" W, A DISTANCE OF 3.998 METERS TO A POINT 33.525 METERS NORTHWESTERLY OF, AS MEASURED AT RIGHT ANGELES TO SAID CENTERLINE OF STATE ROUTE 79;

THENCE N 36°03'34" E PARALLEL WITH AND 33.525 METERS NORTHWESTERLY OF SAID CENTERLINE OF STATE ROUTE 79, A DISTANCE OF 6.611 METERS TO A POINT ON THE SOUTHERLY RIGHT-OF-WAY LINE OF SAID KELLER ROAD;

THENCE S 89°59'41" E ALONG SAID SOUTHERLY RIGHT-OF-WAY LINE A, DISTANCE OF 7.032 METERS TO AN ANGLE POINT THERIN;

THANCE S 26°45'01" E CONTINUING ALONG SAID SOUTHERLY RIGHT-OF-WAY LINE, A DISTANCE OF 12.454 METERS TO THE TRUE POINT OF BEGINNING.

GENERAL NOTES

APPLICANT:
CHAKRABARTY LLC,
ATTN: DR. MILAN S. CHAKRABARTY
1003 E. FLORIDA AVE. SUITE 101
HEMET, CA 92543
(951) 652-2252

EXISTING LAND USE:
VACANT

EXISTING ZONING:
C-1/C-P ZONE, GENERAL COMMERCIAL

PROPOSED ZONING:
C-1/C-P ZONE, GENERAL COMMERCIAL

PROPOSED PROJECT:
STORAGE FACILITY

PREPARED BY:
THE PRIZM GROUP
310 N. COTA ST., SUITE I
CORONA, CA 92880
(951) 737-4406

FEMA FLOOD PLAIN:
ZONE X

WASTE DISPOSAL:
WASTE MANAGEMENT

PROPOSED IMPROVEMENTS:
8 NEW BUILDINGS

NUMBER OF UNITS:
1

PLANT AND TREE PROTECTION:
NOT APPLICABLE

ASSESSORS PARCEL No.:
476-010-060

SOURCE OF CONTOURS:
AERIAL TOPOGRAPHIC MAPPING BY INLAND AERIAL SURVEYS.

SITE ADDRESS
VACANT LAND
WHINCHESTER, CA 92596

UTILITIES:

WATER/SEWER:
E.M.W.D.
CARMEN VALENZUELA
PO BOX 8300
PERRIS, CA 92572

ELECTRIC:
S.C. EDISON
1351 E. FRANCIS ST.
ONTARIO, CA 91761
(909) 503-5565

PHONE:
FRONTIER COMMUNICATIONS
BID KEANS
295 N. SUNRISE LN
PALM SPRINGS, CA 92262

GAS:
S.C. GAS
GEARY AMBERNS
1981 W. LUGONIA AVE.
REDLENDS, CA 92374
(909) 335-7955

SCHOOL DISTRICT:
TEMECULA VALLEY UNIFIED SCHOOL DISTRICT

CABLE T.V.:
CHARTER
GOZETTE MILES
1500 AUTO CENTER DR.
ONTARIO, CA 91761
(909)975-3398

REGISTERED PROFESSIONAL ENGINEER — No. 55750 — CIVIL — STATE OF CALIFORNIA

REVISIONS:			
REMARK	DESCRIPTION:	APR.:	DATE:

DESIGNED: VGK | DRAWN: LEO | CHECKED: VGK

THE PRIZM GROUP
•LEICA HDS LASER SCANNING
•GPS & ROBOTIC SURVEYING
•GEOMATIC ENGINEERING
•CIVIL ENGINEERING
•LAND PLANNING
310 N. COTA ST. SUITE I, CORONA, CA 92880
PHONE: (951) 737-4406 •mail@the-prizm-group.com

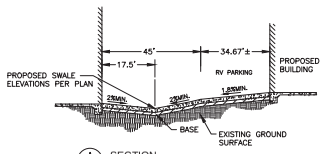
Scale: 1" = 40'
Bench Mark: SEE THIS SHEET
Date: 6-15-22

TEMECULA VALLEY SELF STORAGE C.U.P. EXHIBIT TITLE SHEET

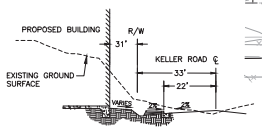
Sheet No. 1 OF 4 SHEETS
FILE NO. 19-004

File name: P:\TPG\19\19-004\CUP\19-004 CUP01.dwg

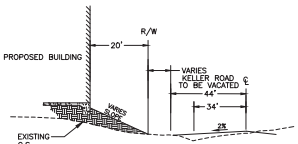
TEMECULA VALLEY SELF STORAGE PRELIMINARY GRADING PLAN



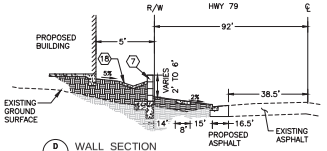
A SECTION N.T.S.



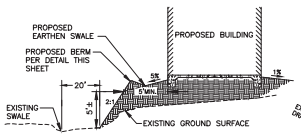
B SECTION N.T.S.



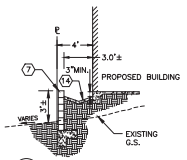
C WALL SECTION N.T.S.



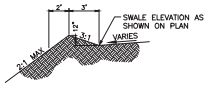
D WALL SECTION N.T.S.



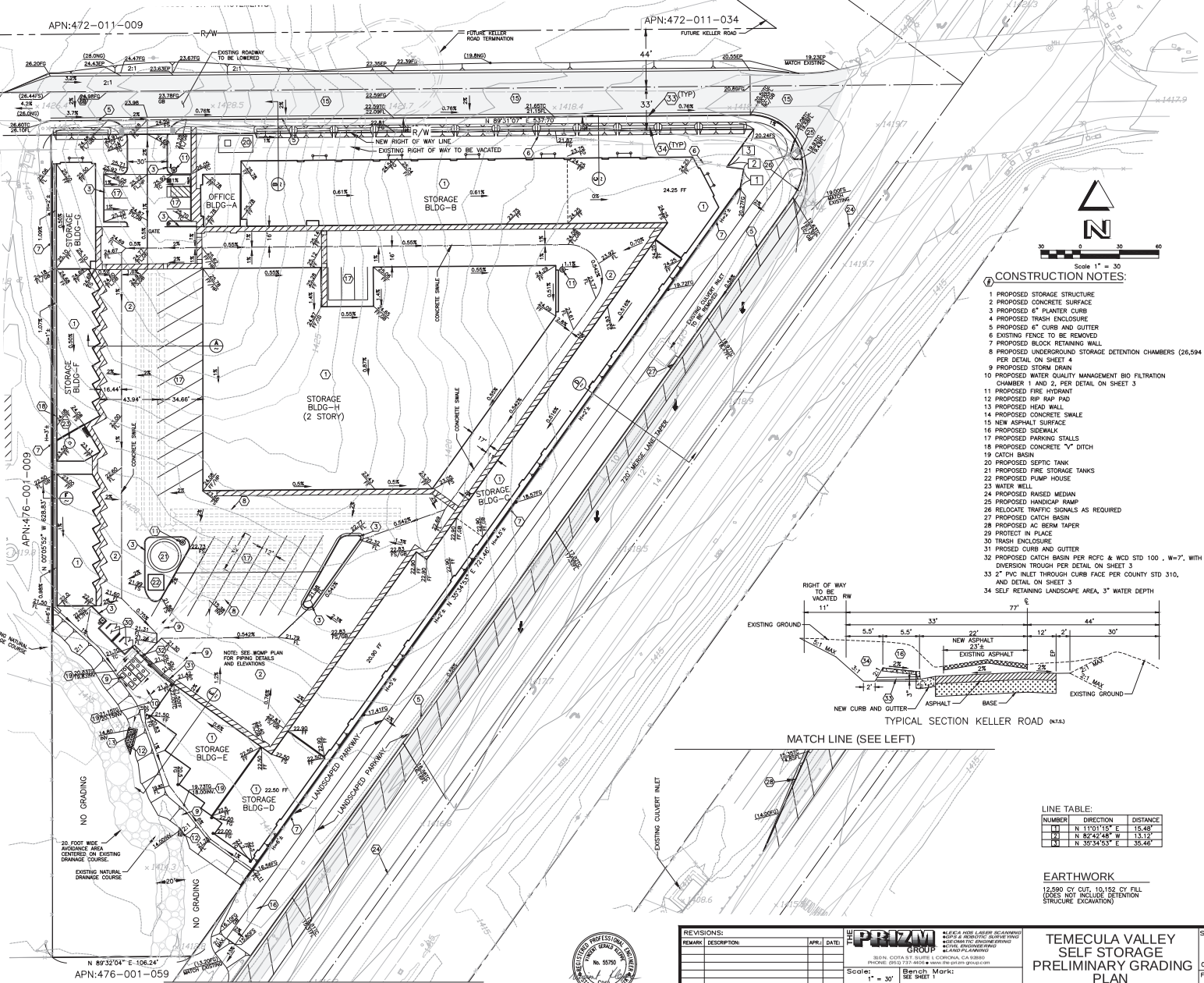
E SECTION N.T.S.



F SECTION N.T.S.



BERM DETAIL N.T.S.



CONSTRUCTION NOTES:

1. PROPOSED STORAGE STRUCTURE
2. PROPOSED CONCRETE SURFACE
3. PROPOSED 6" PLANTER CURB
4. PROPOSED TRASH ENCLOSURE
5. PROPOSED 6" CURB AND GUTTER
6. EXISTING FENCE TO BE REMOVED
7. PROPOSED BLOCK RETAINING WALL
8. PROPOSED UNDERGROUND STORAGE DETENTION CHAMBERS (26,594 CF) PER DETAIL ON SHEET 4
9. PROPOSED STORM DRAIN
10. PROPOSED WATER QUALITY MANAGEMENT BIO FILTRATION CHAMBER 1 AND 2, PER DETAIL ON SHEET 3
11. PROPOSED FIRE HYDRANT
12. PROPOSED RIP RAP PAD
13. PROPOSED HEAD WALL
14. PROPOSED CONCRETE SWALE
15. NEW ASPHALT SURFACE
16. PROPOSED SIDEWALK
17. PROPOSED PARKING STALLS
18. PROPOSED CONCRETE "V" DITCH
19. CATCH BASIN
20. PROPOSED SEPTIC TANK
21. PROPOSED FIRE STORAGE TANKS
22. PROPOSED PUMP HOUSE
23. WATER WELL
24. PROPOSED RAISED MEDIAN
25. PROPOSED HANDICAP RAMP
26. RELOCATE TRAFFIC SIGNALS AS REQUIRED
27. PROPOSED CATCH BASIN
28. PROPOSED AC BERM TAPER
29. PROTECT IN PLACE
30. TRASH ENCLOSURE
31. PROSED CURB AND GUTTER
32. PROPOSED CATCH BASIN PER RCFC & WCD STD 100 , W=7', WITH DIVERSION TROUGH PER DETAIL ON SHEET 3
33. 2" PVC INLET THROUGH CURB FACE PER COUNTY STD 310, AND DETAIL ON SHEET 3
34. SELF RETAINING LANDSCAPE AREA, 3" WATER DEPTH

TYPICAL SECTION KELLER ROAD (N.T.S.)

LINE TABLE:

NUMBER	DIRECTION	DISTANCE
L1	N 11°01'15" E	15.48'
L2	N 82°42'48" W	13.12'
L3	N 35°34'53" E	35.46'

EARTHWORK

12,590 CY CUT, 10,152 CY FILL
(DOES NOT INCLUDE DETENTION STRUCURE EXCAVATION)

REVISIONS:

REMARK	DESCRIPTION:	APR.:	DATE:

DESIGNED: VGK DRAWN: LEO CHECKED: VGK

THE PRIZM GROUP
•LEICA HDS LASER SCANNING
•GPS & ROBOTIC SURVEYING
•GEOMATIC ENGINEERING
•CIVIL ENGINEERING
•LAND PLANNING
310 N. COTA ST. SUITE I CORONA, CA 92880
PHONE: (951) 737-4404 ● www.the-prizm-group.com

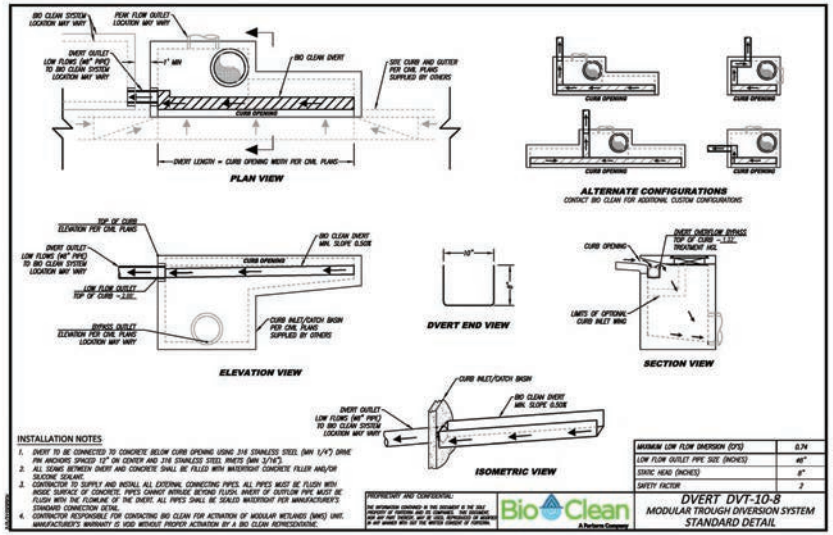
Scale: 1" = 30'
Bench Mark: SEE SHEET 1
Date: 6-15-22

TEMECULA VALLEY SELF STORAGE PRELIMINARY GRADING PLAN

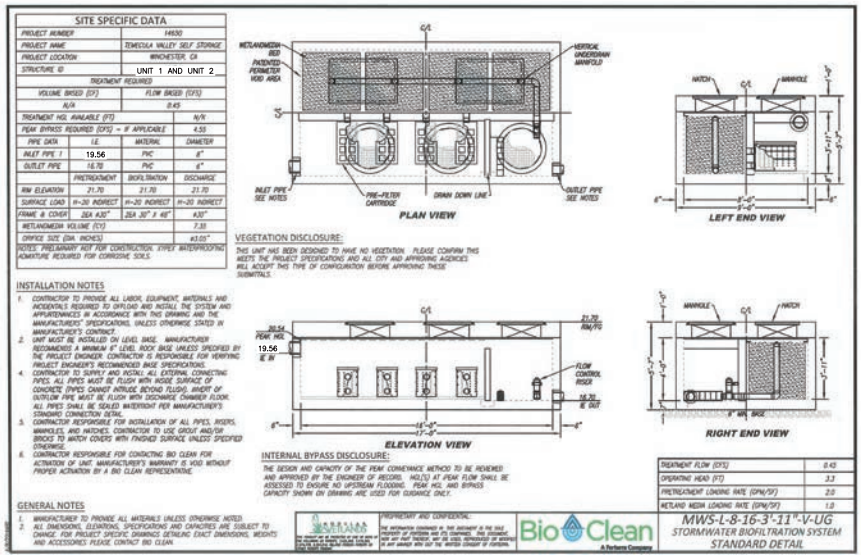
Sheet No. 2 OF 4 SHEETS
FILE NO. 19-004

File name: P:\TPG\19\19-004\GP\19-004PGP02.dwg

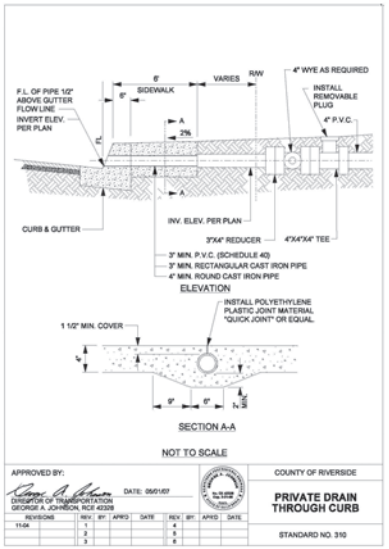
TEMECULA VALLEY SELF STORAGE DETAILS



32 DIVERSION TROUGH DETAIL
N.T.S.



10 WQMP BIOFILTRATION CHAMBER
N.T.S. UNIT 1 AND UNIT 2



33 CURB INLET DETAIL
N.T.S.

REGISTERED PROFESSIONAL ENGINEER — No. 55750 — STATE OF CALIFORNIA

REVISIONS:

REMARK	DESCRIPTION:	APR.:	DATE:

DESIGNED: VGK | DRAWN: LEO | CHECKED: VGK

THE PRIZM GROUP
•LEICA HDS LASER SCANNING
•GPS & ROBOTIC SURVEYING
•GEOMATIC ENGINEERING
•CIVIL ENGINEERING
•LAND PLANNING
310 N. COTA ST. SUITE I CORONA, CA 92880
PHONE: (951) 737-4404 • www.the-prizm-group.com

Scale: NONE
Bench Mark: SEE THIS SHEET
Date: 6-15-22

TEMECULA VALLEY SELF STORAGE DETAILS

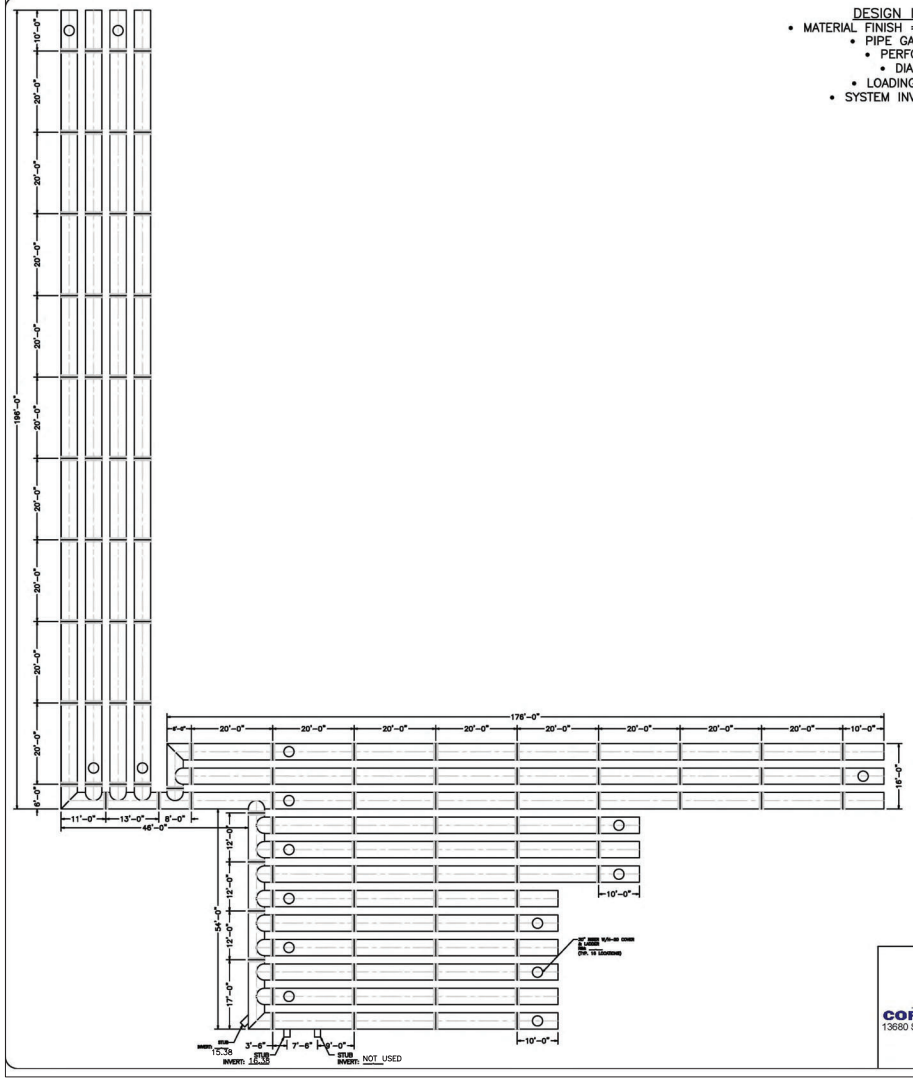
Sheet No. 3 OF 4 SHEETS
FILE NO. 19-004

File name: P:\TPG\19\19-004\GP\19-004PGP03.dwg

TEMECULA VALLEY SELF STORAGE DETAILS

DESIGN INFORMATION

- MATERIAL FINISH = GALVANIZED
- PIPE GAUGE = 16GA.
- PERFORATED = NO
- DIAMETER = 48"
- LOADING = H20/H25
- SYSTEM INVERT = 15.38



HEAVY CONSTRUCTION

For temporary construction vehicle loads (100 kips/axle load), put at least four feet of compacted cover on top of the pipe (but not exceeding the maximum allowable cover over the pipe).

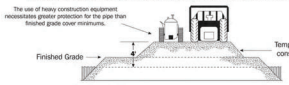
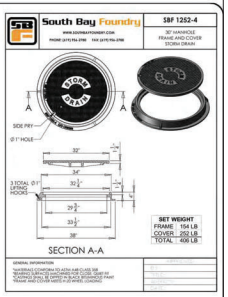


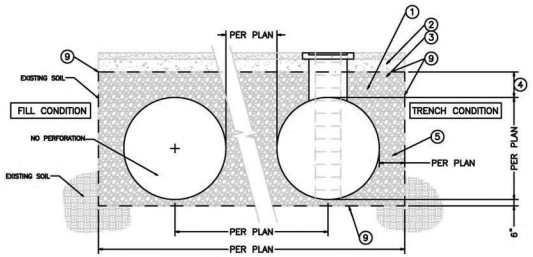
Table 7.8

General guidelines for minimum cover required for heavy off-road construction equipment

Pipe Span, in.	Minimum Cover (ft) for Indicted Axle Loads (kips)*			
	18-50	50-75	75- 110	110- 150
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.





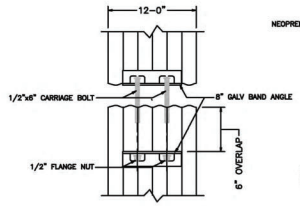
A–A SECTION
N.T.S.

NOTES:

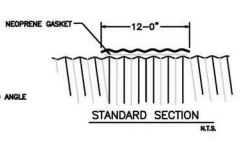
1. TOP 12" OF COVER IS TO BE 1" GRAVEL.
2. SOIL MEDIA
3. NORMAL ROADWAY EMBANKMENT FILL PLACED IN 8" LIFTS AND COMPACTED TO MIN. 90% STANDARD DENSITY PER AASHTO T-99.
4. 12" MIN. FOR DIAMETERS THROUGH 96", 18" MIN. FOR DIAMETERS FROM 102" AND UP. MEASURE FROM TOP OF PIPE TO BOTTOM OF FLEXIBLE PAVEMENT OR TOP OF PIPE TO TOP OF RIGID PAVEMENT.
5. FREE DRAINING ANGULAR WASHED STONE 3/4" – 2" AROUND PIPE ENVELOPE AS SHOWN OR OTHERWISE NOTED.
6. CSP GAGE PER AASHTO SECTION12.
7. NOT USED
8. LISTED SPACING CHART IS FOR MULTIPLE PIPE INSTALLATION. FOR SINGLE RUN, THE TRENCH REQUIRES ONLY THE BOTTOM WIDTH OF THE PIPE'S SPAN, PLUS ROOM FOR COMPACTION EQUIPMENT.

SPACING CHART PER AISI AND NCSPA GUIDELINES	
DIAMETER	REQUIRED SPACING
UP TO 24"	12"
24" – 72"	1/2 PIPE DIA.
72" AND UP	36"

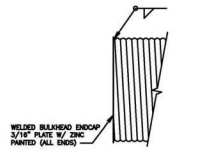
9. 4 oz. NON WOVEN GEOTEXTILE FABRIC TERRATEX NO4E (OR EQUAL).
10. RELATIVELY LOOSE GRANULAR BEDDING ROUGHLY SHAPED TO FIT BOTTOM OF PIPE, 4" TO 6" IN DEPTH. (#57 OR #8 OR OTHER SUITABLE GRANULAR).



ANNULAR BAND DETAIL
N.T.S.



STANDARD SECTION
N.T.S.



B–B
TYPICAL BULKHEAD

GENERAL NOTES:

1. BANDS ARE FURNISHED AS FOLLOWS:
   12" THRU 48" – 1–PIECE
   54" THRU 96" – 2 PIECE
   102" THRU 144" – 3 PIECE
2. GALV BAND ANGLES ARE ATTACHED WITH SPOT WELDS, RIVETS OR HAND WELDED.
3. DIMMENSIONS ARE SUBJECT TO MANUFACTURING TOLERANCES.
4. DIMPLE BANDS FOR ARCHED PIPE ARE THE SAME AS FOR EQUIVALENT ROUND PIPE DIAMETER.

PACIFIC CORRUGATED PIPE CO.
13680 SLOVER AVENUE FONTANA, CA 92337
800.338.5858 * 909.829.4235
Fx. 909.829.8035
SOCAL@PCPIPE.COM

NOTE: THE SUITABILITY OF THE INFORMATION PRESENTED FOR USE ON ANY PARTICULAR PROJECT SHOULD BE DETERMINED BY THE ENGINEER RESPONSIBLE FOR THE DESIGN.

PROJECT NAME: TEMECULA VALLEY SELF STORAGE
PROJECT #:
SIGN & DATE TO RELEASE FOR MANUFACTURE (SUBJECT TO PRICE VERIFICATION)
PLANS APPROVED ☐ (AS NOTED) ☐ (W/CHANGES)
DATE SIGNATURE

REV.	DESCRIPTION	DATE
1		

DRAWN BY: J. BROWN
SCALE: AS NOTED
DATE: 03.31.22
SHEET NO: 1 OF 1

⑧ UNDERGROUND DETENTION CHAMBER
N.T.S.

REGISTERED PROFESSIONAL ENGINEER — No. 55750 — CIVIL — STATE OF CALIFORNIA

REVISIONS:

REMARK	DESCRIPTION:	APR.:	DATE:

DESIGNED: VGK DRAWN: LEO CHECKED: VGK

THE PRISM GROUP
310 N. COTA ST. SUITE I, CORONA, CA 92880
PHONE: (951) 737-4406 ● www.the-prism-group.com

●LEICA HDS LASER SCANNING
●GPS & ROBOTIC SURVEYING
●GEOMATIC ENGINEERING
●CIVIL ENGINEERING
●LAND PLANNING

Scale: NONE
Bench Mark: SEE SHEET 1
Date: 6-15-22

TEMECULA VALLEY SELF STORAGE DETAILS

Sheet No. 4 OF 4 SHEETS
FILE NO. 19–004

File name: P:\TPG\19\19–004\GP\19–004PGP04.dwg

Appendix 3: Soils Information

Geotechnical Study, Other Infiltration Testing Data, and/or Other Documentation

Earth Strata Geotechnical Services, Inc.
Geotechnical, Environmental and Materials Testing Consultants

September 14, 2020

Project No. 182351-10B

Mr. Milan Chakrabarty
1003 East Florida Ave #101
Hemet, CA 92543

Subject: **Updated Preliminary Geotechnical Interpretive Report, Proposed RV and Boat Storage, Assessor's Parcel Number 476-010-060, Located at the Intersection of Highway 79 and Keller Road, Winchester Area, Riverside County, California**

Earth Strata Geotechnical Services is pleased to present our updated preliminary geotechnical interpretive report for the proposed commercial development, Assessor's Parcel Number 476-010-060, located at the intersection of Highway 79 and Keller Road in the Winchester Area of Riverside County, California. This work was performed in accordance with the scope of work described in our proposal, dated July 31, 2018. The purpose of this study is to evaluate the nature, distribution, engineering properties, and geologic strata underlying the site with respect to the proposed development.

Earth Strata Geotechnical Services appreciates the opportunity to offer our consultation and advice on this project. In the event that you have any questions, please do not hesitate to contact the undersigned at your earliest convenience.

Respectfully submitted,

EARTH STRATA GEOTECHNICAL SERVICES

Stephen M. Poole, PE, GE
Principal Engineer

REGISTERED PROFESSIONAL ENGINEER
STEPHEN MICHAEL POOLE
No. 692
GEOTECHNICAL
STATE OF CALIFORNIA

Aaron G. Wood, PG, CEG
Principal Geologist

CERTIFIED ENGINEERING GEOLOGIST
AARON G. WOOD
No. 2550
Exp. 6/30/21
STATE OF CALIFORNIA

SMP/snj/mam

Distribution: (2) Addressee

TABLE OF CONTENTS

Section **Page**

INTRODUCTION 1
SITE DESCRIPTION 1
PROPOSED DEVELOPMENT AND GRADING 1
FIELD EXPLORATION AND LABORATORY TESTING 3
Field Exploration 3
Laboratory Testing 3
FINDINGS 3
Regional Geology 3
Local Geology 4
Faulting 4
Landslides 6
CONCLUSIONS AND RECOMMENDATIONS 6
General 6
Earthwork 6
Earthwork and Grading 6
Clearing and Grubbing 6
Excavation Characteristics 6
Groundwater 7
Ground Preparation for Fill Areas 7
Oversize Rock 7
Compacted Fill Placement 7
Import Earth Materials 8
Cut/Fill Transitions 9
Cut Areas 9
Shrinkage, Bulking and Subsidence 9
Geotechnical Observations 10
Post Grading Considerations 10
Slope Landscaping and Maintenance 10
Site Drainage 10
Utility Trenches 10
SEISMIC DESIGN CONSIDERATIONS 11
Ground Motions 11
Secondary Seismic Hazards 12
Liquefaction and Lateral Spreading 12
General 13
Allowable Bearing Values 13
Settlement 13
Lateral Resistance 13
Structural Setbacks and Building Clearance 14
Foundation Observations 15
Expansive Soil Considerations 15
Medium Expansion Potential (Expansion Index of 51 to 90) 15
Footings 15
Building Floor Slabs 16

Post Tensioned Slab/Foundation Design Recommendations.....16
Corrosivity.....18
RETAINING WALLS.....19
Active and At-Rest Earth Pressures.....19
Subdrain System.....20
Temporary Excavations.....20
Retaining Wall Backfill.....20
CONCRETE FLATWORK.....21
Thickness and Joint Spacing.....21
Subgrade Preparation.....21
PRELIMINARY ASPHALTIC CONCRETE PAVEMENT DESIGN.....21
GRADING PLAN REVIEW AND CONSTRUCTION SERVICES.....22
REPORT LIMITATIONS.....22

Attachments:

Figure 1 – Vicinity Map (Page 2)
Figure 2 – Regional Geologic Map (Page 5)
APPENDIX A – References (Rear of Text)
APPENDIX B – Exploratory Logs (Rear of Text)
APPENDIX C – Laboratory Procedures and Test Results (Rear of Text)
APPENDIX D – Seismicity (Rear of Text)
APPENDIX E - Asphaltic Concrete Pavement Calculations (Rear of Text)
APPENDIX F – General Earthwork and Grading Specifications (Rear of Text)
Plate 1 – Geotechnical Map (In Pocket)

INTRODUCTION

Earth Strata Geotechnical Services is pleased to present our updated preliminary geotechnical interpretive report for the proposed development. The purpose of this study was to evaluate the nature, distribution, engineering properties, and geologic strata underlying the site with respect to the proposed development, and then provide preliminary grading and foundation design recommendations based on the plans you provided. The general location of the subject property is indicated on the Vicinity Map, Figure 1. The plans you provided were used as the base map to show geologic conditions within the subject site, see Geotechnical Map, Plate 1.

SITE DESCRIPTION

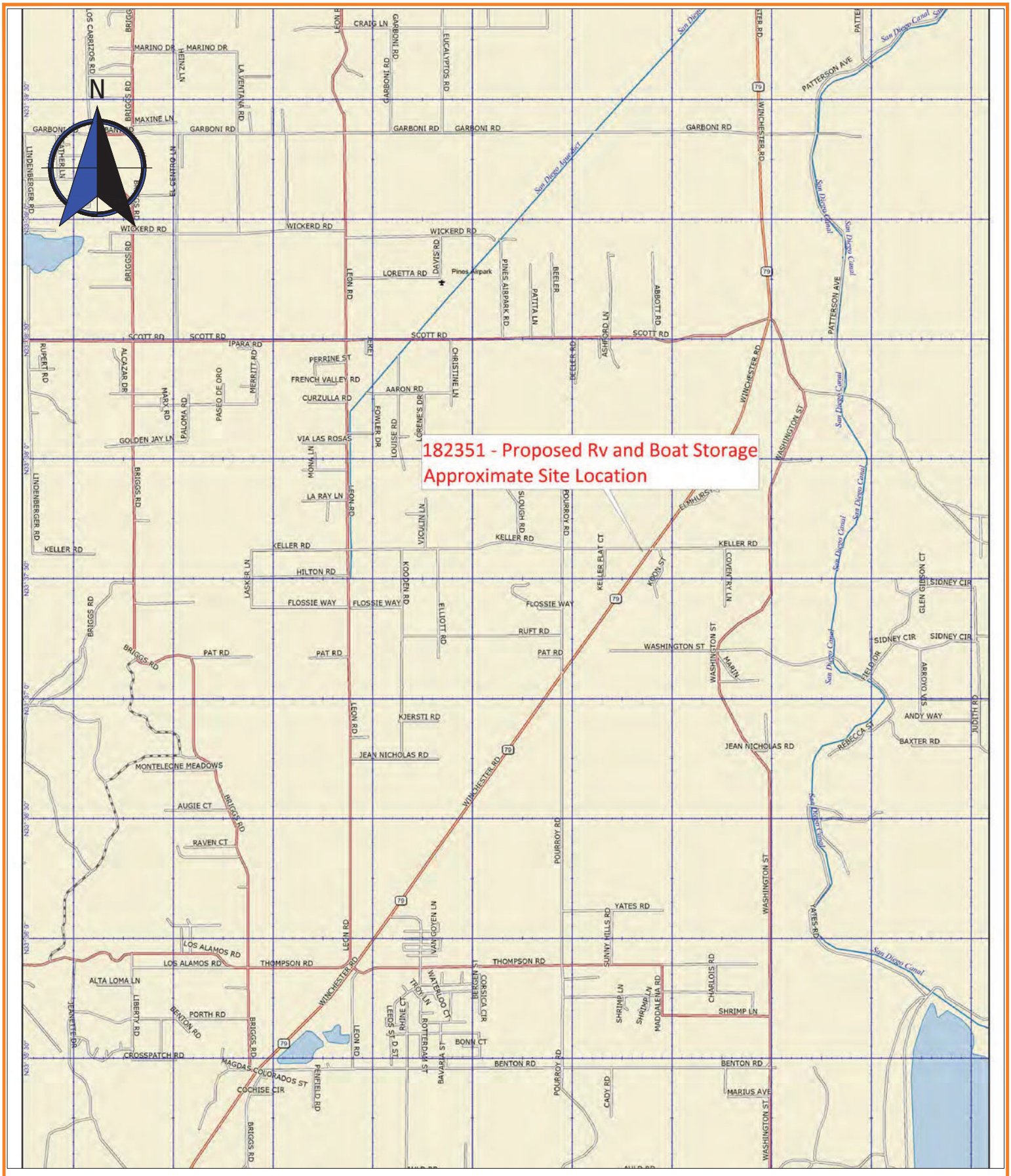
The subject property is located southwest of the intersection of Highway 79 and Keller Road in the Winchester Area of Riverside County, California. The approximate location of the site is shown on the Vicinity Map, Figure 1.

The subject property is comprised of approximately 4.66 acres of undeveloped land. Topographic relief at the subject property is relatively low with the terrain being generally flat. Elevations at the site range from approximately 1,215 to 1,230 feet above mean sea level (msl), for a difference of about 15± feet across the entire site. Drainage within the subject property generally flows to the northwest.

The site is currently bordered by vacant property, as well as a single family residence to the west. Most of the vegetation on the site consists of sparse to moderate amounts of annual weeds/grasses, along with small to large trees bordering western portion of the subject site.

PROPOSED DEVELOPMENT AND GRADING

The proposed commercial development is expected to consist of concrete, wood or steel framed one- and/or two-story structures utilizing slab on grade construction with associated streets, landscape areas, and utilities. The current development plans include four (4) building pads positioned throughout the site.



"© 2007 DeLorme (www.delorme.com) Topo USA®".

Earth Strata Geotechnical Services, Inc.
Geotechnical, Environmental and Materials Testing Consultants
www.ESGSINC.com (951) 397-8315

PROPOSED RV AND BOAT STORAGE | 182351-10A

VICINITY MAP | SCALE 1:40,625

SEP 2018 | FIGURE 1

FIELD EXPLORATION AND LABORATORY TESTING

Field Exploration

Subsurface exploration within the subject site was performed on September 18, 2018 for the exploratory excavations. A truck mounted hollow-stem-auger drill rig was utilized to drill four (4) borings throughout the site to a maximum depth of 8.5 feet. An underground utilities clearance was obtained from Underground Service Alert of Southern California, prior to the subsurface exploration.

Earth materials encountered during exploration were classified and logged in general accordance with the Standard Practice for Description and Identification of Soils (Visual-Manual Procedure) of ASTM D 2488. Upon completion of laboratory testing, exploratory logs and sample descriptions may have been reconciled to reflect laboratory test results with regard to ASTM D 2487.

Associated with the subsurface exploration was the collection of bulk (disturbed) samples and relatively undisturbed samples of earth materials for laboratory testing and analysis. The relatively undisturbed samples were obtained with a 3 inch outside diameter modified California split-spoon sampler lined with 1-inch-high brass rings. Samples obtained using a hollow stem auger drill rig, were mechanically driven with successive 30 inch drops of a 140-pound automatic trip safety hammer. The blow count per one-foot increment was recorded in the boring logs. The central portions of the driven samples were placed in sealed containers and transported to our laboratory for testing and analysis. The approximate exploratory locations are shown on Plate 1 and descriptive logs are presented in Appendix B.

Laboratory Testing

Maximum dry density/optimum moisture content, expansion potential, pH, R-Value, resistivity, sulfate content, chloride content, and in-situ density/moisture content were determined for selected undisturbed and bulk samples of earth materials, considered representative of those encountered. An evaluation of the test data is reflected throughout the Conclusions and Recommendations section of this report. A brief description of laboratory test criteria and summaries of test data are presented in Appendix C.

FINDINGS

Regional Geology

Regionally, the site is located in the Peninsular Ranges Geomorphic Province of California. The Peninsular Ranges are characterized by northwest trending steep mountain ranges separated by sediment filled elongated valleys. The dominant structural geologic features reflect the northwest trend of the province. Associated with and subparallel to the San Andreas Fault are the San Jacinto Fault, Newport-Inglewood, and the Whittier-Elsinore Fault. The Santa Ana Mountains abut the west side of the Elsinore Fault while the Perris Block forms the other side of the fault zone to the east. The Perris Block is bounded to the east by the San Jacinto Fault. The northern perimeter of the Los Angeles basin forms part of a northerly dipping blind thrust fault at the boundary between the Peninsular Ranges Province and the Transverse Range Province.

The mountainous regions within the Peninsular Ranges Province are comprised of Pre-Cretaceous, metasedimentary, and metavolcanic rocks along with Cretaceous plutonic rocks of the Southern California Batholith. The low lying areas are primarily comprised of Tertiary and Quaternary non-marine alluvial sediments consisting of alluvial deposits, sandstones, claystones, siltstones, conglomerates, and occasional volcanic units. A map illustrating the regional geology is presented on the Regional Geologic Map, Figure 2.

Local Geology

The earth materials on the site are primarily comprised of topsoil and bedrock. A general description of the dominant earth materials observed on the site is provided below:

- Topsoil (no map symbol): Residual topsoil, encountered in the upper 1 to 3 feet, blankets the site and underlying bedrock. These materials were noted to be generally medium brown to gray, silty sand and sandy silt which were very porous, dry and in a loose to medium dense state.

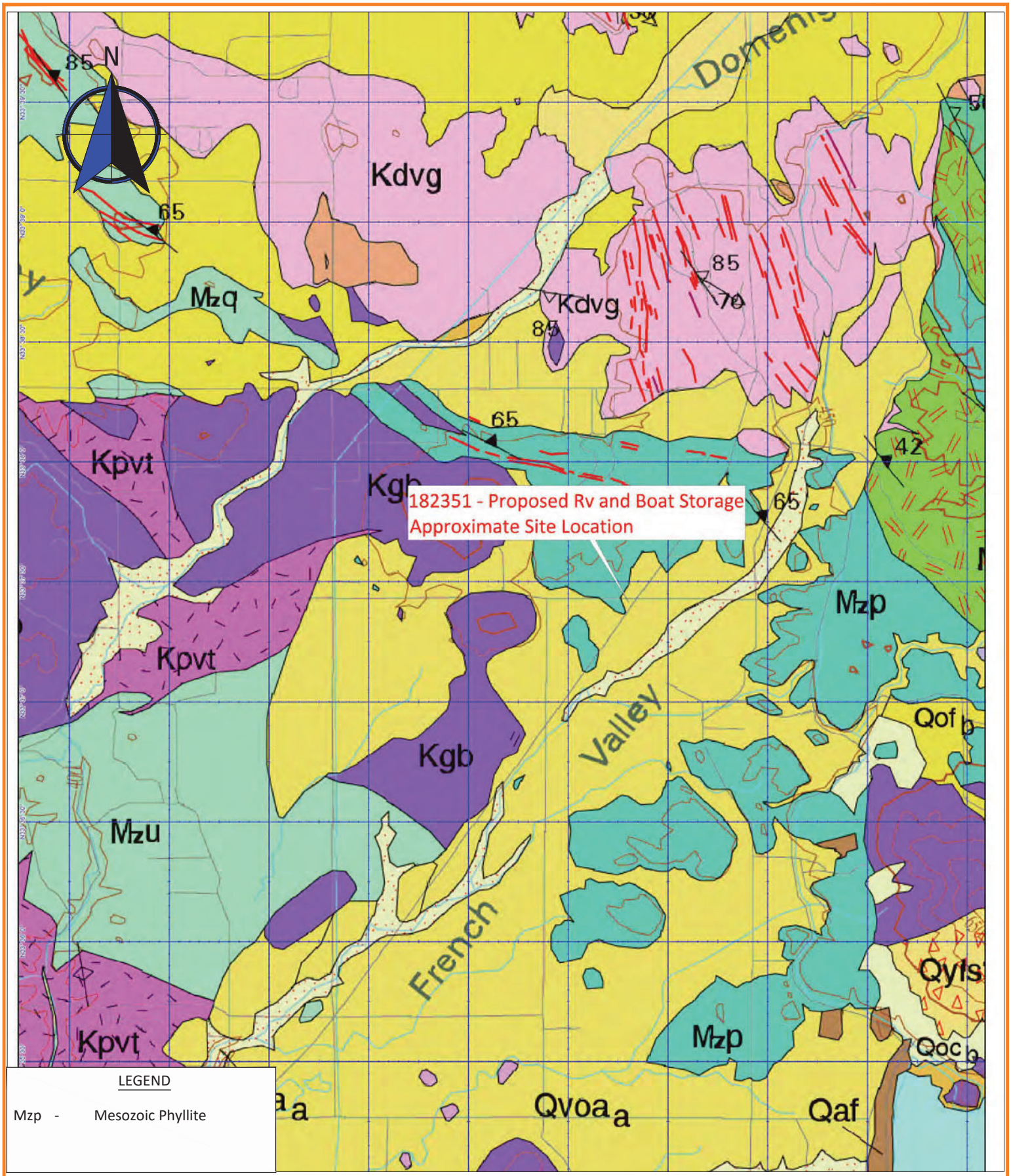
- Mesozoic Phyllite (map symbol Mzp): Phyllite was encountered beneath the topsoil in all of our subsurface excavations to the maximum depth explored. This unit was generally noted to be greenish gray to dark grayand in a dry and very hard state.

Faulting

The project is located in a seismically active region and as a result, significant ground shaking will likely impact the site within the design life of the proposed project. The geologic structure of the entire southern California area is dominated by northwest-trending faults associated with the San Andreas Fault system, which accommodates for most of the right lateral movement associated with the relative motion between the Pacific and North American tectonic plates. Known active faults within this system include the Newport-Inglewood, Whittier-Elsinore, San Jacinto and San Andreas Faults.

No active faults are known to project through the site and the site is not located within an Alquist-Priolo Earthquake Fault Zone, established by the State of California to restrict the construction of new habitable structures across identifiable traces of known active faults. An active fault is defined by the State of California as having surface displacement within the past 11,000 years or during the Holocene geologic time period. Based on our mapping of the subject site, review of current and historical aerial imagery, lack of lineaments indicative of active faulting, and the data compiled during the preparation of this report, it is our interpretation that the potential for surface rupture to adversely impact the proposed structures is very low to remote.

Based on our review of regional geologic maps and applicable computer programs (USGS 2008 Interactive Deaggregation, Caltrans ARS online, and USGS Earthquake Hazard Programs), the Elsinore Fault with an approximate source to site distance of 12.64 kilometers is the closest known active fault anticipated to produce the highest ground accelerations, with an anticipated maximum modal magnitude of 7.7. A list of faults as well as a list of significant historical seismic events within a 100km radius of the subject site are included in Appendix D.



REFERNCES: Morton, D.M., Hauser, Rachel M., and Ruppert, Kelly R., 2004, Preliminary Digital Geologic Map of the San Bernardino and Santa Ana 30' x 60' Quadrangle, Southern California, Version 2.0: U.S. Geological Survey Open-File Report 99-0172.

"© 2007 DeLorme (www.delorme.com) Topo USA®".

Earth Strata Geotechnical Services, Inc.
Geotechnical, Environmental and Materials Testing Consultants
www.ESGSINC.com (951) 397-8315

PROPOSED RV AND BOAT STORAGE		182351-10A
REGIONAL GEOLOGIC MAP	SCALE 1:40,625	
	SEP 2018	FIGURE 2

Landslides

Landslide debris was not observed during our subsurface exploration and no ancient landslides are known to exist on the site. No landslides are known to exist, or have been mapped, in the vicinity of the site. Geologic mapping of the site conducted during our investigation reveal no geomorphic expressions indicative of landsliding.

CONCLUSIONS AND RECOMMENDATIONS

General

From geotechnical and engineering geologic points of view, the subject property is considered suitable for the proposed development, provided the following conclusions and recommendations are incorporated into the plans and are implemented during construction.

Earthwork

Earthwork and Grading

The provisions of the 2019 California Building Code (CBC), including the General Earthwork and Grading Specifications in the last Appendix of this report, should be applied to all earthwork and grading operations, as well as in accordance with all applicable grading codes and requirements of the appropriate reviewing agency. Unless specifically revised or amended herein, grading operations should also be performed in accordance with applicable provisions of our General Earthwork and Grading Specifications within the last appendix of this report.

Clearing and Grubbing

Vegetation including trees, grasses, weeds, brush, shrubs, or any other debris should be stripped from the areas to be graded and properly disposed of offsite. In addition, laborers should be utilized to remove any roots, branches, or other deleterious materials during grading operations.

Earth Strata Geotechnical Services should be notified at the appropriate times to provide observation and testing services during Clearing and Grubbing operations. Any buried structures or unanticipated conditions should be brought to our immediate attention.

Excavation Characteristics

Based on the results of our exploration and experience with similar projects in similar settings, the near surface earth materials, will be readily excavated with conventional earth moving equipment. Excavation difficulty is a function of the degree of weathering and amount of fracturing within the bedrock. Bedrock generally becomes harder and more difficult to excavate with increasing depth.

Groundwater

Groundwater was not observed during our subsurface exploration. It should be noted that localized groundwater could be encountered during grading due to the limited number of exploratory locations or other factors.

Ground Preparation for Fill Areas

For each area to receive compacted fill, the removal of low density, compressible earth materials, such as topsoil and upper alluvial materials, should continue until firm competent bedrock is encountered. Removal excavations are subject to verification by the project engineer, geologist or their representative. Prior to placing compacted fills, the exposed bottom in each removal area should be scarified to a depth of 6 inches or more, watered or air dried as necessary to achieve near optimum moisture conditions and then compacted to a minimum of 90 percent of the maximum dry density determined by ASTM D 1557.

The intent of remedial grading is to diminish the potential for hydro-consolidation, slope instability, and/or settlement. Remedial grading should extend beyond the perimeter of the proposed structures a horizontal distance equal to the depth of excavation or a minimum of 5 feet, whichever is greater. For cursory purposes the anticipated removal depths are shown on the enclosed Geotechnical Map, Plate 1. In general, the anticipated removal depths should vary from 3 to 5 feet below existing grade.

Wet Removals

Wet alluvial materials will probably not be encountered within the low lying areas of the site. If removals of wet alluvial materials are required, special grading equipment and procedures can greatly reduce overall costs. Careful planning by an experienced grading contractor can reduce the need for special equipment, such as swamp cats, draglines, excavators, pumps, and top loading earthmovers. Possible solutions may include the placement of imported angular rock and/or geotextile ground reinforcement. More specific recommendations can be provided based on the actual conditions encountered. Drying or mixing of wet materials with dry materials will be needed to bring the wet materials to near optimum moisture prior to placing wet materials into compacted fills.

Oversize Rock

Oversize rock is expected to be encountered during grading. Oversize rock that is encountered (i.e., rock exceeding a maximum dimension of 8 inches) should be disposed of offsite or stockpiled onsite and crushed for future use. The disposal of oversize rock is discussed in greater detail in General Earthwork and Grading Specifications within the last appendix of this report.

Compacted Fill Placement

Compacted fill materials should be placed in 6 to 8 inch maximum (uncompacted) lifts, watered or air dried as necessary to achieve uniform near optimum moisture content and then compacted to a minimum of 90 percent of the maximum dry density determined by ASTM D 1557.

Import Earth Materials

Should import earth materials be needed to achieve final design grades, all potential import materials should be free of deleterious/oversize materials, non-expansive, and approved by the project geotechnical consultant prior to delivery onsite.

Fill Slopes

When properly constructed, fill slopes up to 10 feet high with inclinations of 2:1 (h:v) or flatter are considered to be grossly stable. Keyways are required at the toe of all fill slopes higher than 5 feet and steeper than 5:1 (h:v). Keyways should be a minimum of 10 feet wide and 2 feet into bedrock, as measured on the downhill side. In order to establish keyway removals, backcuts should be cut no steeper than 1:1 or as recommended by the geotechnical engineer or engineering geologist. Compacted fill should be benched into bedrock.

Cut Slopes

When properly constructed, cut slopes into bedrock up to 10 feet high with inclinations of 2:1 (h:v) or flatter are considered grossly stable. Cut slopes should be observed by the engineering geologist or his representative during grading, but are anticipated to be stable.

Stabilization Fills

Currently, stabilization fills will not be required for cut slopes in the bedrock. Our engineering geologist or his representative should be called to evaluate all slopes during grading. In the event that unfavorable geologic conditions are encountered, recommendations for stabilization fills or flatter slopes will be provided.

Fill Over Cut Slopes

The fill portion of fill over cut slopes should not be constructed until the cut portion of the slope has been cut to finish grade. The earth materials and geologic structure exposed along the cut slope should be evaluated with regard to suitability for compacted fills or foundations and for stability. If the cut materials are determined to be competent, then the construction of the keyway and subdrain system may commence or additional remedial recommendations will be provided.

Temporary Backcuts

It is the responsibility of the grading contractor to follow all Cal-OSHA requirements with regard to excavation safety. Where existing developments are upslope, adequate slope stability to protect those developments must be maintained. Temporary backcuts will be required to accomplish removals of unsuitable materials and possibly, to perform canyon removals, stabilization fills, and/or keyways. Backcuts should be excavated at a gradient of 1:1 (h:v) or flatter. Flatter backcuts may be required where geologic structure or earth materials are unfavorable. It is imperative that grading schedules minimize the exposure time of the unsupported excavations. All excavations should be stabilized within 30 days of initial excavation.

Cut/Fill Transitions

Cut/fill transitions should be eliminated from all building areas where the depth of fill placed within the "fill" portion exceeds proposed footing depths. This is to diminish distress to structures resulting from excessive differential settlement. The entire foundation of each structure should be founded on a uniform bearing material. This should be accomplished by overexcavating the "cut" portion and replacing the excavated materials as properly compacted fill. Refer to the following table for recommended depths of overexcavation.

DEPTH OF FILL ("fill" portion)	DEPTH OF OVEREXCAVATION ("cut" portion)
Up to 5 feet	Equal Depth
5 to 10 feet	5 feet
Greater than 10 feet	One-half the thickness of fill placed on the "fill" portion (10 feet maximum)

Overexcavation of the "cut" portion should extend beyond the building perimeter a horizontal distance equal to the depth of overexcavation or a minimum of 5 feet, whichever is greater.

Cut Areas

In cut areas, an area a minimum of 5 feet beyond the footprint of the proposed structures should overexcavated until; competent bottoms are achieved; to a minimum 3 feet below the proposed foundations; or per the Overexcavation Table above; (whichever is greater) and replaced with compacted fill. Final determination of areas that require overexcavation should be determined in the field by a representative of Earth Strata Geotechnical Services.

Shrinkage, Bulking and Subsidence

Volumetric changes in earth material quantities will occur when poorly consolidated earth materials are replaced with properly compacted fill. Estimates of the percent shrinkage/bulking factors for the various geologic units observed on the subject property are based on in-place densities and on the estimated average percent of relative compaction achieved during grading.

GEOLOGIC UNIT	SHRINKAGE (%)
Topsoil	10 to 15
Bedrock	0 to 5 (Bulking)

Subsidence from scarification and recompaction of exposed bottom surfaces is expected to be negligible to approximately 0.01 foot.

The estimates of shrinkage/bulking and subsidence are intended as an aid for project engineers in determining earthwork quantities. Since many variables can affect the accuracy of these estimates, they should be used with caution and contingency plans should be in place for balancing the project.

Geotechnical Observations

Clearing operations, removal of unsuitable materials, and general grading procedures should be observed by the project geotechnical consultant or his representative. No compacted fill should be placed without observations by the geotechnical consultant or his representative to verify the adequacy of the removals.

The project geotechnical consultant or his representative should be present to observe grading operations and to check that minimum compaction requirements and proper lift thicknesses are being met, as well as to verify compliance with the other recommendations presented herein.

Post Grading Considerations

Slope Landscaping and Maintenance

Adequate slope and building pad drainage is essential for the long term performance of the subject site. The gross stability of graded slopes should not be adversely affected, provided all drainage provisions are properly constructed and maintained. Engineered slopes should be landscaped with deep rooted, drought tolerant maintenance free plant species, as recommended by the project landscape architect.

Site Drainage

Control of site drainage is important for the performance of the proposed project. Roof gutters are recommended for the proposed structures. Pad and roof drainage should be collected and transferred to driveways, adjacent streets, storm-drain facilities, or other locations approved by the building official in non-erosive drainage devices. Drainage should not be allowed to pond on the pad or against any foundation or retaining wall. Drainage should not be allowed to flow uncontrolled over any descending slope. Planters located within retaining wall backfill should be sealed to prevent moisture intrusion into the backfill. Planters located next to structures should be sealed to the depth of the footings. Drainage control devices require periodic cleaning, testing and maintenance to remain effective.

At a minimum, pad drainage should be designed at the minimum gradients required by the CBC. To divert water away from foundations, the ground surface adjacent to foundations should also be graded at the minimum gradients required per the CBC.

Utility Trenches

All utility trench backfill should be compacted at near optimum moisture to a minimum of 90 percent of the maximum dry density determined by ASTM D 1557. For utility trench backfill within pavement areas the upper 6 inches of subgrade materials should be compacted to 95 percent of the maximum dry density determined by ASTM D 1557. This includes within the street right-of-ways, utility easements, under footings, sidewalks, driveways and building floor slabs, as well as within or adjacent to any slopes. Backfill should be placed in approximately 6 to 8 inch maximum loose lifts and then mechanically compacted with a hydro-hammer, rolling with a sheepsfoot, pneumatic

tampers, or similar equipment. The utility trenches should be tested by the project geotechnical engineer or their representative to verify minimum compaction requirements are obtained.

In order to minimize the penetration of moisture below building slabs, all utility trenches should be backfilled with compacted fill, lean concrete or concrete slurry where they undercut the perimeter foundation. Utility trenches that are proposed parallel to any building footings (interior and/or exterior trenches), should not be located within a 1:1 (h:v) plane projected downward from the outside bottom edge of the footing.

SEISMIC DESIGN CONSIDERATIONS

Ground Motions

Structures are required to be designed and constructed to resist the effects of seismic ground motions as provided in the 2016 California Building Code Section 1613. The design is dependent on the site class, occupancy category I, II, III, or IV, mapped spectral accelerations for short periods (S_s), and mapped spectral acceleration for a 1-second period (S_1).

In order for structural design to comply with the 2019 CBC, the USGS "US Seismic Design Maps" online tool was used to compile spectral accelerations for the subject property based on data and maps jointly compiled by the United States Geological Survey (USGS) and the California Geological Survey (CGS). The data found in the following table is based on the Maximum Considered Earthquake (MCE) with 5% damped ground motions having a 2% probability of being exceeded in 50 years (2,475 year return period).

The seismic design coefficients were determined by a combination of the site class, mapped spectral accelerations, and occupancy category. The following seismic design coefficients should be implemented during design of the proposed structures. Summaries of the Seismic Hazard Deaggregation graphs and test data are presented in Appendix D.

2019 CBC	FACTOR (ASCE 7-16)
Site Location	Latitude: 33.626793° (North) Longitude: -117.094886°(West)
Site Class	D
Mapped Spectral Accelerations for short periods, S_s	1.371 g
Mapped Spectral Accelerations for 1-Second Period, S_1	0.509 g
Maximum Considered Earthquake Spectral Response Acceleration for Short Periods, S_{ms}	1.371 g
Maximum Considered Earthquake Spectral Response Acceleration for 1-Second Period, S_{m1}	*null
Design Spectral Response Acceleration for Short Periods, S_{DS}	0.914 g
Design Spectral Response Acceleration for 1-Second Period, S_{D1}	*null
Seismic Design Category	D
Importance Factor Based on Occupancy Category	II

**See 2019 CBC, Section 11.4.8*

We performed the probabilistic seismic hazard assessment for the site in accordance with the 2019 CBC, Section 1803.5.11 and 1803.5.12. The probabilistic seismic hazard maps and data files were jointly prepared by the United States Geological Survey (USGS) and the California Geological Survey (CGS) and can be found at the CGS Probabilistic Seismic Hazards Mapping Ground Motion Page. Actual ground shaking intensities at the site may be substantially higher or lower based on complex variables such as the near source directivity effects, depth and consistency of earth materials, topography, geologic structure, direction of fault rupture, and seismic wave reflection, refraction, and attenuation rates. The mean peak ground acceleration was calculated to be 0.591g.

Secondary Seismic Hazards

Secondary effects of seismic shaking considered as potential hazards include several types of ground failure as well as induced flooding. Different types of ground failure, which could occur as a consequence of severe ground shaking at the site, include landslides, ground lurching, shallow ground rupture, and liquefaction/lateral spreading. The probability of occurrence of each type of ground failure depends on the severity of the earthquake, distance from faults, topography, the state of subsurface earth materials, groundwater conditions, and other factors. Based on our experience, subsurface exploration, and laboratory testing, all of the above secondary effects of seismic activity are considered unlikely.

Seismically induced flooding is normally a consequence of a tsunami (seismic sea wave), a seiche (i.e., a wave-like oscillation of surface water in an enclosed basin that may be initiated by a strong earthquake) or failure of a major reservoir or retention system up gradient of the site. Since the site is at an elevation of more than 1,200 feet above mean sea level and is located more than 30 miles inland from the nearest coastline of the Pacific Ocean, the potential for seismically induced flooding due to a tsunami is considered nonexistent. Lake Skinner is located less than 2.5 miles away to the southeast and Diamond Valley Lake is located less than 3 miles to the northeast. Although both lakes lie up gradient of the site, the likelihood for induced flooding due to a dam failure or a seiche overcoming the dam's freeboard is considered very low.

Liquefaction and Lateral Spreading

Liquefaction occurs as a result of a substantial loss of shear strength or shearing resistance in loose, saturated, cohesionless earth materials subjected to earthquake induced ground shaking. Potential impacts from liquefaction include loss of bearing capacity, liquefaction related settlement, lateral movements, and surface manifestation such as sand boils. Seismically induced settlement occurs when loose sandy soils become denser when subjected to shaking during an earthquake. The three factors determining whether a site is likely to be subject to liquefaction include seismic shaking, type and consistency of earth materials, and groundwater level. The proposed structures will be supported by compacted fill and competent bedrock, with lack of shallow groundwater. As such, the potential for earthquake induced liquefaction and lateral spreading beneath the proposed structures is considered very low to remote due to the recommended compacted fill, relatively low groundwater level, and the dense nature of the deeper onsite earth materials.

TENTATIVE FOUNDATION DESIGN RECOMMENDATIONS

General

Provided grading is performed in accordance with the recommendations of this report, shallow foundations are considered feasible for support of the proposed structures. Tentative foundation recommendations are provided herein and graphic presentations of relevant recommendations may also be included on the enclosed map.

Allowable Bearing Values

An allowable bearing value of 2,000 pounds per square foot (psf) is recommended for design of 24-inch square pad footings and 12-inch-wide continuous footings founded at a minimum depth of 12 inches below the lowest adjacent final grade. This value may be increased by 20 percent for each additional 1-foot of width and/or depth to a maximum value of 2,500 psf. Recommended allowable bearing values include both dead and frequently applied live loads and may be increased by one third when designing for short duration wind or seismic forces.

Settlement

Based on the settlement characteristics of the earth materials that underlie the building sites and the anticipated loading, we estimate that the maximum total settlement of the footings will be less than approximately ¾ inch. Differential settlement is expected to be about ½ inch over a horizontal distance of approximately 20 feet, for an angular distortion ratio of 1:480. It is anticipated that the majority of the settlement will occur during construction or shortly after the initial application of loading.

The above settlement estimates are based on the assumption that the grading and construction are performed in accordance with the recommendations presented in this report and that the project geotechnical consultant will observe or test the earth material conditions in the footing excavations.

Lateral Resistance

Passive earth pressure of 250 psf per foot of depth to a maximum value of 2,500 psf may be used to establish lateral bearing resistance for footings. For areas coved with hardscape, passive earth pressure may be taken from the surface. For areas without hardscape, the upper 12 inches of the soil profile must be neglected when calculating passive earth pressure. A coefficient of friction of 0.36 times the dead load forces may be used between concrete and the supporting earth materials to determine lateral sliding resistance. The above values may be increased by one-third when designing for short duration wind or seismic forces. When combining passive and friction for lateral resistance, the passive component should be reduced by one third. In no case shall the lateral sliding resistance exceed one-half the dead load for clay, sandy clay, sandy silty clay, silty clay, and clayey silt.

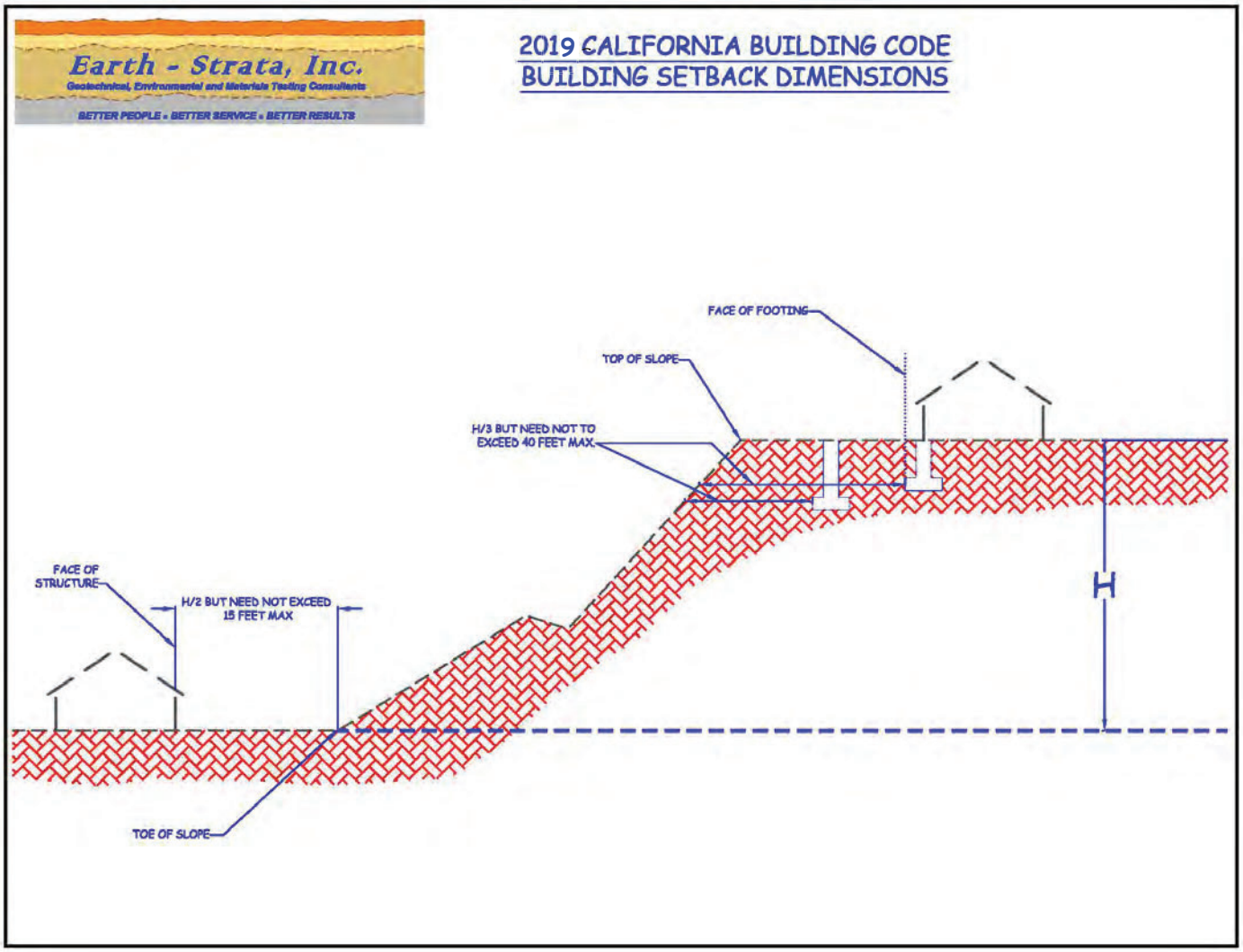
The above lateral resistance values are based on footings for an entire structure being placed directly against either compacted fill or competent bedrock.

Structural Setbacks and Building Clearance

Structural setbacks are required per the 2019 California Building Code (CBC). Additional structural setbacks are not required due to geologic or geotechnical conditions within the site. Improvements constructed in close proximity to natural or properly engineered and compacted slopes can, over time, be affected by natural processes including gravity forces, weathering, and long term secondary settlement. As a result, the CBC requires that buildings and structures be setback or footings deepened to resist the influence of these processes.

For structures that are planned near ascending and descending slopes, the footings should be embedded to satisfy the requirements presented in the CBC, Section 1808.7 as illustrated in the following Foundation Clearances from Slopes diagram.

FOUNDATION CLEARANCES FROM SLOPES



When determining the required clearance from ascending slopes with a retaining wall at the toe, the height of the slope shall be measured from the top of the wall to the top of the slope.

Foundation Observations

In accordance with the 2019 CBC and prior to the placement of forms, concrete, or steel, all foundation excavations should be observed by the geologist, engineer, or his representative to verify that they have been excavated into competent bearing materials. The excavations should be per the approved plans, moistened, cleaned of all loose materials, trimmed neat, level, and square. Any moisture softened earth materials should be removed prior to steel or concrete placement.

Earth materials from foundation excavations should not be placed in slab on grade areas unless the materials are tested for expansion potential and compacted to a minimum of 90 percent of the maximum dry density.

Expansive Soil Considerations

Preliminary laboratory test results indicate onsite earth materials exhibit an expansion potential of **MEDIUM** as classified in accordance with 2019 CBC Section 1803.5.3 and ASTM D4829. Additional, testing for expansive soil conditions should be conducted upon completion of rough grading. The following recommendations should be considered the very minimum requirements, for the earth materials tested. It is common practice for the project architect or structural engineer to require additional slab thickness, footing sizes, and/or reinforcement.

Medium Expansion Potential (Expansion Index of 51 to 90)

Our laboratory test results indicate that the earth materials onsite exhibit a **MEDIUM** expansion potential as classified in accordance with in 2019 CBC Section 1803.5.3 and ASTM D 4829. Accordingly, the CBC specifies that slab on ground foundations (floor slabs) resting on earth materials with expansion indices greater than 20, require special design considerations in accordance with 2019 CBC Sections 1808.6.1 and 1808.6.2. The design procedures are based on the thickness and plasticity index of the various earth materials within the upper 15 feet of the proposed structure. For preliminary design purposes, we have assumed an effective plasticity index of 20.

Footings

- Exterior continuous footings for both one- and two-story construction should be founded at a minimum depth of 18 inches below the lowest adjacent final grade. Exterior continuous footings for three-story construction may be founded at a minimum depth of 24 inches below the lowest adjacent final grade. Interior continuous footings for one-, two-, and three-story construction may be founded at a minimum depth of 12 inches below the lowest adjacent final grade. All continuous footings should have a minimum width of 12, 15, and 18 inches, for one-, two-, and three-story structures, respectively, and should be reinforced with a minimum of two (2) No. 4 bars, one (1) top and one (1) bottom.

- Exterior pad footings intended to support roof overhangs, such as second story decks, patio covers and similar construction should be a minimum of 24 inches square and founded at a

minimum depth of 18 inches below the lowest adjacent final grade. The pad footings should be reinforced with a minimum of No. 4 bars spaced a maximum of 18 inches on center, each way, and should be placed near the bottom-third of the footings.

Building Floor Slabs

- The project architect or structural engineer should evaluate minimum floor slab thickness and reinforcement in accordance with 2019 CBC Section 1808.6.2 based on an assumed effective plasticity index of 20. Building floor slabs should be a minimum of 4 inches thick and reinforced with a minimum of No. 3 bars spaced a maximum of 18 inches on center, each way. All floor slab reinforcement should be supported on concrete chairs or bricks to ensure the desired placement at mid-depth.

- Interior floor slabs, within moisture sensitive areas, should be underlain by a minimum 10-mil thick moisture/vapor barrier to help reduce the upward migration of moisture from the underlying earth materials. The moisture/vapor barrier used should meet the performance standards of an ASTM E 1745 Class A material, and be properly installed in accordance with ACI publication 318-05. It is the responsibility of the contractor to ensure that the moisture/vapor barriers are free of openings, rips, or punctures prior to placing concrete. As an option for additional moisture reduction, higher strength concrete, such as a minimum 28-day compressive strength of 5,000 pounds per square inch (psi) may be used. Ultimately, the design of the moisture/vapor barrier system and recommendations for concrete placement and curing are the purview of the foundation engineer, taking into consideration the project requirements provided by the architect and owner.

- Garage floor slabs should be a minimum of 5 inches thick and should be reinforced in a similar manner as living area floor slabs. Garage floor slabs should be placed separately from adjacent wall footings with a positive separation maintained with ⅜ inch minimum felt expansion joint materials and quartered with weakened plane joints. A 12-inch-wide turn down founded at the same depth as adjacent footings should be provided across garage entrances. The turn down should be reinforced with a minimum of four (4) No. 4 bars, two (2) top and two (2) bottom.

- The subgrade earth materials below all floor slabs should be pre-watered to achieve a moisture content that is at least 2 percent over optimum moisture content, prior to placing concrete. This moisture content should penetrate a minimum depth of 18 inches into the subgrade earth materials. The pre-watering should be verified and tested by Earth Strata Geotechnical Services during construction.

Post Tensioned Slab/Foundation Design Recommendations

In lieu of the proceeding foundation recommendations, post tensioned slabs may be used to support the proposed structures. We recommend that the foundation engineer design the foundation system using the Preliminary Post Tensioned Foundation Slab Design table below. These parameters have been provided in general accordance with Post Tensioned Design. Alternate designs addressing the effects of expansive earth materials are allowed per 2019 CBC Section 1808.6.2. When utilizing these parameters, the foundation engineer should design the foundation system in accordance with the allowable deflection criteria of applicable codes and per the requirements of the structural engineer/architect.

It should be noted that the post tensioned design methodology is partially based on the assumption that soil moisture changes around and underneath post tensioned slabs, are influenced only by climate conditions. Soil moisture change below slabs is the major factor in foundation damages relating to expansive soil. However, the design methodology has no consideration for presaturation, owner irrigation, or other non-climate related influences on the moisture content of subgrade earth materials. In recognition of these factors, we modified the geotechnical parameters determined from this methodology to account for reasonable irrigation practices and proper homeowner maintenance. Additionally, we recommend that prior to excavating footings, slab subgrades be presoaked to a depth of 12 inches and maintained at above optimum moisture until placing concrete. Furthermore, we recommend that the moisture content of the earth materials around the immediate perimeter and below the slab be presaturated to at least 1% above optimum moisture content just prior to placing concrete. The pre-watering should be verified and tested by Earth Strata Geotechnical Services during construction.

The following geotechnical parameters assume that areas adjacent to the foundations, which are planted and irrigated, will be designed with proper drainage to prevent water from ponding. Water ponding near the foundation causes significant moisture change below the foundation. Our recommendations do not account for excessive irrigation and/or incorrect landscape design. Planters placed adjacent to the foundation, should be designed with an effective drainage system or liners, to prevent moisture infiltration below the foundation. Some lifting of the perimeter foundation beam should be expected even with properly constructed planters. Based on our experience monitoring sites with similar earth materials, elevated moisture contents below the foundation perimeter due to incorrect landscaping irrigation or maintenance, can result in uplift at the perimeter foundation relative to the central portion of the slab.

Future owners should be informed and educated of the importance in maintaining a consistent level of moisture within the earth materials around the structures. Future owners should also be informed of the potential negative consequences of either excessive watering, or allowing expansive earth materials to become too dry. Earth materials will shrink as they dry, followed by swelling during the rainy winter season, or when irrigation is resumed. This will cause distress to site improvements and structures.

Preliminary Post Tensioned Foundation Slab Design

PARAMETER		VALUE
Expansion Index		Medium[1]
Percent Finer than 0.002 mm in the Fraction Passing the No. 200 Sieve		< 30 percent (assumed)
Type of Clay Mineral		Montmorillonite (assumed)
Thornthwaite Moisture Index		+20
Depth to Constant Soil Suction		7 feet
Constant Soil Suction		P.F. 3.6
Moisture Velocity		0.7 inches/month
Center Lift	Edge moisture variation distance, e_m Center lift, y_m	5.5 feet 2.5 inches
Edge Lift	Edge moisture variation distance, e_m Edge lift, y_m	3.5 feet 1.0 inches
Soluble Sulfate Content for Design of Concrete Mixtures in Contact with Earth Materials		Negligible
Modulus of Subgrade Reaction, k (assuming presaturation as indicated below)		120 pci
Minimum Perimeter Foundation Embedment		24
Perimeter Foundation Reinforcement		--
Under Slab Moisture/Vapor Barrier and Sand Layer		10-mil thick moisture/vapor barrier meeting the requirements of a ASTM E 1745 Class A material

1. Obtained by laboratory testing.
2. Recommendations for foundation reinforcement are ultimately the purview of the foundation/structural engineer based upon the geotechnical criteria presented in this report, and structural engineering considerations.

Corrosivity

Corrosion is defined by the National Association of Corrosion Engineers (NACE) as "a deterioration of a substance or its properties because of a reaction with its environment." From a geotechnical viewpoint, the "substances" are the reinforced concrete foundations or buried metallic elements (not surrounded by concrete) and the "environment" is the prevailing earth materials in contact with them. Many factors can contribute to corrosivity, including the presence of chlorides, sulfates, salts, organic materials, different oxygen levels, poor drainage, different soil types, and moisture content. It is not considered practical or realistic to test for all of the factors which may contribute to corrosivity.

The potential for concrete exposure to chlorides is based upon the recognized Caltrans reference standard "Bridge Design Specifications", under Subsection 8.22.1 of that document, Caltrans has determined that "Corrosive water or soil contains more than 500 parts per million (ppm) of chlorides". Based on limited preliminary laboratory testing, the onsite earth materials have chloride contents *less* than 500 ppm. As such, specific requirements resulting from elevated chloride contents are not required.

Specific guidelines for concrete mix design are provided in 2019 CBC Section 1904.1 and ACI 318, Section 4.3 Table 4.3.1 when the soluble sulfate content of earth materials exceeds 0.1 percent by weight. Based on limited preliminary laboratory testing, the onsite earth materials are classified in accordance with Table 4.3.1 as having a *negligible* sulfate exposure condition. Therefore, structural concrete in contact with onsite earth materials should utilize Type I or II.

Based on our laboratory testing of resistivity, the onsite earth materials in contact with buried steel should be considered *corrosive*. Additionally, pH values below 9.7 are recognized as being corrosive to most common metallic components including, copper, steel, iron, and aluminum. The pH values for the earth materials tested were *lower* than 9.7. Therefore, any steel or metallic materials that are exposed to the earth materials should be encased in concrete or other measures should be taken to provide corrosion protection.

If building slabs are to be post tensioned, the post tensioning cables should be encased in concrete and/or encapsulated in accordance with the Post Tensioning Institute Guide Specifications. Post tensioning cable end plate anchors and nuts also need to be protected if exposed. If the anchor plates and nuts are in a recess in the edge of the concrete slab, the recess should be filled in with a non-shrink, non-porous, moisture-insensitive epoxy grout so that the anchorage assembly and the end of the cable are completely encased and isolated from the soil. A standard non-shrink, non-metallic cementitious grout may be used only when the post tension anchoring assembly is polyethylene encapsulated similar to that offered by Hayes Industries, LTD or O'Strand, Inc.

The preliminary test results for corrosivity are based on limited samples, and the initiation of grading may blend various earth materials together. This blending or imported material could alter and increase the detrimental properties of the onsite earth materials. Accordingly, additional testing for chlorides and sulfates along with testing for pH and resistivity should be performed upon completion of grading. Laboratory test results are presented in Appendix C.

RETAINING WALLS

Active and At-Rest Earth Pressures

Foundations may be designed in accordance with the recommendations provided in the Tentative Foundation Design Recommendation section of this report. The following table provides the minimum recommended equivalent fluid pressures for design of retaining walls a maximum of 8 feet high. The active earth pressure should be used for design of unrestrained retaining walls, which are free to tilt slightly. The at-rest earth pressure should be used for design of retaining walls that are restrained at the top, such as basement walls, curved walls with no joints, or walls restrained at corners. For curved walls, active pressure may be used if tilting is acceptable and construction joints are provided at each angle point and at a minimum of 15 foot intervals along the curved segments.

MINIMUM STATIC EQUIVALENT FLUID PRESSURES (pcf)		
PRESSURE TYPE	BACKSLOPE CONDITION	
	LEVEL	2:1 (h:v)
Active Earth Pressure	45	75
At-Rest Earth Pressure	68	110

The retaining wall parameters provided do not account for hydrostatic pressure behind the retaining walls. Therefore, the subdrain system is a very important part of the design. All retaining walls should be designed to resist surcharge loads imposed by other nearby walls, structures, or vehicles should be added to the above earth pressures, if the additional loads are being applied within a 1.5:1 (h:v) plane projected

up from the heel of the retaining wall footing. As a way of minimizing surcharge loads and the settlement potential of nearby buildings, the footings for the building can be deepened below the 1.5:1 (h:v)plane projected up from the heel of the retaining wall footing.

Upon request and under a separate scope of work, more detailed analyses can be performed to address equivalent fluid pressures with regard to stepped retaining walls, actual retaining wall heights, actual backfill inclinations, specific backfill materials, higher retaining walls requiring earthquake design motions, etc.

Subdrain System

We recommend a perforated pipe and gravel subdrain system be provided behind all proposed retaining walls to prevent the buildup of hydrostatic pressure behind the proposed retaining walls. The perforated pipe should consist of 4-inch minimum diameter Schedule 40 PVC or ABS SDR-35, placed with the perforations facing down. The pipe should be surrounded by 1 cubic foot per foot of ¾- or 1½ inch open graded gravel wrapped in filter fabric. The filter fabric should consist of Mirafi 140N or equivalent to prevent infiltration of fines and subsequent clogging of the subdrain system.

In lieu of a perforated pipe and gravel subdrain system, weep holes or open vertical masonry joints may be provided in the lowest row of block exposed to the air to prevent the buildup of hydrostatic pressure behind the proposed retaining walls. Weep holes should be a minimum of 3 inches in diameter and provided at intervals of at least every 6 feet along the wall. Open vertical masonry joints should be provided at a minimum of 32 inch intervals. A continuous gravel fill, a minimum of 1 cubic foot per foot, should be placed behind the weep holes or open masonry joints. The gravel should be wrapped in filter fabric consisting of Mirafi 140N or equivalent.

The retaining walls should be adequately coated on the backfilled side of the walls with a proven waterproofing compound by an experienced professional to inhibit infiltration of moisture through the walls.

Temporary Excavations

All excavations should be made in accordance with Cal-OSHA requirements. Earth Strata Geotechnical Services is not responsible for job site safety.

Retaining Wall Backfill

Retaining wall backfill materials should be approved by the geotechnical engineer or his representative prior to placement as compacted fill. Retaining wall backfill should be placed in lifts no greater than 6 to 8 inches, watered or air dried as necessary to achieve near optimum moisture contents. All retaining wall backfill should be compacted to a minimum of 90 percent of the maximum dry density as determined by ASTM D 1557. Retaining wall backfill should be capped with a paved surface drain.

CONCRETE FLATWORK

Thickness and Joint Spacing

Concrete sidewalks and patio type slabs should be at least 3½ inches thick and provided with construction or expansion joints every 6 feet or less, to reduce the potential for excessive cracking. Concrete driveway slabs should be at least 5 inches thick and provided with construction or expansion joints every 10 feet or less, and for earth materials having a **MEDIUM** expansion potential the edges of the driveway slabs should be thickened to 6 inches.

Subgrade Preparation

In order to reduce the potential for unsightly cracking, subgrade earth materials underlying concrete flatwork should be compacted at near optimum moisture to a minimum of 90 percent of the maximum dry density determined by ASTM D 1557 and then moistened to optimum or slightly above optimum moisture content. This moisture should extend to a depth of 12 inches below subgrade and be maintained prior to placement of concrete. Pre-watering of the earth materials prior to placing concrete will promote uniform curing of the concrete and minimize the development of shrinkage cracks. The project geotechnical engineer or his representative should verify the density and moisture content of the earth materials and the depth of moisture penetration prior to placing concrete.

Cracking within concrete flatwork is often a result of factors such as the use of too high a water to cement ratio and/or inadequate steps taken to prevent moisture loss during the curing of the concrete. Concrete distress can be reduced by proper concrete mix design and proper placement and curing of the concrete. Minor cracking within concrete flatwork is normal and should be expected.

PRELIMINARY ASPHALTIC CONCRETE PAVEMENT DESIGN

Laboratory testing of representative earth materials indicate an R-value of 35 may be used for preliminary pavement design. The following table includes our minimum recommended asphaltic concrete pavement sections calculated in accordance with the State of California design procedures using assumed Traffic Indices. Final pavement design should be based on sampling and testing of post grading conditions. Alternative pavement sections and calculation sheets have been provided within the appendices of this report.

PRELIMINARY ASPHALTIC CONCRETE PAVEMENT DESIGN			
PARAMETERS	**AUTO PARKING**	**AUTO DRIVES**	**ENTRANCES/TRUCK DRIVES**
Assumed Traffic Index	5.0	6.0	7.0
Design R-Value	35	35	35
AC Thickness (feet)	3.0	3.0	4.0
AB Thickness (feet)	4.2	7.2	7.8

Notes: AC – Asphaltic Concrete
AB – Aggregate Base

The subgrade earth materials immediately below the aggregate base (base) should be compacted to a minimum of 95 percent of the maximum dry density determined by ASTM D 1557 to a minimum depth of 12 inches. Base materials should be compacted to a minimum of 95 percent of the maximum dry density determined by ASTM D 1557.

Base materials should consist of Class 2 aggregate base conforming to Section 26-1.02B of the State of California Standard Specifications or crushed aggregate base conforming to Section 200-2 of the Standard Specifications for Public Works Construction (Greenbook). Base materials should be compacted at or slightly below optimum moisture content. Asphaltic concrete materials and construction operations should conform to Section 203 of the Greenbook.

GRADING PLAN REVIEW AND CONSTRUCTION SERVICES

This report has been prepared for the exclusive use of **Mr. Milan Chakrabarty** and their authorized representative. It likely does not contain sufficient information for other parties or other uses. Earth Strata Geotechnical Services should be engaged to review the final design plans and specifications prior to construction. This is to verify that the recommendations contained in this report have been properly incorporated into the project plans and specifications. Should Earth Strata Geotechnical Services not be accorded the opportunity to review the project plans and specifications, we are not responsibility for misinterpretation of our recommendations.

We recommend that Earth Strata Geotechnical Services be retained to provide geologic and geotechnical engineering services during grading and foundation excavation phases of the work. In order to allow for design changes in the event that the subsurface conditions differ from those anticipated prior to construction.

Earth Strata Geotechnical Services should review any changes in the project and modify and approve in writing the conclusions and recommendations of this report. This report and the drawings contained within are intended for design input purposes only and are not intended to act as construction drawings or specifications. In the event that conditions encountered during grading or construction operations appear to be different than those indicated in this report, this office should be notified immediately, as revisions may be required.

REPORT LIMITATIONS

Our services were performed using the degree of care and skill ordinarily exercised, under similar circumstances, by reputable soils engineers and geologists, practicing at the time and location this report was prepared. No other warranty, expressed or implied, is made as to the conclusions and professional advice included in this report.

Earth materials vary in type, strength, and other geotechnical properties between points of observation and exploration. Groundwater and moisture conditions can also vary due to natural processes or the works of man on this or adjacent properties. As a result, we do not and cannot have complete knowledge of the subsurface conditions beneath the subject property. No practical study can completely eliminate uncertainty with regard to the anticipated geotechnical conditions in connection with a subject property. The conclusions and recommendations within this report are based upon the findings at the points of

observation and are subject to confirmation by Earth Strata Geotechnical Services based on the conditions revealed during grading and construction.

This report was prepared with the understanding that it is the responsibility of the owner or their representative, to ensure that the conclusions and recommendations contained herein are brought to the attention of the other project consultants and are incorporated into the plans and specifications. The owners' contractor should properly implement the conclusions and recommendations during grading and construction, and notify the owner if they consider any of the recommendations presented herein to be unsafe or unsuitable.

APPENDIX A

REFERENCES

APPENDIX A

References

California Building Standards Commission, 2016, *2016 California Building Code, California Code of Regulations Title 24, Part 2, Volume 2 of 2,* Based on 2012 International Building Code.

DeLorme, 2004, (www.delorme.com) *Topo USA*®.

Hart, Earl W. and Bryant, William A., *1997, Fault Rupture Hazard Zones in California, CDMG Special Publication 42,* revised 2003.

Irvine Geotechnical, 2001, Mult Calc 2000, October 10.

Morton, D.M., and Miller, F.K., 2006, *Geologic Map of the San Bernardino and Santa Ana 30' x 60' Quadrangles, California*: U.S. Geological Survey, Open-File Report OF-2006-1217.

National Association of Corrosion Engineers, 1984, *Corrosion Basics An Introduction*, page 191.

Southern California Earthquake Center (SCEC), 1999, *Recommended Procedures for Implementation of DMG Special Publication 117, Guidelines for Analyzing and Mitigating Liquefaction Hazards in California,* March.

APPENDIX B

EXPLORATORY LOGS

Geotechnical Boring Log B-1

Date: September 18, 2018	**Project Name: Keller Road** **Page: 1 of 1**
Project Number: 182351-10A	**Logged By: MM/JF**
Drilling Company: Drilling It	**Type of Rig: Mobile B60**
Drive Weight (lbs): 140	**Drop (in): 30** **Hole Diameter (in): 8**
Top of Hole Elevation (ft): See Map	**Hole Location: See Geotechnical Map**

Depth (ft)	Blow Count Per Foot	Sample Depth	Dry Density (pcf)	Moisture (%)	Classification Symbol	MATERIAL DESCRIPTION
0		0-5'				**Topsoil:**
					SM	Silty SAND; gray, dry, medium dense, fine to medium sand
	50/4"	2.5'	121.6	4.2		**Mesozoic Phyllite (Mzp):**
						PHYLLITE; gray-green, dry, very hard, breaks down to Sandy SILT
5						
	50/5"	5'	103.0	11.6		
	50/6"	7.5'	121.6	8.7		
						Practical refusal at 8.5 feet
10						Total Depth: 8.5 feet
						No Groundwater
15						
20						
25						
30						

42184 Remington Avenue, Temecula, CA 92590

Earth Strata Geotechnical Services, Inc.
Geotechnical, Environmental and Materials Testing Consultants
www.ESGSINC.com (951) 397-8315

Geotechnical Boring Log B-2

Date: September 18, 2018	**Project Name: Keller Road** **Page: 1 of 1**
Project Number: 182351-10A	**Logged By: MM/JF**
Drilling Company: Drilling It	**Type of Rig: Mobile B60**
Drive Weight (lbs): 140	**Drop (in): 30** **Hole Diameter (in): 8**
Top of Hole Elevation (ft): See Map	**Hole Location: See Geotechnical Map**

Depth (ft)	Blow Count Per Foot	Sample Depth	Dry Density (pcf)	Moisture (%)	Classification Symbol	MATERIAL DESCRIPTION
0						**Topsoil:**
					ML	Sandy SILT; medium brown, dry, medium dense, fine to medium sand
	20	2.5'	134.3	2.6		**Mesozoic Phyllite (Mzp):**
						PHYLLITE; gray-green, dry, very hard, breaks down to Sandy SILT
5						
	71	5'	123.5	4.2		
	50/4"	7.5'	123.0	5.3		
						Practical refusal at 8.5 feet
10						Total Depth: 8.5 feet
						No Groundwater
15						
20						
25						
30						

42184 Remington Avenue, Temecula, CA 92590

Earth Strata Geotechnical Services, Inc.
Geotechnical, Environmental and Materials Testing Consultants
www.ESGSINC.com (951) 397-8315

Geotechnical Boring Log B-3

Date: September 18, 2018	**Project Name: Keller Road** **Page: 1 of 1**
Project Number: 182351-10A	**Logged By: MM/JF**
Drilling Company: Drilling It	**Type of Rig: Mobile B60**
Drive Weight (lbs): 140	**Drop (in): 30** **Hole Diameter (in): 8**
Top of Hole Elevation (ft): See Map	**Hole Location: See Geotechnical Map**

Depth (ft)	Blow Count Per Foot	Sample Depth	Dry Density (pcf)	Moisture (%)	Classification Symbol	MATERIAL DESCRIPTION
0		0-5'				**Topsoil:**
					SM	Silty SAND; gray, dry, medium dense, fine to medium sand
	50/5.5"	2.5'	-	-		**Mesozoic Phyllite (Mzp):**
						PHYLLITE; gray-green, dry, very hard, breaks down to Sandy SILT
5	50/3"	5'	130.5	3.7		
	50/3.5"	7.5'	112.6	8.0		
						Practical refusal at 8.5 feet
10						Total Depth: 8.5 feet
						No Groundwater
15						
20						
25						
30						

42184 Remington Avenue, Temecula, CA 92590

Earth Strata Geotechnical Services, Inc.
Geotechnical, Environmental and Materials Testing Consultants
www.ESGSINC.com (951) 397-8315

Geotechnical Boring Log B-4

Date: September 18, 2018	**Project Name: Keller Road** **Page: 1 of 1**
Project Number: 182351-10A	**Logged By: MM/JF**
Drilling Company: Drilling It	**Type of Rig: Mobile B60**
Drive Weight (lbs): 140	**Drop (in): 30** **Hole Diameter (in): 8**
Top of Hole Elevation (ft): See Map	**Hole Location: See Geotechnical Map**

Depth (ft)	Blow Count Per Foot	Sample Depth	Dry Density (pcf)	Moisture (%)	Classification Symbol	MATERIAL DESCRIPTION
0						**Topsoil:**
					ML	Sandy SILT; yellow brown, dry, medium dense, fine to medium sand
	39	2.5'	104.5	14.5		**Mesozoic Phyllite (Mzp):**
						PHYLLITE; gray-black, dry, very hard, breaks down to Sandy SILT
5	90	5'	126.2	10.7		
	50/4"	7.5'	122.0	6.9		
						Practical refusal at 8.5 feet
10						Total Depth: 8.5 feet
						No Groundwater
15						
20						
25						
30						

42184 Remington Avenue, Temecula, CA 92590

Earth Strata Geotechnical Services, Inc.
Geotechnical, Environmental and Materials Testing Consultants
www.ESGSINC.com (951) 397-8315

APPENDIX C

LABORATORY PROCEDURES AND TEST RESULTS

APPENDIX C

Laboratory Procedures and Test Results

Laboratory testing provided quantitative and qualitative data involving the relevant engineering properties of the representative earth materials selected for testing. The representative samples were tested in general accordance with American Society for Testing and Materials (ASTM) procedures and/or California Test Methods (CTM).

Soil Classification: Earth materials encountered during exploration were classified and logged in general accordance with the Standard Practice for Description and Identification of Soils (Visual-Manual Procedure) of ASTM D 2488. Upon completion of laboratory testing, exploratory logs and sample descriptions were reconciled to reflect laboratory test results with regard to ASTM D 2487.

Moisture and Density Tests: For select samples moisture content was determined using the guidelines of ASTM D 2216 and dry density determinations were made using the guidelines of ASTM D 2937. These tests were performed on relatively undisturbed samples and the test results are presented on the exploratory logs.

Maximum Density Tests: The maximum dry density and optimum moisture content of representative samples were determined using the guidelines of ASTM D 1557. The test results are presented in the table below.

SAMPLE LOCATION	MATERIAL DESCRIPTION	MAXIMUM DRY DENSITY (pcf)	OPTIMUM MOISTURE CONTENT (%)
B-1 @ 0-5 feet	Sandy SILT	126.0	11.0

Expansion Index: The expansion potential of representative samples was evaluated using the guidelines of ASTM D 4829. The test results are presented in the table below.

SAMPLE LOCATION	MATERIAL DESCRIPTION	EXPANSION INDEX	EXPANSION POTENTIAL
B-1 @ 0-5 feet	Sandy SILT	60	Medium

R-Value: The R-value of representative samples was determined using the guidelines of CTM 301. The test results are presented in the table below.

SAMPLE LOCATION	MATERIAL DESCRIPTION	R-VALUE
B-3 @ 0-5 feet	Clayey SAND	35

Minimum Resistivity and pH Tests: Minimum resistivity and pH Tests of select samples were performed using the guidelines of CTM 643. The test results are presented in the table below.

SAMPLE LOCATION	MATERIAL DESCRIPTION	pH	MINIMUM RESISTIVITY (ohm-cm)
B-1 @ 0-5 feet	Sandy SILT	7.6	1,700

Soluble Sulfate: The soluble sulfate content of select samples was determined using the guidelines of CTM 417. The test results are presented in the table below.

SAMPLE LOCATION	MATERIAL DESCRIPTION	SULFATE CONTENT (% by weight)	SULFATE EXPOSURE
B-1 @ 0-5 feet	Sandy SILT	0.005	Negligible

Chloride Content: Chloride content of select samples was determined using the guidelines of CTM 422. The test results are presented in the table below.

SAMPLE LOCATION	MATERIAL DESCRIPTION	CHLORIDE CONTENT (ppm)
B-1 @ 0-5 feet	Sandy SILT	40

APPENDIX D

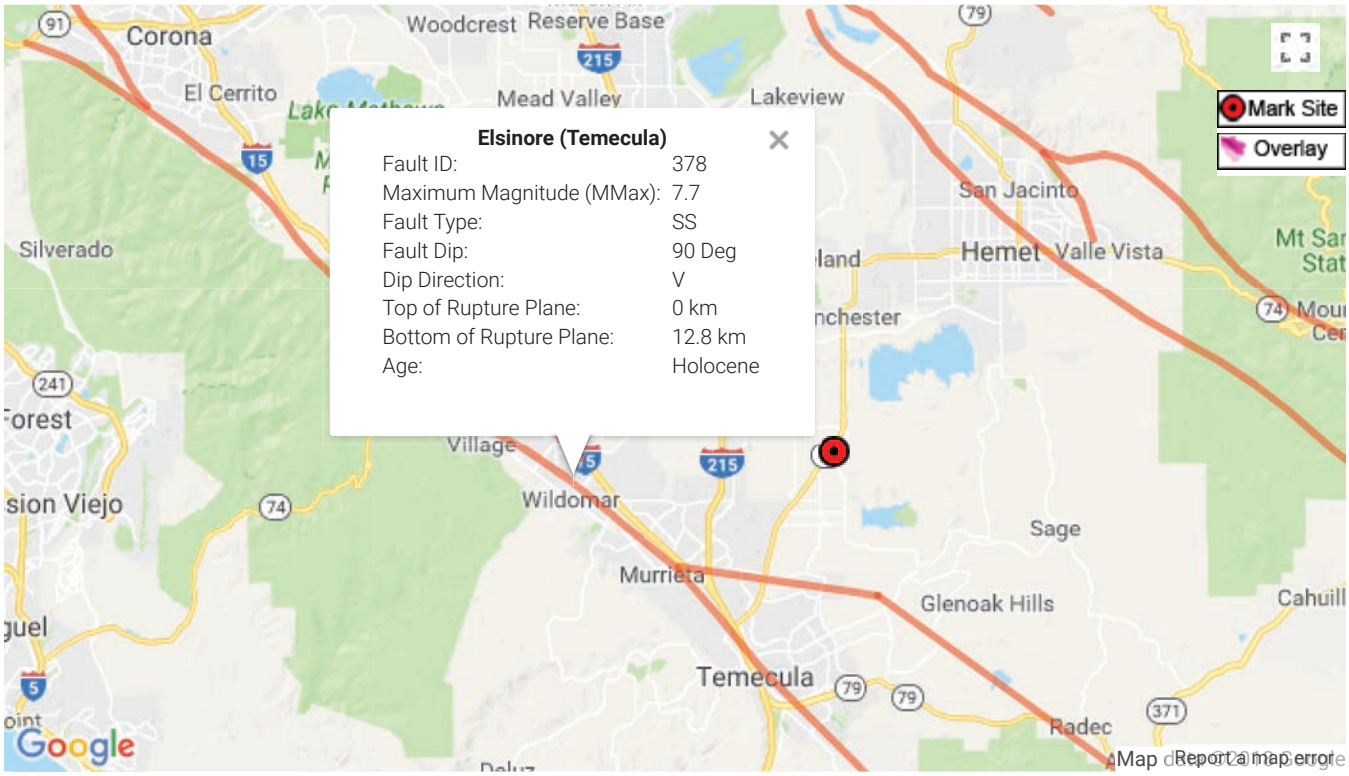
SEISMICITY

CALIFORNIA DEPARTMENT OF
TRANSPORTATION

Caltrans ARS Online (v2.3.09)

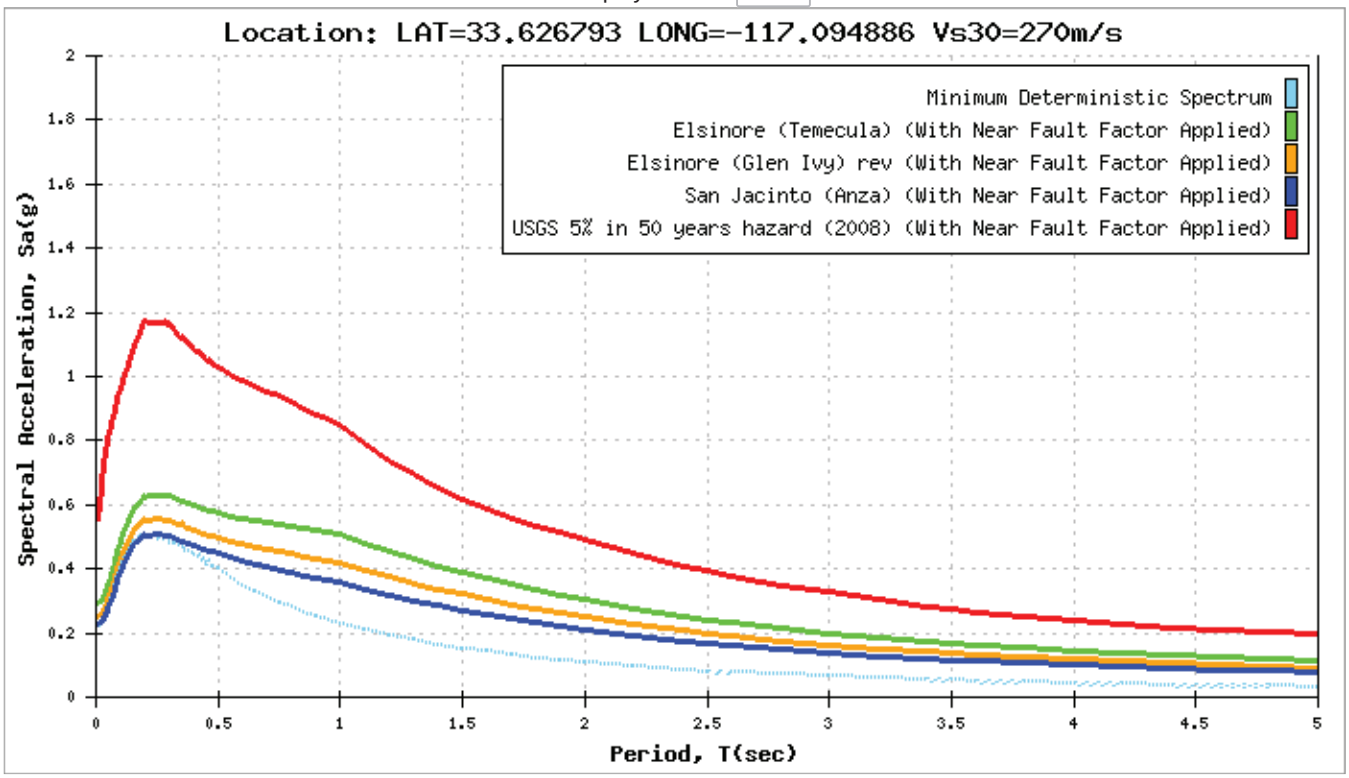
This web-based tool calculates both deterministic and probabilistic acceleration response spectra for any location in California based on criteria provided in *Appendix B of Caltrans Seismic Design Criteria*. More...

SELECT SITE LOCATION



Latitude: 33.626793 **Longitude:** -117.094886 ***V*S30:** 270 m/s Calculate

CALCULATED SPECTRA Display Curves: 3



Tabular Data | Envelope Only | Hide Near Fault | Axis Scale | Show Basin

Apply Near Fault Adjustment To:

NOTE: Caltrans SDC requires application of a Near Fault Adjustment factor for sites less than 25 km (Rrup) from the causative fault.

☑ Deterministic Spectrum Using

12.64 Km Elsinore (Temecula)

16.45 Km Elsinore (Glen Ivy) rev

19.45 Km San Jacinto (Anza)

☑ Probabilistic Spectrum Using

12.64 Km (Recommend Performing Deaggregation To Verify)

◉ Show Spectrum with Adjustment Only

○ Show Spectrum with and without near fault Adjustment

OK

U.S. Geological Survey - Earthquake Hazards Program

2008 National Seismic Hazard Maps - Source Parameters

New Search

Distance in Kilometers	Name	State	Pref Slip Rate (mm/yr)	Dip (degrees)	Dip Dir	Slip Sense	Rupture Top (km)	Rupture Bottom (km)	Length (km)
12.64	Elsinore;T+J+CM	CA	n/a	85	NE	strike slip	0	16	169
12.64	Elsinore;T+J	CA	n/a	86	NE	strike slip	0	17	127
12.64	Elsinore;GI+T+J+CM	CA	n/a	86	NE	strike slip	0	16	195
12.64	Elsinore;GI+T+J	CA	n/a	86	NE	strike slip	0	17	153
12.64	Elsinore;GI+T	CA	5	90	V	strike slip	0	14	78
12.64	Elsinore;W+GI+T+J+CM	CA	n/a	84	NE	strike slip	0	16	241
12.64	Elsinore;W+GI+T+J	CA	n/a	84	NE	strike slip	0	16	199
12.64	Elsinore;W+GI+T	CA	n/a	84	NE	strike slip	0	14	124
12.64	Elsinore;T	CA	5	90	V	strike slip	0	14	52
16.74	Elsinore;W+GI	CA	n/a	81	NE	strike slip	0	14	83
16.74	Elsinore;GI	CA	5	90	V	strike slip	0	13	37
19.34	San Jacinto;A+CC+B+SM	CA	n/a	90	V	strike slip	0.1	15	178
19.34	San Jacinto;A+CC+B	CA	n/a	90	V	strike slip	0.1	15	152
19.34	San Jacinto;A+CC	CA	n/a	90	V	strike slip	0	16	118
19.34	San Jacinto;A+C	CA	n/a	90	V	strike slip	0	17	118
19.34	San Jacinto;A	CA	9	90	V	strike slip	0	17	71
20.56	San Jacinto;SBV+SJV+A	CA	n/a	90	V	strike slip	0	16	134
20.56	San Jacinto;SJV+A+CC+B+SM	CA	n/a	90	V	strike	0.1	15	196

						slip			
20.56	San Jacinto;SJV+A+CC+B	CA	n/a	90	V	strike slip	0.1	15	170
20.56	San Jacinto;SJV+A+CC	CA	n/a	90	V	strike slip	0	16	136
20.56	San Jacinto;SJV+A+C	CA	n/a	90	V	strike slip	0	17	136
20.56	San Jacinto;SJV+A	CA	n/a	90	V	strike slip	0	17	89
20.56	San Jacinto;SBV+SJV+A+CC+B+SM	CA	n/a	90	V	strike slip	0.1	15	241
20.56	San Jacinto;SBV+SJV+A+CC+B	CA	n/a	90	V	strike slip	0.1	15	215
20.56	San Jacinto;SBV+SJV+A+CC	CA	n/a	90	V	strike slip	0	16	181
20.56	San Jacinto;SBV+SJV+A+C	CA	n/a	90	V	strike slip	0	17	181
22.76	San Jacinto;SBV+SJV	CA	n/a	90	V	strike slip	0	16	88
22.76	San Jacinto;SJV	CA	18	90	V	strike slip	0	16	43
32.70	Elsinore;J+CM	CA	3	84	NE	strike slip	0	17	118
32.70	Elsinore;J	CA	3	84	NE	strike slip	0	19	75
44.77	S. San Andreas;CH+CC+BB+NM+SM+NSB+SSB	CA	n/a	90	V	strike slip	0	14	384
44.77	S. San Andreas;CH+CC+BB+NM+SM+NSB+SSB+BG+CO	CA	n/a	86		strike slip	0.1	13	512
44.77	S. San Andreas;SSB+BG	CA	n/a	71		strike slip	0	13	101
44.77	S. San Andreas;NSB+SSB+BG+CO	CA	n/a	79		strike slip	0.2	12	206
44.77	S. San Andreas;CC+BB+NM+SM+NSB+SSB	CA	n/a	90	V	strike slip	0	14	322
44.77	S. San Andreas;CC+BB+NM+SM+NSB+SSB+BG	CA	n/a	85		strike slip	0	14	380
44.77	S. San Andreas;CC+BB+NM+SM+NSB+SSB+BG+CO	CA	n/a	86		strike slip	0.1	13	449
44.77	S. San Andreas;CH+CC+BB+NM+SM+NSB+SSB+BG	CA	n/a	86		strike slip	0	14	442
44.77	S. San Andreas;NM+SM+NSB+SSB	CA	n/a	90	V	strike slip	0	13	213

44.77	S. San Andreas;NM+SM+NSB+SSB+BG	CA	n/a	83		strike slip	0	14	271
44.77	S. San Andreas;NM+SM+NSB+SSB+BG+CO	CA	n/a	84		strike slip	0.1	13	340
44.77	S. San Andreas;NSB+SSB	CA	n/a	90	V	strike slip	0	13	79
44.77	S. San Andreas;NSB+SSB+BG	CA	n/a	75		strike slip	0	14	136
44.77	S. San Andreas;PK+CH+CC+BB+NM+SM+NSB+SSB	CA	n/a	90	V	strike slip	0.1	13	421
44.77	S. San Andreas;PK+CH+CC+BB+NM+SM+NSB+SSB+BG	CA	n/a	86		strike slip	0.1	13	479
44.77	S. San Andreas;PK+CH+CC+BB+NM+SM+NSB+SSB+BG+CO	CA	n/a	86		strike slip	0.1	13	548
44.77	S. San Andreas;SM+NSB+SSB	CA	n/a	90	V	strike slip	0	13	176
44.77	S. San Andreas;SM+NSB+SSB+BG	CA	n/a	81		strike slip	0	13	234
44.77	S. San Andreas;SM+NSB+SSB+BG+CO	CA	n/a	83		strike slip	0.1	13	303
44.77	S. San Andreas;SSB	CA	16	90	V	strike slip	0	13	43
44.77	S. San Andreas;SSB+BG+CO	CA	n/a	77		strike slip	0.2	12	170
44.77	S. San Andreas;BB+NM+SM+NSB+SSB	CA	n/a	90	V	strike slip	0	14	263
44.77	S. San Andreas;BB+NM+SM+NSB+SSB+BG	CA	n/a	84		strike slip	0	14	321
44.77	S. San Andreas;BB+NM+SM+NSB+SSB+BG+CO	CA	n/a	85		strike slip	0.1	13	390
45.18	S. San Andreas;BG+CO	CA	n/a	72		strike slip	0.3	12	125
45.18	S. San Andreas;BG	CA	n/a	58		strike slip	0	13	56
45.27	San Jacinto;SBV	CA	6	90	V	strike slip	0	16	45
48.89	Chino, alt 2	CA	1	65	SW	strike slip	0	14	29
51.15	Elsinore;W	CA	2.5	75	NE	strike slip	0	14	46
52.88	Chino, alt 1	CA	1	50	SW	strike slip	0	9	24
53.93	San Joaquin Hills	CA	0.5	23	SW	thrust	2	13	27

54.09	San Jacinto;CC	CA	4	90	V	strike slip	0	16	43
54.09	San Jacinto;CC+B+SM	CA	n/a	90	V	strike slip	0.2	14	103
54.09	San Jacinto;CC+B	CA	n/a	90	V	strike slip	0.2	14	77
56.03	San Jacinto;C	CA	14	90	V	strike slip	0	17	47
58.38	Newport Inglewood Connected alt 1	CA	1.3	89		strike slip	0	11	208
58.38	Newport-Inglewood (Offshore)	CA	1.5	90	V	strike slip	0	10	66
58.38	Newport Inglewood Connected alt 2	CA	1.3	90	V	strike slip	0	11	208
58.74	Pinto Mtn	CA	2.5	90	V	strike slip	0	16	74
59.24	S. San Andreas;NM+SM+NSB	CA	n/a	90	V	strike slip	0	13	170
59.24	S. San Andreas;BB+NM+SM+NSB	CA	n/a	90	V	strike slip	0	14	220
59.24	S. San Andreas;CC+BB+NM+SM+NSB	CA	n/a	90	V	strike slip	0	14	279
59.24	S. San Andreas;NSB	CA	22	90	V	strike slip	0	13	35
59.24	S. San Andreas;SM+NSB	CA	n/a	90	V	strike slip	0	13	133
59.24	S. San Andreas;PK+CH+CC+BB+NM+SM+NSB	CA	n/a	90	V	strike slip	0.1	13	377
59.24	S. San Andreas;CH+CC+BB+NM+SM+NSB	CA	n/a	90	V	strike slip	0	14	341
63.76	Rose Canyon	CA	1.5	90	V	strike slip	0	8	70
68.44	Earthquake Valley	CA	2	90	V	strike slip	0	19	20
69.18	Cucamonga	CA	5	45	N	thrust	0	8	28
73.41	Cleghorn	CA	3	90	V	strike slip	0	16	25
73.58	Burnt Mtn	CA	0.6	67	W	strike slip	0	16	21
77.22	San Jose	CA	0.5	74	NW	strike slip	0	15	20
77.69	Puente Hills (Coyote Hills)	CA	0.7	26	N	thrust	2.8	15	17
77.95	Newport-Inglewood, alt 1	CA	1	88		strike	0	15	65

						slip			
78.26	North Frontal (West)	CA	1	49	S	reverse	0	16	50
78.88	Eureka Peak	CA	0.6	90	V	strike slip	0	15	19
80.61	S. San Andreas;CO	CA	20	90	V	strike slip	0.6	11	69
81.26	Sierra Madre Connected	CA	2	51		reverse	0	14	76
81.26	Sierra Madre	CA	2	53	N	reverse	0	14	57
81.61	Helendale-So Lockhart	CA	0.6	90	V	strike slip	0	13	114
83.33	North Frontal (East)	CA	0.5	41	S	thrust	0	16	27
83.42	Palos Verdes Connected	CA	3	90	V	strike slip	0	10	285
83.42	Coronado Bank	CA	3	90	V	strike slip	0	9	186
85.64	Palos Verdes	CA	3	90	V	strike slip	0	14	99
86.50	Landers	CA	0.6	90	V	strike slip	0	15	95
87.28	S. San Andreas;NM+SM	CA	n/a	90	V	strike slip	0	14	134
87.28	S. San Andreas;BB+NM+SM	CA	n/a	90	V	strike slip	0	14	184
87.28	S. San Andreas;CH+CC+BB+NM+SM	CA	n/a	90	V	strike slip	0	14	306
87.28	S. San Andreas;PK+CH+CC+BB+NM+SM	CA	n/a	90	V	strike slip	0.1	13	342
87.28	S. San Andreas;SM	CA	29	90	V	strike slip	0	13	98
87.28	S. San Andreas;CC+BB+NM+SM	CA	n/a	90	V	strike slip	0	14	243
90.39	Lenwood-Lockhart-Old Woman Springs	CA	0.9	90	V	strike slip	0	13	145
91.98	Puente Hills (Santa Fe Springs)	CA	0.7	29	N	thrust	2.8	15	11
94.91	San Jacinto;B+SM	CA	n/a	90	V	strike slip	0.4	12	61
94.91	San Jacinto;B	CA	4	90	V	strike slip	0.7	13	34
96.18	Johnson Valley (No)	CA	0.6	90	V	strike slip	0	16	35
97.27	Clamshell-Sawpit	CA	0.5	50	NW	reverse	0	14	16

Search Results

8 of 8 earthquakes in map area.

Click for more information

6.3	**7km SSE of Big Bear City, CA** 1992-06-28 15:05:30 (UTC)	3.6 km
7.3	**Landers, California Earthquake** 1992-06-28 11:57:34 (UTC)	-0.1 km
6.1	**17km NNE of Thousand Palms, California** 1992-04-23 04:50:23 (UTC)	11.6 km
6.0	**6km SSW of Morongo Valley, CA** 1986-07-08 09:20:44 (UTC)	9.5 km
6.0	**16km E of Desert Hot Springs, CA** 1948-12-04 23:43:16 (UTC)	6.0 km
6.0	**16km WSW of Oasis, CA** 1937-03-25 16:49:02 (UTC)	6.0 km
6.4	**Long Beach, California Earthquake** 1933-03-11 01:54:09 (UTC)	6.0 km
6.7	**Southern California** 1918-04-21 22:32:29 (UTC)	10.0 km

Didn't find what you were looking for?

- Check your Settings.
- Which earthquakes are included on the map and list?
- Felt something not shown – report it here.

Earthquakes updated

Hazards by Location

Search Information



Coordinates: 33.626793, -117.094886

Elevation: 1424 ft

Timestamp: 2020-07-13T19:37:15.766Z

Hazard Type: Seismic

Reference Document: ASCE7-16

Risk Category: II

Site Class: D

Basic Parameters

Name	Value	Description
S_S	1.371	MCE_R ground motion (period=0.2s)
S_1	0.509	MCE_R ground motion (period=1.0s)
S_{MS}	1.371	Site-modified spectral acceleration value
S_{M1}	* null	Site-modified spectral acceleration value
S_{DS}	0.914	Numeric seismic design value at 0.2s SA
S_{D1}	* null	Numeric seismic design value at 1.0s SA

* See Section 11.4.8

Additional Information

Name	Value	Description
SDC	* null	Seismic design category
F_a	1	Site amplification factor at 0.2s
F_v	* null	Site amplification factor at 1.0s
CR_S	0.925	Coefficient of risk (0.2s)
CR_1	0.912	Coefficient of risk (1.0s)
PGA	0.538	MCE_G peak ground acceleration
F_{PGA}	1.1	Site amplification factor at PGA
PGA_M	0.591	Site modified peak ground acceleration
T_L	8	Long-period transition period (s)

SsRT	1.371	Probabilistic risk-targeted ground motion (0.2s)
SsUH	1.482	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
SsD	1.5	Factored deterministic acceleration value (0.2s)
S1RT	0.509	Probabilistic risk-targeted ground motion (1.0s)
S1UH	0.558	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
S1D	0.6	Factored deterministic acceleration value (1.0s)
PGAd	0.538	Factored deterministic acceleration value (PGA)

* See Section 11.4.8

The results indicated here DO NOT reflect any state or local amendments to the values or any delineation lines made during the building code adoption process. Users should confirm any output obtained from this tool with the local Authority Having Jurisdiction before proceeding with design.

Disclaimer

Hazard loads are provided by the U.S. Geological Survey Seismic Design Web Services.

While the information presented on this website is believed to be correct, ATC and its sponsors and contributors assume no responsibility or liability for its accuracy. The material presented in the report should not be used or relied upon for any specific application without competent examination and verification of its accuracy, suitability and applicability by engineers or other licensed professionals. ATC does not intend that the use of this information replace the sound judgment of such competent professionals, having experience and knowledge in the field of practice, nor to substitute for the standard of care required of such professionals in interpreting and applying the results of the report provided by this website. Users of the information from this website assume all liability arising from such use. Use of the output of this website does not imply approval by the governing building code bodies responsible for building code approval and interpretation for the building site described by latitude/longitude location in the report.

APPENDIX E

ASPHALTIC CONCRETE PAVEMENT CALCULATIONS

PAVING DESIGN

Earth - Strata, Inc.
Geotechnical, Environmental and Materials Testing Consultants
BETTER PEOPLE • BETTER SERVICE • BETTER RESULTS

JN: **182351-10** CONSULT: **SMP**
PROJECT: **Winchester**

CALCULATION SHEET # **AutoParking**

CALTRANS METHOD FOR DESIGN OF FLEXIBLE PAVEMENT

Input "R" value or "CBR" of native soil	35	
Type of Index Property - "R" value or "CBR" (C or R)	R	R Value
R Value used for Caltrans Method	35	
Input Traffic Index (TI)	5	
Calculated Total Gravel Equivalent (GE)	1.04	feet
Calculated Total Gravel Equivalent (GE)	12.48	inches
Calculated Gravel Factor (Gf) for A/C paving	2.53	
Gravel Factor for Base Course (Gf)	1.1	

Pavement sections provided below are considered equal; but, do not reflect reviewing agency minimums.

Gravel Equivalent GE (feet)	GE (inches)	Delta (inches)	INCHES A/C Section Thickness (inches)	INCHES Minimum Base (inches)	FEET A/C Section Thickness (feet)	FEET Minimum Base (feet)
0.63	7.60	4.88	3.0	4.2	0.25	0.35
0.74	8.87	3.61	3.5	3.0	0.29	0.25
0.76	9.13	3.35	3.6	3.0	0.30	0.25
0.84	10.14	2.34	4.0	2.4	0.33	0.20
0.89	10.65	1.83	4.2	1.8	0.35	0.15
0.95	11.41	1.07	4.5	1.2	0.38	0.10
1.01	12.17	0.31	4.8	0.0	0.40	0.00
1.06	12.67	-0.19	5.0		0.42	
1.27	15.21	-2.73	6.0		0.50	
2.11	25.35	-12.87	10.0		0.83	
2.53	30.42	-17.94	12.0		1.00	

PAVING DESIGN

Earth - Strata, Inc.
Geotechnical, Environmental and Materials Testing Consultants
BETTER PEOPLE • BETTER SERVICE • BETTER RESULTS

JN: **182351-10** CONSULT: **SMP**
PROJECT: **Winchester**

CALCULATION SHEET # **AutoDrive**

CALTRANS METHOD FOR DESIGN OF FLEXIBLE PAVEMENT

Input "R" value or "CBR" of native soil	35	
Type of Index Property - "R" value or "CBR" (C or R)	R	R Value
R Value used for Caltrans Method	35	
Input Traffic Index (TI)	6	
Calculated Total Gravel Equivalent (GE)	1.248	feet
Calculated Total Gravel Equivalent (GE)	14.976	inches
Calculated Gravel Factor (Gf) for A/C paving	2.31	
Gravel Factor for Base Course (Gf)	1.1	

Pavement sections provided below are considered equal; but, do not reflect reviewing agency minimums.

Gravel Equivalent GE (feet)	GE (inches)	Delta (inches)	INCHES A/C Section Thickness (inches)	Minimum Base (inches)	FEET A/C Section Thickness (feet)	Minimum Base (feet)
0.58	6.94	8.03	3.0	7.2	0.25	0.60
0.67	8.10	6.88	3.5	6.0	0.29	0.50
0.69	8.33	6.65	3.6	6.0	0.30	0.50
0.77	9.26	5.72	4.0	5.4	0.33	0.45
0.81	9.72	5.26	4.2	4.8	0.35	0.40
0.87	10.41	4.56	4.5	4.2	0.38	0.35
0.96	11.57	3.41	5.0	3.0	0.42	0.25
1.06	12.73	2.25	5.5	1.8	0.46	0.15
1.16	13.88	1.09	6.0	1.2	0.50	0.10
1.25	15.04	-0.06	6.5		0.54	
1.35	16.20	-1.22	7.0		0.58	

PAVING DESIGN

Earth - Strata, Inc.
Geotechnical, Environmental and Materials Testing Consultants
BETTER PEOPLE • BETTER SERVICE • BETTER RESULTS

JN: **182351-10** CONSULT: **SMP**
PROJECT: **Winchester**

CALCULATION SHEET # **Entrance**

CALTRANS METHOD FOR DESIGN OF FLEXIBLE PAVEMENT

Input "R" value or "CBR" of native soil	35	
Type of Index Property - "R" value or "CBR" (C or R)	R	R Value
R Value used for Caltrans Method	35	
Input Traffic Index (TI)	7	
Calculated Total Gravel Equivalent (GE)	1.456	feet
Calculated Total Gravel Equivalent (GE)	17.472	inches
Calculated Gravel Factor (Gf) for A/C paving	2.14	
Gravel Factor for Base Course (Gf)	1.1	

Pavement sections provided below are considered equal; but, do not reflect reviewing agency minimums.

Gravel Equivalent GE (feet)	GE (inches)	Delta (inches)	INCHES A/C Section Thickness (inches)	Minimum Base (inches)	FEET A/C Section Thickness (feet)	Minimum Base (feet)
0.71	8.57	8.90	4.0	7.8	0.33	0.65
0.75	9.00	8.47	4.2	7.8	0.35	0.65
0.80	9.64	7.83	4.5	7.2	0.38	0.60
0.86	10.28	7.19	4.8	6.6	0.40	0.55
0.89	10.71	6.76	5.0	6.0	0.42	0.50
0.98	11.78	5.69	5.5	5.4	0.46	0.45
1.07	12.85	4.62	6.0	4.2	0.50	0.35
1.25	15.00	2.48	7.0	2.4	0.58	0.20
1.43	17.14	0.33	8.0	0.6	0.67	0.05
1.52	18.21	-0.74	8.5		0.71	
1.61	19.28	-1.81	9.0		0.75	

APPENDIX F

GENERAL EARTHWORK AND GRADING SPECIFICATIONS

EARTH-STRATA

General Earthwork and Grading Specifications

General

Intent: These General Earthwork and Grading Specifications are intended to be the minimum requirements for the grading and earthwork shown on the approved grading plan(s) and/or indicated in the geotechnical report(s). These General Earthwork and Grading Specifications should be considered a part of the recommendations contained in the geotechnical report(s) and if they are in conflict with the geotechnical report(s), the specific recommendations in the geotechnical report shall supersede these more general specifications. Observations made during earthwork operations by the project Geotechnical Consultant may result in new or revised recommendations that may supersede these specifications and/or the recommendations in the geotechnical report(s).

The Geotechnical Consultant of Record: The Owner shall employ a qualified Geotechnical Consultant of Record (Geotechnical Consultant), prior to commencement of grading or construction. The Geotechnical Consultant shall be responsible for reviewing the approved geotechnical report(s) and accepting the adequacy of the preliminary geotechnical findings, conclusions, and recommendations prior to the commencement of the grading or construction.

Prior to commencement of grading or construction, the Owner shall coordinate with the Geotechnical Consultant, and Earthwork Contractor (Contractor) to schedule sufficient personnel for the appropriate level of observation, mapping, and compaction testing.

During earthwork and grading operations, the Geotechnical Consultant shall observe, map, and document the subsurface conditions to confirm assumptions made during the geotechnical design phase of the project. Should the observed conditions differ significantly from the interpretive assumptions made during the design phase, the Geotechnical Consultant shall recommend appropriate changes to accommodate the observed conditions, and notify the reviewing agency where required.

The Geotechnical Consultant shall observe the moisture conditioning and processing of the excavations and fill materials. The Geotechnical Consultant should perform periodic relative density testing of fill materials to verify that the attained level of compaction is being accomplished as specified.

The Earthwork Contractor: The Earthwork Contractor (Contractor) shall be qualified, experienced, and knowledgeable in earthwork logistics, preparation and processing of earth materials to receive compacted fill, moisture-conditioning and processing of fill, and compacting fill. The Contractor shall be provided with the approved grading plans and geotechnical report(s) for his review and acceptance of responsibilities, prior to commencement of grading. The Contractor shall be solely responsible for performing the grading in accordance with the approved grading plans and geotechnical report(s). Prior to commencement of grading, the Contractor shall prepare and submit to the Owner and the Geotechnical Consultant a work plan that indicates the sequence of earthwork grading, the number of "equipment" of work and the estimated quantities of daily earthwork contemplated for the site. The Contractor shall inform the Owner and the Geotechnical Consultant of work schedule changes and revisions to the work plan at least 24 hours in advance of such changes so that appropriate personnel will be available for observation and testing. No assumptions shall be made by the Contractor with regard to whether the Geotechnical Consultant is aware of all grading operations.

It is the sole responsibility of the Contractor to provide adequate equipment and methods to accomplish the earthwork operations in accordance with the applicable grading codes and agency ordinances, these specifications, and the recommendations in the approved geotechnical report(s) and grading plan(s). At the sole discretion of the Geotechnical Consultant, any unsatisfactory conditions, such as unsuitable earth materials, improper moisture conditioning, inadequate compaction, insufficient buttress keyway size, adverse weather conditions, etc., resulting in a quality of work less than required in the approved grading plans and geotechnical report(s), the Geotechnical Consultant shall reject the work and may recommend to the Owner that grading be stopped until conditions are corrected.

Preparation of Areas for Compacted Fill

Clearing and Grubbing: Vegetation, such as brush, grass, roots, and other deleterious material shall be sufficiently removed and properly disposed in a method acceptable to the Owner, Geotechnical Consultant, and governing agencies.

The Geotechnical Consultant shall evaluate the extent of these removals on a site by site basis. Earth materials to be placed as compacted fill shall not contain more than 1 percent organic materials (by volume). No compacted fill lift shall contain more than 10 percent organic matter.

Should potentially hazardous materials be encountered, the Contractor shall stop work in the affected area, and a hazardous materials specialist shall immediately be consulted to evaluate the potentially hazardous materials, prior to continuing to work in that area.

It is our understanding that the State of California defines most refined petroleum products (gasoline, diesel fuel, motor oil, grease, coolant, etc.) as hazardous waste. As such, indiscriminate dumping or spillage of these fluids may constitute a misdemeanor, punishable by fines and/or imprisonment, and shall be prohibited. The contractor is responsible for all hazardous waste related to his operations. The Geotechnical Consultant does not have expertise in this area. If hazardous waste is a concern, then the Owner should contract the services of a qualified environmental assessor.

Processing: Exposed earth materials that have been observed to be satisfactory for support of compacted fill by the Geotechnical Consultant shall be scarified to a minimum depth of 6 inches. Exposed earth materials that are not observed to be satisfactory shall be removed or alternative recommendations may be provided by the Geotechnical Consultant. Scarification shall continue until the exposed earth materials are broken down and free of oversize material and the working surface is reasonably uniform, flat, and free of uneven features that would inhibit uniform compaction. The earth materials should be moistened or air dried to near optimum moisture content, prior to compaction.

Overexcavation: The Cut Lot Typical Detail and Cut/Fill Transition Lot Typical Detail, included herein provides a graphic illustration that depicts typical overexcavation recommendations made in the approved geotechnical report(s) and/or grading plan(s).

Keyways and Benching: Where fills are to be placed on slopes steeper than 5:1 (horizontal to vertical units), the ground shall be thoroughly benched as compacted fill is placed. Please see the three Keyway and Benching Typical Details with subtitles Cut Over Fill Slope, Fill Over Cut Slope, and Fill Slope for a graphic illustration. The lowest bench or smallest keyway shall be a minimum of 15 feet wide (or ½ the proposed slope height) and at least 2 feet into competent earth materials as advised by the Geotechnical Consultant. Typical benches shall be excavated a minimum height of 4 feet into competent earth materials or as recommended by the Geotechnical Consultant. Fill placed on slopes steeper than 5:1 should be thoroughly benched or otherwise excavated to provide a flat subgrade for the compacted fill.

Evaluation/Acceptance of Bottom Excavations: All areas to receive compacted fill (bottom excavations), including removal excavations, processed areas, keyways, and benching, shall be observed, mapped, general elevations recorded, and/or tested prior to being accepted by the Geotechnical Consultant as suitable to receive compacted fill. The Contractor shall obtain a written acceptance from the Geotechnical Consultant prior to placing compacted fill. A licensed surveyor shall provide the survey control for determining elevations of bottom excavations, processed areas, keyways, and

benching. The Geotechnical Consultant is not responsible for erroneously located, fills, subdrain systems, or excavations.

Fill Materials

General: Earth material to be used as compacted fill should to a large extent be free of organic matter and other deleterious substances as evaluated and accepted by the Geotechnical Consultant.

Oversize: Oversize material is rock that does not break down into smaller pieces and has a maximum diameter greater than 8 inches. Oversize rock shall not be included within compacted fill unless specific methods and guidelines acceptable to the Geotechnical Consultant are followed. For examples of methods and guidelines of oversize rock placement see the enclosed Oversize Rock Disposal Detail. The inclusion of oversize materials in the compacted fill shall only be acceptable if the oversize material is completely surrounded by compacted fill or thoroughly jetted granular materials. No oversize material shall be placed within 10 vertical feet of finish grade or within 2 feet of proposed utilities or underground improvements.

Import: Should imported earth materials be required, the proposed import materials shall meet the requirements of the Geotechnical Consultant. Well graded, very low expansion potential earth materials free of organic matter and other deleterious substances are usually sought after as import materials. However, it is generally in the Owners best interest that potential import earth materials are provided to the Geotechnical Consultant to determine their suitability for the intended purpose. At least 48 hours should be allotted for the appropriate laboratory testing to be performed, prior to starting the import operations.

Fill Placement and Compaction Procedures

Fill Layers: Fill materials shall be placed in areas prepared to receive fill in nearly horizontal layers not exceeding 8 inches in loose thickness. Thicker layers may be accepted by the Geotechnical Consultant, provided field density testing indicates that the grading procedures can adequately compact the thicker layers. Each layer of fill shall be spread evenly and thoroughly mixed to obtain uniformity within the earth materials and consistent moisture throughout the fill.

Moisture Conditioning of Fill: Earth materials to be placed as compacted fill shall be watered, dried, blended, and/or mixed, as needed to obtain relatively uniform moisture contents that are at or slightly above optimum. The maximum density and optimum moisture content tests should be performed in accordance with the American Society of Testing and Materials (ASTM test method D1557-00).

Compaction of Fill: After each layer has been moisture-conditioned, mixed, and evenly spread, it should be uniformly compacted to a minimum of 90 percent of maximum dry density as determined by ASTM test method D1557-00. Compaction equipment shall be adequately sized and be either specifically designed for compaction of earth materials or be proven to consistently achieve the required level of compaction.

Compaction of Fill Slopes: In addition to normal compaction procedures specified above, additional effort to obtain compaction on slopes is needed. This may be accomplished by backrolling of slopes with sheepsfoot rollers as the fill is being placed, by overbuilding the fill slopes, or by other methods producing results that are satisfactory to the Geotechnical Consultant. Upon completion of grading, relative compaction of the fill and the slope face shall be a minimum of 90 percent of maximum density per ASTM test method D1557-00.

Compaction Testing of Fill: Field tests for moisture content and relative density of the compacted fill earth materials shall be periodically performed by the Geotechnical Consultant. The location and frequency of tests shall be at the Geotechnical Consultant's discretion based on field observations. Compaction test locations will not necessarily be random. The test locations may or may not be selected to verify minimum compaction requirements in areas that are typically prone to inadequate compaction, such as close to slope faces and near benching.

Frequency of Compaction Testing: Compaction tests shall be taken at minimum intervals of every 2 vertical feet and/or per 1,000 cubic yards of compacted materials placed. Additionally, as a guideline, at least one (1) test shall be taken on slope faces for each 5,000 square feet of slope face and/or for each 10 vertical feet of slope. The Contractor shall assure that fill placement is such that the testing schedule described herein can be accomplished by the Geotechnical Consultant. The Contractor shall stop or slow down the earthwork operations to a safe level so that these minimum standards can be obtained.

Compaction Test Locations: The approximate elevation and horizontal coordinates of each test location shall be documented by the Geotechnical Consultant. The Contractor shall coordinate with the Surveyor to assure that sufficient grade stakes are established. This will provide the Geotechnical Consultant with sufficient accuracy to determine the approximate test locations and elevations. The Geotechnical Consultant can not be responsible for staking erroneously located by the Surveyor or Contractor. A minimum of two grade stakes should be provided at a maximum horizontal distance of 100 feet and vertical difference of less than 5 feet.

Subdrain System Installation

Subdrain systems shall be installed in accordance with the approved geotechnical report(s), the approved grading plan, and the typical details provided herein. The Geotechnical Consultant may recommend additional subdrain systems and/or changes to the subdrain systems described herein, with regard to the extent, location, grade, or material depending on conditions encountered during grading or other factors. All subdrain systems shall be surveyed by a licensed land surveyor (except for retaining wall subdrain systems) to verify line and grade after installation and prior to burial. Adequate time should be allowed by the Contractor to complete these surveys.

Excavation

All excavations and over-excavations for remedial purposes shall be evaluated by the Geotechnical Consultant during grading operations. Remedial removal depths indicated on the geotechnical plans are estimates only. The actual removal depths and extent shall be determined by the Geotechnical Consultant based on the field evaluation of exposed conditions during grading operations. Where fill over cut slopes are planned, the cut portion of the slope shall be excavated, evaluated, and accepted by the Geotechnical Consultant prior to placement of the fill portion of the proposed slope, unless specifically addressed by the Geotechnical Consultant. Typical details for cut over fill slopes and fill over cut slopes are provided herein.

Trench Backfill

1) The Contractor shall follow all OHSA and Cal/OSHA requirements for trench excavation safety.

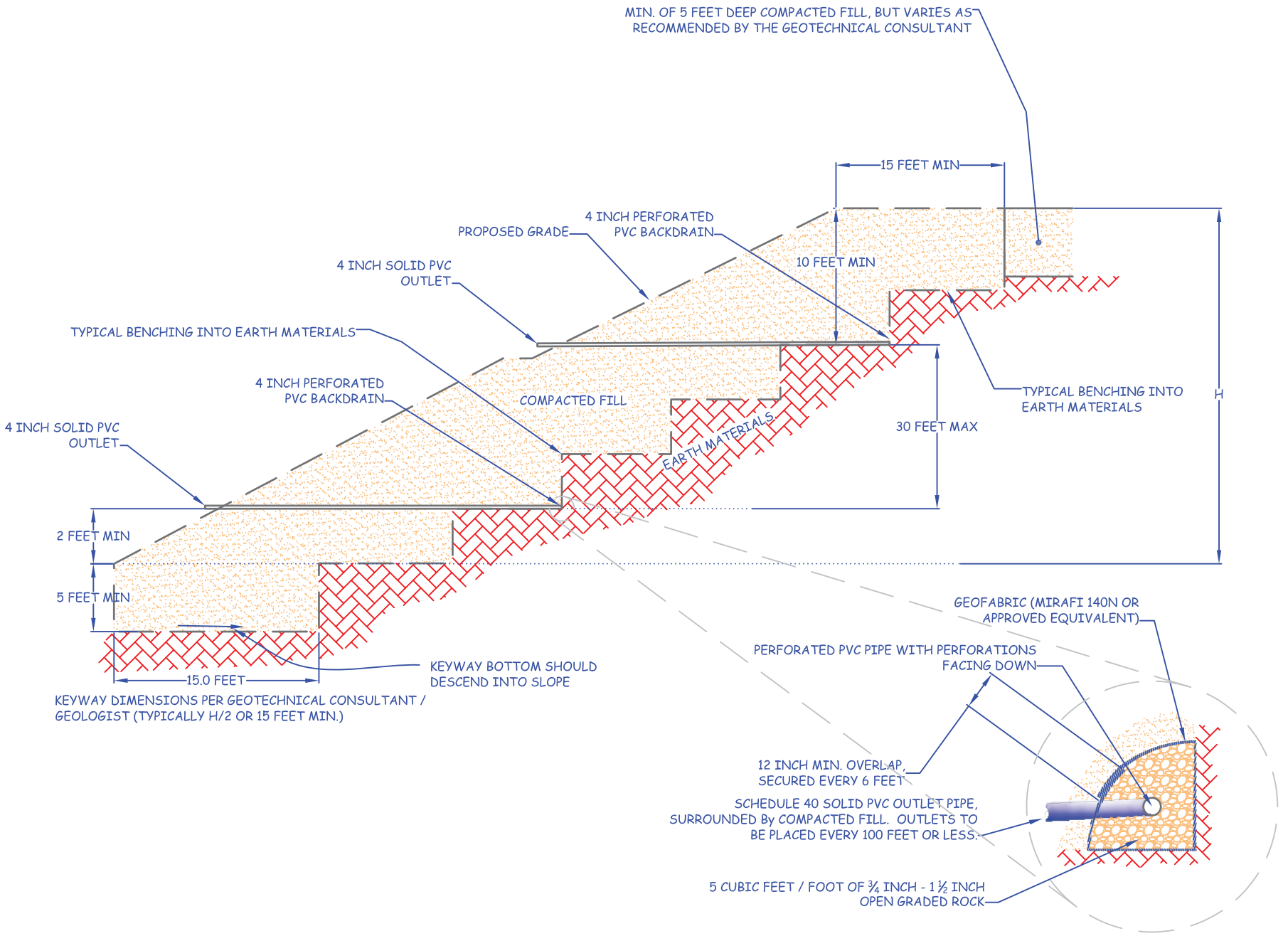
2) Bedding and backfill of utility trenches shall be done in accordance with the applicable provisions in the Standard Specifications of Public Works Construction. Bedding materials shall have a Sand Equivalency more than 30 (SE>30). The bedding shall be placed to 1 foot over the conduit and thoroughly jetting to provide densification. Backfill should be compacted to a minimum of 90 percent of maximum dry density, from 1 foot above the top of the conduit to the surface.

3) Jetting of the bedding materials around the conduits shall be observed by the Geotechnical Consultant.

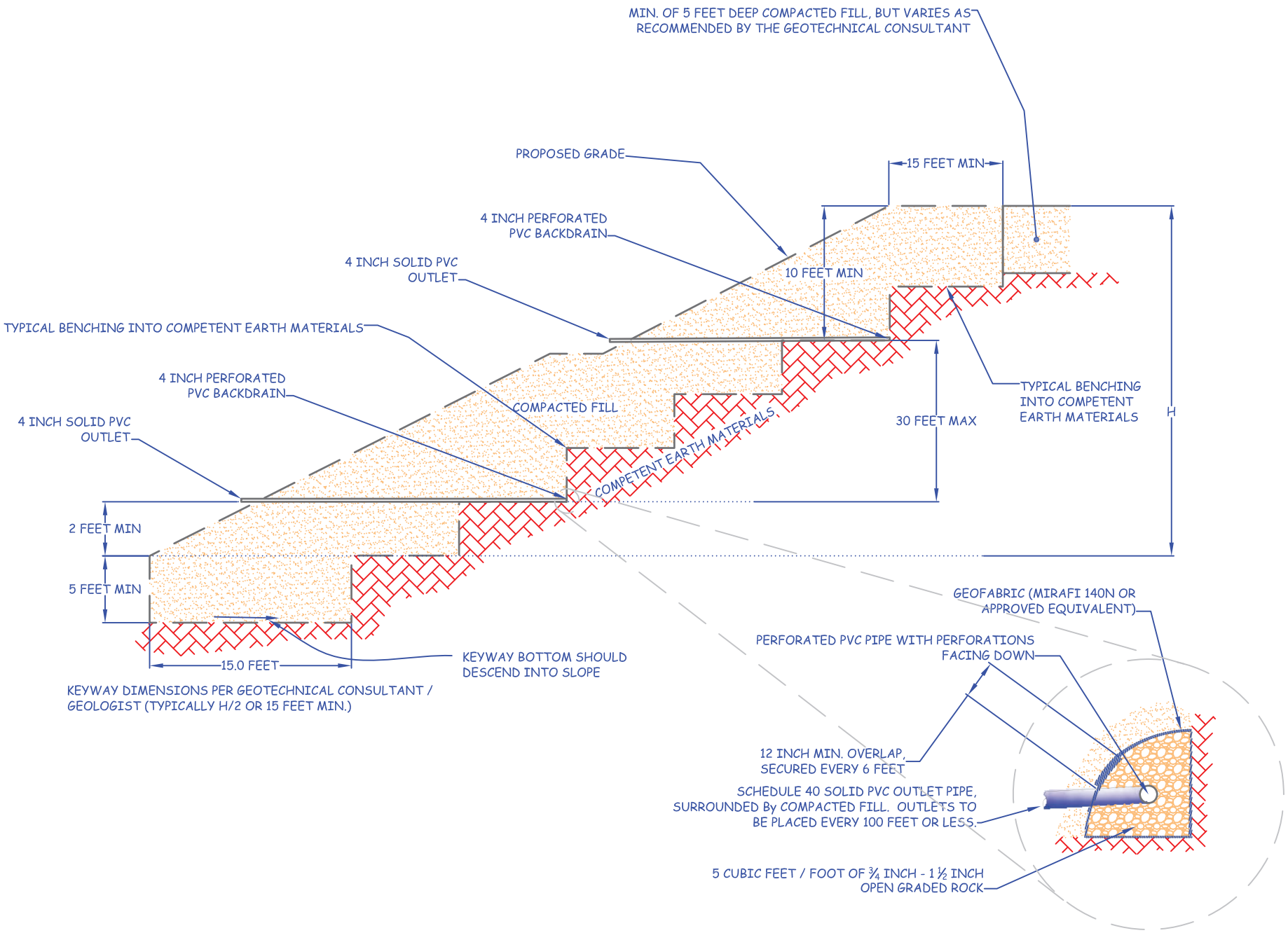
4) The Geotechnical Consultant shall test trench backfill for the minimum compaction requirements recommended herein. At least one test should be conducted for every 300 linear feet of trench and for each 2 vertical feet of backfill.

5) For trench backfill the lift thicknesses shall not exceed those allowed in the Standard Specifications of Public Works Construction, unless the Contractor can demonstrate to the Geotechnical Consultant that the fill lift can be compacted to the minimum relative compaction by his alternative equipment or method.

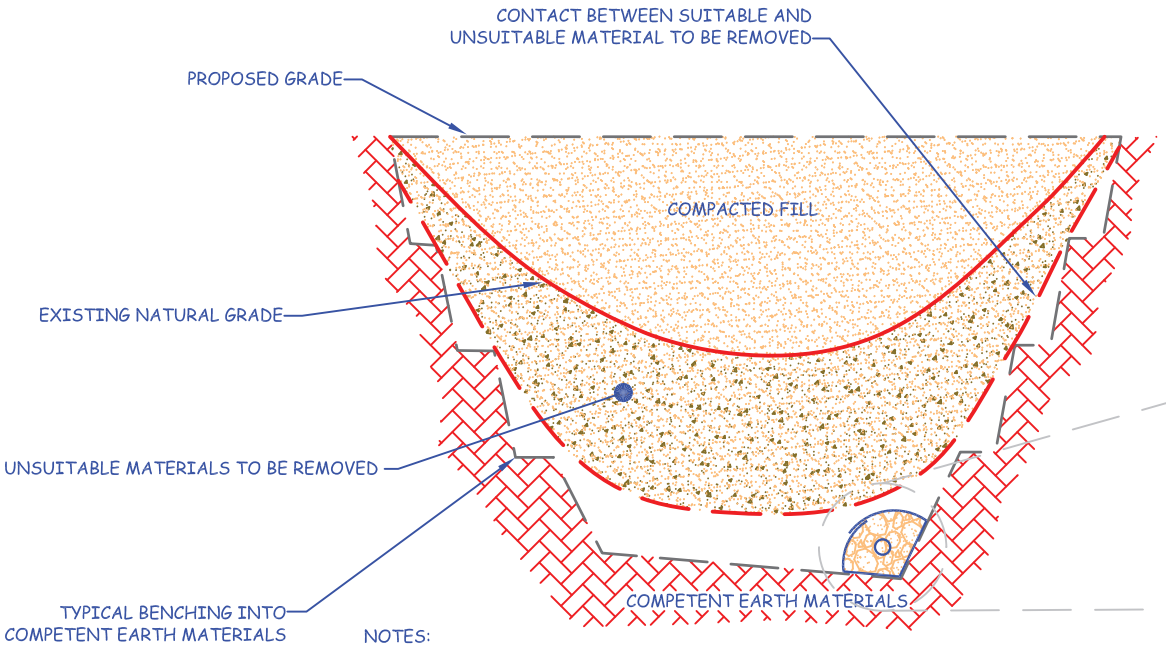
STABILIZATION FILL TYPICAL DETAIL

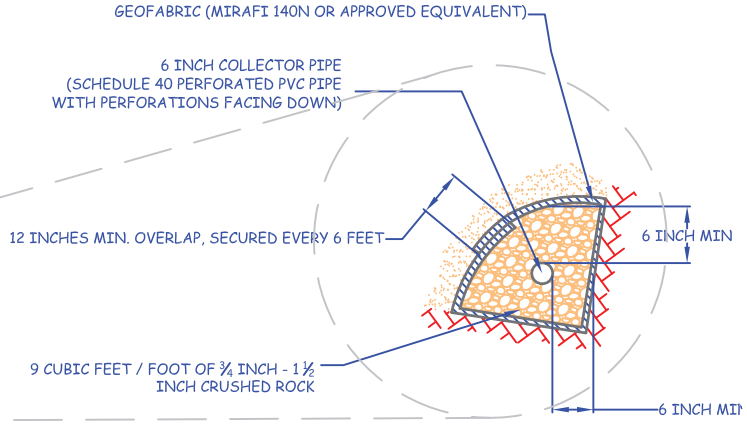


BUTTRESS TYPICAL DETAIL



CANYON SUBDRAIN SYSTEM TYPICAL DETAIL

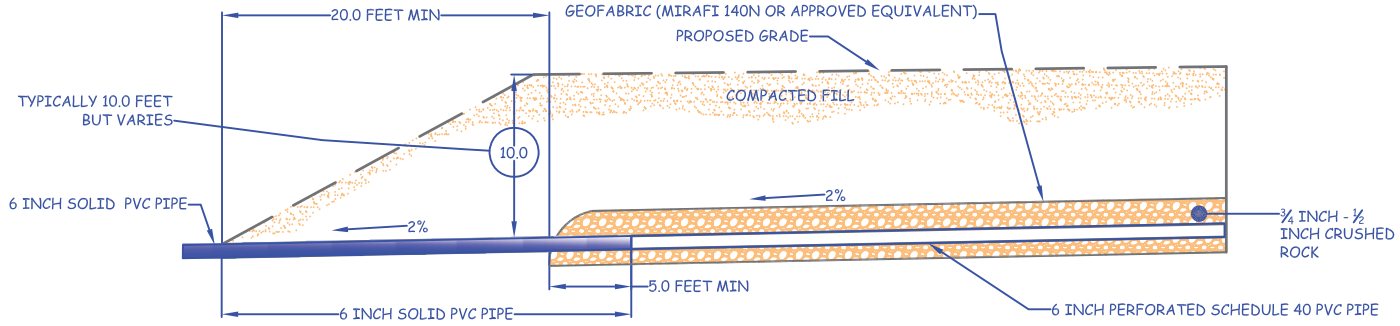




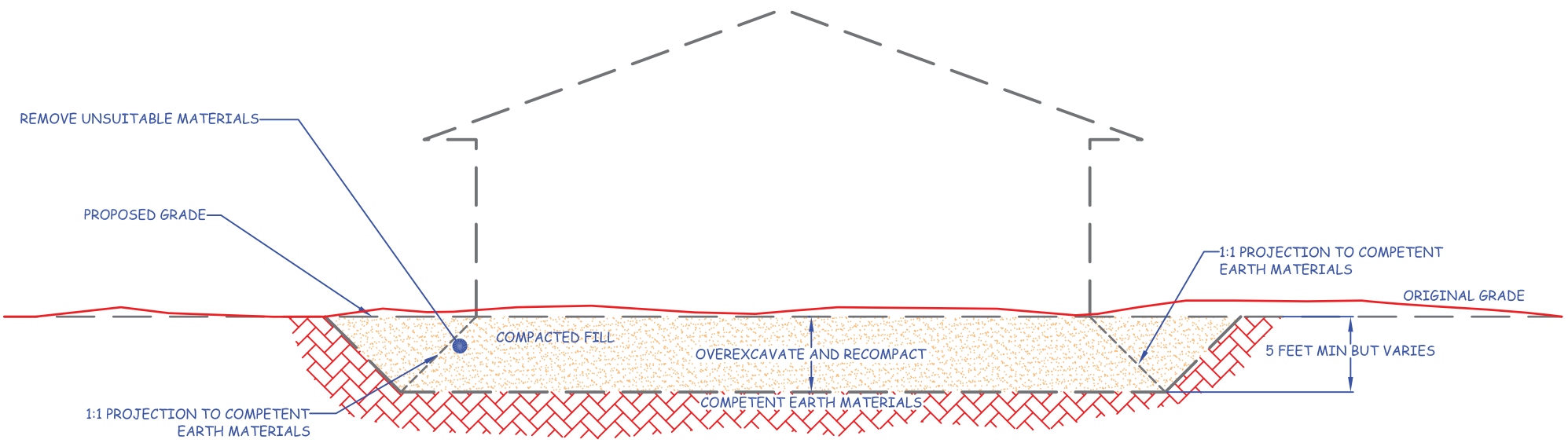
NOTES:
1 - CONTINUOUS RUNS IN EXCESS OF 500 FEET LONG WILL REQUIRE AN 8 INCH DIAMETER PIPE.

2 - FINAL 20 FEET OF PIPE AT OUTLET WILL BE SOLID AND BACKFILLED WITH COMPACTED FINE-GRAINED EARTH MATERIALS.

CANYON SUBDRAIN TYPICAL OUTLET



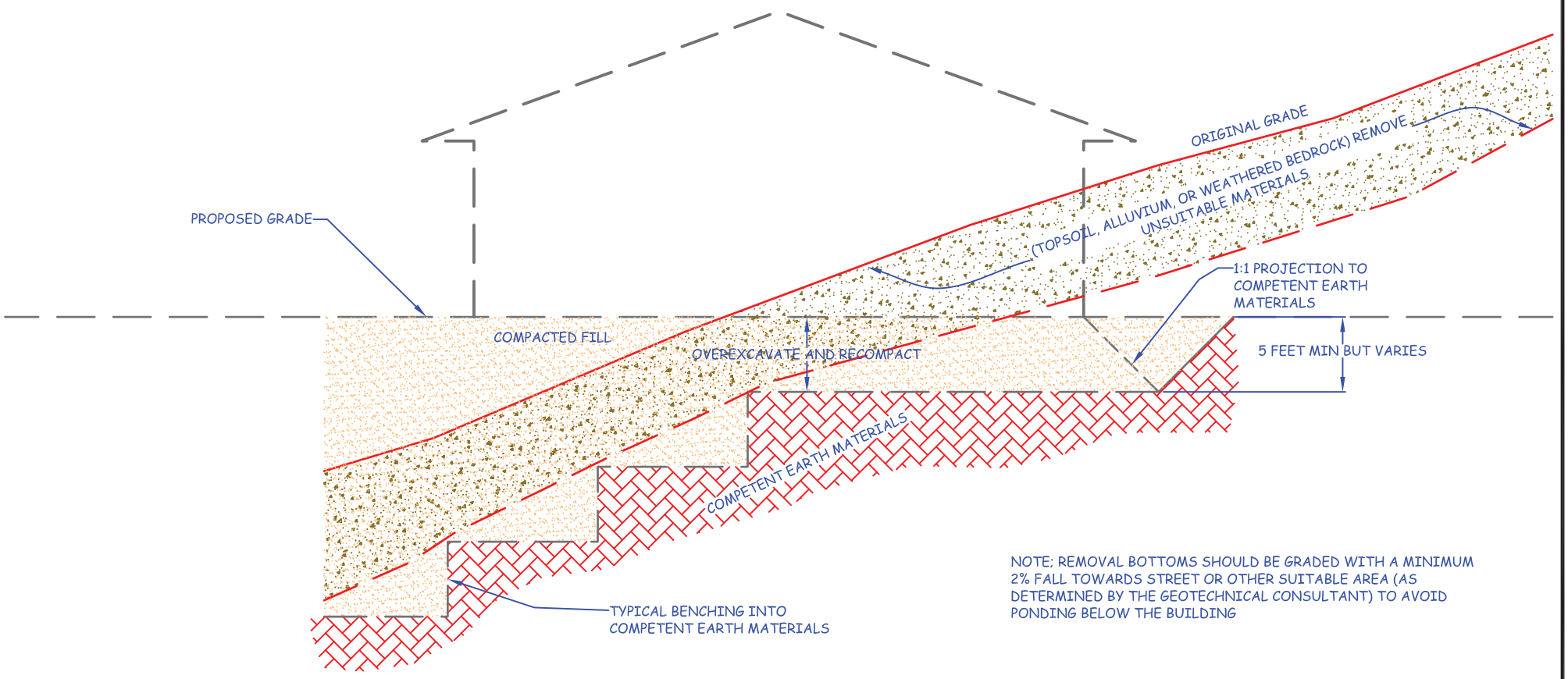
CUT LOT TYPICAL DETAIL



NOTE; REMOVAL BOTTOMS SHOULD BE GRADED WITH A MINIMUM 2% FALL TOWARDS STREET OR OTHER SUITABLE AREA (AS DETERMINED BY THE GEOTECHNICAL CONSULTANT) TO AVOID PONDING BELOW THE BUILDING

NOTE: WHERE DESIGN CUT LOTS ARE EXCAVATED ENTIRELY INTO COMPETENT EARTH MATERIALS, OVEREXCAVATION MAY STILL BY NEEDED FOR HARD-ROCK CONDITIONS OR MATERIALS WITH VARIABLE EXPANSION POTENTIALS

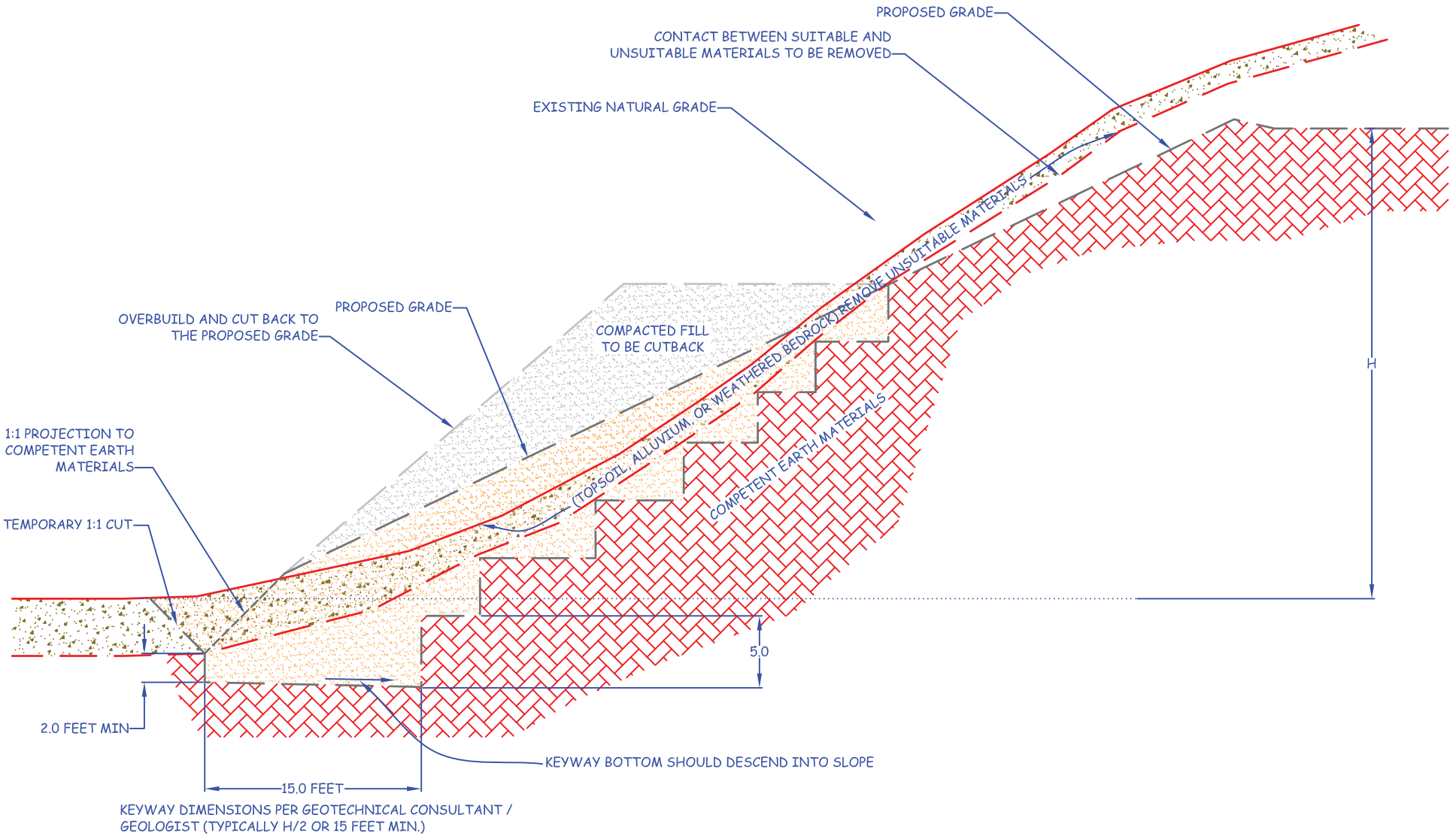
CUT / FILL TRANSITION LOT TYPICAL DETAIL



NOTE; REMOVAL BOTTOMS SHOULD BE GRADED WITH A MINIMUM 2% FALL TOWARDS STREET OR OTHER SUITABLE AREA (AS DETERMINED BY THE GEOTECHNICAL CONSULTANT) TO AVOID PONDING BELOW THE BUILDING

NOTE: WHERE DESIGN CUT LOTS ARE EXCAVATED ENTIRELY INTO COMPETENT EARTH MATERIALS, OVEREXCAVATION MAY STILL BY NEEDED FOR HARD-ROCK CONDITIONS OR MATERIALS WITH VARIABLE EXPANSION POTENTIALS

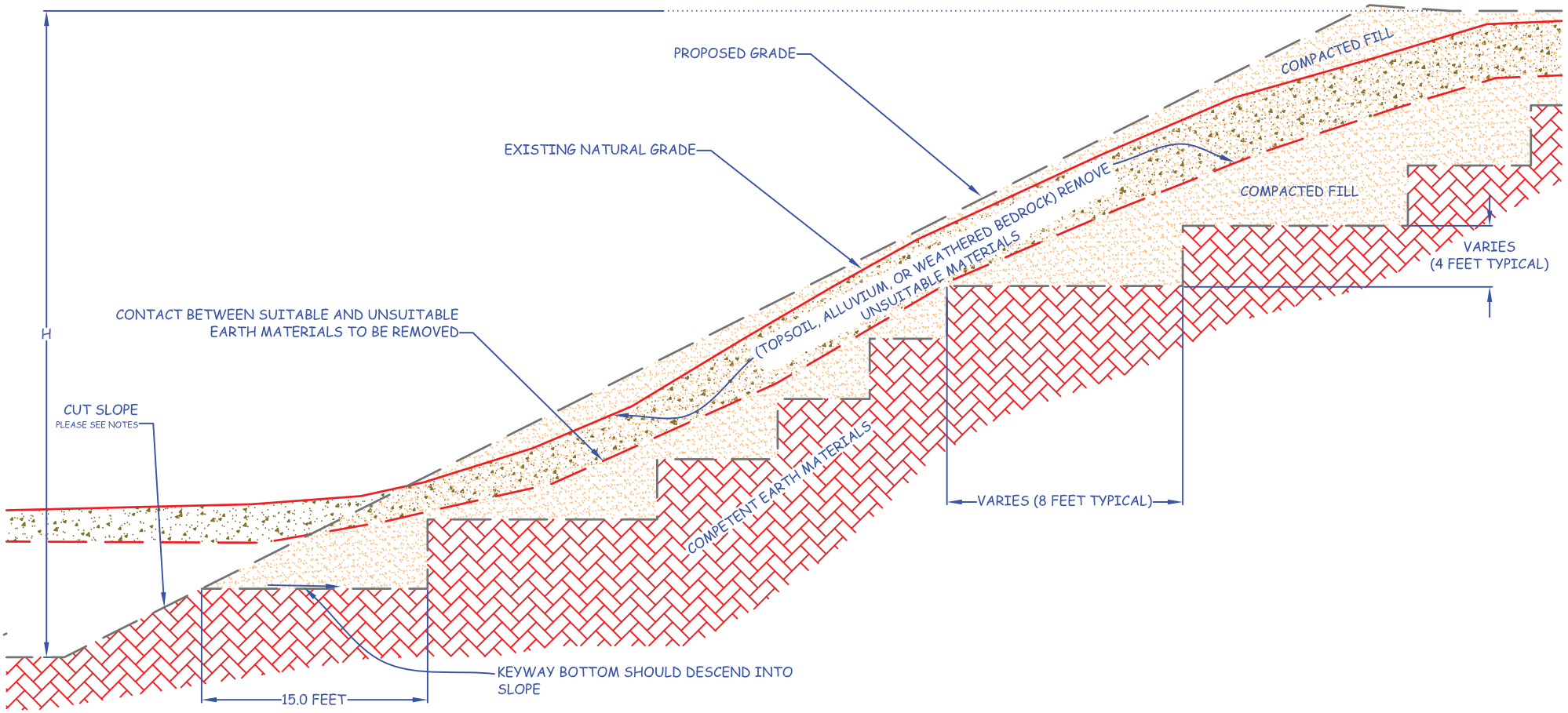
KEYWAY & BENCHING TYPICAL DETAILS
CUT OVER FILL SLOPE



NOTE:

NATURAL SLOPES STEEPER THAN 5:1 (H:V) MUST BE BENCHED INTO COMPETENT EARTH MATERIALS

KEYWAY & BENCHING TYPICAL DETAILS
FILL OVER CUT SLOPE



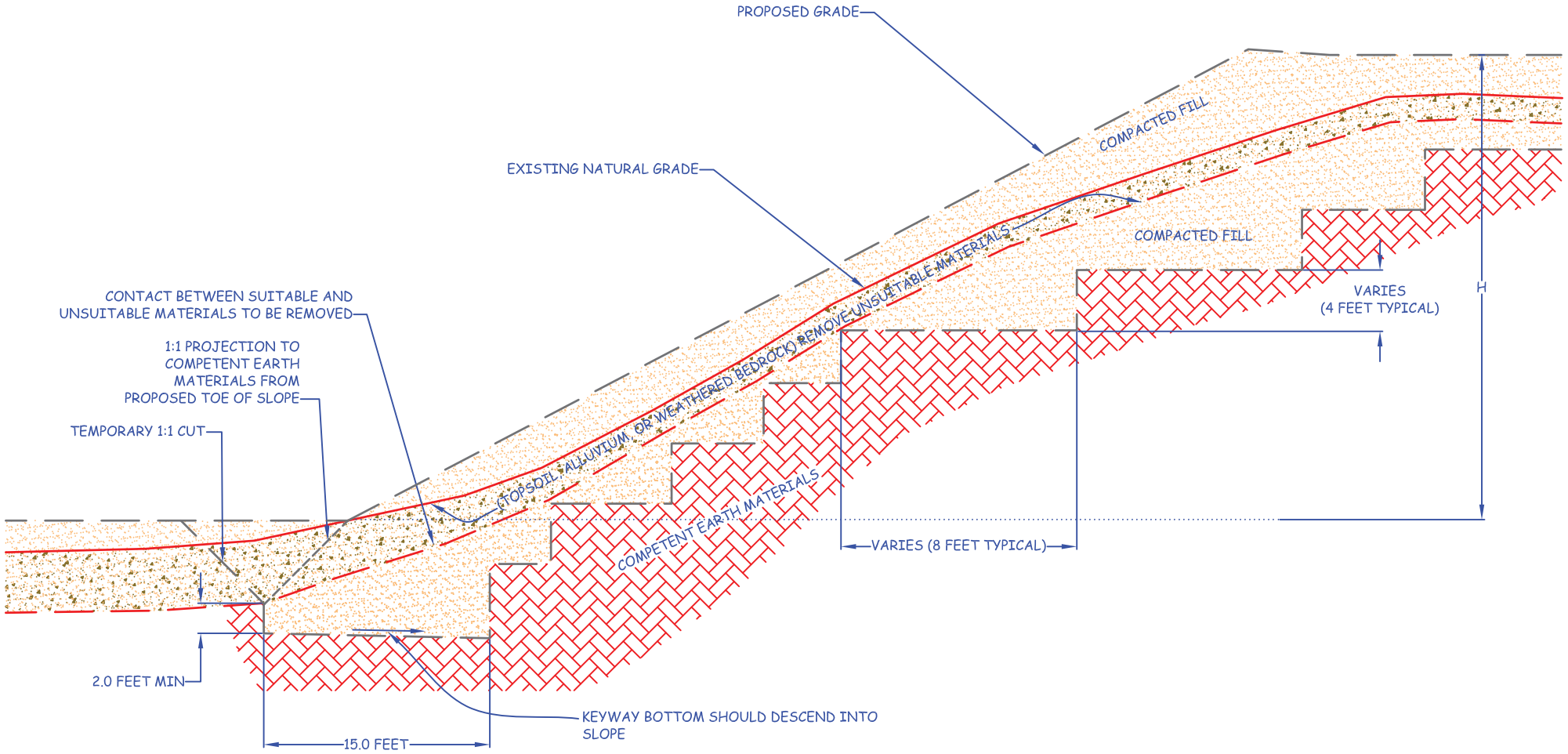
KEYWAY DIMENSIONS PER GEOTECHNICAL CONSULTANT / GEOLOGIST (TYPICALLY H/2 OR 15 FEET MIN.)

NOTES:

NATURAL SLOPES STEEPER THAN 5:1 (H:V) MUST BE BENCHED INTO COMPETENT EARTH MATERIALS

THE CUT SLOPE MUST BE CONSTRUCTED FIRST

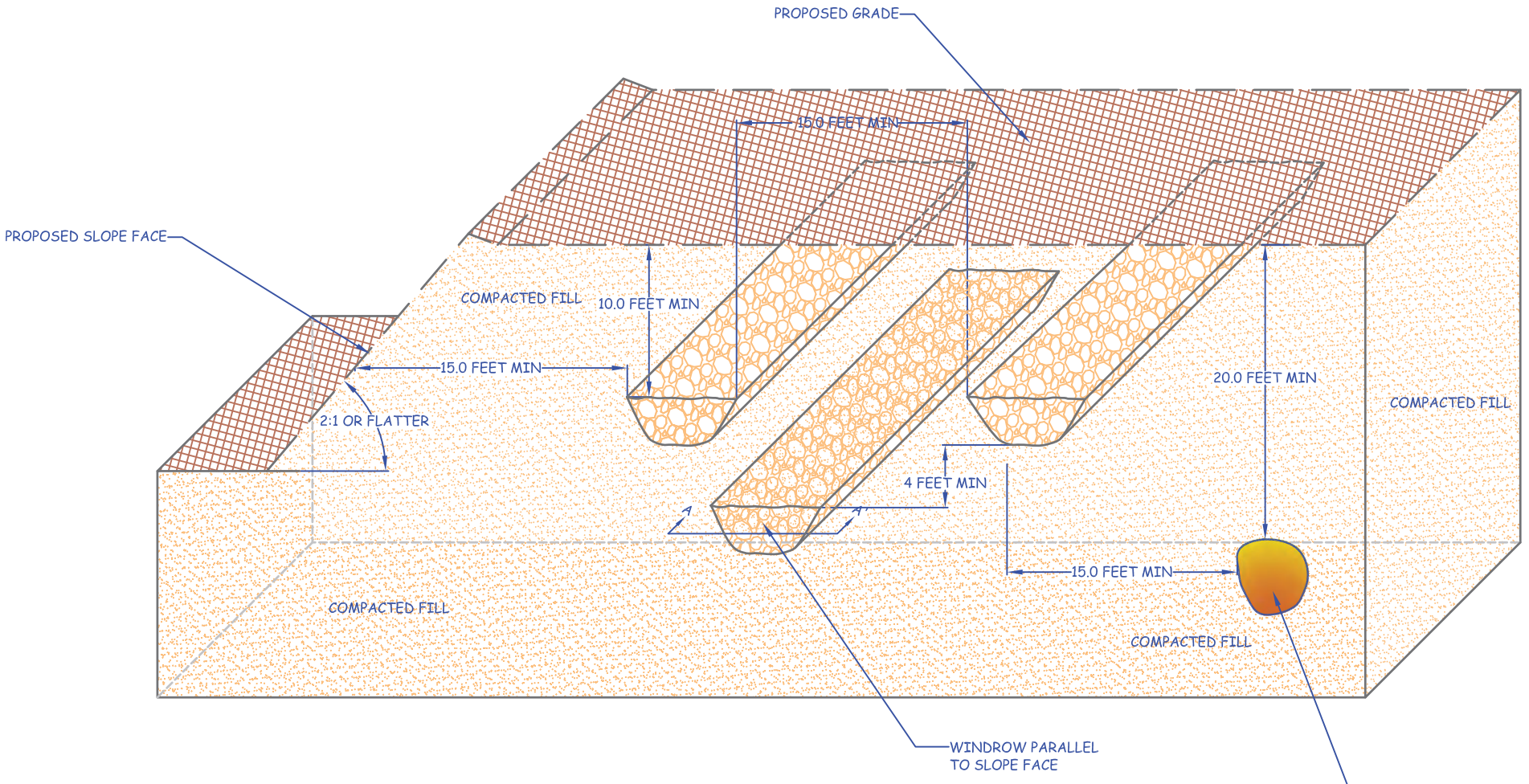
KEYWAY & BENCHING TYPICAL DETAILS
FILL SLOPE



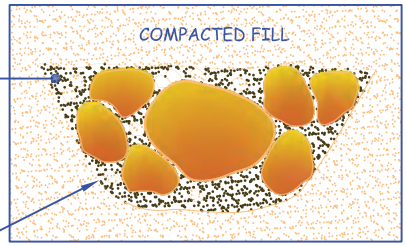
NOTES:

NATURAL SLOPES STEEPER THAN 5:1 (H:V) MUST BE
BENCHED INTO COMPETENT EARTH MATERIALS

OVERSIZE ROCK TYPICAL DETAIL



CROSS SECTION A-A'

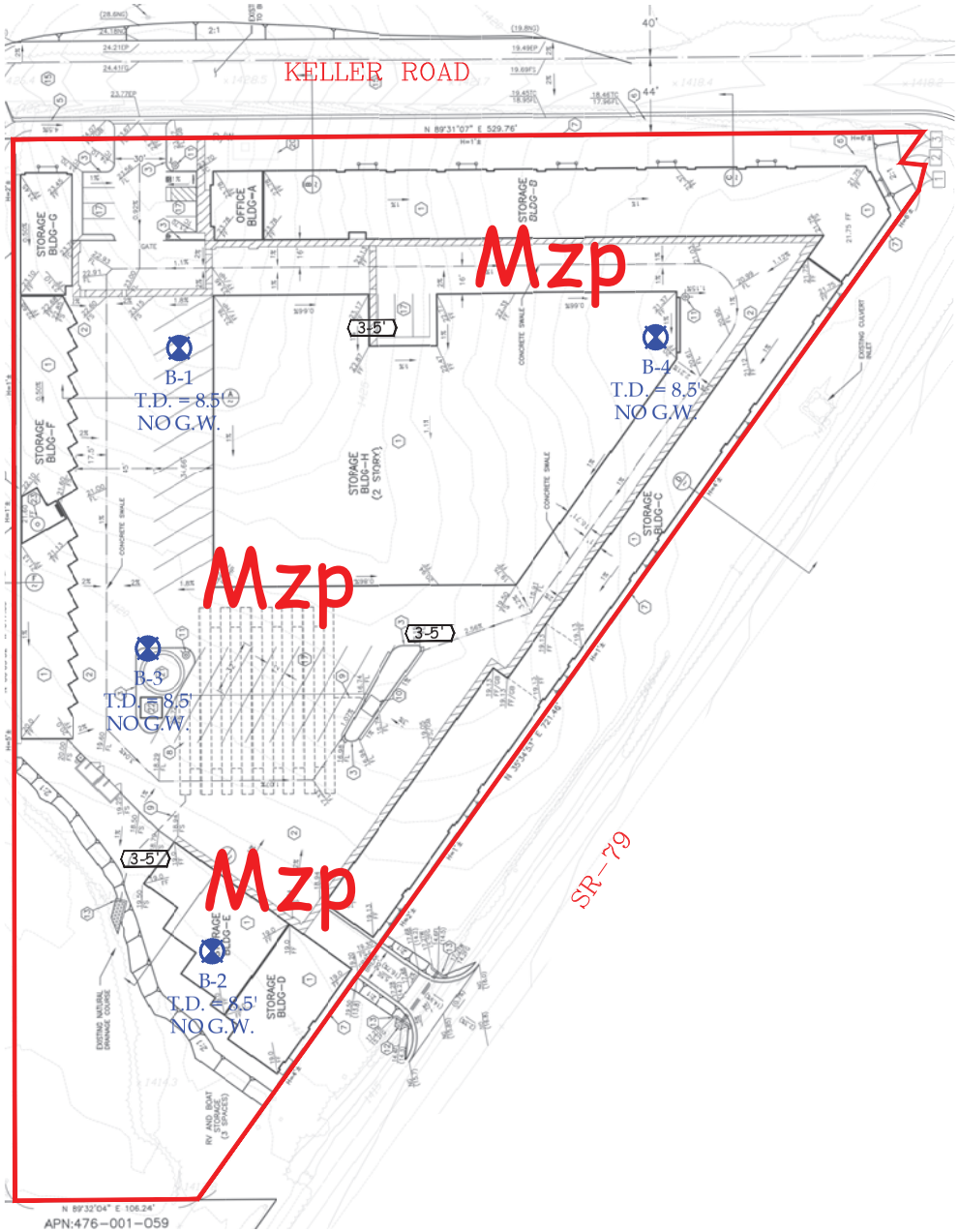


JETTING OF APPROVED
GRANULAR MATERIAL

EXCAVATED TRENCH
OR DOZER V-CUT

NOTES:

OVERSIZE ROCK IS LARGER THAN
8 INCHES IN MAX DIAMETER



LEGEND

Locations are Approximate

Geologic Units

Mzp - Mesozoic Phylite

Symbols

- Limits of Report

B-4 T.D. = 8.5' NO G.W. - Boring Location
Including Total Depth and Depth to Groundwater

3-5' - Recommended Removal Depths

North

GEOTECHNICAL MAP

LOCATED AT THE INTERSECTION OF HIGHWAY 79 AND KELLER ROAD
WINCHESTER AREA, RIVERSIDE COUNTY, CALIFORNIA
APN 476-010-060

PROJECT	PROPOSED RV AND BOAT STORAGE		
CLIENT	MR. MILAN CHAKRABARTY		
PROJECT NO.	182351-10B		
DATE	SEPTEMBER 2020		
SCALE	1:70		
DWG XREFS			
REVISION			
DRAWN BY	JDG	PLATE	1 OF 1

Earth Strata Geotechnical Services, Inc.
Geotechnical, Environmental and Materials Testing Consultants
www.ESGSINC.com (951) 397-8315

Earth Strata Geotechnical Services, Inc.
Geotechnical, Environmental and Materials Testing Consultants

November 8, 2021 Project No. 192851-12A

Dr. Milan Chakrabarty
CHAKRABARTY, LLC
1003 East Florida Avenue, Suite 101
Hemet, CA 92543

Subject: **Infiltration Testing for Water Quality Treatment Areas, Proposed Commercial Development, Assessor Parcel Number 476-010-060, Located on the South West Corner of Winchester Road and Keller Road, City of Winchester, Riverside County, California**

INTRODUCTION

Earth Strata Geotechnical Services is pleased to present this infiltration feasibility report for the proposed commercial development, located on the southwest corner of Winchester Road and Keller Road, Assessor Parcel Number 476-010-060, in the City of Winchester, Riverside County, California. The purpose of our study was to determine the infiltration rates and physical characteristics of the subsurface earth materials at the approximate depth of the proposed WQMP area within the proposed development. This feasibility report provides the infiltration rates to be used for the design and the development of the water quality management plan, where applicable.

PROPERTY DESCRIPTION

The subject property is located on the southwest corner of Winchester Road and Keller Road in the City of Winchester, Riverside County, California. The approximate location of the site is shown on the Vicinity Map, Figure 1.

The subject property is comprised of approximately 5.25 acres of undeveloped land. The site has not been graded. Topographic relief at the subject property is relatively low with the terrain being generally flat. Elevations at the site range from approximately 1,413 to 1,428 feet above mean sea level (msl), for a difference of about 15± feet across the entire site. Drainage within the subject property generally flows to the northeast.

The site is currently bordered by a residential development to the west, Winchester Road to the south and east, and Keller Road to the north. Most of the vegetation on the site consists of light to moderate amounts of annual weeds/grasses throughout the subject site.

PROPOSED CONSTRUCTION

Based on the proposed development as illustrated on the conceptual grading plans will consist of a RV and Self-Storage development complete with interior streets, utilities, driveways, park, and an onsite water quality treatment basin.

SUBSURFACE EXPLORATION

Subsurface Exploration

Subsurface exploration within the subject site was performed on November 2, 2021, for the exploratory excavations. A truck mounted hollow-stem-auger drill rig was utilized to drill one (1) boring to a maximum depth of 20 feet. The exploratory holes were excavated for geotechnical evaluation purposes with respect to the proposed developments and to interpret whether groundwater or impermeable soil layers were present. An underground utilities clearance was obtained from Underground Service Alert of Southern California, prior to the subsurface exploration. The approximate locations of the exploratory excavations are shown on the attached Infiltration Location Map, Plate 1 and descriptive logs are presented in Appendix A.

Earth materials encountered during exploration were classified and logged in general accordance with the Standard Practice for Description and Identification of Soils (Visual-Manual Procedure) of ASTM D 2488. Upon completion of laboratory testing, exploratory logs and sample descriptions may have been reconciled to reflect laboratory test results with regard to ASTM D 2487.

Earth Materials

A general description of the earth materials observed on site is provided below.

Quaternary Alluvium (Qa): Quaternary Alluvium was encountered directly from the surface to a maximum depth of 5 feet. These materials were found to be light brown and in a dry, dense state.

Metasedimentary Rocks (ms): The bedrock deposits were encountered below the alluvium materials to the full depth of the excavation. This bedrock unit consists predominately of interbedded light to medium brown, fine to medium grained silty sand, fine to coarse grained sandstone, with occasional siltstone and claystone layers.

INFILTRATION TESTING

The double ring infiltrometer test method was utilized to perform a total of four (4) infiltration tests on November 3, 2021 to evaluate near surface infiltration rates in order to estimate the amount of storm water runoff that can infiltrate into the onsite water quality treatment plan areas. The infiltration tests were performed in general accordance with the requirements of double ring infiltration testing, ASTM D3385 and Appendix A of the Riverside County Flood Control and Water Conservation District.

The infiltration tests were performed using double ring infiltrometer and Mariotte tubes at a depth of 6 feet below existing grades. The locations of the infiltration tests are indicated on the attached infiltration Location Map, Plate 1. The double ring infiltrometer tests were located by property boundary measurement on the site plan and by using geographic features. Infiltration test data recorded in the field are summarized in the following table and is included within Appendix B including the graph of Infiltration Rate versus Elapsed Time.

Infiltration Test Summary

TEST NUMBER	INFILTRATION HOLE DEPTH (ft.)	INFILTRATION RATE (in/hr)	DESCRIPTION
DR-1	5	0.0	CLAY
DR-2	5	0.0	CLAY
DR-3	5	0.0	CLAY
DR-4	5	0.0	CLAY

The infiltration test rates were documented to be 0.0 inches per hour (in/hr). The observed hard compacted clay and bedrock material caused the infiltration testing to fail.

CONCLUSIONS AND RECOMMENDATIONS

General

From geotechnical and engineering geologic points of view, the proposed WQMP areas, where tested, is considered unsuitable for infiltration for the proposed development.

Groundwater

Groundwater was not observed during our subsurface exploration to a total depth of 20 feet.

Based on the data presented in this report and the recommendations set forth herein, it is the opinion of Earth Strata Geotechnical Services that a WQMP area cannot be utilized for infiltration at the subject site.

GRADING PLAN REVIEW AND CONSTRUCTION SERVICES

This report has been prepared for the exclusive use of **Mr. Milan Chakrabarty** and their authorized representative. It likely does not contain sufficient information for other parties or other uses. Earth Strata should be engaged to review the final design plans and specifications prior to construction. This is to verify that the recommendations contained in this report have been properly incorporated into the project plans and specifications. Should Earth Strata not be accorded the opportunity to review the project plans and specifications, we are not responsibility for misinterpretation of our recommendations.
Earth Strata should be retained to provide observations during construction to validate this report. In order to allow for design changes in the event that the subsurface conditions differ from those anticipated prior to construction.

Earth Strata should review any changes in the project and modify and approve in writing the conclusions and recommendations of this report. This report and the drawings contained within are intended for design input purposes only and are not intended to act as construction drawings or specifications. In the event that conditions encountered during grading or construction operations appear to be different than those indicated in this report, this office should be notified immediately, as revisions may be required.

REPORT LIMITATIONS

Our services were performed using the degree of care and skill ordinarily exercised, under similar circumstances, by reputable soils engineers and geologists, practicing at the time and location this report was prepared. No other warranty, expressed or implied, is made as to the conclusions and professional advice included in this report.

Earth materials vary in type, strength, and other geotechnical properties between points of observation and exploration. Groundwater and moisture conditions can also vary due to natural processes or the works of man on this or adjacent properties. As a result, we do not and cannot have complete knowledge of the subsurface conditions beneath the subject property. No practical study can completely eliminate uncertainty with regard to the anticipated geotechnical conditions in connection with a subject property.

The conclusions and recommendations within this report are based upon the findings at the points of observation and are subject to confirmation by Earth Strata during construction. This report is considered valid for a period of one year from the time the report was issued.

This report was prepared with the understanding that it is the responsibility of the owner or their representative, to ensure that the conclusions and recommendations contained herein are brought to the attention of the other project consultants and are incorporated into the plans and specifications. The owners' contractor should properly implement the conclusions and recommendations during grading and construction, and notify the owner if they consider any of the recommendations presented herein to be unsafe or unsuitable.

Respectfully submitted,

EARTH STRATA GEOTECHNICAL SERVICES

Stephen M. Poole, PE 40219
President
Principal Engineer

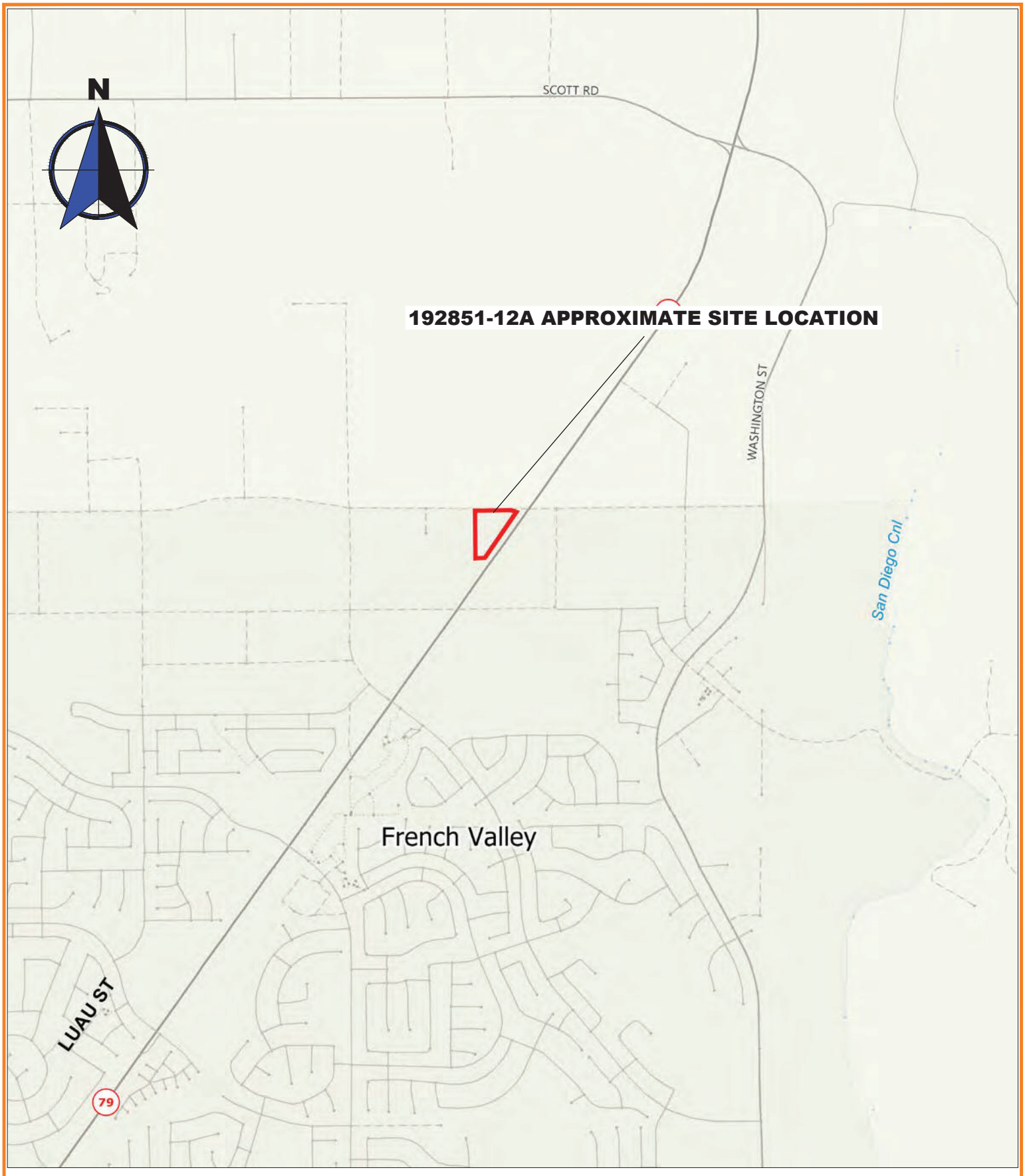
SMP/jmr

Distribution: (1) Addressee

Attachments: Figure 1 – Vicinity Map *(Rear of Text)*
Appendix A – Exploratory Logs *(Rear of Text)*
Appendix B – Infiltration Test Sheets *(Rear of Text)*
Plate 1 – Infiltration Location Map *(Rear of Text)*

FIGURE 1

VICINITY MAP



SCALE

0 1,000 2,000 3,000

Feet

Earth Strata Geotechnical Services, Inc.

Geotechnical, Environmental and Materials Testing Consultants

www.ESGSINC.com (951) 397-8315

PROPOSED SINGLE FAMILY RESIDENCE	192851-12A
VICINITY MAP	SEE BAR SCALE
NOV 2021	FIGURE 1

APPENDIX A

EXPLORATORY LOGS

Geotechnical Log MW-1

Date: May 13, 2021	**Project Name: Winchester and Keller - Winchester** **Page: 1 of 1**
Project Number: 192851-11A	**Logged By: JMR**
Drilling Company: Drilling IT	**Type of Rig: B-61**
Drive Weight (lbs): -	**Drop (in): -** **Hole Diameter (in): -**
Top of Hole Elevation (ft): See Map	**Hole Location: See Geotechnical Map**

Depth (ft)	Blow Count Per Foot	Sample Depth	Dry Density (pcf)	Moisture (%)	Classification Symbol	MATERIAL DESCRIPTION
0						**Quaternary Alluvium (Qa):**
					SM	Silty SAND; light brown, dry, dense, fine to carse sand with gravel
						Metasedimentary Rocks (ms):
					CL	yellowish brown, dry, hard, fine to coarse grained, breaks down to clay
5						
						very hard
10						
15						
20						Total Depth: 20 feet
25						
30						

42184 Remington Avenue, Temecula, CA 92590

Earth Strata Geotechnical Services, Inc.
Geotechnical, Environmental and Materials Testing Consultants
www.ESGSINC.com (951) 397-8315

APPENDIX B

INFILTRATION TEST SHEETS

Test No.	DR-1	Location	See Map	Turf-Tec International - Record Chart for IN10-W - (12 & 24 Inch Infiltration Rings)

Earth Strata Geotechnical Services, Inc.
Geotechnical, Environmental and Materials Testing Consultants
www.ESGSINC.com (951) 397-8315

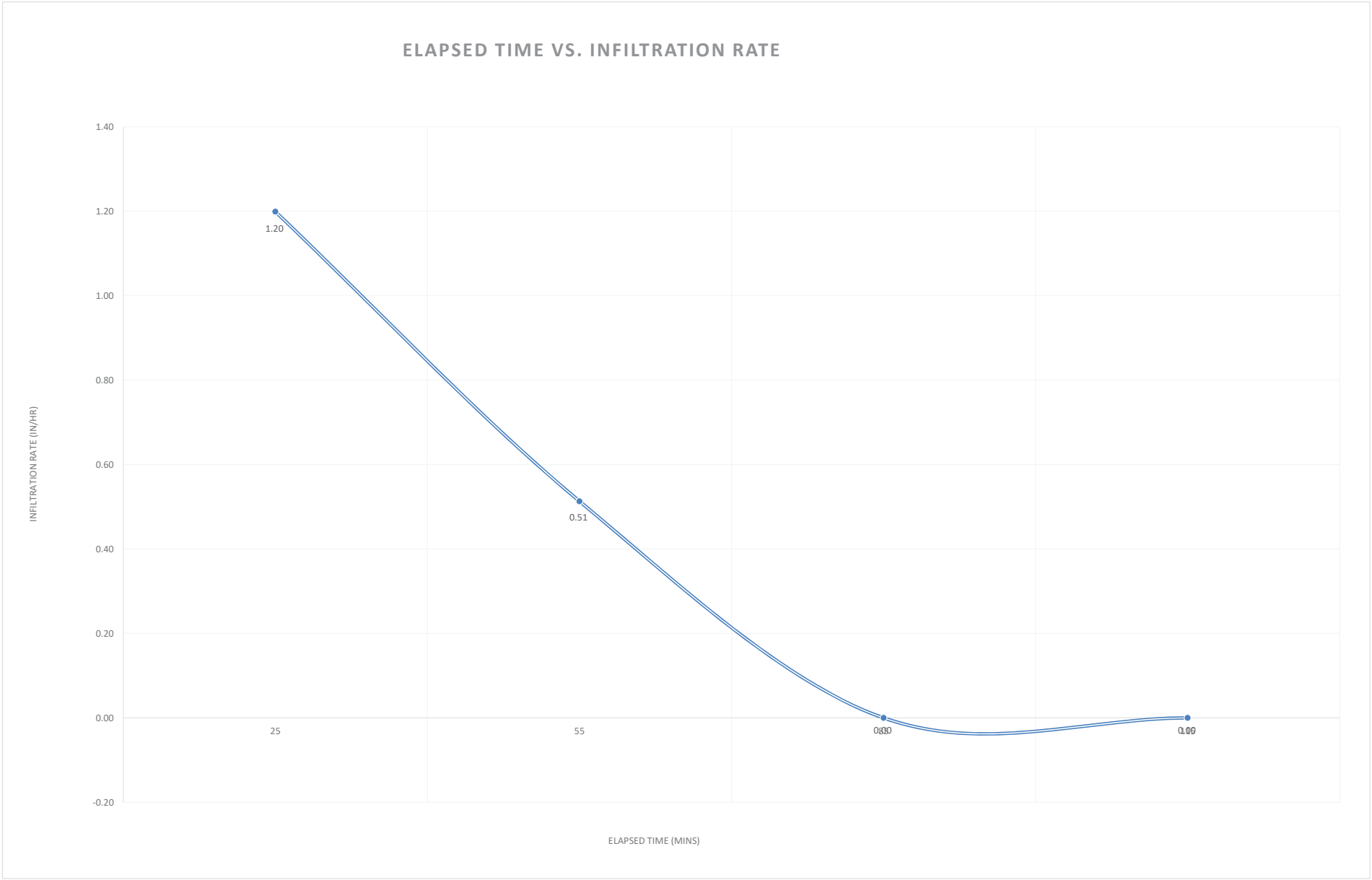
Project Identification:	192851-12A				Constants	Area cm2	Depth of Liquid (cm)	Liquid Container Number		Marriotte Tube Volume	
Test Location:	DR-1				Inner Ring	729	10.0	1		10000	
Liquid Used:	TAP WATE	pH:	8.0		Annular Ring	2189	10.0	2		10000	
Tested By:	JMR/GG		Date	11/3/2021	Liquid level maintained	(X) Flow Valve	( ) Float Valve	( ) Mariotte Tubes			
Depth to water table:	400		Depth of Test	6'	Penetration Depth of Outer Ring:	9 cm		Other			

Trial #	Start / End	Date MM/DD/YY	Time HR:MIN	Time Increment /(Total)	Elapsed Time (Min)	Flow Readings				Liquid Temp ºF	Infiltration Rates				Ground Temperature		Remarks
						Inner Ring Reading cm	Inner Maroitte Tube Flow (ml)	Annular Space Reading cm	Annular Space Marriotte Tube Flow (ml)		Inner Infiltration Rate cm/h	Inner Infiltration Rate In/h	Annular Infiltration Rate cm/h	Annular Infiltration Rate In/h	Ground Temp Depth (cm)	Temp at Depth (c)	Weather conditions Etc...
1	Start Test	11/3/2021	8:30	0:25	25												
	End Test	11/3/2021	8:55	0:25			925		1400		3.05	**1.20**	1.53	**0.60**			
2	Start Test	11/3/2021	8:56	0:30	55												
	End Test	11/3/2021	9:26	0:55			475		575		1.30	**0.51**	0.53	**0.21**			
3	Start Test	11/3/2021	9:27	0:30	85												
	End Test	11/3/2021	9:57	1:25			0		0		0.00	**0.00**	0.00	**0.00**			
4	Start Test	11/3/2021	10:00	0:30	115												
	End Test	11/3/2021	10:30	1:55			0		0		0.00	**0.00**	0.00	**0.00**			

Turf-Tec International

Project Identification:	192851-12A		
Test Location:	DR-1		
Liquid Used:	TAP WATE	**pH:**	8.0
Tested By:	JMR/GG		
Depth to water table:			400

Earth Strata Geotechnical Services, Inc.
Geotechnical, Environmental and Materials Testing Consultants
www.ESGSINC.com (951) 397-8315



Test No.	DR-2	Location	See Map	Turf-Tec International - Record Chart for IN10-W - (12 & 24 Inch Infiltration Rings)

Earth Strata Geotechnical Services, Inc.
Geotechnical, Environmental and Materials Testing Consultants
www.ESGSINC.com (951) 397-8315

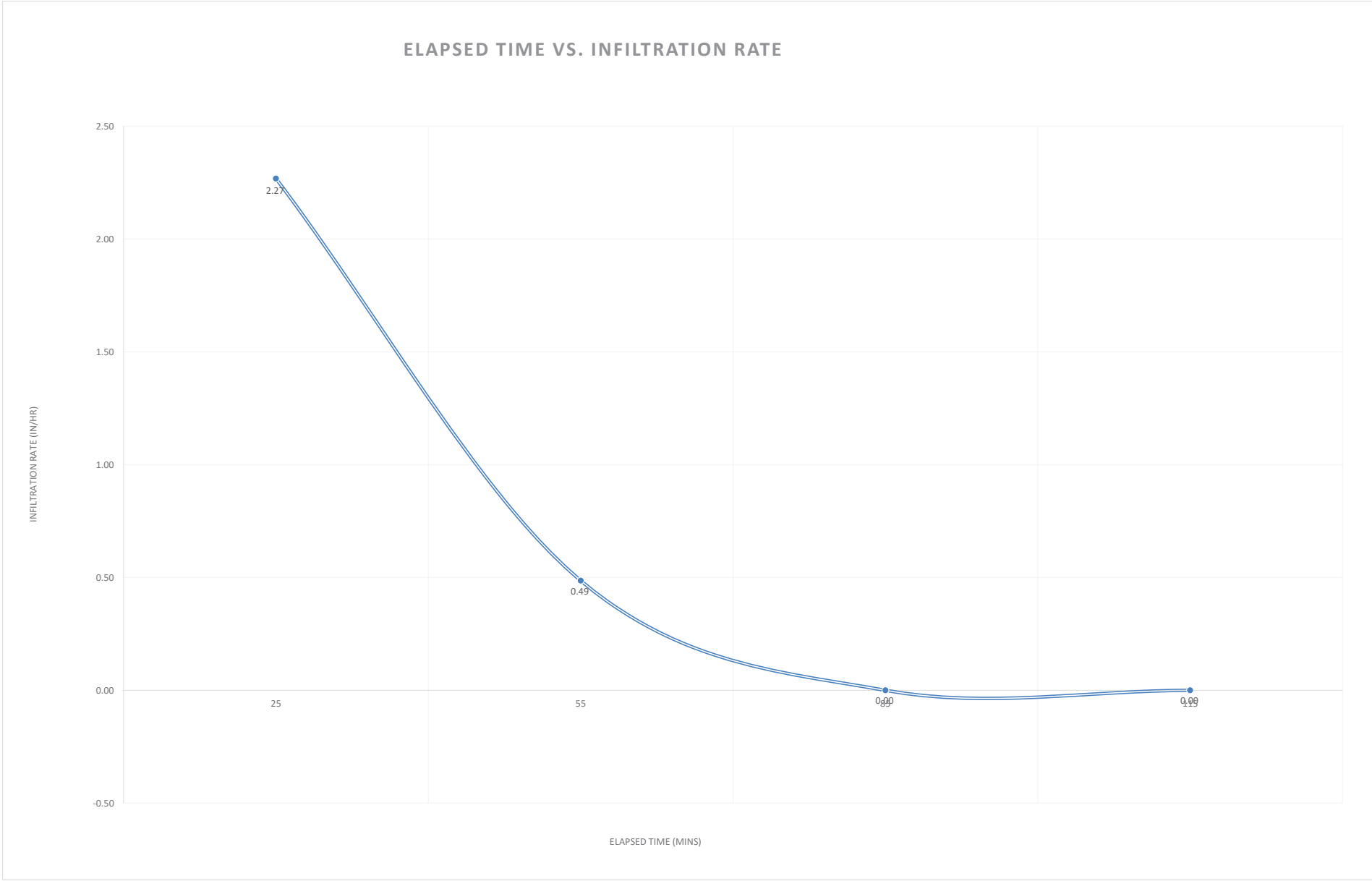
Project Identification:	192851-12A				**Constants**	**Area cm2**	**Depth of Liquid (cm)**	**Liquid Container Number**		**Marriotte Tube Volume**	
Test Location:	DR-2				**Inner Ring**	729	10.0	1		10000	
Liquid Used:	TAP WATE	**pH:**	8.0		**Annular Ring**	2189	10.0	2		10000	
Tested By:	JMR/GG		**Date**	11/3/2021	**Liquid level maintained**	(X) Flow Valve	( ) Float Valve	( ) Mariotte Tubes			
Depth to water table:	400		**Depth of Test**	6'	**Penetration Depth of Outer Ring:**	9 cm		**Other**			

Trial #	Start / End	Date MM/DD/YY	Time HR:MIN	Time Increment /(Total)	Elapsed Time (Min)	Flow Readings				Liquid Temp °F	Infiltration Rates				Ground Temperature		Remarks
						Inner Ring Reading cm	Inner Maroitte Tube Flow (ml)	Annular Space Reading cm	Annular Space Marriotte Tube Flow (ml)		Inner Infiltration Rate cm/h	Inner Infiltration Rate In/h	Annular Infiltration Rate cm/h	Annular Infiltration Rate In/h	Ground Temp Depth (cm)	Temp at Depth (c)	Weather conditions Etc...
	Start Test	11/3/2021	8:32	0:25	25												
1	End Test	11/3/2021	8:57	0:25			1750		1400		5.76	**2.27**	1.53	**0.60**			
	Start Test	11/3/2021	8:58	0:30	55												
2	End Test	11/3/2021	9:28	0:55			450		575		1.23	**0.49**	0.53	**0.21**			
	Start Test	11/3/2021	9:29	0:30	85												
3	End Test	11/3/2021	9:59	1:25			0		0		0.00	**0.00**	0.00	**0.00**			
	Start Test	11/3/2021	10:01	0:30	115												
4	End Test	11/3/2021	10:31	1:55			0		0		0.00	**0.00**	0.00	**0.00**			

Turf-Tec International

Project Identification:	192851-12A		
Test Location:	DR-2		
Liquid Used:	TAP WATE	**pH:**	8.0
Tested By:	JMR/GG		
Depth to water table:			400

Earth Strata Geotechnical Services, Inc.
Geotechnical, Environmental and Materials Testing Consultants
www.ESGSINC.com (951) 397-8315



Test No.	DR-3	Location	See Map	Turf-Tec International - Record Chart for IN10-W - (12 & 24 Inch Infiltration Rings)

Earth Strata Geotechnical Services, Inc.
Geotechnical, Environmental and Materials Testing Consultants
www.ESGSINC.com (951) 397-8315

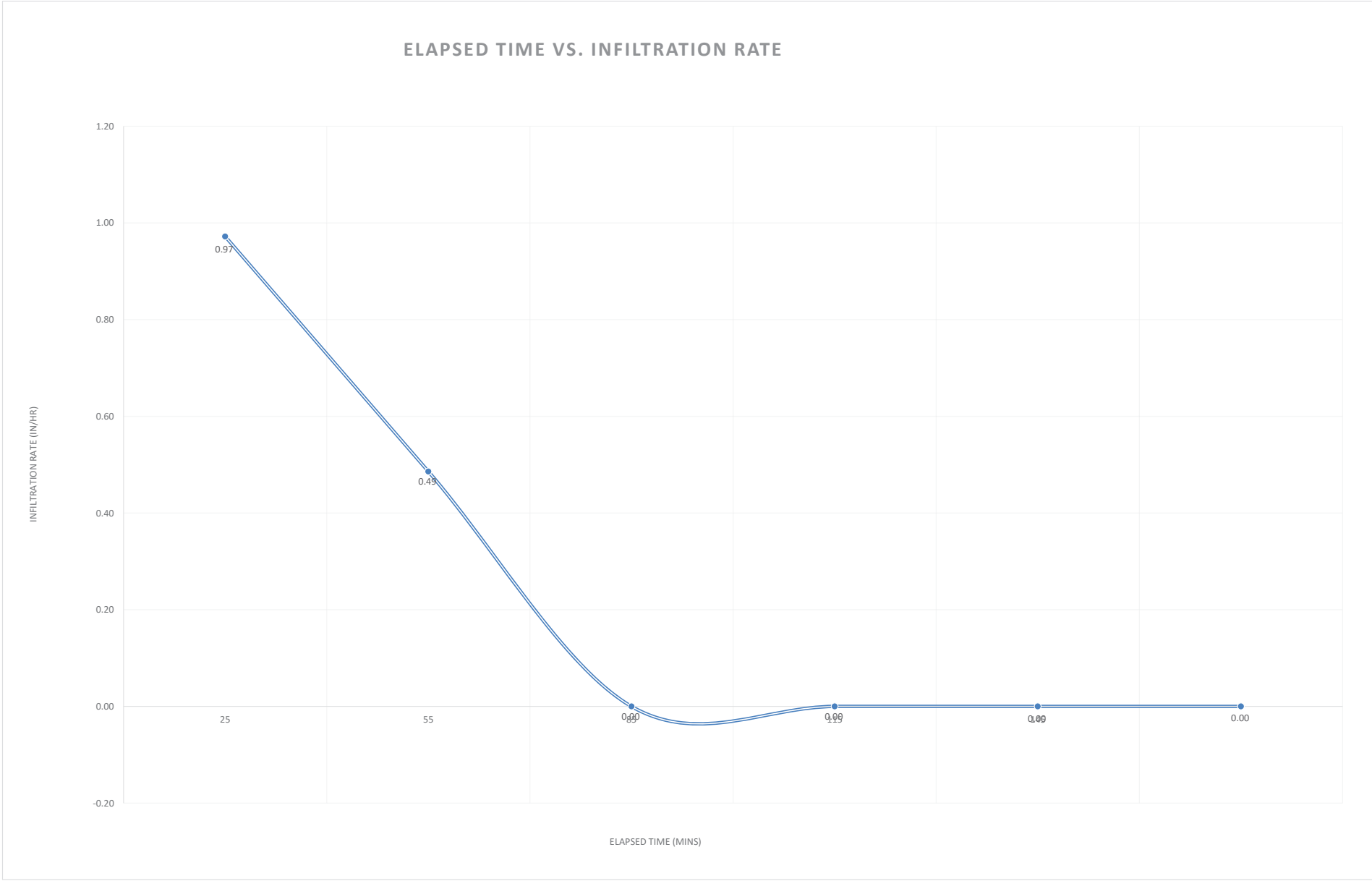
Project Identification:	192851-12A				Constants	Area cm2	Depth of Liquid (cm)	Liquid Container Number		Marriotte Tube Volume	
Test Location:	DR-3				Inner Ring	729	10.0	1		10000	
Liquid Used:	TAP WATE	pH:	8.0		Annular Ring	2189	10.0	2		10000	
Tested By:	JMR/GG		Date	11/3/2021	Liquid level maintained	(X) Flow Valve	( ) Float Valve	( ) Mariotte Tubes			
Depth to water table:	400		Depth of Test	6'	Penetration Depth of Outer Ring:	9 cm		Other			

Trial #	Start / End	Date MM/DD/YY	Time HR:MIN	Time Increment /(Total)	Elapsed Time (Min)	Flow Readings				Liquid Temp °F	Infiltration Rates				Ground Temperature		Remarks
						Inner Ring Reading cm	Inner Maroitte Tube Flow (ml)	Annular Space Reading cm	Annular Space Marriotte Tube Flow (ml)		Inner Infiltration Rate cm/h	Inner Infiltration Rate In/h	Annular Infiltration Rate cm/h	Annular Infiltration Rate In/h	Ground Temp Depth (cm)	Temp at Depth (c)	Weather conditions Etc...
1	Start Test	11/3/2021	11:00	0:25	25												
	End Test	11/3/2021	11:25	0:25			750		1250		2.47	**0.97**	1.37	**0.54**			
2	Start Test	11/3/2021	11:26	0:30	55												
	End Test	11/3/2021	11:56	0:55			450		950		1.23	**0.49**	0.87	**0.34**			
3	Start Test	11/3/2021	11:57	0:30	85												
	End Test	11/3/2021	12:27	1:25			0		600		0.00	**0.00**	0.55	**0.22**			
4	Start Test	11/3/2021	12:28	0:30	115												
	End Test	11/3/2021	12:58	1:55			0		0		0.00	**0.00**	0.00	**0.00**			
5	Start Test	11/3/2021	12:59	0:30	145												
	End Test	11/3/2021	13:29	2:25			0		0		0.00	**0.00**	0.00	**0.00**			

Turf-Tec International

Project Identification:	192851-12A		
Test Location:	DR-3		
Liquid Used:	TAP WATE	**pH:**	8.0
Tested By:	JMR/GG		
Depth to water table:			400

Earth Strata Geotechnical Services, Inc.
Geotechnical, Environmental and Materials Testing Consultants
www.ESGSINC.com (951) 397-8315



Test No.	DR-4	Location	See Map	Turf-Tec International - Record Chart for IN10-W - (12 & 24 Inch Infiltration Rings)

Earth Strata Geotechnical Services, Inc.
Geotechnical, Environmental and Materials Testing Consultants
www.ESGSINC.com (951) 397-8315

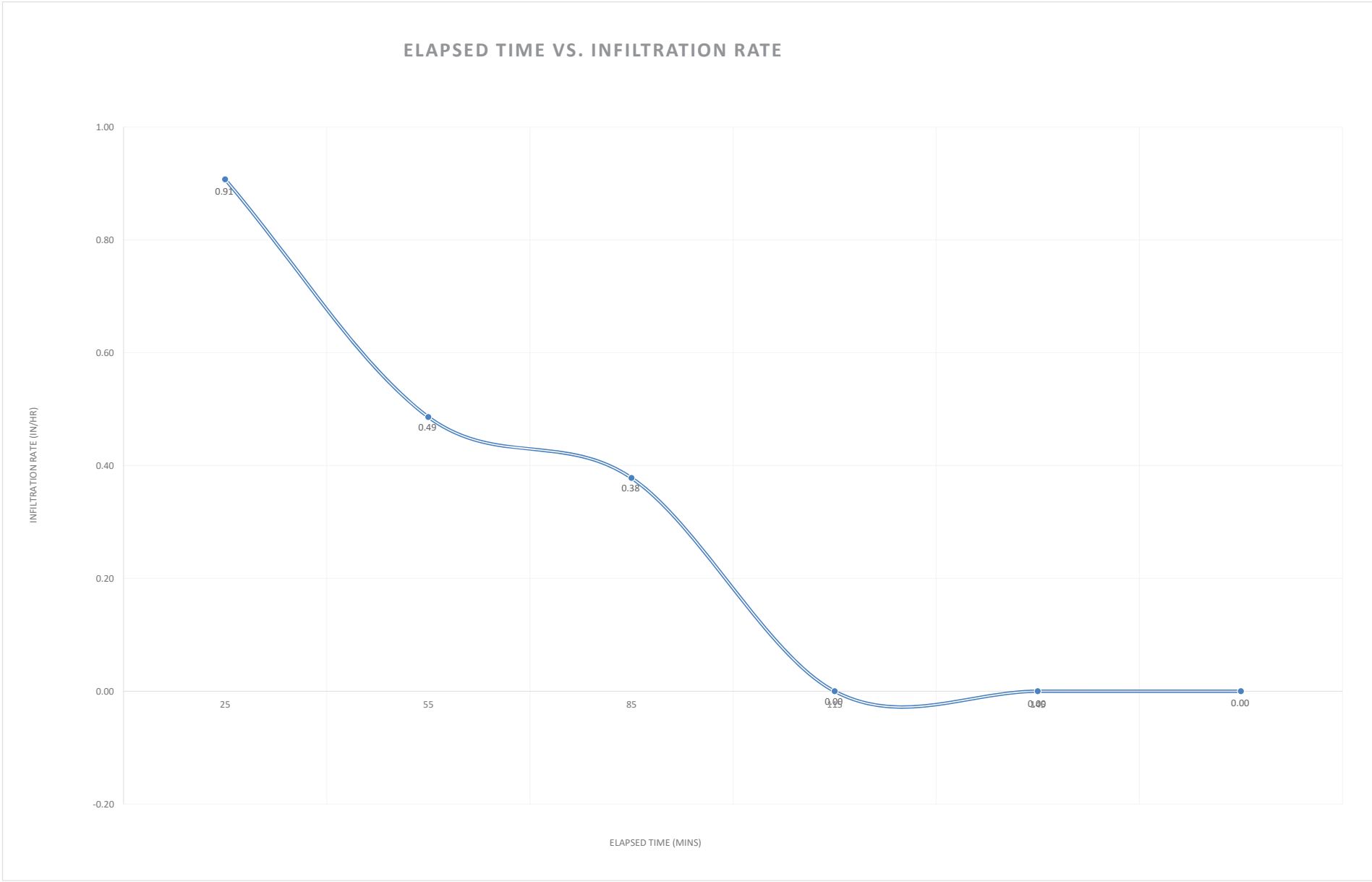
Project Identification:	192851-12A				Constants	Area cm2	Depth of Liquid (cm)	Liquid Container Number		Marriotte Tube Volume	
Test Location:	DR-4				Inner Ring	729	10.0	1		10000	
Liquid Used:	TAP WATE	pH:	8.0		Annular Ring	2189	10.0	2		10000	
Tested By:	JMR/GG		Date	11/3/2021	Liquid level maintained	(X) Flow Valve	( ) Float Valve	( ) Mariotte Tubes			
Depth to water table:	400		Depth of Test	6'	Penetration Depth of Outer Ring:	9 cm		Other			

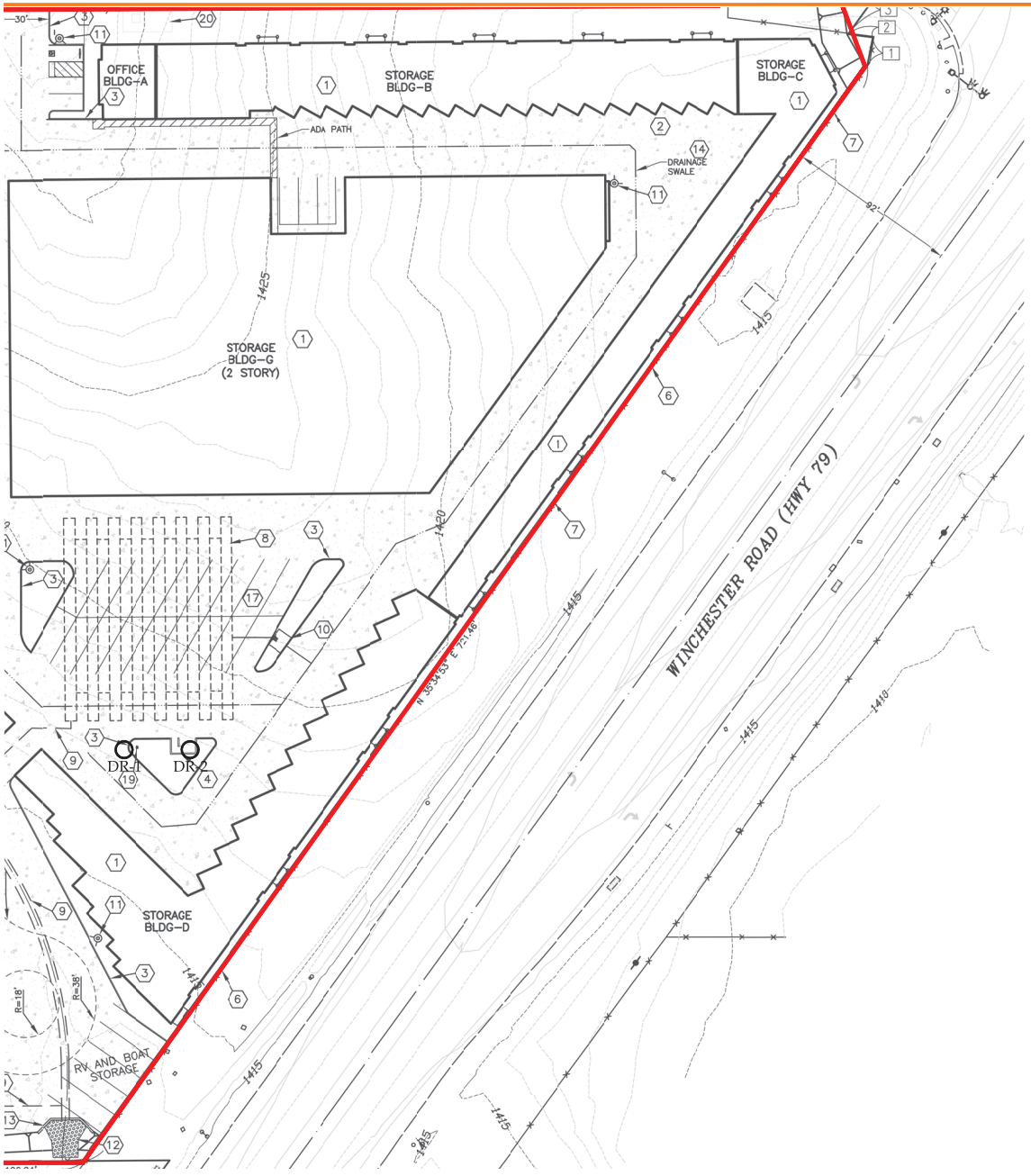
Trial #	Start / End	Date MM/DD/YY	Time HR:MIN	Time Increment /(Total)	Elapsed Time (Min)	Flow Readings				Liquid Temp ºF	Infiltration Rates				Ground Temperature		Remarks
						Inner Ring Reading cm	Inner Maroitte Tube Flow (ml)	Annular Space Reading cm	Annular Space Marriotte Tube Flow (ml)		Inner Infiltration Rate cm/h	Inner Infiltration Rate In/h	Annular Infiltration Rate cm/h	Annular Infiltration Rate In/h	Ground Temp Depth (cm)	Temp at Depth (c)	Weather conditions Etc...
1	Start Test	11/3/2021	11:02	0:25	25												
	End Test	11/3/2021	11:27	0:25			700		1400		2.30	**0.91**	1.53	**0.60**			
2	Start Test	11/3/2021	11:28	0:30	55												
	End Test	11/3/2021	11:58	0:55			450		600		1.23	**0.49**	0.55	**0.22**			
3	Start Test	11/3/2021	11:59	0:30	85												
	End Test	11/3/2021	12:29	1:25			350		0		0.96	**0.38**	0.00	**0.00**			
4	Start Test	11/3/2021	12:30	0:30	115												
	End Test	11/3/2021	13:00	1:55			0		0		0.00	**0.00**	0.00	**0.00**			
5	Start Test	11/3/2021	13:01	0:30	145												
	End Test	11/3/2021	13:31	2:25			0		0		0.00	**0.00**	0.00	**0.00**			

Turf-Tec International

Project Identification:	192851-12A		
Test Location:	DR-4		
Liquid Used:	TAP WATE	**pH:**	8.0
Tested By:	JMR/GG		
Depth to water table:			400

Earth Strata Geotechnical Services, Inc.
Geotechnical, Environmental and Materials Testing Consultants
www.ESGSINC.com (951) 397-8315





LEGEND

Locations are Approximate

Symbols

- Limits of Report

DR-4 - Double Ring Test Location

NORTH

0 30 60 120

SCALE: 1" = 60'

INFILTRATION LOCATION MAP

LOCATED ON THE SOUTHWEST CORNER OF WINCHESTER ROAD AND KELLER ROAD, CITY OF WINCHESTER, RIVERSIDE COUNTY, CALIFORNIA

APN 476-010-060

PROJECT	*PROPOSED SINGLE FAMILY RESIDENCE*		
CLIENT	*DR. MILAN CHAKRABARTY*		
PROJECT NO.	*192851-12A*		
DATE	*NOVEMBER 2021*		
SCALE	*1" = 60'*		
DWG XREFS			
REVISION			
DRAWN BY	*JDG*	*PLATE*	*1 OF 1*

Earth Strata Geotechnical Services, Inc.
Geotechnical, Environmental and Materials Testing Consultants
www.ESGSINC.com (951) 397-8315

Appendix 4: Historical Site Conditions

Phase I Environmental Site Assessment or Other Information on Past Site Use

Appendix 5: LID Feasibility Supplemental Information

Information that supports or supplements the determination of LID technical feasibility documented in Section D

Examples of material to provide in Appendix 5 may include but are not limited to the following:

- Technical feasibility criteria for DMAs
- Site specific analysis of technical infeasibility of all LID BMPs (if Alternative Compliance is needed)
- Documentation of Approval criteria for Proprietary Biofiltration BMPs

This information should support the Full Infiltration Applicability, and Biofiltration Applicability sections of this Template. Refer to Section 2.3 of the SMR WQMP and Sections D of this Template.

Proprietary Biofiltration Criteria

The applicant shall provide documentation of compliance with each criterion in this checklist as part of the project submittal. Proprietary Biofiltration BMPs shall not be proposed if the BMP will accept undeveloped off-site tributary flows, where potential silt/sediment could clog or otherwise negatively impact the BMP.

1	**All BMPs must be sited/designed with the max. feasible infiltration/evapotranspiration[5].**	
	Requirement	Response
1a	What was the development status of the site prior to project application (i.e. raw ungraded land, or redevelopment with existing graded conditions)? – There will be more expectations to infiltrate if the project is a new development.	Raw Ungraded Vacant Land
1b	History of design discussions/coordination for the site proposed project, resulting in the final design determination (i.e. infiltration vs. flow-thru):	Initial Investigation Indicates Poor Infiltration Rates.
1c	The consideration of site design alternatives to achieve infiltration or partial infiltration on site;	Initial Investigation Indicates Poor Infiltration Rates.
1d	The physical impairments (i.e., fire road egress, public safety considerations, sewer lines, etc.) and public safety concerns (impermeable liners only to avoid geotech or contamination issues);	Initial Investigation Indicates Poor Infiltration Rates.
1e	The extent low impact development BMP requirements were included in the project site design (site design worksheets can be attached).	Yes, See Attached
1f	When in the development process (e.g. entitlement or plan check, with dates of geotechnical work and development approval dates) did a geotechnical engineer analyze the site for infiltration feasibility?	Not Completed Yet
1g	What was the scope of the geotechnical testing?	Field Exploration and Lab Testing with Earthwork, Seismic, Grading, & Concrete Recommendations.
1h	What are Public Health and Safety requirements that affect infiltration locations?	Poor Infiltration Rate Will Result in Saturated Soil & Ponding.
1i	What are the conclusions and recommendations from the geotechnical engineer, in regards to infiltrating/retaining on-site or allowing some or all of the flows to flow-thru as a proprietary BMP?	Infiltration Rate Acquired via Soil Survey Website.

[5] To address San Diego Regional Board letter dated April 28, 2017 regarding documentation to support infeasibility to retain or infiltrate storm water on-site. This document will be used to meet the Regional Board requirements for documentation. As such, not apply or non-responses will not be accepted.

1j	How will the proposed proprietary biofiltration BMPs achieve maximum feasible retention (evapotranspiration and infiltration) of the water quality volume, as required by MS4 Permits?	The Stormwater is Treated and then Enters Underground Detention and is Released.

2	**Proprietary Biofiltration BMP sizing (all proprietary/compact BMPs require TAPE approval)[6]**	
	Requirement	Response
2a	Use Table F-1 and F-2 of the WQMP template to identify and list all the pollutants of concern.	Toxic Organic Compounds Trash & Debris Oil & Grease
2b	Attached Active Technology Acceptance Protocol-Ecology (TAPE) certification, with General Use Level Designation (GULD) for all of applicable pollutants of concern	Yes _____ or No____X_____
2c	The most restrictive loading rates outlined in TAPE GULD approval[7] for all of the pollutants of concern.	Yes
2d	Attach calculations, and all relevant steps to show that the sizing of the proprietary BMP is based on the flowrate (or volume) used to obtain TAPE/GULD approval (the most restrictive rate).	Yes ____X_____ or No_____
2e	Are the infiltration rates are outlet controlled (e.g., via an underdrain and orifice/weir) or controlled by the infiltration rate of the media? Faster infiltration rates thru the media tend to reduce O&M issues.	Is the design infiltration rate controlled by the outlet? Yes _____ or No____X_____ If No, provide the rates for the outlet and the media and explain why outlet control is not practicable. It is regulated by an orifice inside the piping at the bottom of the unit.
2f	Does the water surface drains to at least 12 inches below the media surface within 24 hours from the end of storm event flow to preserve plant health and promote healthy soil structure?	Yes ____X_____ or No_____ The units can accommodate up to 164"/hour.

3	**Biofiltration BMPs must be designed to promote appropriate biological activity to support and maintain treatment processes.**

[6] Full scale field testing data that has been verified by Washington Department of Ecology and General Use Level Designation is required. https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Stormwater-permittee-guidance-resources/Emerging-stormwater-treatment-technologies. Otherwise, the County has no obligation to accept the use of any other proprietary flow-thru BMP. Additional guidance can be found at the end of this checklist from the San Diego BMPDM Appendix F.1 for other verified third-party, field scale testing performance criteria that does not meet the Washington Department of Ecology standards.

[7] E.g. if the BMP was certified/verified with 100 gallons per minute treatment rate, the BMP shall be sized with no more than the equivalent rate).

	Requirement	Response
3a	Plants tolerant of project climate, design ponding depths and the treatment media composition.	Provide documentation justifying plant selection.[8] Documentation to Follow.
3b	Plants that minimize irrigation requirements.	Provide documentation describing irrigation requirements for establishment and long term operation. Documentation to Follow.
3c	Plant location and growth will not impede expected long-term media filtration rates and will enhance long-term infiltration rates to the extent possible.	Provide documentation justifying plant selection.[4] Documentation to Follow.
3d	If plants are not applicable to the biofiltration design, other biological processes are supported as needed to sustain treatment processes (e.g., biofilm in a subsurface flow wetland). TAPE GULD approval that identifies approval with and without plants can be submitted for approval.	For biofiltration designs without plants, describe the biological processes that will support effective treatment and how they will be sustained.

4	**Biofiltration BMPs must be designed with a hydraulic loading rate to prevent erosion, scour, and channeling within the BMP. Erosion, scour, and/or channeling can disrupt treatment processes and reduce effectiveness.**	
	Requirement	Response
4a	What pre-treatment devices (e.g. vegetated buffers, catch basin inserts) and designs (e.g. forebay berms with cutouts) are proposed?	None
4b	Adequate scour protection has been provided for both sheet flow and pipe inflows to the BMP.	Yes
4c	Where scour protection has not been provided, flows into and within the BMP are kept to non-erosive velocities.	What are the maximum velocities for sheet flow and pipe inflows into the BMP? Reasonably at 4ft/second
4d	The BMP is used in a manner consistent with manufacturer guidelines and conditions of its third-party certification (e.g. maximum tributary area, maximum inflow velocities, etc.).	Manufacturer Requirements vs. the Design Yes
4e	To preserve permeability, the media should have substantial void ratios and avoidance of choking layers.	Provide media gradation calculations and (if proposed) geotextile selection calculations if the geotextile could affect hydraulic loading rate. The mulch layer captures sediment prior to reaching the media bed. The mulch can be easily replaced regularly instead of the media.

[8] See Appendix E.20 of the San Deigo BMPDM for initial plan list for consideration for Riverside County.

5	**Biofiltration BMP must include operation and maintenance design features and planning considerations for continued effectiveness of pollutant removal and flow control functions. Biofiltration BMPs require regular maintenance in order provide ongoing function as intended. Additionally, it is not possible to foresee and avoid potential issues as part of design; therefore, plans must be in place to correct issues if they arise.**	
	Requirement	Response
5a	Is there any media or cartridge required to maintain the function of the BMP sole-sourced or proprietary in any way? If yes, obtain explicit approval by the Agency. Potentially full replacement costs to a non-proprietary BMP needs to be considered.	Yes ____X_____ or No_____, explain:
5b	The maintenance plan specific for the proprietary BMP specific inspection activities, regular/periodic maintenance activities and specific corrective actions relating to scour, erosion, channeling, media clogging, vegetation health, and inflow and outflow structures.	This is in addition to the O&M Plan described in the WQMP guidance document, Section 5.
5c	Adequate site area and features have been provided for BMP inspection and maintenance access.	Yes, Open Area.
5d	For proprietary biofiltration BMPs, the BMP maintenance plan is consistent with manufacturer guidelines and conditions of its third-party certification (i.e., maintenance activities, frequencies).	Yes ____X_____ or No_____
5e	Describe all portions of the BMP that may potentially clog or present an O&M issue.	There is a potential for clogging only if there is no maintenance performed.
5f	Describe design features to address each of the potential clogging or O&M issues.	Restoring or replacing the mulch layer periodically will prevent clogging. The product includes two training inspections.

By signing below, the preparer certifies all the information provided with this submittal and submittals related to proprietary BMPs for the project is accurate, and relevant information to assess the long term operation and maintenance of this proprietary BMP was not omitted with this submittal.

Prepared by: Vincent Kleppe

Title: Project Engineer

Signature: _____

Date: 9/28/2020

Alternative Pollutant Treatment Performance Standard

County staff may allow the applicant to submit alternative third-party documentation that the pollutant treatment performance of the system is consistent with Technology Acceptance Protocol-Ecology certifications. Table F.1-1 describes the required levels of certification and Table F.1-2 describes the pollutant treatment performance levels associated with each level of certification. Acceptance of this approach is at the sole discretion of County staff, preference would be given to:

a. Verified third-party, field-scale testing performance under the Technology Acceptance Reciprocity Partnership Tier II Protocol. This protocol is no longer operated, however this is considered to be a valid protocol and historic verifications are considered to be representative provided that product models being proposed are consistent with those that were tested. Technology Acceptance Reciprocity Partnership verifications were conducted under New Jersey Corporation for Advance Testing and are archived at the website linked below. Note that Technology Acceptance Reciprocity Partnership verifications must be matched to pollutant treatment standards in Table F.1-2 then matched to an equivalent Technology Acceptance Protocol-Ecology certification in Table F.1-1.

b. Verified third-party, field-scale testing performance under the New Jersey Corporation for Advance Testing protocol. Note that New Jersey Corporation for Advance Testing verifications must be matched to pollutant treatment standards in Table F.1-2 then matched to an equivalent Technology Acceptance Protocol- Ecology certification in Table F.1-1. A list of field-scale verified technologies under Technology Acceptance Reciprocity Partnership Tier II and New Jersey Corporation for Advance Testing can be accessed at: http://www.njcat.org/verification-process/technology-verification-database.html (refer to: field verified technologies only).

Table F.1-1: Required Technology Acceptance Protocol-Ecology Certifications for Polltuants of Concern for Biofiltration Performance Standard

Project Pollutant of Concern	Required Technology Acceptance Protocol-Ecology Certification for Biofiltration Performance Standard
Trash	Basic Treatment OR Phosphorus Treatment OR Enhanced Treatment
Sediments	Basic Treatment OR Phosphorus Treatment OR Enhanced Treatment
Oil and Grease	Basic Treatment OR Phosphorus Treatment OR Enhanced Treatment
Nutrients	Phosphorus Treatment[1]
Metals	Enhanced Treatment
Pesticides	Basic Treatment (including filtration)[2] OR Phosphorus Treatment OR Enhanced Treatment
Organics	Basic Treatment (including filtration)[2] OR Phosphorus Treatment OR Enhanced Treatment
Bacteria and Viruses	Basic Treatment (including bacteria removal processes)[3] OR Phosphorus Treatment OR Enhanced Treatment

1 – There is no Technology Acceptance Protocol-Ecology equivalent for nitrogen compounds; however systems that are designed to retain phosphorus (as well as meet basic treatment designation), generally also provide treatment of nitrogen compounds. Where nitrogen is a pollutant of concern, relative performance of available certified systems for nitrogen removal should be considered in BMP selection.
2 – Pesticides, organics, and oxygen demanding substances are typically addressed by particle filtration consistent with the level of treatment required to achieve Basic treatment certification; if a system with Basic treatment certification does not provide filtration, it is not acceptable for pesticides, organics or oxygen demanding substances.
3 – There is no Technology Acceptance Protocol-Ecology equivalent for pathogens (viruses and bacteria), and testing data are limited because of typical sample hold times. Systems with Technology Acceptance Protocol-Ecology Basic Treatment must be include one or more significant bacteria removal process such as media filtration, physical sorption, predation, reduced redox conditions, and/or solar inactivation. Where design options are available to enhance pathogen removal (i.e., pathogen-specific media mix offered by vendor), this design variation should be used.

Table F.1-2: Performance Standards for Technology Acceptance Protocol-Ecology Certification

Performance Goal	Influent Range	Criteria
Basic Treatment	20 – 100 mg/L TSS	Effluent goal ≤ 20 mg/L TSS
	100 – 200 mg/L TSS	≥ 80% TSS removal
	>200 mg/L TSS	> 80% TSS removal
Enhanced (Dissolved Metals) Treatment	Dissolved copper 0.005 – 0.02 mg/L	Must meet basic treatment goal and better than basic treatment currently defined as >30% dissolved copper removal
	Dissolved zinc 0.02 – 0.3 mg/L	Must meet basic treatment goal and better than basic treatment currently defined as >60% dissolved zinc removal
Phosphorous Treatment	Total phosphorous 0.1 – 0.5 mg/L	Must meet basic treatment goal and exhibit ≥50% total phosphorous removal
Oil Treatment	Total petroleum hydrocarbon > 10 mg/L	No ongoing or recurring visible sheen in effluent Daily average effluent Total petroleum hydrocarbon concentration < 10 mg/L Maximum effluent Total petroleum hydrocarbon concentration for a 15 mg/L for a discrete (grab) sample
Pretreatment	50 – 100 mg/L TSS	≤ 50 mg/L TSS
	≥ 200 mg/L TSS	≥ 50% TSS removal

Appendix 6: LID BMP Design Details

BMP Sizing, Design Details and other Supporting Documentation to supplement Section D

Examples of material to provide in Appendix 6 may include but are not limited to the following:

- DCV calculations,
- LID BMP sizing calculations from Exhibit C of the SMR WQMP
- Design details/drawings from manufacturers for proprietary BMPs

This information should support the Full Infiltration Applicability, and Biofiltration Applicability sections of this Template. Refer to Section 3.4 of the SMR WQMP and Sections D.4 of this Template.

Santa Margarita Watershed

V_{BMP} and Q_{BMP} worksheets

These worksheets are to be used to determine the required

Design Capture Volume (V_{BMP})
or the
Design Flow Rate (Q_{BMP})

for BMPs in the Santa Margarita Watershed

To verify which watershed your project is located within, visit

www.rcflood.org/npdes

and use the 'Locate my Watershed' tool

If your project is not located in the Santa Margarita Watershed,

Do not use these worksheets! Instead visit

www.rcflood.org/npdes/developers.aspx

To access worksheets applicable to your watershed

Use the tabs across the bottom
to access the worksheets for the Santa Margarita Watershed

Santa Margarita Watershed

BMP Design Volume, V_{BMP} (Rev. 03-2012)

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	The Prizm Group	Date	6/3/2022
Designed by	Vincent Kleppe	County/City Case No	Riverside
Company Project Number/Name	19-004 Keller Rd. Self Storage		
Drainage Area Number/Name	DMA 1		

Enter the Area Tributary to this Feature A_T = 3.75 acres

85th Percentile, 24-hour Rainfall Depth, from the Isohyetal Map in Handbook Appendix E

Site Location

Township: 6S

Range: 2W

Section: 21

Enter the 85th Percentile, 24-hour Rainfall Depth D_{85} = 0.60

Determine the Effective Impervious Fraction

Type of post-development surface cover (use pull down menu): Concrete or Asphalt

Effective Impervious Fraction I_f = 1.00

Calculate the composite Runoff Coefficient, C for the BMP Tributary Area

Use the following equation based on the WEF/ASCE Method

$C = 0.858I_f^3 - 0.78I_f^2 + 0.774I_f + 0.04$

C = 0.89

Determine Design Storage Volume, V_{BMP}

Calculate V_U, the 85% Unit Storage Volume $V_U = D_{85} \times C$

V_u = 0.54 (in*ac)/ac

Calculate the design storage volume of the BMP, V_{BMP}.

$$V_{BMP}\ (ft^3) = \frac{V_U\ (in\text{-}ac/ac) \times A_T\ (ac) \times 43{,}560\ (ft^2/ac)}{12\ (in/ft)}$$

V_{BMP} = 7,351 ft^3

Notes:

Santa Margarita Watershed

BMP Design Flow Rate, Q_{BMP} (Rev. 03-2012)

Legend: Required Entries / Calculated Cells

Company Name	The Prizm Group	Date	6/2/2022
Designed by	Vincent Kleppe	County/City Case No	Riverside
Company Project Number/Name	19-004 Temecula Valley Storage		
Drainage Area Number/Name	DMA 1		

Enter the Area Tributary to this Feature A_T = 3.75 acres

Determine the Effective Impervious Fraction

Type of post-development surface cover (use pull down menu): Concrete or Asphalt

Effective Impervious Fraction I_f = 1.00

Calculate the composite Runoff Coefficient, C for the BMP Tributary Area

Use the following equation based on the WEF/ASCE Method

$C = 0.858I_f^3 - 0.78I_f^2 + 0.774I_f + 0.04$

C = 0.89

BMP Design Flow Rate

$Q_{BMP} = C \times I \times A_T$

Q_{BMP} = 0.7 ft^3/s

Notes:

Santa Margarita Watershed

BMP Design Volume, V_{BMP} (Rev. 03-2012)

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	The Prizm Group	Date	5/10/2022
Designed by	Vincent Kleppe	County/City Case No	Riverside
Company Project Number/Name	19-004 Keller Rd. Self Storage		
Drainage Area Number/Name	DMA 2		

Enter the Area Tributary to this Feature A_T = 0.7 acres

85th Percentile, 24-hour Rainfall Depth, from the Isohyetal Map in Handbook Appendix E

Site Location

Township 6S

Range 2W

Section 21

Enter the 85th Percentile, 24-hour Rainfall Depth D_{85} = 0.60

Determine the Effective Impervious Fraction

Type of post-development surface cover (use pull down menu): Mixed Surface Types

Effective Impervious Fraction I_f = 0.53

Calculate the composite Runoff Coefficient, C for the BMP Tributary Area

Use the following equation based on the WEF/ASCE Method

$C = 0.858I_f^3 - 0.78I_f^2 + 0.774I_f + 0.04$ C = 0.36

Determine Design Storage Volume, V_{BMP}

Calculate V_U, the 85% Unit Storage Volume $V_U = D_{85} \times C$ V_u = 0.22 (in*ac)/ac

Calculate the design storage volume of the BMP, V_{BMP}.

$$V_{BMP}\ (ft^3) = \frac{V_U\ (in\text{-}ac/ac) \times A_T\ (ac) \times 43{,}560\ (ft^2/ac)}{12\ (in/ft)}$$

V_{BMP} = 559 ft^3

Notes:

Santa Margarita Watershed

BMP Design Flow Rate, Q_{BMP} (Rev. 03-2012)

Legend: Required Entries / Calculated Cells

Company Name	The Prizm Group	Date	5/10/2022
Designed by	Vincent Kleppe	County/City Case No	Riverside
Company Project Number/Name	19-004 Keller Rd. Storage		
Drainage Area Number/Name	DMA 2		

Enter the Area Tributary to this Feature A_T = 0.7 acres

Determine the Effective Impervious Fraction

Type of post-development surface cover (use pull down menu): Mixed Surface Types

Effective Impervious Fraction I_f = 0.53

Calculate the composite Runoff Coefficient, C for the BMP Tributary Area

Use the following equation based on the WEF/ASCE Method

$C = 0.858I_f^3 - 0.78I_f^2 + 0.774I_f + 0.04$

C = 0.36

BMP Design Flow Rate

$Q_{BMP} = C \times I \times A_T$

Q_{BMP} = 0.1 ft^3/s

Notes:

Santa Margarita Watershed

BMP Design Volume, V_{BMP} (Rev. 03-2012)

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	The Prizm Group	Date	5/10/2022
Designed by	Vincent Kleppe	County/City Case No	Riverside
Company Project Number/Name	19-004 Keller Rd. Self Storage		
Drainage Area Number/Name	DMA 3		

Enter the Area Tributary to this Feature A_T = 1.88 acres

85th Percentile, 24-hour Rainfall Depth, from the Isohyetal Map in Handbook Appendix E

Site Location

Township: 6S

Range: 2W

Section: 21

Enter the 85th Percentile, 24-hour Rainfall Depth D_{85} = 0.60

Determine the Effective Impervious Fraction

Type of post-development surface cover (use pull down menu): Mixed Surface Types

Effective Impervious Fraction I_f = 0.68

Calculate the composite Runoff Coefficient, C for the BMP Tributary Area

Use the following equation based on the WEF/ASCE Method

$C = 0.858I_f^3 - 0.78I_f^2 + 0.774I_f + 0.04$

C = 0.48

Determine Design Storage Volume, V_{BMP}

Calculate V_U, the 85% Unit Storage Volume $V_U = D_{85} \times C$

V_u = 0.29 (in*ac)/ac

Calculate the design storage volume of the BMP, V_{BMP}.

$$V_{BMP}\ (ft^3) = \frac{V_U\ (in\text{-}ac/ac) \times A_T\ (ac) \times 43{,}560\ (ft^2/ac)}{12\ (in/ft)}$$

V_{BMP} = 1,979 ft^3

Notes:

Santa Margarita Watershed

BMP Design Flow Rate, Q_{BMP} (Rev. 03-2012)

Legend: Required Entries / Calculated Cells

Company Name	The Prizm Group	Date	6/2/2022
Designed by	Vincent Kleppe	County/City Case No	Riverside
Company Project Number/Name	19-004 Temecula Valley Storage		
Drainage Area Number/Name	DMA 3		

Enter the Area Tributary to this Feature A_T = 1.88 acres

Determine the Effective Impervious Fraction

Type of post-development surface cover (use pull down menu): Mixed Surface Types

Effective Impervious Fraction I_f = 0.68

Calculate the composite Runoff Coefficient, C for the BMP Tributary Area

Use the following equation based on the WEF/ASCE Method

$C = 0.858I_f^3 - 0.78I_f^2 + 0.774I_f + 0.04$

C = 0.48

BMP Design Flow Rate

$Q_{BMP} = C \times I \times A_T$

Q_{BMP} = 0.2 ft^3/s

Notes:

Santa Margarita Watershed

BMP Design Volume, V_{BMP} (Rev. 03-2012)

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	The Prizm Group	Date	5/10/2022
Designed by	Vincent Kleppe	County/City Case No	Riverside
Company Project Number/Name	19-004 Keller Rd. Self Storage		
Drainage Area Number/Name	DMA 4		

Enter the Area Tributary to this Feature A_T = 0.21 acres

85th Percentile, 24-hour Rainfall Depth, from the Isohyetal Map in Handbook Appendix E

Site Location

Township: 6S

Range: 2W

Section: 21

Enter the 85th Percentile, 24-hour Rainfall Depth D_{85} = 0.60

Determine the Effective Impervious Fraction

Type of post-development surface cover (use pull down menu): Mixed Surface Types

Effective Impervious Fraction I_f = 0.16

Calculate the composite Runoff Coefficient, C for the BMP Tributary Area

Use the following equation based on the WEF/ASCE Method

$C = 0.858I_f^3 - 0.78I_f^2 + 0.774I_f + 0.04$

C = 0.15

Determine Design Storage Volume, V_{BMP}

Calculate V_U, the 85% Unit Storage Volume $V_U = D_{85} \times C$

V_u = 0.09 (in*ac)/ac

Calculate the design storage volume of the BMP, V_{BMP}.

$$V_{BMP}\ (ft^3) = \frac{V_U\ (in\text{-}ac/ac) \times A_T\ (ac) \times 43{,}560\ (ft^2/ac)}{12\ (in/ft)}$$

V_{BMP} = 69 ft^3

Notes:

Santa Margarita Watershed

BMP Design Flow Rate, Q_{BMP} (Rev. 03-2012)

Legend: Required Entries / Calculated Cells

Company Name	The Prizm Group	Date	5/10/2022
Designed by	Vincent Kleppe	County/City Case No	Riverside
Company Project Number/Name	19-004 Keller Rd. Storage		
Drainage Area Number/Name	DMA 4		

Enter the Area Tributary to this Feature A_T = 0.21 acres

Determine the Effective Impervious Fraction

Type of post-development surface cover (use pull down menu): Mixed Surface Types

Effective Impervious Fraction I_f = 0.16

Calculate the composite Runoff Coefficient, C for the BMP Tributary Area

Use the following equation based on the WEF/ASCE Method

$C = 0.858I_f^3 - 0.78I_f^2 + 0.774I_f + 0.04$

C = 0.15

BMP Design Flow Rate

$Q_{BMP} = C \times I \times A_T$

Q_{BMP} = 0.0 ft^3/s

Notes:

Effective Impervious Fraction

Developed Cover Types	Effective Impervious Fraction
Roofs	1.00
Concrete or Asphalt	1.00
Grouted or Gapless Paving Blocks	1.00
Compacted Soil (e.g. unpaved parking)	0.40
Decomposed Granite	0.40
Permeable Paving Blocks w/ Sand Filled Gap	0.25
Class 2 Base	0.30
Gravel or Class 2 Permeable Base	0.10
Pervious Concrete / Porous Asphalt	0.10
Open and Porous Pavers	0.10
Turf block	0.10
Ornamental Landscaping	0.10
Natural (A Soil)	0.03
Natural (B Soil)	0.15
Natural (C Soil)	0.30
Natural (D Soil)	0.40
Mixed Surface Types	

Use this table to determine the effective impervious fraction for the V_{BMP} and Q_{BMP} calculation sheets

Proprietary BMP - Design Procedure	BMP ID BMP 1	

Company Name:	The Prizm Group	Date:	6/15/2022
Designed by:	Vincent Kleppe	County/City Case No:	Riverside

Design Volume

1. Determine Design Flow Rate Q_{BMP} = 0.45 cfs

Design Criteria

2. Proprietary BMP information (complete information as applicable)

Manufacturer Name	Make	BioClean	
Model	Model	MWS-L-8-16-V-UG	
Unit Treatment Flow Capacity of Model, per testing	Capacity	20	gal. /min./ sq.ft.
Unit Treatment Flow Capacity of Model, per testing	Capacity	0.45	cfs / sq.ft.
Surface Area proposed	Design	128	sq. ft.
Total Treatment Flow Capacity of Model	Capacity	0.45	cfs

For Biofiltration equivalency, incdlue the Proprietary BioFiltration Criteria checklist including supporting documentation, and manufacturer's data.

Notes:

Proprietary BMP - Design Procedure	BMP ID	
	BMP 2	

Company Name:	The Prizm Group	Date:	6/15/2022
Designed by:	Vincent Kleppe	County/City Case No:	Riverside

Design Volume

1. Determine Design Flow Rate — Q_{BMP} = 0.1 cfs

Design Criteria

2. Proprietary BMP information (complete information as applicable)

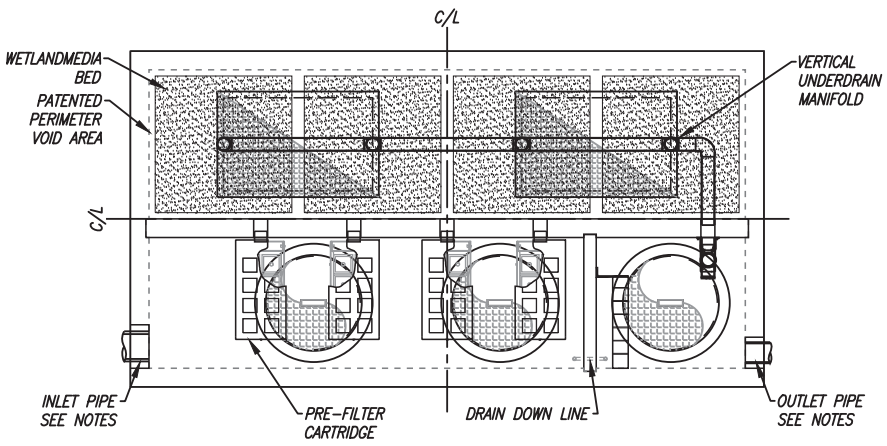
Manufacturer Name	Make	BioClean	
Model	Model	MWS-L-*-V-UG	
Unit Treatment Flow Capacity of Model, per testing	Capacity	202	gal. /min./ sq.ft.
Unit Treatment Flow Capacity of Model, per testing	Capacity	0.45	cfs / sq.ft.
Surface Area proposed	Design	128	sq. ft.
Total Treatment Flow Capacity of Model	Capacity	0.45	cfs

For Biofiltration equivalency, incdlue the Proprietary BioFiltration Criteria checklist including supporting documentation, and manufacturer's data.

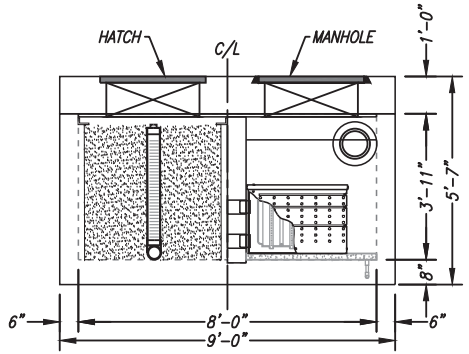
Notes:

SITE SPECIFIC DATA			
PROJECT NUMBER		14650	
PROJECT NAME		TEMECULA VALLEY SELF STORAGE	
PROJECT LOCATION		WINCHESTER, CA	
STRUCTURE ID		UNIT 1	
TREATMENT REQUIRED			
VOLUME BASED (CF)		FLOW BASED (CFS)	
N/A		0.45	
TREATMENT HGL AVAILABLE (FT)			N/K
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE			4.55
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	19.56	PVC	8"
OUTLET PIPE	16.70	PVC	6"
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION	21.70	21.70	21.70
SURFACE LOAD	H-20 INDIRECT	H-20 INDIRECT	H-20 INDIRECT
FRAME & COVER	2EA Ø30"	2EA 30" X 48"	Ø30"
WETLANDMEDIA VOLUME (CY)			7.35
ORIFICE SIZE (DIA. INCHES)			Ø3.05"

NOTES: PRELIMINARY NOT FOR CONSTRUCTION. XYPEX WATERPROOFING ADMIXTURE REQUIRED FOR CORROSIVE SOILS.



PLAN VIEW



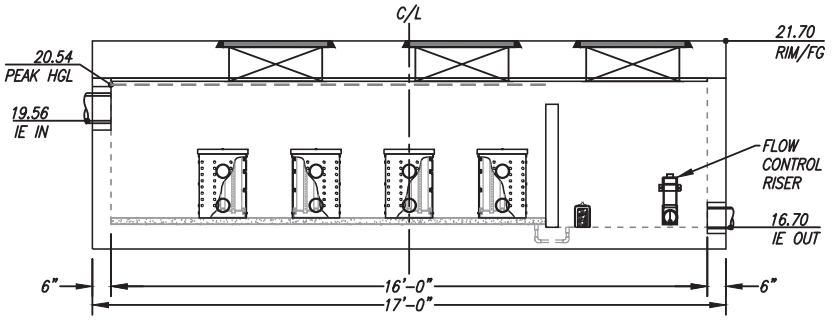
LEFT END VIEW

VEGETATION DISCLOSURE:

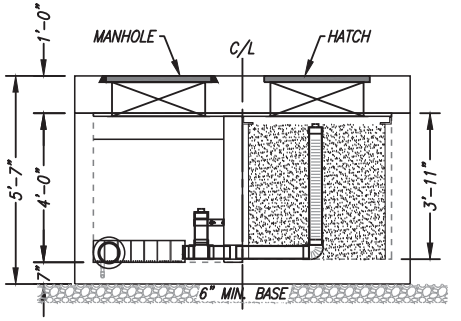
THIS UNIT HAS BEEN DESIGNED TO HAVE NO VEGETATION. PLEASE CONFIRM THIS MEETS THE PROJECT SPECIFICATIONS AND ALL CITY AND APPROVING AGENCIES WILL ACCEPT THIS TYPE OF CONFIGURATION BEFORE APPROVING THESE SUBMITTALS.

INSTALLATION NOTES

1. CONTRACTOR TO PROVIDE ALL LABOR, EQUIPMENT, MATERIALS AND INCIDENTALS REQUIRED TO OFFLOAD AND INSTALL THE SYSTEM AND APPURTENANCES IN ACCORDANCE WITH THIS DRAWING AND THE MANUFACTURERS' SPECIFICATIONS, UNLESS OTHERWISE STATED IN MANUFACTURER'S CONTRACT.
2. UNIT MUST BE INSTALLED ON LEVEL BASE. MANUFACTURER RECOMMENDS A MINIMUM 6" LEVEL ROCK BASE UNLESS SPECIFIED BY THE PROJECT ENGINEER. CONTRACTOR IS RESPONSIBLE FOR VERIFYING PROJECT ENGINEER'S RECOMMENDED BASE SPECIFICATIONS.
4. CONTRACTOR TO SUPPLY AND INSTALL ALL EXTERNAL CONNECTING PIPES. ALL PIPES MUST BE FLUSH WITH INSIDE SURFACE OF CONCRETE (PIPES CANNOT INTRUDE BEYOND FLUSH). INVERT OF OUTFLOW PIPE MUST BE FLUSH WITH DISCHARGE CHAMBER FLOOR. ALL PIPES SHALL BE SEALED WATERTIGHT PER MANUFACTURER'S STANDARD CONNECTION DETAIL.
5. CONTRACTOR RESPONSIBLE FOR INSTALLATION OF ALL PIPES, RISERS, MANHOLES, AND HATCHES. CONTRACTOR TO USE GROUT AND/OR BRICKS TO MATCH COVERS WITH FINISHED SURFACE UNLESS SPECIFIED OTHERWISE.
6. CONTRACTOR RESPONSIBLE FOR CONTACTING BIO CLEAN FOR ACTIVATION OF UNIT. MANUFACTURER'S WARRANTY IS VOID WITHOUT PROPER ACTIVATION BY A BIO CLEAN REPRESENTATIVE.



ELEVATION VIEW



RIGHT END VIEW

INTERNAL BYPASS DISCLOSURE:

THE DESIGN AND CAPACITY OF THE PEAK CONVEYANCE METHOD TO BE REVIEWED AND APPROVED BY THE ENGINEER OF RECORD. HGL(S) AT PEAK FLOW SHALL BE ASSESSED TO ENSURE NO UPSTREAM FLOODING. PEAK HGL AND BYPASS CAPACITY SHOWN ON DRAWING ARE USED FOR GUIDANCE ONLY.

TREATMENT FLOW (CFS)	0.45
OPERATING HEAD (FT)	3.3
PRETREATMENT LOADING RATE (GPM/SF)	2.0
WETLAND MEDIA LOADING RATE (GPM/SF)	1.0

GENERAL NOTES

1. MANUFACTURER TO PROVIDE ALL MATERIALS UNLESS OTHERWISE NOTED.
2. ALL DIMENSIONS, ELEVATIONS, SPECIFICATIONS AND CAPACITIES ARE SUBJECT TO CHANGE. FOR PROJECT SPECIFIC DRAWINGS DETAILING EXACT DIMENSIONS, WEIGHTS AND ACCESSORIES PLEASE CONTACT BIO CLEAN.

MODULAR WETLANDS
THIS PRODUCT MAY BE PROTECTED BY ONE OR MORE OF THE FOLLOWING US PATENTS: 7,425,262; 7,470,362; 7,674,378; 8,303,816; RELATED FOREIGN PATENTS OR OTHER PATENTS PENDING

PROPRIETARY AND CONFIDENTIAL:
THE INFORMATION CONTAINED IN THIS DOCUMENT IS THE SOLE PROPERTY OF FORTERRA AND ITS COMPANIES. THIS DOCUMENT, NOR ANY PART THEREOF, MAY BE USED, REPRODUCED OR MODIFIED IN ANY MANNER WITH OUT THE WRITTEN CONSENT OF FORTERRA.

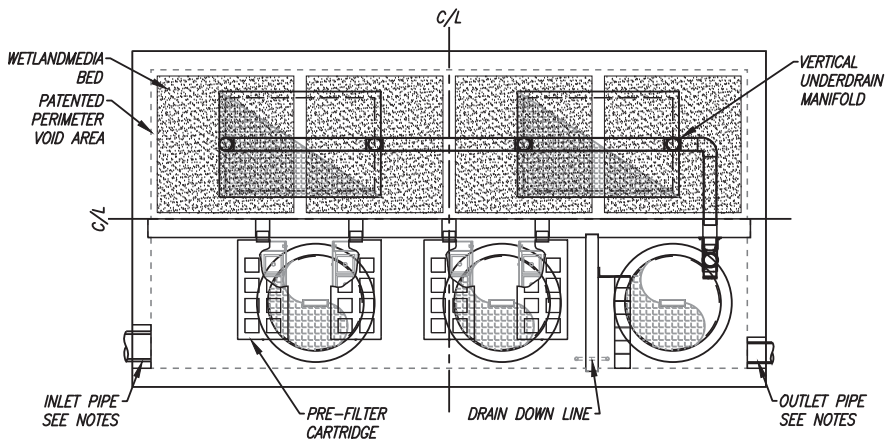
Bio Clean
A Forterra Company

MWS-L-8-16-3'-11"-V-UG
STORMWATER BIOFILTRATION SYSTEM
STANDARD DETAIL

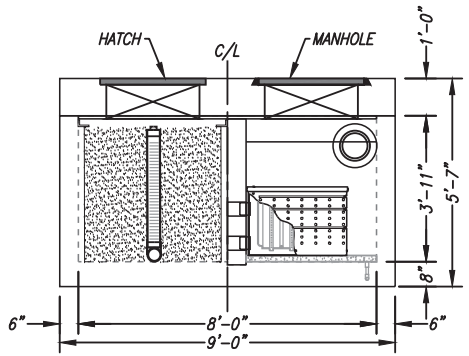
6/15/2021KBRG

SITE SPECIFIC DATA			
PROJECT NUMBER		14650	
PROJECT NAME		TEMECULA VALLEY SELF STORAGE	
PROJECT LOCATION		WINCHESTER, CA	
STRUCTURE ID		UNIT 2	
TREATMENT REQUIRED			
VOLUME BASED (CF)		FLOW BASED (CFS)	
N/A		0.45	
TREATMENT HGL AVAILABLE (FT)			N/K
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE			4.55
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	19.56	PVC	8"
OUTLET PIPE	16.70	PVC	6"
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION	21.70	21.70	21.70
SURFACE LOAD	H-20 INDIRECT	H-20 INDIRECT	H-20 INDIRECT
FRAME & COVER	2EA Ø30"	2EA 30" X 48"	Ø30"
WETLANDMEDIA VOLUME (CY)			7.35
ORIFICE SIZE (DIA. INCHES)			Ø3.05"

NOTES: PRELIMINARY NOT FOR CONSTRUCTION. XYPEX WATERPROOFING ADMIXTURE REQUIRED FOR CORROSIVE SOILS.



PLAN VIEW



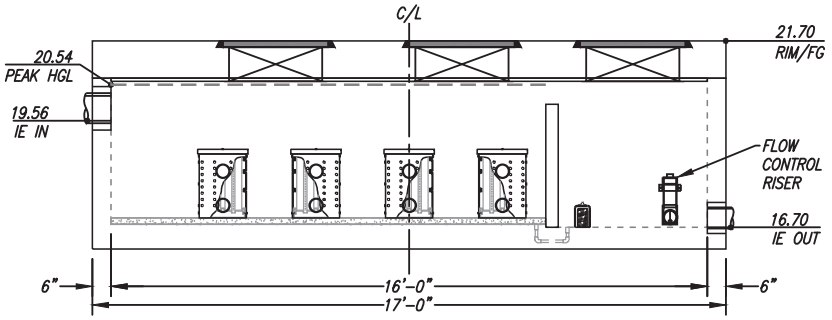
LEFT END VIEW

VEGETATION DISCLOSURE:

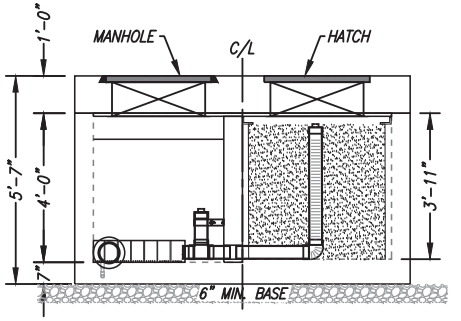
THIS UNIT HAS BEEN DESIGNED TO HAVE NO VEGETATION. PLEASE CONFIRM THIS MEETS THE PROJECT SPECIFICATIONS AND ALL CITY AND APPROVING AGENCIES WILL ACCEPT THIS TYPE OF CONFIGURATION BEFORE APPROVING THESE SUBMITTALS.

INSTALLATION NOTES

1. CONTRACTOR TO PROVIDE ALL LABOR, EQUIPMENT, MATERIALS AND INCIDENTALS REQUIRED TO OFFLOAD AND INSTALL THE SYSTEM AND APPURTENANCES IN ACCORDANCE WITH THIS DRAWING AND THE MANUFACTURERS' SPECIFICATIONS, UNLESS OTHERWISE STATED IN MANUFACTURER'S CONTRACT.
2. UNIT MUST BE INSTALLED ON LEVEL BASE. MANUFACTURER RECOMMENDS A MINIMUM 6" LEVEL ROCK BASE UNLESS SPECIFIED BY THE PROJECT ENGINEER. CONTRACTOR IS RESPONSIBLE FOR VERIFYING PROJECT ENGINEER'S RECOMMENDED BASE SPECIFICATIONS.
4. CONTRACTOR TO SUPPLY AND INSTALL ALL EXTERNAL CONNECTING PIPES. ALL PIPES MUST BE FLUSH WITH INSIDE SURFACE OF CONCRETE (PIPES CANNOT INTRUDE BEYOND FLUSH). INVERT OF OUTFLOW PIPE MUST BE FLUSH WITH DISCHARGE CHAMBER FLOOR. ALL PIPES SHALL BE SEALED WATERTIGHT PER MANUFACTURER'S STANDARD CONNECTION DETAIL.
5. CONTRACTOR RESPONSIBLE FOR INSTALLATION OF ALL PIPES, RISERS, MANHOLES, AND HATCHES. CONTRACTOR TO USE GROUT AND/OR BRICKS TO MATCH COVERS WITH FINISHED SURFACE UNLESS SPECIFIED OTHERWISE.
6. CONTRACTOR RESPONSIBLE FOR CONTACTING BIO CLEAN FOR ACTIVATION OF UNIT. MANUFACTURER'S WARRANTY IS VOID WITHOUT PROPER ACTIVATION BY A BIO CLEAN REPRESENTATIVE.



ELEVATION VIEW



RIGHT END VIEW

INTERNAL BYPASS DISCLOSURE:

THE DESIGN AND CAPACITY OF THE PEAK CONVEYANCE METHOD TO BE REVIEWED AND APPROVED BY THE ENGINEER OF RECORD. HGL(S) AT PEAK FLOW SHALL BE ASSESSED TO ENSURE NO UPSTREAM FLOODING. PEAK HGL AND BYPASS CAPACITY SHOWN ON DRAWING ARE USED FOR GUIDANCE ONLY.

TREATMENT FLOW (CFS)	0.45
OPERATING HEAD (FT)	3.3
PRETREATMENT LOADING RATE (GPM/SF)	2.0
WETLAND MEDIA LOADING RATE (GPM/SF)	1.0

GENERAL NOTES

1. MANUFACTURER TO PROVIDE ALL MATERIALS UNLESS OTHERWISE NOTED.
2. ALL DIMENSIONS, ELEVATIONS, SPECIFICATIONS AND CAPACITIES ARE SUBJECT TO CHANGE. FOR PROJECT SPECIFIC DRAWINGS DETAILING EXACT DIMENSIONS, WEIGHTS AND ACCESSORIES PLEASE CONTACT BIO CLEAN.

MODULAR WETLANDS

THIS PRODUCT MAY BE PROTECTED BY ONE OR MORE OF THE FOLLOWING US PATENTS: 7,425,262; 7,470,362; 7,674,378; 8,303,816; RELATED FOREIGN PATENTS OR OTHER PATENTS PENDING

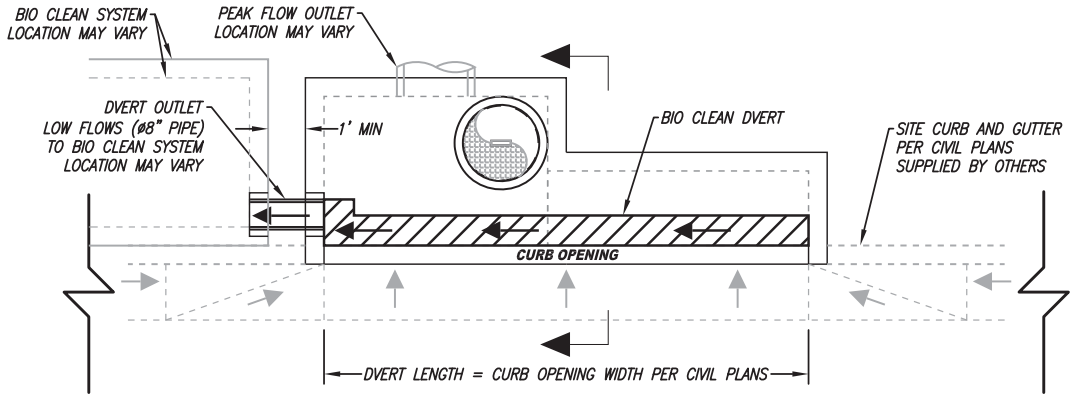
PROPRIETARY AND CONFIDENTIAL:

THE INFORMATION CONTAINED IN THIS DOCUMENT IS THE SOLE PROPERTY OF FORTERRA AND ITS COMPANIES. THIS DOCUMENT, NOR ANY PART THEREOF, MAY BE USED, REPRODUCED OR MODIFIED IN ANY MANNER WITH OUT THE WRITTEN CONSENT OF FORTERRA.

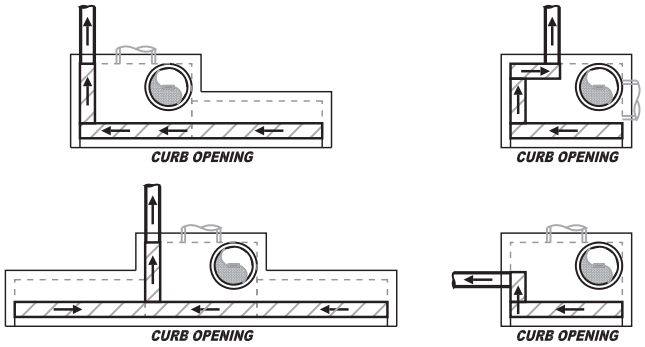
Bio Clean
A Forterra Company

MWS-L-8-16-3'-11"-V-UG
STORMWATER BIOFILTRATION SYSTEM
STANDARD DETAIL

6/15/2021KBRG

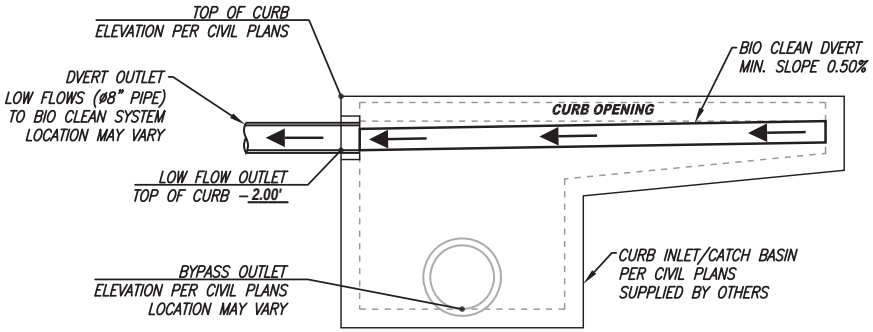


PLAN VIEW

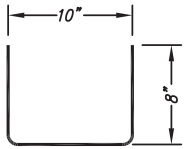


ALTERNATE CONFIGURATIONS

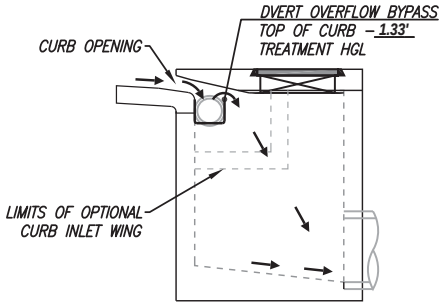
CONTACT BIO CLEAN FOR ADDITIONAL CUSTOM CONFIGURATIONS



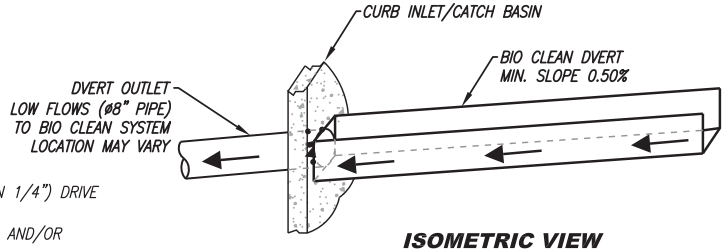
ELEVATION VIEW



DVERT END VIEW



SECTION VIEW



ISOMETRIC VIEW

INSTALLATION NOTES

1. DVERT TO BE CONNECTED TO CONCRETE BELOW CURB OPENING USING 316 STAINLESS STEEL (MIN 1/4") DRIVE PIN ANCHORS SPACED 12" ON CENTER AND 316 STAINLESS STEEL RIVETS (MIN 3/16").
2. ALL SEAMS BETWEEN DVERT AND CONCRETE SHALL BE FILLED WITH WATERTIGHT CONCRETE FILLER AND/OR SILICONE SEALANT.
3. CONTRACTOR TO SUPPLY AND INSTALL ALL EXTERNAL CONNECTING PIPES. ALL PIPES MUST BE FLUSH WITH INSIDE SURFACE OF CONCRETE. PIPES CANNOT INTRUDE BEYOND FLUSH. INVERT OF OUTFLOW PIPE MUST BE FLUSH WITH THE FLOWLINE OF THE DVERT. ALL PIPES SHALL BE SEALED WATERTIGHT PER MANUFACTURER'S STANDARD CONNECTION DETAIL.
4. CONTRACTOR RESPONSIBLE FOR CONTACTING BIO CLEAN FOR ACTIVATION OF MODULAR WETLANDS (MWS) UNIT. MANUFACTURER'S WARRANTY IS VOID WITHOUT PROPER ACTIVATION BY A BIO CLEAN REPRESENTATIVE.

MAXIMUM LOW FLOW DIVERSION (CFS)	0.74
LOW FLOW OUTLET PIPE SIZE (INCHES)	ø8"
STATIC HEAD (INCHES)	8"
SAFETY FACTOR	2

PROPRIETARY AND CONFIDENTIAL:

THE INFORMATION CONTAINED IN THIS DOCUMENT IS THE SOLE PROPERTY OF FORTERRA AND ITS COMPANIES. THIS DOCUMENT, NOR ANY PART THEREOF, MAY BE USED, REPRODUCED OR MODIFIED IN ANY MANNER WITH OUT THE WRITTEN CONSENT OF FORTERRA.

Bio Clean
A Forterra Company

DVERT DVT-10-8
MODULAR TROUGH DIVERSION SYSTEM
STANDARD DETAIL

2/5/2015 7:42:51 PM

Section [_____]
Modular Subsurface Flow Wetland System

PART 1 – GENERAL

01.01.00 Purpose
The purpose of this specification is to establish generally acceptable criteria for Modular Subsurface Flow Wetland Systems used for biofiltration of stormwater runoff including dry weather flows and other contaminated water sources. It is intended to serve as a guide to producers, distributors, architects, engineers, contractors, plumbers, installers, inspectors, agencies and users; to promote understanding regarding materials, manufacture and installation; and to provide for identification of devices complying with this specification.

01.02.00 Description
Modular Subsurface Flow Wetland Systems (MSFWS) are used for filtration of stormwater runoff including dry weather flows. The MSFWS is a pre-engineered biofiltration system composed of a pretreatment chamber containing filtration cartridges, a horizontal flow biofiltration chamber with a peripheral void area and a centralized and vertically extending underdrain, the biofiltration chamber containing a sorptive media mix which does not contain any organic material and a layer of plant establishment media, and a discharge chamber containing an orifice control structure. Treated water flows horizontally in series through the pretreatment chamber cartridges, biofiltration chamber and orifice control structure.

01.03.00 Manufacturer
The manufacturer of the MSFWS shall be one that is regularly engaged in the engineering design and production of systems developed for the treatment of stormwater runoff for at least (10) years, and which have a history of successful production, acceptable to the engineer of work. In accordance with the drawings, the MSFWS(s) shall be a filter device Manufactured by Bio Clean A Forterra Company, or assigned distributors or licensees. Bio Clean A Forterra Company, can be reached at:

Headquarters:
Bio Clean A Forterra Company
398 Via El Centro
Oceanside, CA 92058
Phone: (760) 433-7640
Fax: (760) 433-3176
www.biocleanenvironmental.com

01.04.00 Submittals

01.04.01 Shop drawings are to be submitted with each order to the contractor and consulting engineer.

01.04.02 Shop drawings are to detail the MSFWS and all components required and the sequence for installation, including:

- System configuration with primary dimensions
- Interior components
- Any accessory equipment called out on shop drawings

01.04.03 Inspection and maintenance documentation submitted upon request.

01.05.00 Work Included

01.05.01 Specification requirements for installation of MSFWS.

01.05.02 Manufacturer to supply components of the MSFWS(s):

- Pretreatment chamber components (pre-assembled)
- Concrete Structure(s)
- Biofiltration chamber components (pre-assembled)
- Flow control discharge structure (pre-assembled)

01.06.00 Reference Standards

ASTM C 29	Standard Test Method for Unit Weight and Voids in Aggregate
ASTM C 88	C 88 Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
ASTM C131	C 131 Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregates by Abrasion and Impact in the Los Angeles Machine
ASTM C 136	C 136 Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
ASTM C 330	C 330 Standard Specification for Lightweight Aggregate for Structural Concrete
ASTM D 698	Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft.-lbf/ft3 (600 kN-m/m3)
ASTM D 1621	10 Standard Test Method for Compressive Properties Of Rigid Cellular Plastics
ASTM D 1777	ASTM D1777 - 96(2007) Standard Test Method for Thickness of Textile Materials
ASTM D 4716	Standard Test Method for Determining the (In-plane) Flow Rate per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head
ASTM A 615	Standard Specifications for Deformed and Plan Carbon-Steel Bars for Concrete Reinforcement
ASTM A 706	Standard Specifications for Deformed and Plan Low-Alloy Steel Bars for Concrete Reinforcement
AASHTO T 99-01	Standard Method of Test for Moisture-Density Relations of Soils Using a 2.5-kg (5.5-lb) Rammer and a 305-mm (12-in) Drop
AASHTO T 104	Standard Method of Test for Soundness of Aggregate by Use of Sodium Sulfate or Magnesium Sulfate
AASHTO T 260	Standard Method of Test for Sampling and Testing for Chloride Ion in Concrete and Concrete Raw Materials.
AASHTO T 288	Standard Method of Test for Determining Minimum Laboratory Soil Resistivity
AASHTO T 289	Standard Method of Test for Determining ph of Soil for Use in Corrosion Testing
AASHTO T 291	Standard Method of Test for Determining Water Soluble Chloride Ion Content in Soil
AASHTO T 290	T 290 Standard Method of Test for Determining Water Soluble Sulfate Ion Content in Soil

Bio Clean
A Forterra Company

PART 2 – COMPONENTS

The Modular Subsurface Flow Wetland Systems (MSFWS) and all of its components shall be self-contained within a concrete structure constructed of concrete with a minimum 28 day compressive strength of 5,000 psi, with reinforcing per ASTM A 615 or ASTM A 706, Grade 60, and supports and H20 loading as indicated by AASHTO. Each Chamber shall have appropriate access hatches for easy maintenance and sized to allow removal of all internal components without disassembly. All water transfer system components shall conform with the following;

- Filter netting shall be 100% Polyester with a number 16 sieve size, and strength tested per ASTM D 3787.
- Drainage cells shall be manufactured of lightweight injection-molded plastic and have a minimum compressive strength test of 6,000 psi and a void area along the surface making contact with the filter media of 75% or greater. The cells shall be at least 2" in thickness and allow water to freely flow in all four directions.

02.01.00 Pretreatment Chamber Components

02.01.01 Filter Cartridges shall operate at a loading rate not to exceed 3 gallons per minute per square foot surface area.

02.01.02 Drain Down System shall include a pervious floor that allows water to drain into the underdrain pipe that is connected to the discharge chamber.

02.02.00 Biofiltration Chamber Components

02.02.01 Media shall consist of ceramic material produced by expanding and vitrifying select material in a rotary kiln. Media must be produced to meet the requirements of ASTM C330, ASTM C331, and AASHTO M195. Aggregates must have a minimum 24-hour water absorption of 10.5% mass. Media shall not contain any organic material. Flow through media shall be horizontal from the outer perimeter of the chamber toward the centralized and vertically extending underdrain. The retention time in the media shall be at least 3 minutes. Downward flow filters are not acceptable alternatives. The thickness of the media shall be at least 19" from influent end to effluent end. The loading rate on the media shall not exceed 1.1 gallons per minute per square foot surface area. Media must be contained within structure that spaces the surface of the media at least 2" from all vertically extending walls of the concrete structure.

02.02.02 Planting shall be native, drought tolerant species recommend by manufacturer and/or landscape architect.

02.02.03 Plant Support Media shall be made of a 3" thick moisture retention cell that is inert and contains no chemicals or fertilizers, is not made of organic material and has an internal void percentage of 80%.

02.03.00 Discharge Chamber

The discharge device shall house a flow control orifice plate that restricts flows greater than designed treatment flow rate. All piping components shall be made of a high-density polyethylene. The discharge chamber shall also contain a drain down filter if specified on the drawing.

PART 3 – PERFORMANCE

03.01.00 General

03.01.01 Function - The MSFWS has no moving internal components and functions based on gravity flow, unless otherwise specified. The MSFWS is composed of a pretreatment chamber, a biofiltration chamber and a discharge chamber. The pretreatment device houses cartridge media filters, which consist of filter media housed in a perforated enclosure. The untreated runoff flows into the system via subsurface piping and or surface inlet. Water entering the system is forced through the filter cartridge enclosures by gravity flow. Then the flow contacts the filter media. The flow through the media is horizontal toward the center of each individual media filter. In the center of the media shall be a round slotted PVC pipe of no greater than 1.5" in diameter. The slotted PVC pipe shall extend downward into the water transfer cavity of the cartridge. The slotted PVC pipe shall be threaded on the bottom to connect to the water transfer cavity. After pollutants have been removed by the filter media the water discharges the pretreatment chamber and flows into the water transfer system and is conveyed to the biofiltration chamber. Once runoff has been filtered by the biofiltration chamber it is collected by the vertical underdrain and conveyed to a discharge chamber equipped with a flow control orifice plate. Finally the treated flow exits the system.

03.01.02 Pollutants - The MSFWS will remove and retain debris, sediments, TSS, dissolved and particulate metals and nutrients including nitrogen and phosphorus species, bacteria, BOD, oxygen demanding substances, organic compounds and hydrocarbons entering the filter during frequent storm events and continuous dry weather flows.

03.01.03 Treatment Flow Rate and Bypass - The MSFWS operates in-line. The MSFWS will treat 100% of the required water quality treatment flow based on a minimum filtration capacities listed in section 03.02.00. The size of the system must match those provided on the drawing to ensure proper performance and hydraulic residence time.

03.02.00 Minimum Treatment Capabilities

System must be capable of treating flows to the specified treatment flow rate on the drawings. The flow rate shall be controlled by an orifice.

PART 4 - EXECUTION

04.01.00 General

The installation of the MSFWS shall conform to all applicable national, state, state highway, municipal and local specifications.

04.02.00 Installation

The Contractor shall furnish all labor, equipment, materials and incidentals required to install the (MSFWS) device(s) and appurtenances in accordance with the drawings and these specifications.

04.02.01 Grading and Excavation site shall be properly surveyed by a registered professional surveyor, and clearly marked with excavation limits and elevations. After site is marked it is the responsibility of the contractor to contact local utility companies and/or DigAlert to check for underground utilities. All grading permits shall be approved by governing agencies before commencement of grading and excavation. Soil conditions shall be tested in accordance with the governing

agencies requirements. All earth removed shall be transported, disposed, stored, and handled per governing agencies standards. It is the responsibility of the contractor to install and maintain proper erosion control measures during grading and excavation operations.

04.02.02 Compaction – All soil shall be compacted per registered professional soils engineer's recommendations prior to installation of MSFWS components. Compaction shall be to 95% of Standard Proctor or 90% of Modified Proctor.

04.02.03 Backfill shall be placed according to a registered professional soils engineer's recommendations, and with a minimum of 6" of gravel under all concrete structures.

04.02.04 Concrete Structures – After backfill has been inspected by the governing agency and approved the concrete structures shall be lifted and placed in proper position per plans.

04.02.05 Subsurface Flow Wetland Media shall be carefully loaded into area so not to damage the Wetland Liner or Water Transfer Systems. The entire wetland area shall be filled to a level 9 inches below finished surface.

04.02.06 Planting layer shall be installed per manufacturer's drawings and consist of a minimum 3" grow enhancement media that ensures greater than 95% plant survival rate, and 6" of wetland media. Planting shall consist of native plants recommended by manufacturer and/or landscape architect. Planting shall be drip irrigated for at least the first 3 months to insure long term plant growth. No chemical herbicides, pesticides, or fertilizers shall be used in the planting or care and maintenance of the planted area.

04.03.00 Shipping, Storage and Handling

04.03.01 Shipping – MSFWS shall be shipped to the contractor's address or job site, and is the responsibility of the contractor to offload the unit(s) and place in the exact site of installation.

04.03.02 Storage and Handling– The contractor shall exercise care in the storage and handling of the MSFWS and all components prior to and during installation. Any repair or replacement costs associated with events occurring after delivery is accepted and unloading has commenced shall be born by the contractor. The MSFWS(s) and all components shall always be stored indoors and transported inside the original shipping container until the unit(s) are ready to be installed. The MSFWS shall always be handled with care and lifted according to OSHA and NIOSA lifting recommendations and/or contractor's workplace safety professional recommendations.

04.04.00 Maintenance and Inspection

04.04.01 Inspection – After installation, the contractor shall demonstrate that the MSFWS has been properly installed at the correct location(s), elevations, and with appropriate components. All components associated with the MSFWS and its installation shall be subject to inspection by the engineer at the place of installation. In addition, the contractor shall demonstrate that the MSFWS has been installed per the manufacturer's specifications and recommendations. All components shall be inspected by a qualified person once a year and results of inspection shall be kept in an inspection log.

04.04.02 Maintenance – The manufacturer recommends cleaning and debris removal maintenance of once a year and replacement of the Cartridge Filters as needed. The maintenance shall be performed by someone qualified. A Maintenance Manual is available upon request from the manufacturer. The manual has detailed information regarding the maintenance of the MSFWS. A

Maintenance/Inspection record shall be kept by the maintenance operator. The record shall include any maintenance activities preformed, amount and description of debris collected, and the condition of the filter.

04.04.03 Material Disposal - All debris, trash, organics, and sediments captured by the MSFWS shall be transported and disposed of at an approved facility for disposal in accordance with local and state requirements. Please refer to state and local regulations for the proper disposal of toxic and non-toxic material.

PART 5 – QUALITY ASSURANCE

05.01.00 Warranty

The Manufacturer shall guarantee the MSFWS against all manufacturing defects in materials and workmanship for a period of (1) year from the date of delivery to the customer. The manufacturer shall be notified of repair or replacement issues in writing within the warranty period. The MSFWS is limited to recommended application for which it was designed.

05.02.00 Performance Certification

The MSFWS manufacturer shall submit to the Engineer of Record a "Manufacturer's Performance Certificate" certifying the MSFWS is capable of achieving the specified removal efficiency for suspended solids, phosphorous and dissolved metals.

[End of This Section]

Washington Specifications

Section [_____]
Modular Subsurface Flow Wetland System

PART 1 – GENERAL

01.01.00 Purpose
The purpose of this specification is to establish generally acceptable criteria for Modular Subsurface Flow Wetland Systems used for biofiltration of stormwater runoff including dry weather flows and other contaminated water sources. It is intended to serve as a guide to producers, distributors, architects, engineers, contractors, plumbers, installers, inspectors, agencies and users; to promote understanding regarding materials, manufacture and installation; and to provide for identification of devices complying with this specification.

01.02.00 Description
Modular Subsurface Flow Wetland Systems (MSFWS) are used for filtration of stormwater runoff including dry weather flows. The MSFWS is a pre-engineered biofiltration system composed of a pretreatment chamber containing filtration cartridges, a horizontal flow biofiltration chamber with a peripheral void area and a centralized and vertically extending underdrain, the biofiltration chamber containing a sorptive media mix which does not contain any organic material and a layer of plant establishment media, and a discharge chamber containing an orifice control structure. Treated water flows horizontally in series through the pretreatment chamber cartridges, biofiltration chamber and orifice control structure.

01.03.00 Manufacturer
The manufacturer of the MSFWS shall be one that is regularly engaged in the engineering design and production of systems developed for the treatment of stormwater runoff for at least (10) years, and which have a history of successful production, acceptable to the engineer of work. In accordance with the drawings, the MSFWS(s) shall be a filter device Manufactured by Bio Clean Environmental Services, Inc., or Modular Wetland Systems, Inc., or assigned distributors or licensees. Bio Clean Environmental Services Inc., and Modular Wetland Systems, Inc., can be reached at:

Corporate Headquarters:
Bio Clean a Forterra Company
398 Via El Centro
Oceanside, CA 92058
Phone: (760) 433-7640
Fax: (760) 433-3176
www.BioCleanEnvironmental.com

01.04.00 Submittals

01.04.01 Shop drawings are to be submitted with each order to the contractor and consulting engineer.

01.04.02 Shop drawings are to detail the MSFWS and all components required and the sequence for installation, including:

- System configuration with primary dimensions
- Interior components
- Any accessory equipment called out on shop drawings

01.04.03 Inspection and maintenance documentation submitted upon request.

01.05.00 Work Included

01.05.01 Specification requirements for installation of MSFWS.

01.05.02 Manufacturer to supply components of the MSFWS(s):

- Pretreatment chamber components (pre-assembled)
- Concrete Structure(s)
- Biofiltration chamber components (pre-assembled)
- Flow control discharge structure (pre-assembled)

01.06.00 Reference Standards

ASTM C 29	Standard Test Method for Unit Weight and Voids in Aggregate
ASTM C 88	C 88 Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
ASTM C131	C 131 Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregates by Abrasion and Impact in the Los Angeles Machine
ASTM C 136	C 136 Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
ASTM C 330	C 330 Standard Specification for Lightweight Aggregate for Structural Concrete
ASTM D 698	Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft.-lbf/ft3 (600 kN-m/m3)
ASTM D 1621	10 Standard Test Method for Compressive Properties Of Rigid Cellular Plastics
ASTM D 1777	ASTM D1777 - 96(2007) Standard Test Method for Thickness of Textile Materials
ASTM D 4716	Standard Test Method for Determining the (In-plane) Flow Rate per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head
ASTM A 615	Standard Specifications for Deformed and Plan Carbon-Steel Bars for Concrete Reinforcement
ASTM A 706	Standard Specifications for Deformed and Plan Low-Alloy Steel Bars for Concrete Reinforcement
AASHTO T 99-01	Standard Method of Test for Moisture-Density Relations of Soils Using a 2.5-kg (5.5-lb) Rammer and a 305-mm (12-in) Drop
AASHTO T 104	Standard Method of Test for Soundness of Aggregate by Use of Sodium Sulfate or Magnesium Sulfate
AASHTO T 260	Standard Method of Test for Sampling and Testing for Chloride Ion in Concrete and Concrete Raw Materials.
AASHTO T 288	Standard Method of Test for Determining Minimum Laboratory Soil Resistivity
AASHTO T 289	Standard Method of Test for Determining ph of Soil for Use in Corrosion Testing
AASHTO T 291	Standard Method of Test for Determining Water Soluble Chloride Ion Content in Soil
AASHTO T 290	T 290 Standard Method of Test for Determining Water Soluble Sulfate Ion Content in Soil

PART 2 – COMPONENTS

The Modular Subsurface Flow Wetland Systems (MSFWS) and all of its components shall be self-contained within a concrete structure constructed of concrete with a minimum 28 day compressive strength of 5,000 psi, with reinforcing per ASTM A 615 or ASTM A 706, Grade 60, and supports and H20 loading as indicated by AASHTO. Each Chamber shall have appropriate access hatches for easy maintenance and sized to allow removal of all internal components without disassembly. All water transfer system components shall conform with the following;

- Filter netting shall be 100% Polyester with a number 16 sieve size, and strength tested per ASTM D 3787.
- Drainage cells shall be manufactured of lightweight injection-molded plastic and have a minimum compressive strength test of 6,000 psi and a void area along the surface making contact with the filter media of 75% or greater. The cells shall be at least 2" in thickness and allow water to freely flow in all four directions.

02.01.00 Pretreatment Chamber Components

02.01.01 Filter Cartridges shall operate at a loading rate not to exceed 3 gallons per minute per square foot surface area.

02.02.00 Biofiltration Chamber Components

02.02.01 Media shall consist of ceramic material produced by expanding and vitrifying select material in a rotary kiln. Media must be produced to meet the requirements of ASTM C330, ASTM C331, and AASHTO M195. Aggregates must have a minimum 24-hour water absorption of 10.5% mass. Media shall not contain any organic material. Flow through media shall be horizontal from the outer perimeter of the chamber toward the centralized and vertically extending underdrain. The retention time in the media shall be at least 3 minutes. Downward flow filters are not acceptable alternatives. The thickness of the media shall be at least 19" from influent end to effluent end. The loading rate on the media shall not exceed 1.1 gallons per minute per square foot surface area. Media must be contained within structure that spaces the surface of the media at least 2" from all vertically extending walls of the concrete structure.

02.02.02 Planting shall be native, drought tolerant species recommend by manufacturer and/or landscape architect.

02.02.03 Plant Support Media shall be made of a 3" thick moisture retention cell that is inert and contains no chemicals or fertilizers, is not made of organic material and has an internal void percentage of 80%.

02.03.00 Discharge Chamber

The discharge device shall house a flow control orifice plate that restricts flows greater than designed treatment flow rate. All piping components shall be made of a high-density polyethylene.

PART 3 – PERFORMANCE

03.01.00 General

03.01.01 Function - The MSFWS has no moving internal components and functions based on gravity flow, unless otherwise specified. The MSFWS is composed of a pretreatment chamber, a biofiltration chamber and a discharge chamber. The pretreatment device houses cartridge media filters, which consist of filter media housed in a perforated enclosure. The untreated runoff flows into the system via subsurface piping and or surface inlet. Water entering the system is forced through the filter cartridge enclosures by gravity flow. Then the flow contacts the filter media. The flow through the media is horizontal toward the center of each individual media filter. In the center of the media shall be a round slotted PVC pipe of no greater than 1.5" in diameter. The slotted PVC pipe shall extend downward into the water transfer cavity of the cartridge. The slotted PVC pipe shall be threaded on the bottom to connect to the water transfer cavity. After pollutants have been removed by the filter media the water discharges the pretreatment chamber and flows into the water transfer system and is conveyed to the biofiltration chamber. Once runoff has been filtered by the biofiltration chamber it is collected by the vertical underdrain and conveyed to a discharge chamber equipped with a flow control orifice plate. Finally the treated flow exits the system.

03.01.02 Pollutants - The MSFWS will remove and retain debris, sediments, TSS, dissolved and particulate metals and nutrients including nitrogen and phosphorus species, bacteria, BOD, oxygen demanding substances, organic compounds and hydrocarbons entering the filter during frequent storm events and continuous dry weather flows.

03.01.03 Treatment Flow Rate and Bypass - The MSFWS operates in-line. The MSFWS will treat 100% of the required water quality treatment flow based on a minimum filtration capacities listed in section 03.02.00. The size of the system must match those provided on the drawing to ensure proper performance and hydraulic residence time.

03.01.04 Minimum Treatment Capabilities - System must be capable of treating flows to the specified treatment flow rate on the drawings. The flow rate shall be controlled by an orifice plate.

PART 4 - EXECUTION

04.01.00 General

The installation of the MSFWS shall conform to all applicable national, state, state highway, municipal and local specifications.

04.02.00 Installation

The Contractor shall furnish all labor, equipment, materials and incidentals required to install the (MSFWS) device(s) and appurtenances in accordance with the drawings and these specifications.

04.02.01 Grading and Excavation site shall be properly surveyed by a registered professional surveyor, and clearly marked with excavation limits and elevations. After site is marked it is the responsibility of the contractor to contact local utility companies and/or DigAlert to check for underground utilities. All grading permits shall be approved by governing agencies before commencement of grading and

excavation. Soil conditions shall be tested in accordance with the governing agencies requirements. All earth removed shall be transported, disposed, stored, and handled per governing agencies standards. It is the responsibility of the contractor to install and maintain proper erosion control measures during grading and excavation operations.

04.02.02 Compaction – All soil shall be compacted per registered professional soils engineer's recommendations prior to installation of MSFWS components. Compaction shall be to 95% of Standard Proctor or 90% of Modified Proctor.

04.02.03 Backfill shall be placed according to a registered professional soils engineer's recommendations, and with a minimum of 6" of gravel under all concrete structures.

04.02.04 Concrete Structures – After backfill has been inspected by the governing agency and approved the concrete structures shall be lifted and placed in proper position per plans.

04.02.05 Subsurface Flow Wetland Media shall be carefully loaded into area so not to damage the Wetland Liner or Water Transfer Systems. The entire wetland area shall be filled to a level 9 inches below finished surface.

04.02.06 Planting layer shall be installed per manufacturer's drawings and consist of a minimum 3" grow enhancement media that ensures greater than 95% plant survival rate, and 6" of wetland media. Planting shall consist of native plants recommended by manufacturer and/or landscape architect. Planting shall be drip irrigated for at least the first 3 months to insure long term plant growth. No chemical herbicides, pesticides, or fertilizers shall be used in the planting or care and maintenance of the planted area.

04.03.00 Shipping, Storage and Handling

04.03.01 Shipping – MSFWS shall be shipped to the contractor's address or job site, and is the responsibility of the contractor to offload the unit(s) and place in the exact site of installation.

04.03.02 Storage and Handling– The contractor shall exercise care in the storage and handling of the MSFWS and all components prior to and during installation. Any repair or replacement costs associated with events occurring after delivery is accepted and unloading has commenced shall be born by the contractor. The MSFWS(s) and all components shall always be stored indoors and transported inside the original shipping container until the unit(s) are ready to be installed. The MSFWS shall always be handled with care and lifted according to OSHA and NIOSA lifting recommendations and/or contractor's workplace safety professional recommendations.

04.04.00 Maintenance and Inspection

04.04.01 Inspection – After installation, the contractor shall demonstrate that the MSFWS has been properly installed at the correct location(s), elevations, and with appropriate components. All components associated with the MSFWS and its installation shall be subject to inspection by the engineer at the place of installation. In addition, the contractor shall demonstrate that the MSFWS has been installed per the manufacturer's specifications and recommendations. All components shall be inspected by a qualified person once a year and results of inspection shall be kept in an inspection log.

04.04.02 Maintenance – The manufacturer recommends cleaning and debris removal maintenance of once a year and replacement of the Cartridge Filters as needed. The maintenance shall be performed by someone qualified. A Maintenance

Manual is available upon request from the manufacturer. The manual has detailed information regarding the maintenance of the MSFWS. A Maintenance/Inspection record shall be kept by the maintenance operator. The record shall include any maintenance activities preformed, amount and description of debris collected, and the condition of the filter.

04.04.03 Material Disposal - All debris, trash, organics, and sediments captured by the MSFWS shall be transported and disposed of at an approved facility for disposal in accordance with local and state requirements. Please refer to state and local regulations for the proper disposal of toxic and non-toxic material.

PART 5 – QUALITY ASSURANCE

05.01.00 Warranty

The Manufacturer shall guarantee the MSFWS against all manufacturing defects in materials and workmanship for a period of (1) year from the date of delivery to the customer. The manufacturer shall be notified of repair or replacement issues in writing within the warranty period. The MSFWS is limited to recommended application for which it was designed.

05.02.00 Performance Certification

The MSFWS manufacturer shall submit to the Engineer of Record a "Manufacturer's Performance Certificate" certifying the MSFWS is capable of achieving the specified removal efficiency for suspended solids, phosphorous and dissolved metals.

[End of This Section]

Appendix 7:
Hydromodification & Critical Coarse Sediment

Supporting Detail for Hydromodification compliance & Exhibit G - CCSY & PSS Areas with the project location.

The preparer shall include the following in this Appendix (Refer to Section 2.4 and 3.6 of the SMR WQMP and Sections E of this Template):

- Hydromodification Exemption Exhibit (if the project is in an area exempt from Hydromod)
- Potential Critical Coarse Sediment Yield Area Mapping (to show if the site is out of a CCSYA)
- Hydromodification BMP sizing calculations (i.e. County Hydromod Spreadsheet – Hydromod, and BMP Design tabs, SMRHM report files, or other acceptable Hydromod calculations)
- Site-Specific Critical Coarse Sediment Analysis (if a project impacts a CCSYA)
- Design details/drawings from manufacturers for proprietary BMPs (if proprietary BMPs are proposed)

In addition, the project shall comply with drainage law and good practices:

- Protect the Site and Roads from Q100yr, without impacting adjacent property owners.
- Pad elevations must be above the Q100yr water surface at all locations.

I. Identify Offsite Hydrology

A. If the project intends to allow the flows to pass through the project uninterrupted, the flows must remain along its natural flow-path and natural condition. The project must also:
   (1) Ensure that the existing stream is stable. If not, the design must include stabilization.
   (2) Does the 100 year flow path affect proposed project elements, such as streets and fill slopes? If so, the project must properly design for impingements, provide revetment, etc. If the water surface changes due to impingements on neighbor's properties, Permission to pond letters must be provided.

B. If the project intends to collect and convey the offsite flows, see the next section:

II. Hydraulics

A. Project must provide collection inlets that can be accessed for maintenance. If located outside of the project boundary, the project must provide a Permission Letter or drainage easement. If the inlet creates new ponding on private property, the project must provide a Permission to Pond letter or easement.

B. The project should not divert watershed areas over 1 acre. If so, Permission Letter to accept project's diversion and drainage concept must be received by the project.

C. The project should have an adequate outlet. If not, include Permission Letters and implement Increased Runoff criteria (2, 5,10 year storm events and the 1, 3, 6 and 24 hour durations). 100 year storm routing is not to be used. Runoff from the offsite plus onsite must be returned to its natural (existing) condition of velocity, peak flow-rate, flow-width and location/right of way, if permission letters have not been obtained.

D. The project must adequately convey the 100 year storm between the combination of street flow and pipe flow per County Ordinance.

E. The project should use the downstream connection as the Q100yr water surface control elevation, to ensure 6 inches minimum of freeboard in proposed drainage system.

III. Basin Layout

A. Implement Basin Guidelines as best as possible from Appendix C, Design Handbook for LID BMPs.

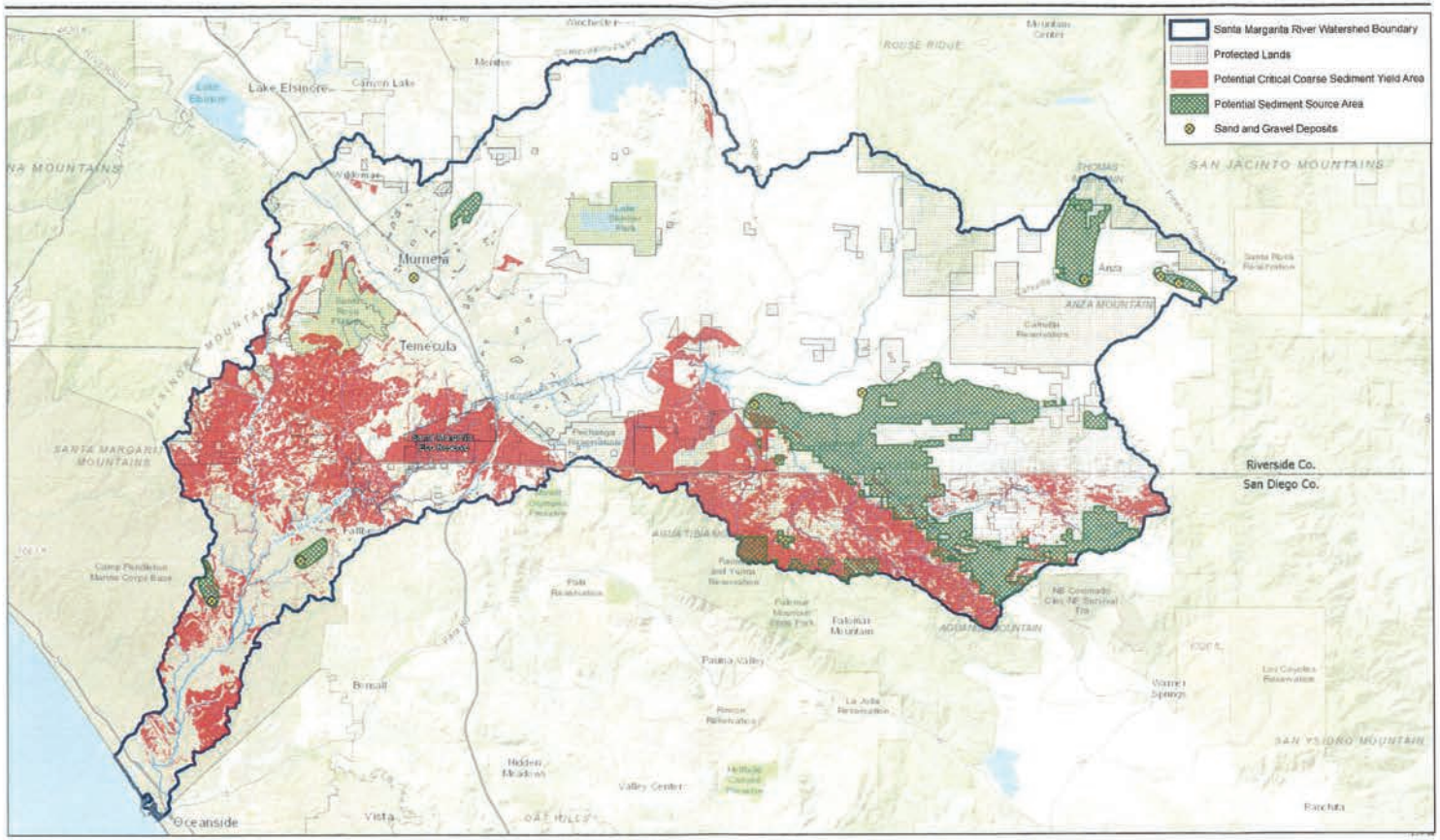


Exhibit G-1

SANTA MARGARITA RIVER WATERSHED
POTENTIAL CRITICAL COARSE SEDIMENT YIELD AREAS AND POTENTIAL SEDIMENT SOURCE AREAS

TEMECULA VALLEY MIN STORAGE
CUP 190012
SWC KELLER ROAD AND WINCHESTER ROAD
APN: 476-010-060
WINCHESTER, CALIFORNIA

PRELIMINARY HYDROLOGY ANALYSIS

PREPARED BY:
THE PRIZM GROUP
310 North Cota Street, Suite I
Corona, CA 92880

SIGNATURE: Vincent Koppe

DATE: 4-7-22



JOB NO. 19-004

TABLE OF CONTENTS

PROJECT DESCRIPTION	1
PURPOSE	1
SITE HYDROLOGY	1
DRAINAGE MAPS	APPENDIX A
SOIL GROUP MAP	APPENDIX B
RAINFALL DATA	APPENDIX C
UNDEVELOPED CONDITION RATIONAL EVENTS	APPENDIX D
DEVELOPED CONDITION RATIONAL EVENTS	APPENDIX E
UNIT HYDROGRAPH ANALYSIS UNDEVELOPED CONDITION	APPENDIX F
UNIT HYDROGRAPH ANALYSIS DEVELOPED CONDITION	APPENDIX G
BASIN AND OUTLET PIPE CALCULATIONS	APPENDIX H
PRELIMINARY PERC TEST RESULTS	APPENDIX I
PRELIMINARY GRADING PLAN	APPENDIX J

PROJECT DESCRIPTION

The site for proposed gas station site is located near the southwest corner of the intersection of Foothill Blvd. and Alder Avenue in Fontana. The site is approximately 4.6 acres and drains from northeast to southwest in a sheet flow fashion. This area flows to a unlined channel which in turn creates a hydraulic condition of concern (HCOC) for the project.

The proposed project includes constructing a mini storage facility with indoor storage as well as outdoor boat and RV storage. The site is currently a pasture dry land setting with annual native grass. On site house keeping and best management practices (BMP'S) will be incorporated in the site design and operation to conform to NPDES requirements.

PURPOSE

The purpose of this preliminary study is to analyze the 24 hour storm duration for the 2 and 10 year storm events of the developed site storm runoff flows to determine if HCOC mitigation is required, and also detention basin storage requirements to mitigate the increased runoff for various storm events. Table 2 shows the results of the 2 year 24 hour storm event unit hydrograph analysis. The site runoff increased from 0.10 cfs to 0.76 cfs after development. Since the increase is greater than 10% the HCOC will require mitigation. See appendix F & G for hydrograph analysis results.

SITE HYDROLOGY

Post development storm flows are conveyed across the site via a system of concrete swales, catch basins, and drain pipes to a water quality treatment structure. An internal bypass diverts runoff to the underground detention basin after exceeding the WQMP flow rate. Treated flows are also piped to the underground detention structure.

For the preliminary design the detention volume required will be calculated as the difference between the developed and undeveloped storm volumes for the 10 year 24 hour event. As seen in table 3 the difference in volume is 0.6105 acre feet (26,594 cubic feet). See appendix F & G for hydrograph analysis results. Utilizing a 48 inch diameter pipe structure for storage, a preliminary estimate of 2,116 feet of pipe will be required to accommodate the required volume. For this site the soil percolation test conducted by Earth Strata Geotechnical Services, Inc., indicated that infiltration was poor and not recommended to be incorporated in the site design. For this reason the underground detention structure will not incorporate perforations. All flows will exit the detention structure through a controlled outlet orifice and weir to meter the flow for WQMP and to mitigate the increased runoff as necessary. Runoff is then piped to a headwall outleting at the south end of the site.

TABLE 1 - SITE RUNOFF RESULTS RATIONAL METHOD

1 HOUR STORM EVENT	UNDEVELOPED CONDITION	DEVELOPED CONDITION	AREAS BYPASSING BASIN	
			AREA A	AREA D
	Q (CFS)	Q (CFS)	Q (CFS)	Q (CFS)
2 YEAR	2.38	3.87	.43	.09
5 YEAR	3.45	5.10	.61	.13
10 YEAR	5.28	6.14	.85	.19
100 YEAR	9.05	9.27	1.33	.31

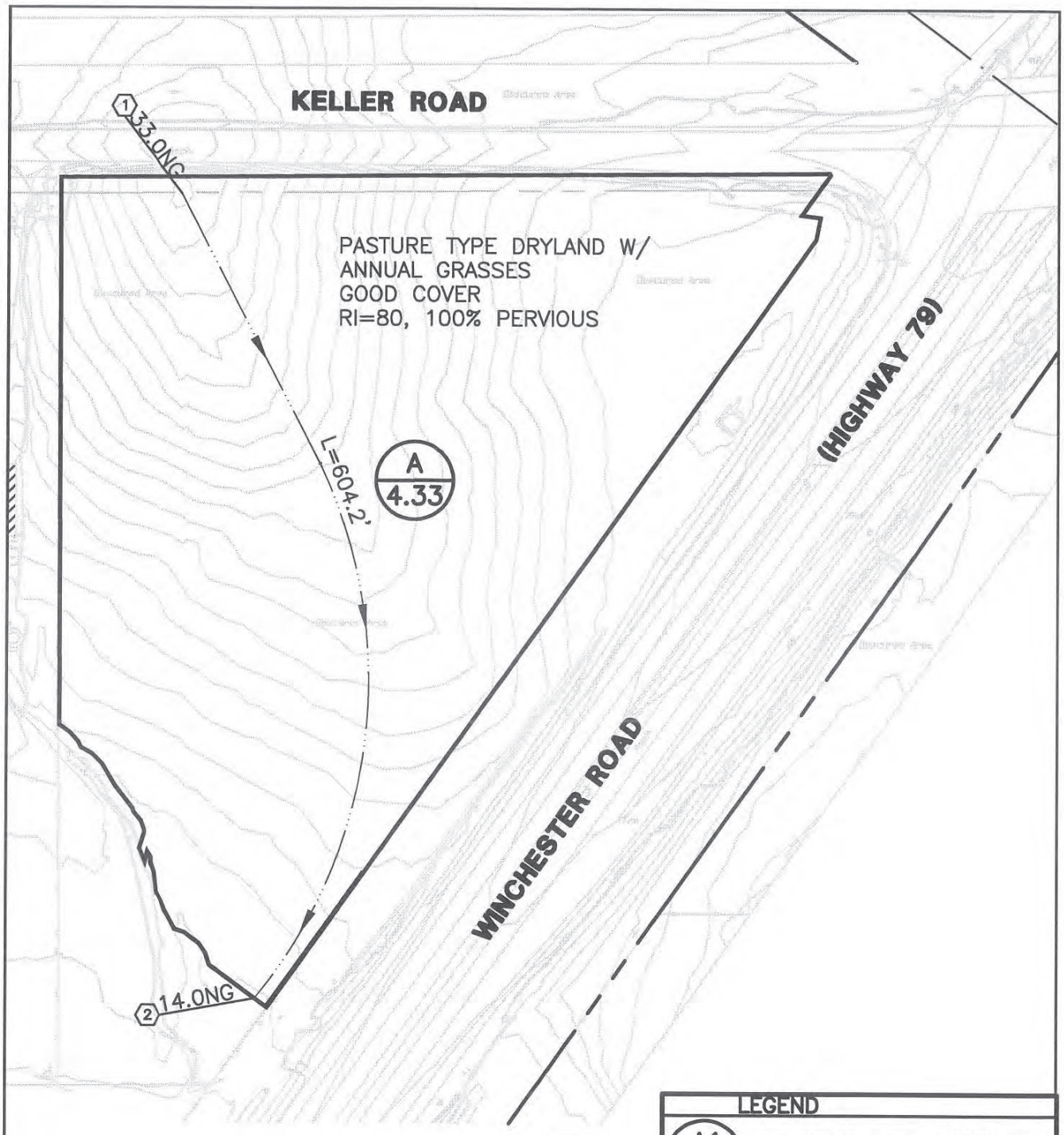
TABLE 2 - HYDROGRAPH METHOD RESULTS 2 YEAR EVENT

STORM EVENT	DURATION (HRS)	UNDEVELOPED 4.33 ACRES Qp (CFS)	DEVELOPED 4.33 ACRES Qp (CFS)
2 YEAR	24	0.10	0.76

TABLE 3 - HYDROGRAPH METHOD RESULTS 10 YEAR EVENT

STORM EVENT	DURATION (HRS)	UNDEVELOPED 4.33 ACRES Qp (CFS)	VOLUME (ACRE FEET)	DEVELOPED 4.33 ACRES Qp (CFS)	VOLUME (ACRE FEET)	DIFFERENCE (ACRE FEET)
10 YEAR	24	0.65	0.1536	1.32	0.7641	0.6105

APPENDIX A



100 0 100 200

Scale 1" = 100'

LEGEND

- A1 / XX — AREA DESIGNATION / AREA (AC.) — INDICATES DIRECTION OF FLOW
- (2) NODE NUMBER
- FLOW PATH
- DRAINAGE AREA BOUNDARY — SOIL TYPE "D"

DRAWN BY: VGK

DATE: 1-6-22

JOB. NO.: 19-004

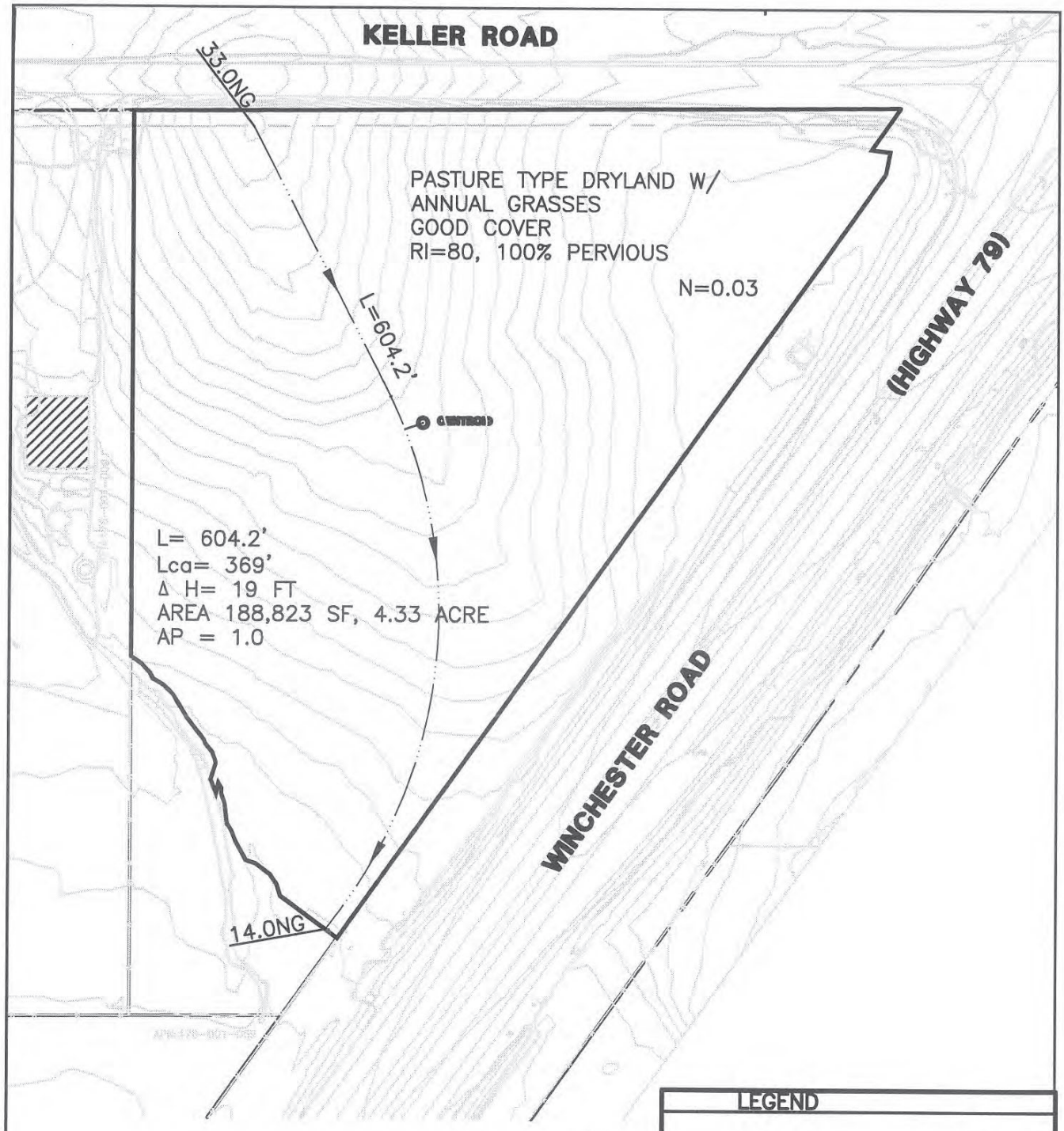
FILE: P:\TPG\19\19-004\HYDROLOGY\19-004 UNDEV RAT HYDROLOGY.DWG

THE PRIZM GROUP
CIVIL ENGINEERS AND LAND SURVEYORS
• CYRAX 3-D LASER SCANNING
• GPS & ROBOTIC SURVEYING
• GEOMATIC ENGINEERING
• CIVIL ENGINEERING
• LAND PLANNING
310 N. COTA ST. SUITE I, CORONA, CA 92878
PHONE: (951) 737-4406
www.the-prizm-group.com

PROJECT:

TEMECULA VALLEY SELF STORAGE
UNDEVELOPED CONDITION
RATIONAL HYDROLOGY EXHIBIT

SHT. NO. 1 OF 1



LEGEND

INDICATES DIRECTION OF FLOW — SOIL TYPE "D"

FLOW PATH

DRAINAGE AREA BOUNDARY

DRAWN BY: VGK

DATE: 1-6-22

JOB. NO.: 19-004

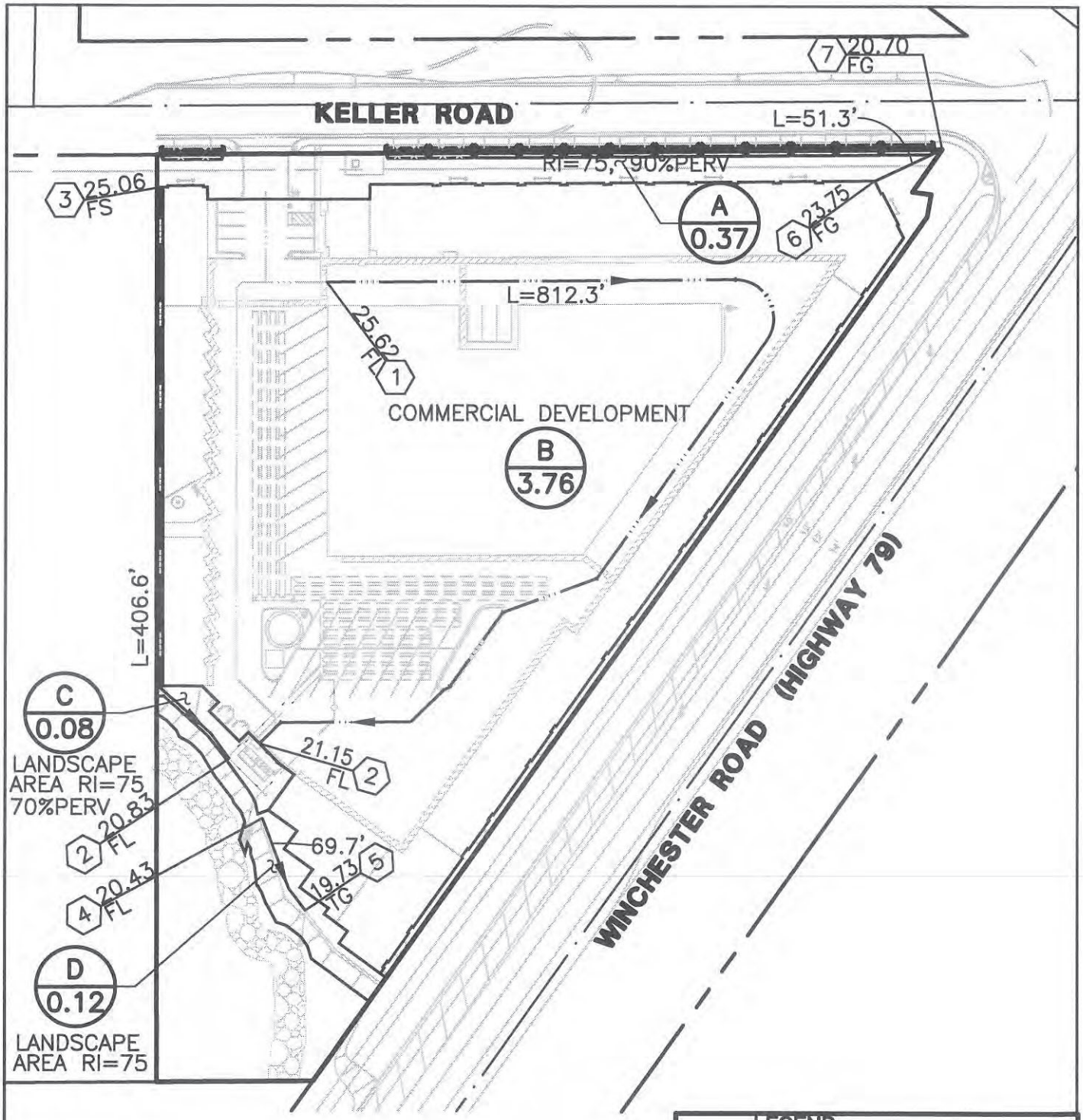
FILE: P:\TPG\19\19-004\HYDROLOGY\19-004 UNDEV HYDRO HYDROLOGY.DWG

CIVIL ENGINEERS AND LAND SURVEYORS
THE PRIZM GROUP
• CYRAX 3-D LASER SCANNING
• GPS & ROBOTIC SURVEYING
• GEOMATIC ENGINEERING
• CIVIL ENGINEERING
• LAND PLANNING
310 N. COTA ST. SUITE I, CORONA, CA 92878
PHONE: (951) 737-4406
www.the-prizm-group.com

PROJECT:

TEMECULA VALLEY SELF STORAGE
UNDEVELOPED CONDITION
HYDROGRAPH METHODHYDROLOGY
EXHIBIT

SHT. NO. 1 OF 1



100 0 100 200

Scale 1" = 100'

N

LEGEND

- A1 / 0.00 — AREA DESIGNATION / AREA (AC.) — INDICATES DIRECTION OF FLOW
- (2) — NODE NUMBER
- FLOW PATH
- DRAINAGE AREA BOUNDARY — SOIL TYPE "D"

DRAWN BY: VGK

DATE: 4-7-22

JOB. NO.: 19-004

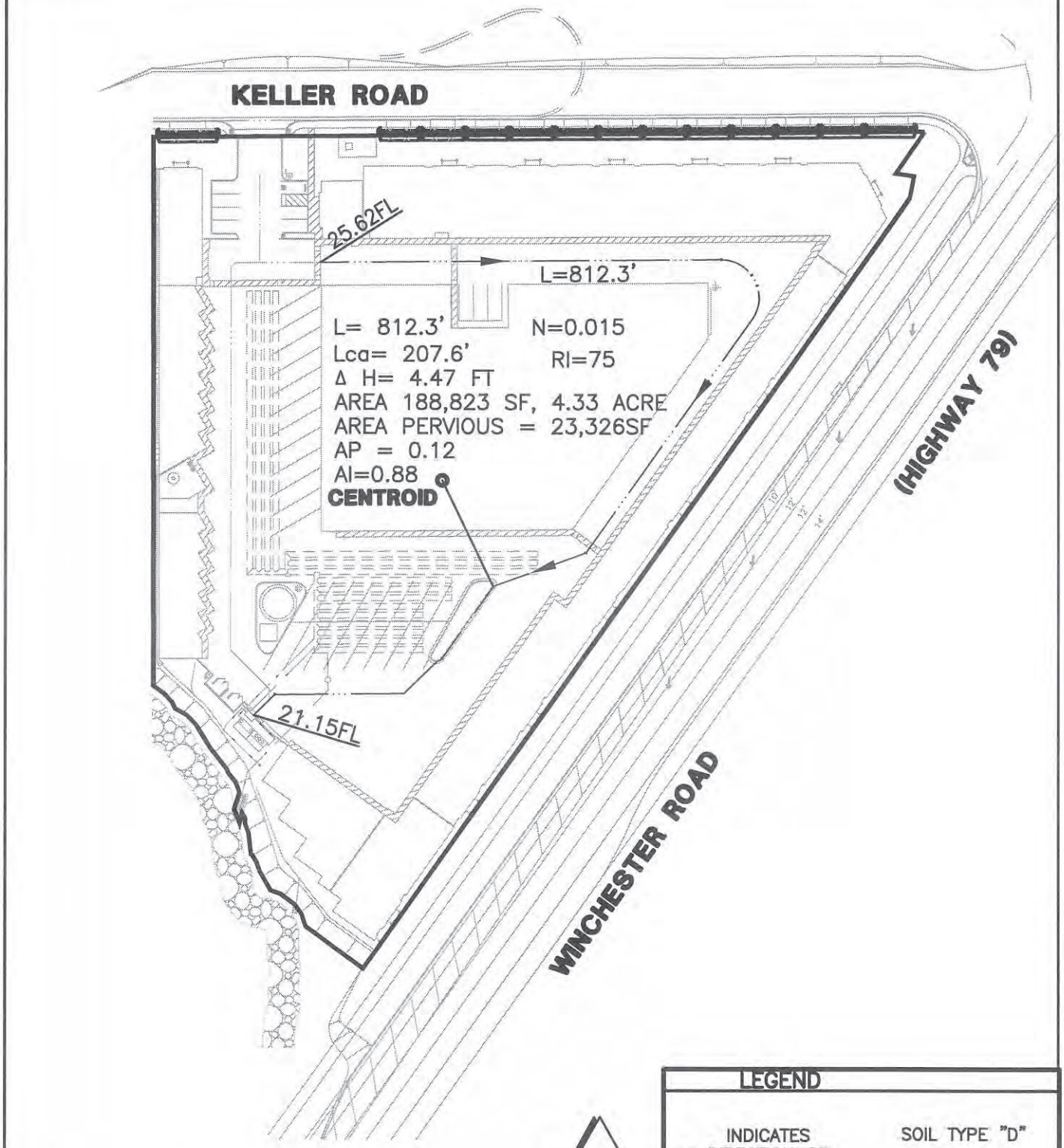
FILE: P:\TPG\19\19-004\HYDROLOGY\19-004 DEVELOPED RAT HYDROLOGY.DWG

CIVIL ENGINEERS AND LAND SURVEYORS
THE PRIZM GROUP
• CYRAX 3-D LASER SCANNING
• GPS & ROBOTIC SURVEYING
• GEOMATIC ENGINEERING
• CIVIL ENGINEERING
• LAND PLANNING
310 N. COTA ST. SUITE I, CORONA, CA 92878
PHONE: (951) 737-4406
www.the-prizm-group.com

PROJECT:

TEMECULA VALLEY SELF STORAGE
DEVELOPED CONDITION
RATIONAL DRAINAGE MAP

SHT. NO. 1 OF 1



DRAWN BY: VGK

DATE: 4-7-22

JOB. NO.: 19-004

FILE: P:\TPG\19\19-004\HYDROLOGY\19-004 DEVELOPED HYDRO HYDROLOGY.DWG

CIVIL ENGINEERS AND LAND SURVEYORS
THE PRIZM GROUP
• CYRAX 3-D LASER SCANNING
• GPS & ROBOTIC SURVEYING
• GEOMATIC ENGINEERING
• CIVIL ENGINEERING
• LAND PLANNING
310 N. COTA ST. SUITE I, CORONA, CA 92878
PHONE: (951) 737-4406
www.the-prizm-group.com

PROJECT:

TEMECULA VALLEY SELF STORAGE
DEVELOPED HYDROGRAPH
HYDROLOGY EXHIBIT

SHT. NO.

1

OF 1

RUNOFF INDEX NUMBERS OF HYDROLOGIC SOIL-COVER COMPLEXES FOR PERVIOUS AREAS-AMC II

Cover Type (3)	Quality of Cover (2)	Soil Group A	B	C	D
NATURAL COVERS -					
Barren (Rockland, eroded and graded land)		78	86	91	93
Chaparrel, Broadleaf (Manzonita, ceanothus and scrub oak)	Poor	53	70	80	85
	Fair	40	63	75	81
	Good	31	57	71	78
Chaparrel, Narrowleaf (Chamise and redshank)	Poor	71	82	88	91
	Fair	55	72	81	86
Grass, Annual or Perennial	Poor	67	78	86	89
	Fair	50	69	79	84
	Good	38	61	74	80
Meadows or Cienegas (Areas with seasonally high water table, principal vegetation is sod forming grass)	Poor	63	77	85	88
	Fair	51	70	80	84
	Good	30	58	72	78
Open Brush (Soft wood shrubs - buckwheat, sage, etc.)	Poor	62	76	84	88
	Fair	46	66	77	83
	Good	41	63	75	81
Woodland (Coniferous or broadleaf trees predominate. Canopy density is at least 50 percent)	Poor	45	66	77	83
	Fair	36	60	73	79
	Good	28	55	70	77
Woodland, Grass (Coniferous or broadleaf trees with canopy density from 20 to 50 percent)	Poor	57	73	82	86
	Fair	44	65	77	82
	Good	33	58	72	79
URBAN COVERS -					
Residential or Commercial Landscaping (Lawn, shrubs, etc.)	Good	32	56	69	75
Turf (Irrigated and mowed grass)	Poor	58	74	83	87
	Fair	44	65	77	82
	Good	33	58	72	79
AGRICULTURAL COVERS -					
Fallow (Land plowed but not tilled or seeded)		76	85	90	92

RCFC & WCD
HYDROLOGY MANUAL

RUNOFF INDEX NUMBERS FOR PERVIOUS AREA

PLATE D-5.5 (1 of 2)

RUNOFF INDEX NUMBERS OF HYDROLOGIC SOIL-COVER COMPLEXES FOR PERVIOUS AREAS-AMC II

Cover Type (3)	Quality of Cover (2)	Soil Group A	B	C	D
AGRICULTURAL COVERS (cont.) -					
Legumes, Close Seeded (Alfalfa, sweetclover, timothy, etc.)	Poor	66	77	85	89
	Good	58	72	81	85
Orchards, Deciduous (Apples, apricots, pears, walnuts, etc.)		See Note 4			
Orchards, Evergreen (Citrus, avocados, etc.)	Poor	57	73	82	86
	Fair	44	65	77	82
	Good	33	58	72	79
Pasture, Dryland (Annual grasses)	Poor	67	78	86	89
	Fair	50	69	79	84
	Good	38	61	74	80
Pasture, Irrigated (Legumes and perennial grass)	Poor	58	74	83	87
	Fair	44	65	77	82
	Good	33	58	72	79
Row Crops (Field crops - tomatoes, sugar beets, etc.)	Poor	72	81	88	91
	Good	67	78	85	89
Small Grain (Wheat, oats, barley, etc.)	Poor	65	76	84	88
	Good	63	75	83	87
Vineyard		See Note 4			

Notes:

1. All runoff index (RI) numbers are for Antecedent Moisture Condition (AMC) II.

2. Quality of cover definitions:
   Poor-Heavily grazed or regularly burned areas. Less than 50 percent of the ground surface is protected by plant cover or brush and tree canopy.
   Fair-Moderate cover with 50 percent to 75 percent of the ground surface protected.
   Good-Heavy or dense cover with more than 75 percent of the ground surface protected.

3. See Plate C-2 for a detailed description of cover types.

4. Use runoff index numbers based on ground cover type. See discussion under "Cover Type Descriptions" on Plate C-2.

5. Reference Bibliography item 17.

RCFC & WCD
HYDROLOGY MANUAL

RUNOFF INDEX NUMBERS FOR PERVIOUS AREA

PLATE D-5.5 (2 of 2)

ACTUAL IMPERVIOUS COVER

Land Use (1)	Range-Percent	Recommended Value For Average Conditions-Percent(2)
Natural or Agriculture	0 - 10	0
Single Family Residential: (3)		
40,000 S. F. (1 Acre) Lots	10 - 25	20
20,000 S. F. (½ Acre) Lots	30 - 45	40
7,200 - 10,000 S. F. Lots	45 - 55	50
Multiple Family Residential:		
Condominiums	45 - 70	65
Apartments	65 - 90	80
Mobile Home Park	60 - 85	75
Commercial, Downtown Business or Industrial	80 -100	90

Notes:

1. Land use should be based on ultimate development of the watershed. Long range master plans for the County and incorporated cities should be reviewed to insure reasonable land use assumptions.

2. Recommended values are based on average conditions which may not apply to a particular study area. The percentage impervious may vary greatly even on comparable sized lots due to differences in dwelling size, improvements, etc. Landscape practices should also be considered as it is common in some areas to use ornamental gravels underlain by impervious plastic materials in place of lawns and shrubs. A field investigation of a study area should always be made, and a review of aerial photos, where available may assist in estimating the percentage of impervious cover in developed areas.

3. For typical horse ranch subdivisions increase impervious area 5 percent over the values recommended in the table above.

RCFC & WCD
HYDROLOGY MANUAL

IMPERVIOUS COVER FOR DEVELOPED AREAS

PLATE D-5.6

RUNOFF COEFFICIENT CURVE DATA

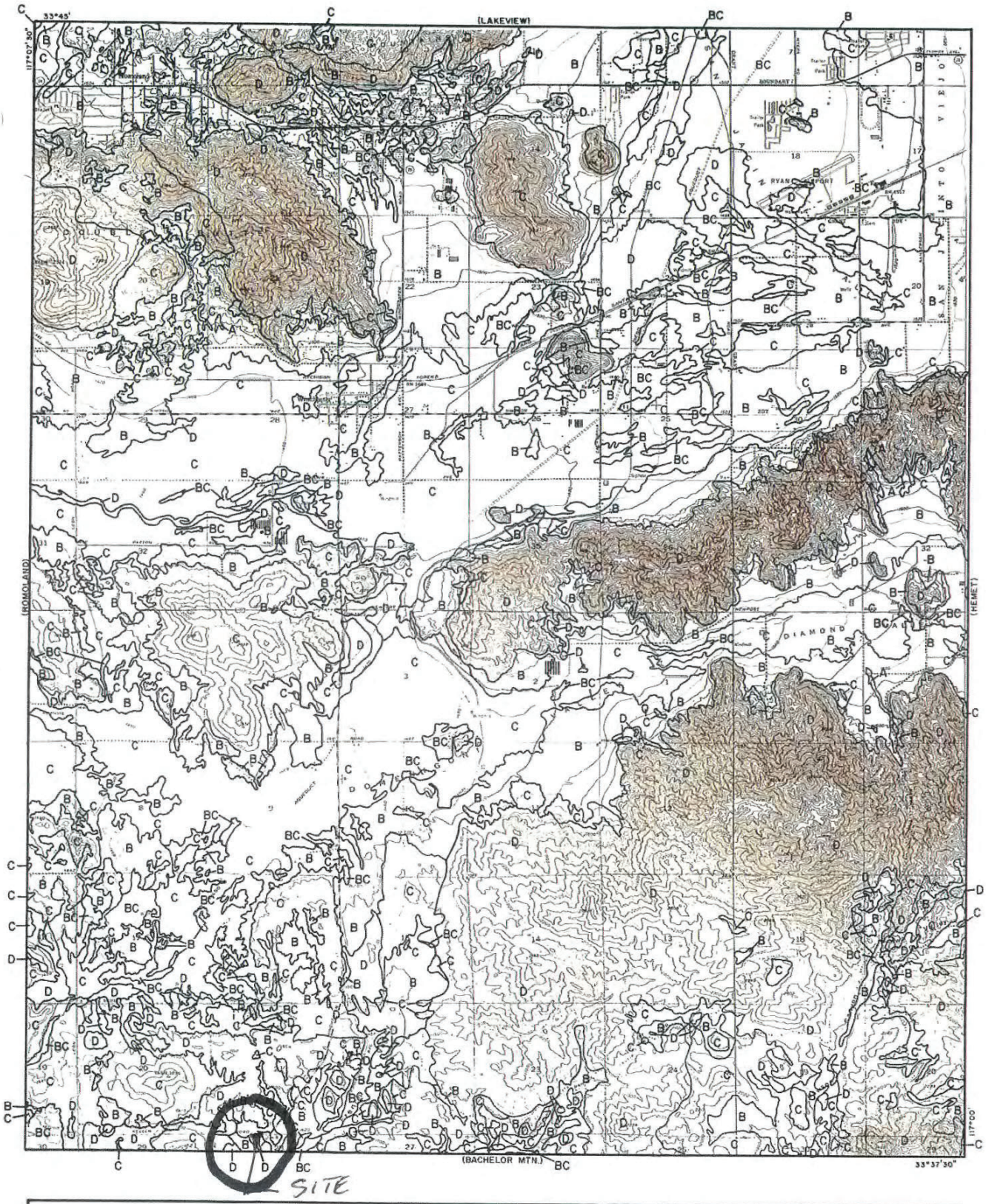
The data in the following tables may be used to develop runoff coefficient (C) curves for any combination of runoff index (RI) number and antecedent mositure condition (AMC). For an RI number with an AMC of II (from Plate D-5.5) enter the tables on the following pages and plot the "C" curve data directly on Plate D-5.8. "C" curve data is given for even RI numbers only, but values may easily be interpolated for odd RI numbers.

For an AMC of I or III enter the tabulation on this page with the RI for AMC II, and read the appropriate RI for AMC I or III. Use this revised RI to enter the tables on the following pages to determine "C". For example if RI = 40 for AMC II, then RI = 22 for AMC I and RI = 60 for AMC III.

AMC ADJUSTMENT RELATIONSHIPS

RI FOR AMC II	RI FOR OTHER AMC CONDITIONS: AMC I	AMC III	RI FOR AMC II	RI FOR OTHER AMC CONDITIONS: AMC I	AMC III
10	--	22	55	35	74
11	--	24	56	36	75
12	--	25	57	37	75
13	--	27	58	38	76
14	--	28	59	39	77
15	--	30	60	40	78
16	--	31	61	41	78
17	--	33	62	42	79
18	--	34	63	43	80
19	--	36	64	44	81
20	--	37	65	45	82
21	10	38	66	46	82
22	10	39	67	47	83
23	11	41	68	48	84
24	11	42	69	50	84
25	12	43	70	51	85
26	12	44	71	52	86
27	13	46	72	53	86
28	14	47	73	54	87
29	14	49	74	55	88
30	15	50	75	57	88
31	16	51	76	58	89
32	16	52	77	59	89
33	17	53	78	60	90
34	18	54	79	62	91
35	18	55	80	63	91
36	19	56	81	64	92
37	20	57	82	66	92
38	21	58	83	67	93
39	21	59	84	68	93
40	22	60	85	70	94
41	23	61	86	72	94
42	24	62	87	73	95
43	25	63	88	75	95
44	25	64	89	76	96
45	26	65	90	78	96
46	27	66	91	80	97
47	28	67	92	81	97
48	29	68	93	83	98
49	30	69	94	85	98
50	31	70	95	87	98
51	31	70	96	89	99
52	32	71	97	91	99
53	33	72	98	94	99
54	34	73	99	97	--

APPENDIX B



LEGEND

—— SOILS GROUP BOUNDARY

A SOILS GROUP DESIGNATION

RCFC&WCD

HYDROLOGY MANUAL

N

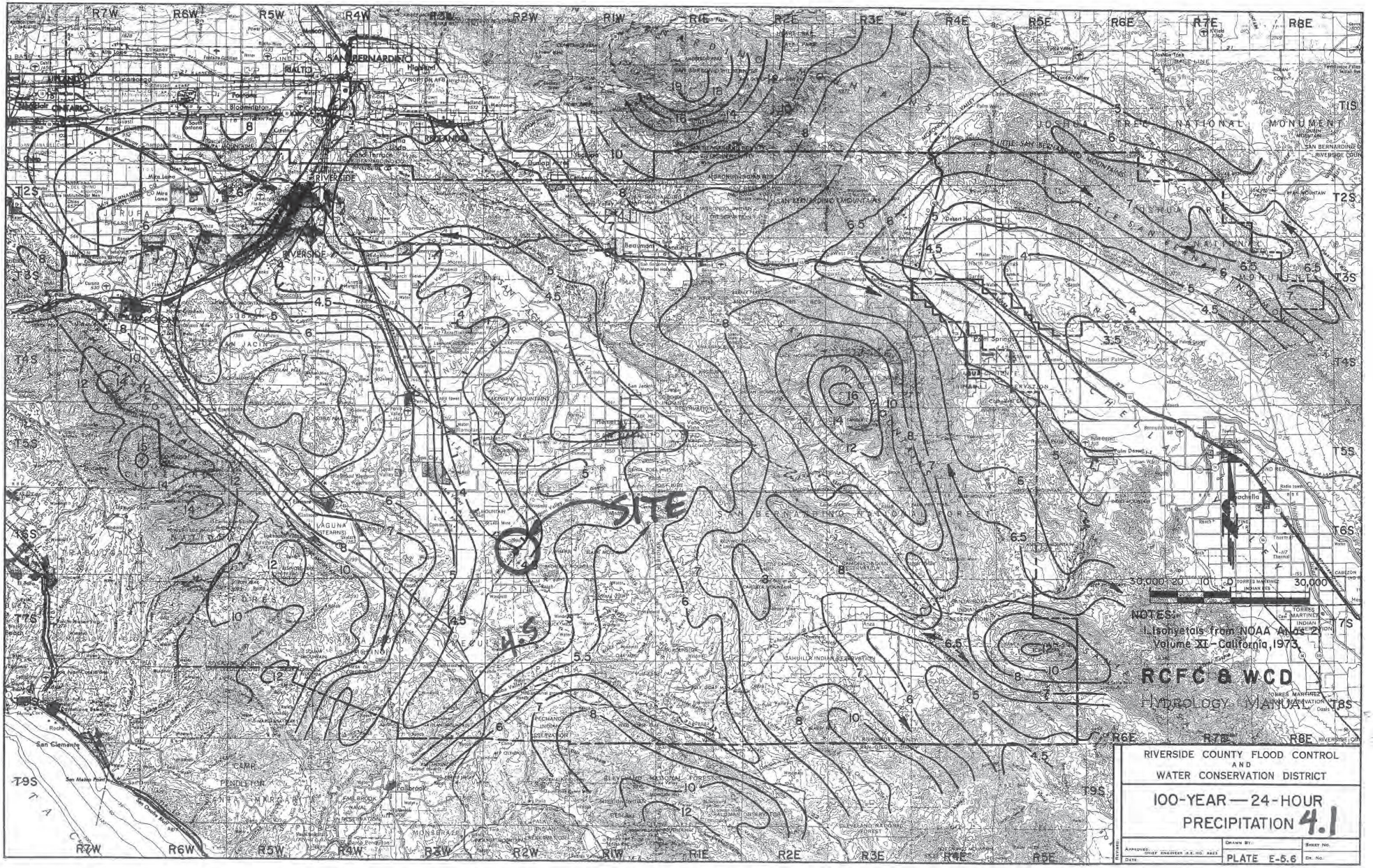
0 FEET 5000

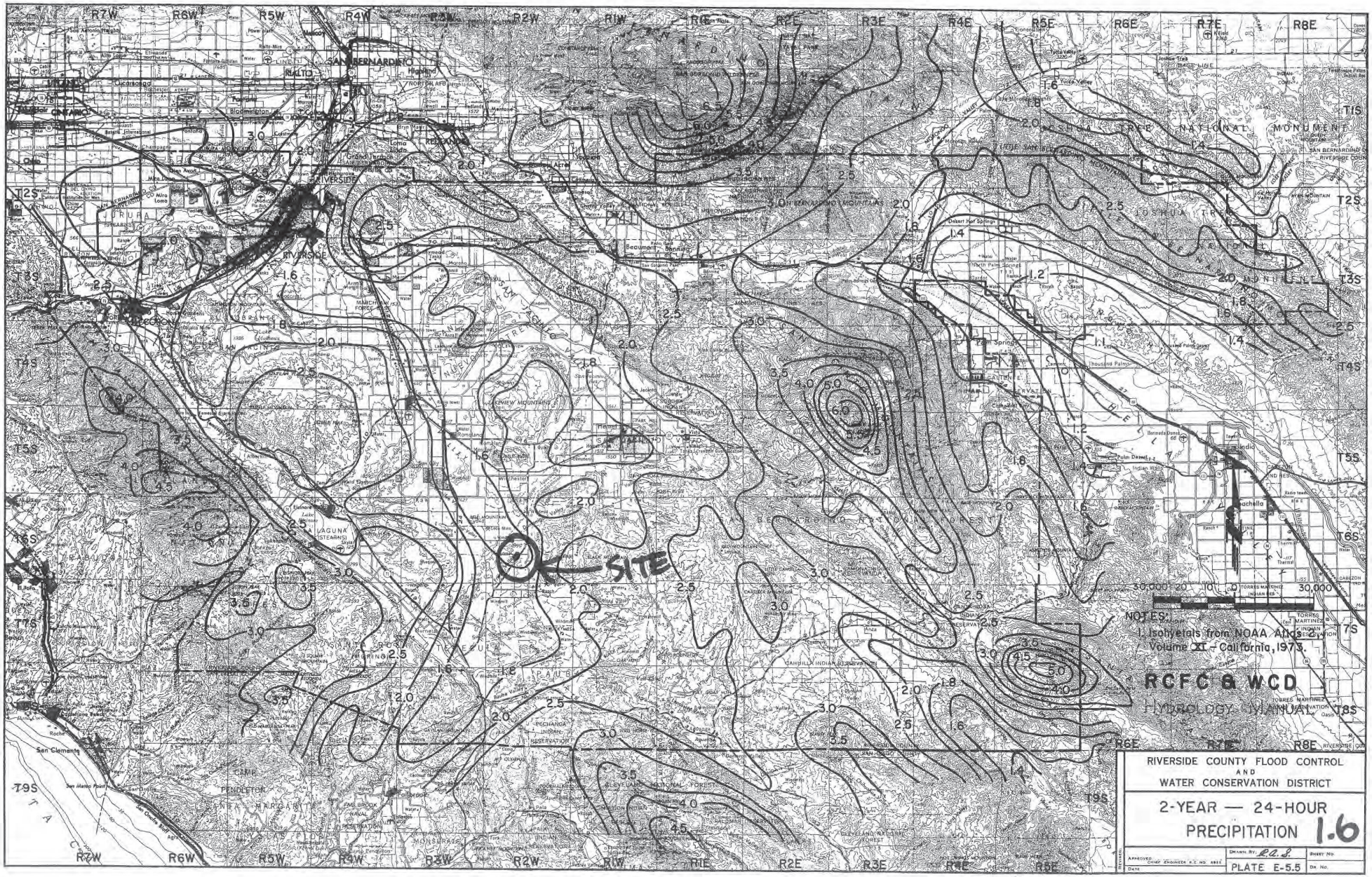
HYDROLOGIC SOILS GROUP MAP "D" FOR WINCHESTER

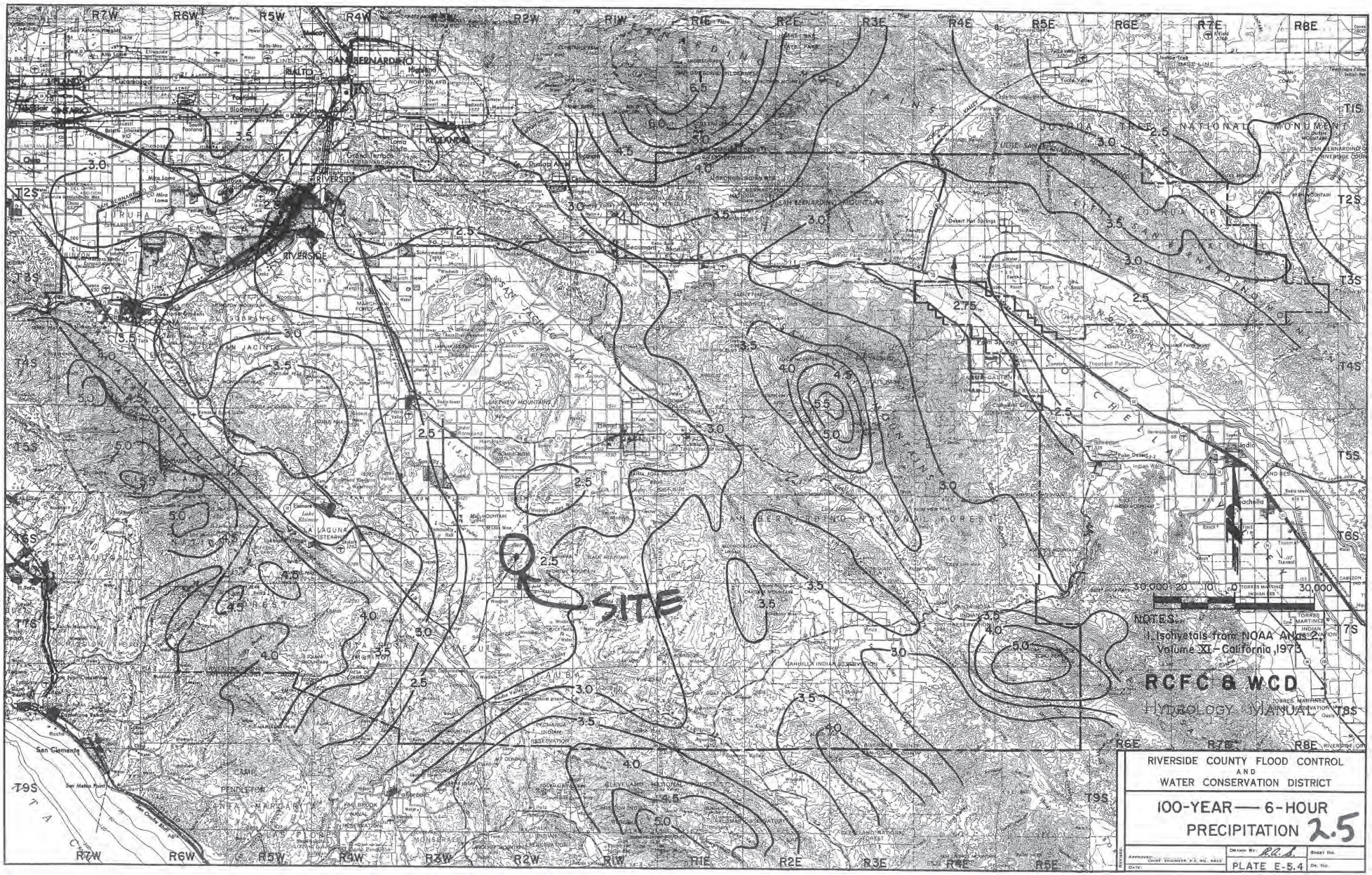
PLATE C-1.43

APPENDIX C


SITE
.45
.50
.55
.58
.59
.60
.63
NOTES
1. Slope of Intensity-Duration Curve based on District analysis of automatic recording rain gage records
RCFC & WCD
HYDROLOGY MANUAL
RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
SLOPE OF INTENSITY DURATION CURVE
0.55
PLATE D-4.6


SITE
NOTES:
1. Isohyetals from NOAA Atlas 2
Volume XI - California, 1973.
RCFC & WCD
HYDROLOGY MANUAL
RIVERSIDE COUNTY FLOOD CONTROL
AND
WATER CONSERVATION DISTRICT
100-YEAR — 24-HOUR
PRECIPITATION 4.1
PLATE E-5.6

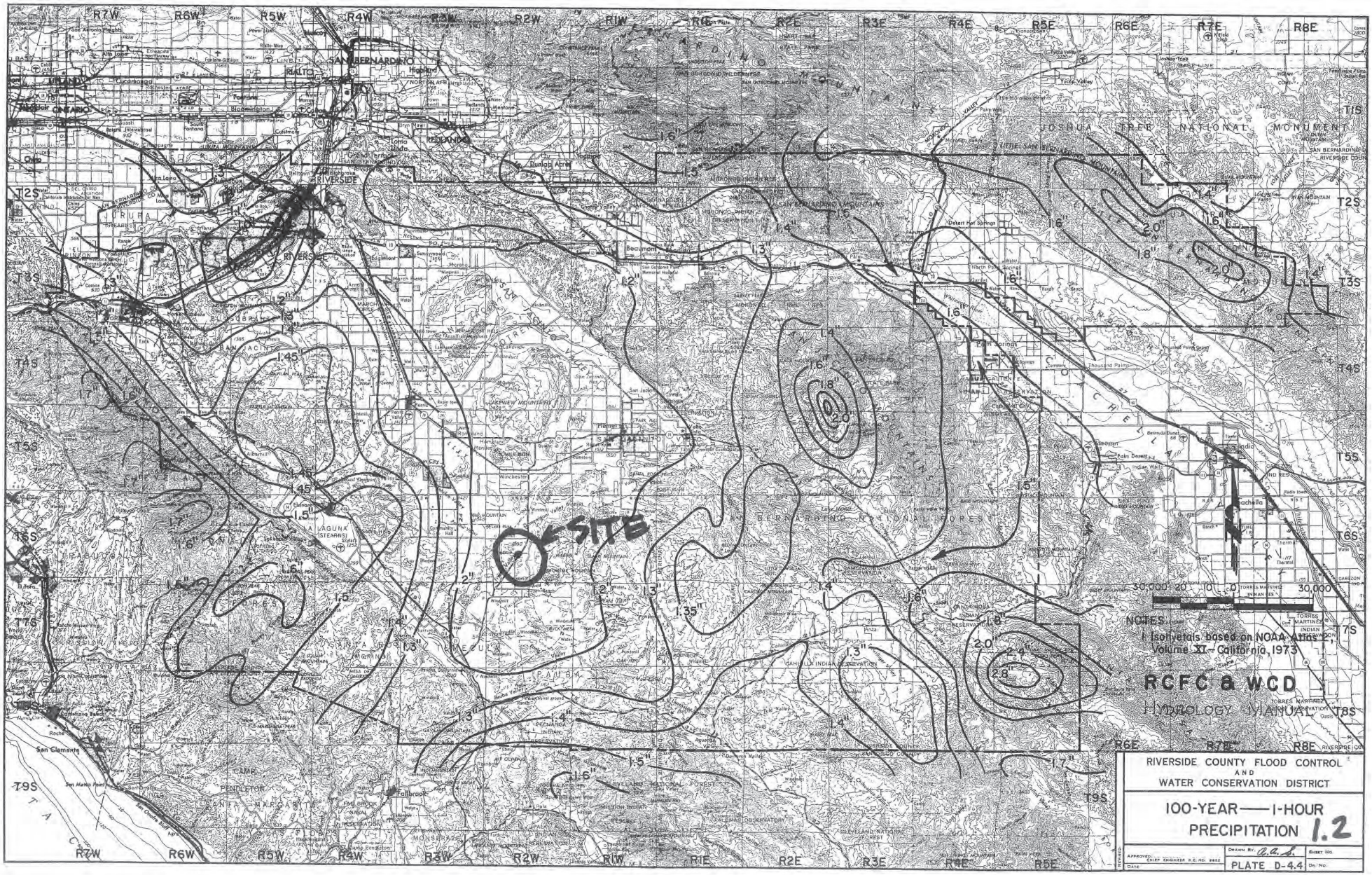

SITE
NOTES:
1. Isohyetals from NOAA Atlas 2 - Volume XI - California, 1973.
RCFC & WCD
HYDROLOGY MANUAL
RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
2-YEAR — 24-HOUR PRECIPITATION 1.6
PLATE E-5.5


R7W
R6W
R5W
R4W
R3W
R2W
R1W
R1E
R2E
R3E
R4E
R5E
R6E
R7E
R8E
T1S
T2S
T3S
T4S
T5S
T6S
T7S
T8S
T9S
SAN BERNARDINO
RIVERSIDE
RIALTO
COLTON
REDLANDS
SAN JACINTO MOUNTAINS
SAN BERNARDINO MOUNTAINS
SAN BERNARDINO NATIONAL FOREST
JOSHUA TREE NATIONAL MONUMENT
Q SITE
NOTES:
1. Isohyetals from NOAA Atlas 2,
Volume XI - California, 1973
RCFC & WCD
HYDROLOGY MANUAL
RIVERSIDE COUNTY FLOOD CONTROL
AND
WATER CONSERVATION DISTRICT
100-YEAR — 6-HOUR
PRECIPITATION 2.5
PLATE E-5.4


R7W
R6W
R5W
R4W
R3W
R2W
R1W
R1E
R2E
R3E
R4E
R5E
R6E
R7E
R8E
T1S
T2S
T3S
T4S
T5S
T6S
T7S
T8S
T9S
SAN BERNARDINO
RIVERSIDE
RIALTO
ONTARIO
CORONA
SAN JACINTO MOUNTAINS
JOSHUA TREE NATIONAL MONUMENT
SAN JACINTO FAULT
SAN JACINTO MTNS
SAN JACINTO FAULT ZONE


OKSITE
NOTES:
1. Isohyetals based on NOAA Atlas 2, Volume XI - California, 1973
RCFC & WCD
HYDROLOGY MANUAL
RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
100-YEAR — 3-HOUR PRECIPITATION
1.8
PLATE E-5.2


R7W
R6W
R5W
R4W
R3W
R2W
R1W
R1E
R2E
R3E
R4E
R5E
R6E
R7E
R8E
T1S
T2S
T3S
T4S
T5S
T6S
T7S
T8S
T9S
SAN BERNARDINO
RIVERSIDE
RIALTO
COLTON
CORONA
SAN JACINTO
SAN BERNARDINO MOUNTAINS
SAN JACINTO MOUNTAINS
SAN BERNARDINO NATIONAL FOREST
JOSHUA TREE NATIONAL MONUMENT
SAN JACINTO RIVER
SANTA ANA RIVER
SANTA ANA MOUNTAINS
PERRIS
HEMET
SAN JACINTO
SAN GORGONIO PASS
SAN TIMOTEO CANYON
SAN GABRIEL MOUNTAINS
SAN GABRIEL RIVER
SAN GABRIEL RESERVOIR
SAN DIMAS
SAN DIMAS EXPERIMENTAL FOREST
SAN DIMAS CANYON
SAN DIMAS RESERVOIR
SAN ANTONIO CANYON
SAN ANTONIO RESERVOIR
SAN ANTONIO CREEK
SAN ANTONIO FALLS
SAN ANTONIO HEIGHTS
SAN ANTONIO MOUNTAIN
SAN ANTONIO RESERVOIR
SAN ANTONIO CANYON


SITE
1.2"
1.3"
1.4"
1.5"
1.6"
1.7"
1.8"
2.0"
2.4"
2.8"
NOTES
1. Isohyetals based on NOAA Atlas 2, Volume XI - California, 1973
RCFC & WCD
HYDROLOGY MANUAL
RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
100-YEAR — 1-HOUR PRECIPITATION 1.2
PLATE D-4.4


SITE
NOTES:
1. Isohyetals based on NOAA Atlas 2, Volume XI - California, 1973
RCFC & WCD
HYDROLOGY MANUAL
RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
2-YEAR — 1-HOUR PRECIPITATION 0.5
PLATE D-4.3

APPENDIX D

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2005 Version 7.1
Rational Hydrology Study Date: 01/04/22 File:19004UNDEVRAT.out

19-004 UNDEVELOPED CONDITION RATIONAL STUDY 2 YEAR EVENT

********* Hydrology Study Control Information **********

English (in-lb) Units used in input data file

Program License Serial Number 6106

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 2.00 Antecedent Moisture Condition = 1

Standard intensity-duration curves data (Plate D-4.1)
For the [Homeland-Winchester] area used.
10 year storm 10 minute intensity = 2.030(In/Hr)
10 year storm 60 minute intensity = 0.800(In/Hr)
100 year storm 10 minute intensity = 3.050(In/Hr)
100 year storm 60 minute intensity = 1.200(In/Hr)

Storm event year = 2.0
Calculated rainfall intensity data:
1 hour intensity = 0.520(In/Hr)
Slope of intensity duration curve = 0.5200

++
Process from Point/Station 1.000 to Point/Station 2.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 604.200(Ft.)
Top (of initial area) elevation = 33.000(Ft.)
Bottom (of initial area) elevation = 14.000(Ft.)
Difference in elevation = 19.000(Ft.)
Slope = 0.03145 s(percent)= 3.14
TC = k(0.589)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 15.246 min.
Rainfall intensity = 1.061(In/Hr) for a 2.0 year storm
USER INPUT of soil data for subarea
Runoff Coefficient = 0.518
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 1) = 63.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Initial subarea runoff = 2.379(CFS)
Total initial stream area = 4.330(Ac.)
Pervious area fraction = 1.000
End of computations, total study area = 4.33 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 1.000
Area averaged RI index number = 80.0

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2005 Version 7.1
Rational Hydrology Study Date: 01/04/22 File:19004UNDEVRAT.out

---

19-004 UNDEVELOPED CONDITION RATIONAL STUDY 5 YEAR EVENT

********* Hydrology Study Control Information **********

English (in-lb) Units used in input data file

Program License Serial Number 6106

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 5.00 Antecedent Moisture Condition = 1

Standard intensity-duration curves data (Plate D-4.1)
For the [Homeland-Winchester] area used.
10 year storm 10 minute intensity = 2.030(In/Hr)
10 year storm 60 minute intensity = 0.800(In/Hr)
100 year storm 10 minute intensity = 3.050(In/Hr)
100 year storm 60 minute intensity = 1.200(In/Hr)

Storm event year = 5.0
Calculated rainfall intensity data:
1 hour intensity = 0.680(In/Hr)
Slope of intensity duration curve = 0.5200

++
Process from Point/Station 1.000 to Point/Station 2.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 604.200(Ft.)
Top (of initial area) elevation = 33.000(Ft.)
Bottom (of initial area) elevation = 14.000(Ft.)
Difference in elevation = 19.000(Ft.)
Slope = 0.03145 s(percent)= 3.14
TC = k(0.589)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 15.246 min.
Rainfall intensity = 1.386(In/Hr) for a 5.0 year storm
USER INPUT of soil data for subarea
Runoff Coefficient = 0.575
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 1) = 63.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Initial subarea runoff = 3.450(CFS)
Total initial stream area = 4.330(Ac.)
Pervious area fraction = 1.000
End of computations, total study area = 4.33 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 1.000
Area averaged RI index number = 80.0

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2005 Version 7.1
Rational Hydrology Study Date: 01/04/22 File:19004UNDEVRAT.out

---

19-004 UNDEVELOPED CONDITION RATIONAL STUDY 10 YEAR EVENT

********* Hydrology Study Control Information **********

English (in-lb) Units used in input data file

Program License Serial Number 6106

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 10.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [Homeland-Winchester] area used.
10 year storm 10 minute intensity = 2.030(In/Hr)
10 year storm 60 minute intensity = 0.800(In/Hr)
100 year storm 10 minute intensity = 3.050(In/Hr)
100 year storm 60 minute intensity = 1.200(In/Hr)

Storm event year = 10.0
Calculated rainfall intensity data:
1 hour intensity = 0.800(In/Hr)
Slope of intensity duration curve = 0.5200

++
Process from Point/Station 1.000 to Point/Station 2.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 604.200(Ft.)
Top (of initial area) elevation = 33.000(Ft.)
Bottom (of initial area) elevation = 14.000(Ft.)
Difference in elevation = 19.000(Ft.)
Slope = 0.03145 s(percent)= 3.14
TC = k(0.589)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 15.246 min.
Rainfall intensity = 1.631(In/Hr) for a 10.0 year storm
USER INPUT of soil data for subarea
Runoff Coefficient = 0.747
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2) = 80.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Initial subarea runoff = 5.278(CFS)
Total initial stream area = 4.330(Ac.)
Pervious area fraction = 1.000
End of computations, total study area = 4.33 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 1.000
Area averaged RI index number = 80.0

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2005 Version 7.1
Rational Hydrology Study Date: 01/04/22 File:19004UNDEVRAT.out

---

19-004 UNDEVELOPED CONDITION RATIONAL STUDY 100 YEAR EVENT

********* Hydrology Study Control Information **********

English (in-lb) Units used in input data file

Program License Serial Number 6106

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 3

Standard intensity-duration curves data (Plate D-4.1)
For the [Homeland-Winchester] area used.
10 year storm 10 minute intensity = 2.030(In/Hr)
10 year storm 60 minute intensity = 0.800(In/Hr)
100 year storm 10 minute intensity = 3.050(In/Hr)
100 year storm 60 minute intensity = 1.200(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.200(In/Hr)
Slope of intensity duration curve = 0.5200

++
Process from Point/Station 1.000 to Point/Station 2.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 604.200(Ft.)
Top (of initial area) elevation = 33.000(Ft.)
Bottom (of initial area) elevation = 14.000(Ft.)
Difference in elevation = 19.000(Ft.)
Slope = 0.03145 s(percent)= 3.14
TC = k(0.589)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 15.246 min.
Rainfall intensity = 2.447(In/Hr) for a 100.0 year storm
USER INPUT of soil data for subarea
Runoff Coefficient = 0.854
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 3) = 91.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Initial subarea runoff = 9.047(CFS)
Total initial stream area = 4.330(Ac.)
Pervious area fraction = 1.000
End of computations, total study area = 4.33 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 1.000
Area averaged RI index number = 80.0

APPENDIX E

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2005 Version 7.1
Rational Hydrology Study Date: 01/06/22 File:19004DEVRAT.out

19-004 DEVELOPED CONDITION RATIONAL STUDY 2 YEAR EVENT

********* Hydrology Study Control Information **********

English (in-lb) Units used in input data file

Program License Serial Number 6106

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 2.00 Antecedent Moisture Condition = 1

Standard intensity-duration curves data (Plate D-4.1)
For the [Homeland-Winchester] area used.
10 year storm 10 minute intensity = 2.030(In/Hr)
10 year storm 60 minute intensity = 0.800(In/Hr)
100 year storm 10 minute intensity = 3.050(In/Hr)
100 year storm 60 minute intensity = 1.200(In/Hr)

Storm event year = 2.0
Calculated rainfall intensity data:
1 hour intensity = 0.520(In/Hr)
Slope of intensity duration curve = 0.5200

++
Process from Point/Station 1.000 to Point/Station 2.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 812.300(Ft.)
Top (of initial area) elevation = 25.620(Ft.)
Bottom (of initial area) elevation = 21.150(Ft.)
Difference in elevation = 4.470(Ft.)
Slope = 0.00550 s(percent)= 0.55
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 12.385 min.
Rainfall intensity = 1.182(In/Hr) for a 2.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.859
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 1) = 57.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 3.817(CFS)
Total initial stream area = 3.760(Ac.)
Pervious area fraction = 0.100

++
Process from Point/Station 1.000 to Point/Station 2.000
**** CONFLUENCE OF MINOR STREAMS ****

```
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      3.760(Ac.)
Runoff from this stream =      3.817(CFS)
Time of concentration =   12.38 min.
Rainfall intensity =     1.182(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        3.000 to Point/Station        2.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
Initial area flow distance =   406.600(Ft.)
Top (of initial area) elevation =    25.060(Ft.)
Bottom (of initial area) elevation =    20.830(Ft.)
Difference in elevation =     4.230(Ft.)
Slope =    0.01040  s(percent)=       1.04
TC = k(0.450)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   12.401 min.
Rainfall intensity =      1.181(In/Hr) for a     2.0 year storm
USER INPUT of soil data for subarea
Runoff Coefficient = 0.610
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 1)  =  57.00
Pervious area fraction =  0.700; Impervious fraction =  0.300
Initial subarea runoff =      0.058(CFS)
Total initial stream area =        0.080(Ac.)
Pervious area fraction = 0.700


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        3.000 to Point/Station        2.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.080(Ac.)
Runoff from this stream =      0.058(CFS)
Time of concentration =   12.40 min.
Rainfall intensity =     1.181(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1        3.817     12.38                 1.182
2        0.058     12.40                 1.181
Largest stream flow has longer or shorter time of concentration
Qp =      3.817 + sum of
          Qa          Tb/Ta
           0.058 *    0.999 =      0.058
Qp =      3.874

Total of 2 streams to confluence:
Flow rates before confluence point:
       3.817       0.058
Area of streams before confluence:
       3.760       0.080
Results of confluence:
Total flow rate =      3.874(CFS)
Time of concentration =    12.385 min.
Effective stream area after confluence =      3.840(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        4.000 to Point/Station        5.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
```

```
Initial area flow distance =    69.700(Ft.)
Top (of initial area) elevation =    20.430(Ft.)
Bottom (of initial area) elevation =    19.730(Ft.)
Difference in elevation =     0.700(Ft.)
Slope =    0.01004  s(percent)=       1.00
TC = k(0.656)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.991 min.
Rainfall intensity =      1.396(In/Hr) for a     2.0 year storm
USER INPUT of soil data for subarea
Runoff Coefficient = 0.523
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 1)  =  57.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      0.088(CFS)
Total initial stream area =        0.120(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        6.000 to Point/Station        7.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
Initial area flow distance =    51.300(Ft.)
Top (of initial area) elevation =    23.750(Ft.)
Bottom (of initial area) elevation =    20.700(Ft.)
Difference in elevation =     3.050(Ft.)
Slope =    0.05945  s(percent)=       5.95
TC = k(-0.910)*[(length^3)/(elevation change)]^0.2
Warning: TC computed to be less than 5 min.; program is assuming the
time of concentration is 5 minutes.
Initial area time of concentration =    5.000 min.
Rainfall intensity =      1.895(In/Hr) for a     2.0 year storm
USER INPUT of soil data for subarea
Runoff Coefficient = 0.619
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 1)  =  57.00
Pervious area fraction =  0.900; Impervious fraction =  0.100
Initial subarea runoff =      0.434(CFS)
Total initial stream area =        0.370(Ac.)
Pervious area fraction = 0.900
End of computations, total study area =            4.33 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.204
Area averaged RI index number =  75.0
```

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2005 Version 7.1
Rational Hydrology Study Date: 01/06/22 File:19004DEVRAT.out

19-004 DEVELOPED CONDITION RATIONAL STUDY 5 YEAR EVENT

********* Hydrology Study Control Information **********

English (in-lb) Units used in input data file

Program License Serial Number 6106

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 5.00 Antecedent Moisture Condition = 1

Standard intensity-duration curves data (Plate D-4.1)
For the [Homeland-Winchester] area used.
10 year storm 10 minute intensity = 2.030(In/Hr)
10 year storm 60 minute intensity = 0.800(In/Hr)
100 year storm 10 minute intensity = 3.050(In/Hr)
100 year storm 60 minute intensity = 1.200(In/Hr)

Storm event year = 5.0
Calculated rainfall intensity data:
1 hour intensity = 0.680(In/Hr)
Slope of intensity duration curve = 0.5200

++
Process from Point/Station 1.000 to Point/Station 2.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 812.300(Ft.)
Top (of initial area) elevation = 25.620(Ft.)
Bottom (of initial area) elevation = 21.150(Ft.)
Difference in elevation = 4.470(Ft.)
Slope = 0.00550 s(percent)= 0.55
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 12.385 min.
Rainfall intensity = 1.544(In/Hr) for a 5.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.864
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 1) = 57.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 5.018(CFS)
Total initial stream area = 3.760(Ac.)
Pervious area fraction = 0.100

++
Process from Point/Station 1.000 to Point/Station 2.000
**** CONFLUENCE OF MINOR STREAMS ****

```
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      3.760(Ac.)
Runoff from this stream =      5.018(CFS)
Time of concentration =   12.38 min.
Rainfall intensity =     1.544(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        3.000 to Point/Station        2.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
Initial area flow distance =   406.600(Ft.)
Top (of initial area) elevation =    25.060(Ft.)
Bottom (of initial area) elevation =    20.830(Ft.)
Difference in elevation =     4.230(Ft.)
Slope =    0.01040  s(percent)=       1.04
TC = k(0.450)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   12.401 min.
Rainfall intensity =      1.543(In/Hr) for a     5.0 year storm
USER INPUT of soil data for subarea
Runoff Coefficient = 0.651
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 1)  =  57.00
Pervious area fraction =  0.700; Impervious fraction =  0.300
Initial subarea runoff =      0.080(CFS)
Total initial stream area =        0.080(Ac.)
Pervious area fraction = 0.700


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        3.000 to Point/Station        2.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.080(Ac.)
Runoff from this stream =      0.080(CFS)
Time of concentration =   12.40 min.
Rainfall intensity =     1.543(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                (In/Hr)


1        5.018     12.38                1.544
2        0.080     12.40                1.543
Largest stream flow has longer or shorter time of concentration
Qp =      5.018 + sum of
          Qa          Tb/Ta
           0.080 *    0.999 =      0.080
Qp =      5.098

Total of 2 streams to confluence:
Flow rates before confluence point:
       5.018       0.080
Area of streams before confluence:
        3.760        0.080
Results of confluence:
Total flow rate =      5.098(CFS)
Time of concentration =    12.385 min.
Effective stream area after confluence =      3.840(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        4.000 to Point/Station        5.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
```

```
Initial area flow distance =    69.700(Ft.)
Top (of initial area) elevation =    20.430(Ft.)
Bottom (of initial area) elevation =    19.730(Ft.)
Difference in elevation =     0.700(Ft.)
Slope =    0.01004  s(percent)=       1.00
TC = k(0.656)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.991 min.
Rainfall intensity =      1.823(In/Hr) for a     5.0 year storm
USER INPUT of soil data for subarea
Runoff Coefficient = 0.580
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 1)  =  57.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      0.127(CFS)
Total initial stream area =        0.120(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        6.000 to Point/Station        7.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
Initial area flow distance =    51.300(Ft.)
Top (of initial area) elevation =    23.750(Ft.)
Bottom (of initial area) elevation =    20.700(Ft.)
Difference in elevation =     3.050(Ft.)
Slope =    0.05945  s(percent)=       5.95
TC = k(-0.910)*[(length^3)/(elevation change)]^0.2
Warning: TC computed to be less than 5 min.; program is assuming the
time of concentration is 5 minutes.
Initial area time of concentration =    5.000 min.
Rainfall intensity =      2.474(In/Hr) for a     5.0 year storm
USER INPUT of soil data for subarea
Runoff Coefficient = 0.666
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 1)  =  57.00
Pervious area fraction =  0.900; Impervious fraction =  0.100
Initial subarea runoff =      0.610(CFS)
Total initial stream area =        0.370(Ac.)
Pervious area fraction = 0.900
End of computations, total study area =            4.33 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.204
Area averaged RI index number =  75.0
```

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2005 Version 7.1
Rational Hydrology Study Date: 01/06/22 File:19004DEVRAT.out

19-004 DEVELOPED CONDITION RATIONAL STUDY 10 YEAR EVENT

********* Hydrology Study Control Information **********

English (in-lb) Units used in input data file

Program License Serial Number 6106

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 10.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [Homeland-Winchester] area used.
10 year storm 10 minute intensity = 2.030(In/Hr)
10 year storm 60 minute intensity = 0.800(In/Hr)
100 year storm 10 minute intensity = 3.050(In/Hr)
100 year storm 60 minute intensity = 1.200(In/Hr)

Storm event year = 10.0
Calculated rainfall intensity data:
1 hour intensity = 0.800(In/Hr)
Slope of intensity duration curve = 0.5200

++
Process from Point/Station 1.000 to Point/Station 2.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 812.300(Ft.)
Top (of initial area) elevation = 25.620(Ft.)
Bottom (of initial area) elevation = 21.150(Ft.)
Difference in elevation = 4.470(Ft.)
Slope = 0.00550 s(percent)= 0.55
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 12.385 min.
Rainfall intensity = 1.817(In/Hr) for a 10.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.882
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2) = 75.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 6.029(CFS)
Total initial stream area = 3.760(Ac.)
Pervious area fraction = 0.100

++
Process from Point/Station 1.000 to Point/Station 2.000
**** CONFLUENCE OF MINOR STREAMS ****

```
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      3.760(Ac.)
Runoff from this stream =      6.029(CFS)
Time of concentration =   12.38 min.
Rainfall intensity =     1.817(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        3.000 to Point/Station        2.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
Initial area flow distance =   406.600(Ft.)
Top (of initial area) elevation =    25.060(Ft.)
Bottom (of initial area) elevation =    20.830(Ft.)
Difference in elevation =     4.230(Ft.)
Slope =    0.01040  s(percent)=       1.04
TC = k(0.450)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   12.401 min.
Rainfall intensity =      1.816(In/Hr) for a    10.0 year storm
USER INPUT of soil data for subarea
Runoff Coefficient = 0.776
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2)  =  75.00
Pervious area fraction =  0.700; Impervious fraction =  0.300
Initial subarea runoff =      0.113(CFS)
Total initial stream area =        0.080(Ac.)
Pervious area fraction = 0.700


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        3.000 to Point/Station        2.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.080(Ac.)
Runoff from this stream =      0.113(CFS)
Time of concentration =   12.40 min.
Rainfall intensity =     1.816(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                (In/Hr)


1        6.029     12.38                1.817
2        0.113     12.40                1.816
Largest stream flow has longer or shorter time of concentration
Qp =      6.029 + sum of
          Qa          Tb/Ta
           0.113 *    0.999 =      0.113
Qp =      6.142

Total of 2 streams to confluence:
Flow rates before confluence point:
       6.029       0.113
Area of streams before confluence:
       3.760       0.080
Results of confluence:
Total flow rate =      6.142(CFS)
Time of concentration =    12.385 min.
Effective stream area after confluence =      3.840(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        4.000 to Point/Station        5.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
```

```
Initial area flow distance =    69.700(Ft.)
Top (of initial area) elevation =    20.430(Ft.)
Bottom (of initial area) elevation =    19.730(Ft.)
Difference in elevation =     0.700(Ft.)
Slope =    0.01004  s(percent)=       1.00
TC = k(0.656)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.991 min.
Rainfall intensity =      2.147(In/Hr) for a    10.0 year storm
USER INPUT of soil data for subarea
Runoff Coefficient = 0.746
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2)  =  75.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      0.192(CFS)
Total initial stream area =        0.120(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        6.000 to Point/Station        7.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
Initial area flow distance =    51.300(Ft.)
Top (of initial area) elevation =    23.750(Ft.)
Bottom (of initial area) elevation =    20.700(Ft.)
Difference in elevation =     3.050(Ft.)
Slope =    0.05945  s(percent)=       5.95
TC = k(-0.910)*[(length^3)/(elevation change)]^0.2
Warning: TC computed to be less than 5 min.; program is assuming the
time of concentration is 5 minutes.
Initial area time of concentration =    5.000 min.
Rainfall intensity =      2.912(In/Hr) for a    10.0 year storm
USER INPUT of soil data for subarea
Runoff Coefficient = 0.793
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2)  =  75.00
Pervious area fraction =  0.900; Impervious fraction =  0.100
Initial subarea runoff =      0.854(CFS)
Total initial stream area =        0.370(Ac.)
Pervious area fraction = 0.900
End of computations, total study area =            4.33 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.204
Area averaged RI index number =  75.0
```

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2005 Version 7.1
Rational Hydrology Study Date: 01/06/22 File:19004DEVRAT.out

19-004 DEVELOPED CONDITION RATIONAL STUDY 100 YEAR EVENT

********* Hydrology Study Control Information **********

English (in-lb) Units used in input data file

Program License Serial Number 6106

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [Homeland-Winchester] area used.
10 year storm 10 minute intensity = 2.030(In/Hr)
10 year storm 60 minute intensity = 0.800(In/Hr)
100 year storm 10 minute intensity = 3.050(In/Hr)
100 year storm 60 minute intensity = 1.200(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.200(In/Hr)
Slope of intensity duration curve = 0.5200

++

Process from Point/Station 1.000 to Point/Station 2.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 812.300(Ft.)
Top (of initial area) elevation = 25.620(Ft.)
Bottom (of initial area) elevation = 21.150(Ft.)
Difference in elevation = 4.470(Ft.)
Slope = 0.00550 s(percent)= 0.55
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 12.385 min.
Rainfall intensity = 2.726(In/Hr) for a 100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.887
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2) = 75.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 9.095(CFS)
Total initial stream area = 3.760(Ac.)
Pervious area fraction = 0.100

++

Process from Point/Station 1.000 to Point/Station 2.000
**** CONFLUENCE OF MINOR STREAMS ****

```
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      3.760(Ac.)
Runoff from this stream =      9.095(CFS)
Time of concentration =   12.38 min.
Rainfall intensity =     2.726(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        3.000 to Point/Station        2.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
Initial area flow distance =   406.600(Ft.)
Top (of initial area) elevation =    25.060(Ft.)
Bottom (of initial area) elevation =    20.830(Ft.)
Difference in elevation =     4.230(Ft.)
Slope =    0.01040  s(percent)=       1.04
TC = k(0.450)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   12.401 min.
Rainfall intensity =      2.724(In/Hr) for a   100.0 year storm
USER INPUT of soil data for subarea
Runoff Coefficient = 0.812
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2)  =  75.00
Pervious area fraction =  0.700; Impervious fraction =  0.300
Initial subarea runoff =      0.177(CFS)
Total initial stream area =       0.080(Ac.)
Pervious area fraction = 0.700


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        3.000 to Point/Station        2.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.080(Ac.)
Runoff from this stream =      0.177(CFS)
Time of concentration =   12.40 min.
Rainfall intensity =     2.724(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                (In/Hr)


1        9.095     12.38                 2.726
2        0.177     12.40                 2.724
Largest stream flow has longer or shorter time of concentration
Qp =      9.095 + sum of
          Qa          Tb/Ta
           0.177 *    0.999 =      0.177
Qp =      9.272

Total of 2 streams to confluence:
Flow rates before confluence point:
       9.095       0.177
Area of streams before confluence:
       3.760       0.080
Results of confluence:
Total flow rate =      9.272(CFS)
Time of concentration =    12.385 min.
Effective stream area after confluence =      3.840(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        4.000 to Point/Station        5.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
```

```
Initial area flow distance =    69.700(Ft.)
Top (of initial area) elevation =    20.430(Ft.)
Bottom (of initial area) elevation =    19.730(Ft.)
Difference in elevation =     0.700(Ft.)
Slope =    0.01004  s(percent)=       1.00
TC = k(0.656)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.991 min.
Rainfall intensity =      3.220(In/Hr) for a   100.0 year storm
USER INPUT of soil data for subarea
Runoff Coefficient = 0.791
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2)  =  75.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      0.306(CFS)
Total initial stream area =        0.120(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        6.000 to Point/Station        7.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
Initial area flow distance =    51.300(Ft.)
Top (of initial area) elevation =    23.750(Ft.)
Bottom (of initial area) elevation =    20.700(Ft.)
Difference in elevation =     3.050(Ft.)
Slope =    0.05945  s(percent)=       5.95
TC = k(-0.910)*[(length^3)/(elevation change)]^0.2
Warning: TC computed to be less than 5 min.; program is assuming the
time of concentration is 5 minutes.
Initial area time of concentration =    5.000 min.
Rainfall intensity =      4.369(In/Hr) for a   100.0 year storm
USER INPUT of soil data for subarea
Runoff Coefficient = 0.825
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2)  =  75.00
Pervious area fraction =  0.900; Impervious fraction =  0.100
Initial subarea runoff =      1.334(CFS)
Total initial stream area =        0.370(Ac.)
Pervious area fraction = 0.900
End of computations, total study area =            4.33 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.204
Area averaged RI index number =  75.0
```

APPENDIX F

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 01/04/22 File: 19004UNDEVHYD242.out

++

Riverside County Synthetic Unit Hydrology Method
RCFC & WCD Manual date - April 1978

Program License Serial Number 6106

English (in-lb) Input Units Used
English Rainfall Data (Inches) Input Values Used

English Units used in output format

19-004 UNDEVELOPED CONDITION HYDROGRAPHY METHOD 2 YEAR 24 HOUR YEAR EVENT

Drainage Area = 4.33(Ac.) = 0.007 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 4.33(Ac.) = 0.007 Sq. Mi.
Length along longest watercourse = 604.20(Ft.)
Length along longest watercourse measured to centroid = 369.00(Ft.)
Length along longest watercourse = 0.114 Mi.
Length along longest watercourse measured to centroid = 0.070 Mi.
Difference in elevation = 19.00(Ft.)
Slope along watercourse = 166.0377 Ft./Mi.
Average Manning's 'N' = 0.030
Lag time = 0.044 Hr.
Lag time = 2.61 Min.
25% of lag time = 0.65 Min.
40% of lag time = 1.04 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]
4.33	1.60	6.93

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
4.33	4.10	17.75

STORM EVENT (YEAR) = 2.00
Area Averaged 2-Year Rainfall = 1.600(In)
Area Averaged 100-Year Rainfall = 4.100(In)

Point rain (area averaged) = 1.600(In)
Areal adjustment factor = 100.00 %
Adjusted average point rain = 1.600(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %

```
     4.330           80.00          0.000
 Total Area Entered =      4.33(Ac.)


RI    RI   Infil. Rate Impervious   Adj. Infil. Rate  Area%     F
AMC2 AMC-1     (In/Hr)    (Dec.%)     (In/Hr)       (Dec.)    (In/Hr)
80.0  63.0      0.438     0.000        0.438         1.000      0.438
                                                  Sum (F) =    0.438
Area averaged mean soil loss (F) (In/Hr) =  0.438
Minimum soil loss rate ((In/Hr)) =  0.219
(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        191.518         41.897             1.828
    2   0.167        383.035         43.964             1.918
    3   0.250        574.553          9.149             0.399
    4   0.333        766.070          3.628             0.158
    5   0.417        957.588          1.363             0.059
                              Sum = 100.000   Sum=       4.364
------------------------------------------------------------------------
```

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	0.013	(0.776)	0.012	0.001
2	0.17	0.07	0.013	(0.773)	0.012	0.001
3	0.25	0.07	0.013	(0.770)	0.012	0.001
4	0.33	0.10	0.019	(0.767)	0.017	0.002
5	0.42	0.10	0.019	(0.764)	0.017	0.002
6	0.50	0.10	0.019	(0.761)	0.017	0.002
7	0.58	0.10	0.019	(0.758)	0.017	0.002
8	0.67	0.10	0.019	(0.755)	0.017	0.002
9	0.75	0.10	0.019	(0.752)	0.017	0.002
10	0.83	0.13	0.026	(0.749)	0.023	0.003
11	0.92	0.13	0.026	(0.746)	0.023	0.003
12	1.00	0.13	0.026	(0.743)	0.023	0.003
13	1.08	0.10	0.019	(0.740)	0.017	0.002
14	1.17	0.10	0.019	(0.737)	0.017	0.002
15	1.25	0.10	0.019	(0.734)	0.017	0.002
16	1.33	0.10	0.019	(0.731)	0.017	0.002
17	1.42	0.10	0.019	(0.728)	0.017	0.002
18	1.50	0.10	0.019	(0.726)	0.017	0.002
19	1.58	0.10	0.019	(0.723)	0.017	0.002
20	1.67	0.10	0.019	(0.720)	0.017	0.002
21	1.75	0.10	0.019	(0.717)	0.017	0.002
22	1.83	0.13	0.026	(0.714)	0.023	0.003
23	1.92	0.13	0.026	(0.711)	0.023	0.003
24	2.00	0.13	0.026	(0.708)	0.023	0.003
25	2.08	0.13	0.026	(0.705)	0.023	0.003
26	2.17	0.13	0.026	(0.702)	0.023	0.003
27	2.25	0.13	0.026	(0.700)	0.023	0.003
28	2.33	0.13	0.026	(0.697)	0.023	0.003
29	2.42	0.13	0.026	(0.694)	0.023	0.003
30	2.50	0.13	0.026	(0.691)	0.023	0.003
31	2.58	0.17	0.032	(0.688)	0.029	0.003
32	2.67	0.17	0.032	(0.685)	0.029	0.003
33	2.75	0.17	0.032	(0.683)	0.029	0.003
34	2.83	0.17	0.032	(0.680)	0.029	0.003
35	2.92	0.17	0.032	(0.677)	0.029	0.003

36	3.00	0.17	0.032	(0.674)	0.029	0.003
37	3.08	0.17	0.032	(0.671)	0.029	0.003
38	3.17	0.17	0.032	(0.669)	0.029	0.003
39	3.25	0.17	0.032	(0.666)	0.029	0.003
40	3.33	0.17	0.032	(0.663)	0.029	0.003
41	3.42	0.17	0.032	(0.660)	0.029	0.003
42	3.50	0.17	0.032	(0.658)	0.029	0.003
43	3.58	0.17	0.032	(0.655)	0.029	0.003
44	3.67	0.17	0.032	(0.652)	0.029	0.003
45	3.75	0.17	0.032	(0.649)	0.029	0.003
46	3.83	0.20	0.038	(0.647)	0.035	0.004
47	3.92	0.20	0.038	(0.644)	0.035	0.004
48	4.00	0.20	0.038	(0.641)	0.035	0.004
49	4.08	0.20	0.038	(0.638)	0.035	0.004
50	4.17	0.20	0.038	(0.636)	0.035	0.004
51	4.25	0.20	0.038	(0.633)	0.035	0.004
52	4.33	0.23	0.045	(0.630)	0.040	0.004
53	4.42	0.23	0.045	(0.628)	0.040	0.004
54	4.50	0.23	0.045	(0.625)	0.040	0.004
55	4.58	0.23	0.045	(0.622)	0.040	0.004
56	4.67	0.23	0.045	(0.620)	0.040	0.004
57	4.75	0.23	0.045	(0.617)	0.040	0.004
58	4.83	0.27	0.051	(0.614)	0.046	0.005
59	4.92	0.27	0.051	(0.612)	0.046	0.005
60	5.00	0.27	0.051	(0.609)	0.046	0.005
61	5.08	0.20	0.038	(0.606)	0.035	0.004
62	5.17	0.20	0.038	(0.604)	0.035	0.004
63	5.25	0.20	0.038	(0.601)	0.035	0.004
64	5.33	0.23	0.045	(0.598)	0.040	0.004
65	5.42	0.23	0.045	(0.596)	0.040	0.004
66	5.50	0.23	0.045	(0.593)	0.040	0.004
67	5.58	0.27	0.051	(0.591)	0.046	0.005
68	5.67	0.27	0.051	(0.588)	0.046	0.005
69	5.75	0.27	0.051	(0.585)	0.046	0.005
70	5.83	0.27	0.051	(0.583)	0.046	0.005
71	5.92	0.27	0.051	(0.580)	0.046	0.005
72	6.00	0.27	0.051	(0.578)	0.046	0.005
73	6.08	0.30	0.058	(0.575)	0.052	0.006
74	6.17	0.30	0.058	(0.572)	0.052	0.006
75	6.25	0.30	0.058	(0.570)	0.052	0.006
76	6.33	0.30	0.058	(0.567)	0.052	0.006
77	6.42	0.30	0.058	(0.565)	0.052	0.006
78	6.50	0.30	0.058	(0.562)	0.052	0.006
79	6.58	0.33	0.064	(0.560)	0.058	0.006
80	6.67	0.33	0.064	(0.557)	0.058	0.006
81	6.75	0.33	0.064	(0.555)	0.058	0.006
82	6.83	0.33	0.064	(0.552)	0.058	0.006
83	6.92	0.33	0.064	(0.550)	0.058	0.006
84	7.00	0.33	0.064	(0.547)	0.058	0.006
85	7.08	0.33	0.064	(0.545)	0.058	0.006
86	7.17	0.33	0.064	(0.542)	0.058	0.006
87	7.25	0.33	0.064	(0.540)	0.058	0.006
88	7.33	0.37	0.070	(0.537)	0.063	0.007
89	7.42	0.37	0.070	(0.535)	0.063	0.007
90	7.50	0.37	0.070	(0.532)	0.063	0.007
91	7.58	0.40	0.077	(0.530)	0.069	0.008
92	7.67	0.40	0.077	(0.528)	0.069	0.008
93	7.75	0.40	0.077	(0.525)	0.069	0.008
94	7.83	0.43	0.083	(0.523)	0.075	0.008
95	7.92	0.43	0.083	(0.520)	0.075	0.008
96	8.00	0.43	0.083	(0.518)	0.075	0.008
97	8.08	0.50	0.096	(0.515)	0.086	0.010
98	8.17	0.50	0.096	(0.513)	0.086	0.010
99	8.25	0.50	0.096	(0.511)	0.086	0.010
100	8.33	0.50	0.096	(0.508)	0.086	0.010
101	8.42	0.50	0.096	(0.506)	0.086	0.010
102	8.50	0.50	0.096	(0.504)	0.086	0.010
103	8.58	0.53	0.102	(0.501)	0.092	0.010
104	8.67	0.53	0.102	(0.499)	0.092	0.010
105	8.75	0.53	0.102	(0.496)	0.092	0.010
106	8.83	0.57	0.109	(0.494)	0.098	0.011

107	8.92	0.57	0.109	(0.492)	0.098	0.011
108	9.00	0.57	0.109	(0.489)	0.098	0.011
109	9.08	0.63	0.122	(0.487)	0.109	0.012
110	9.17	0.63	0.122	(0.485)	0.109	0.012
111	9.25	0.63	0.122	(0.483)	0.109	0.012
112	9.33	0.67	0.128	(0.480)	0.115	0.013
113	9.42	0.67	0.128	(0.478)	0.115	0.013
114	9.50	0.67	0.128	(0.476)	0.115	0.013
115	9.58	0.70	0.134	(0.473)	0.121	0.013
116	9.67	0.70	0.134	(0.471)	0.121	0.013
117	9.75	0.70	0.134	(0.469)	0.121	0.013
118	9.83	0.73	0.141	(0.467)	0.127	0.014
119	9.92	0.73	0.141	(0.464)	0.127	0.014
120	10.00	0.73	0.141	(0.462)	0.127	0.014
121	10.08	0.50	0.096	(0.460)	0.086	0.010
122	10.17	0.50	0.096	(0.458)	0.086	0.010
123	10.25	0.50	0.096	(0.455)	0.086	0.010
124	10.33	0.50	0.096	(0.453)	0.086	0.010
125	10.42	0.50	0.096	(0.451)	0.086	0.010
126	10.50	0.50	0.096	(0.449)	0.086	0.010
127	10.58	0.67	0.128	(0.447)	0.115	0.013
128	10.67	0.67	0.128	(0.444)	0.115	0.013
129	10.75	0.67	0.128	(0.442)	0.115	0.013
130	10.83	0.67	0.128	(0.440)	0.115	0.013
131	10.92	0.67	0.128	(0.438)	0.115	0.013
132	11.00	0.67	0.128	(0.436)	0.115	0.013
133	11.08	0.63	0.122	(0.434)	0.109	0.012
134	11.17	0.63	0.122	(0.431)	0.109	0.012
135	11.25	0.63	0.122	(0.429)	0.109	0.012
136	11.33	0.63	0.122	(0.427)	0.109	0.012
137	11.42	0.63	0.122	(0.425)	0.109	0.012
138	11.50	0.63	0.122	(0.423)	0.109	0.012
139	11.58	0.57	0.109	(0.421)	0.098	0.011
140	11.67	0.57	0.109	(0.419)	0.098	0.011
141	11.75	0.57	0.109	(0.417)	0.098	0.011
142	11.83	0.60	0.115	(0.415)	0.104	0.012
143	11.92	0.60	0.115	(0.413)	0.104	0.012
144	12.00	0.60	0.115	(0.411)	0.104	0.012
145	12.08	0.83	0.160	(0.408)	0.144	0.016
146	12.17	0.83	0.160	(0.406)	0.144	0.016
147	12.25	0.83	0.160	(0.404)	0.144	0.016
148	12.33	0.87	0.166	(0.402)	0.150	0.017
149	12.42	0.87	0.166	(0.400)	0.150	0.017
150	12.50	0.87	0.166	(0.398)	0.150	0.017
151	12.58	0.93	0.179	(0.396)	0.161	0.018
152	12.67	0.93	0.179	(0.394)	0.161	0.018
153	12.75	0.93	0.179	(0.392)	0.161	0.018
154	12.83	0.97	0.186	(0.390)	0.167	0.019
155	12.92	0.97	0.186	(0.388)	0.167	0.019
156	13.00	0.97	0.186	(0.386)	0.167	0.019
157	13.08	1.13	0.218	(0.384)	0.196	0.022
158	13.17	1.13	0.218	(0.383)	0.196	0.022
159	13.25	1.13	0.218	(0.381)	0.196	0.022
160	13.33	1.13	0.218	(0.379)	0.196	0.022
161	13.42	1.13	0.218	(0.377)	0.196	0.022
162	13.50	1.13	0.218	(0.375)	0.196	0.022
163	13.58	0.77	0.147	(0.373)	0.132	0.015
164	13.67	0.77	0.147	(0.371)	0.132	0.015
165	13.75	0.77	0.147	(0.369)	0.132	0.015
166	13.83	0.77	0.147	(0.367)	0.132	0.015
167	13.92	0.77	0.147	(0.365)	0.132	0.015
168	14.00	0.77	0.147	(0.363)	0.132	0.015
169	14.08	0.90	0.173	(0.362)	0.156	0.017
170	14.17	0.90	0.173	(0.360)	0.156	0.017
171	14.25	0.90	0.173	(0.358)	0.156	0.017
172	14.33	0.87	0.166	(0.356)	0.150	0.017
173	14.42	0.87	0.166	(0.354)	0.150	0.017
174	14.50	0.87	0.166	(0.352)	0.150	0.017
175	14.58	0.87	0.166	(0.351)	0.150	0.017
176	14.67	0.87	0.166	(0.349)	0.150	0.017
177	14.75	0.87	0.166	(0.347)	0.150	0.017

178	14.83	0.83	0.160	(0.345)	0.144	0.016
179	14.92	0.83	0.160	(0.344)	0.144	0.016
180	15.00	0.83	0.160	(0.342)	0.144	0.016
181	15.08	0.80	0.154	(0.340)	0.138	0.015
182	15.17	0.80	0.154	(0.338)	0.138	0.015
183	15.25	0.80	0.154	(0.337)	0.138	0.015
184	15.33	0.77	0.147	(0.335)	0.132	0.015
185	15.42	0.77	0.147	(0.333)	0.132	0.015
186	15.50	0.77	0.147	(0.331)	0.132	0.015
187	15.58	0.63	0.122	(0.330)	0.109	0.012
188	15.67	0.63	0.122	(0.328)	0.109	0.012
189	15.75	0.63	0.122	(0.326)	0.109	0.012
190	15.83	0.63	0.122	(0.325)	0.109	0.012
191	15.92	0.63	0.122	(0.323)	0.109	0.012
192	16.00	0.63	0.122	(0.321)	0.109	0.012
193	16.08	0.13	0.026	(0.320)	0.023	0.003
194	16.17	0.13	0.026	(0.318)	0.023	0.003
195	16.25	0.13	0.026	(0.316)	0.023	0.003
196	16.33	0.13	0.026	(0.315)	0.023	0.003
197	16.42	0.13	0.026	(0.313)	0.023	0.003
198	16.50	0.13	0.026	(0.312)	0.023	0.003
199	16.58	0.10	0.019	(0.310)	0.017	0.002
200	16.67	0.10	0.019	(0.308)	0.017	0.002
201	16.75	0.10	0.019	(0.307)	0.017	0.002
202	16.83	0.10	0.019	(0.305)	0.017	0.002
203	16.92	0.10	0.019	(0.304)	0.017	0.002
204	17.00	0.10	0.019	(0.302)	0.017	0.002
205	17.08	0.17	0.032	(0.301)	0.029	0.003
206	17.17	0.17	0.032	(0.299)	0.029	0.003
207	17.25	0.17	0.032	(0.298)	0.029	0.003
208	17.33	0.17	0.032	(0.296)	0.029	0.003
209	17.42	0.17	0.032	(0.295)	0.029	0.003
210	17.50	0.17	0.032	(0.293)	0.029	0.003
211	17.58	0.17	0.032	(0.292)	0.029	0.003
212	17.67	0.17	0.032	(0.290)	0.029	0.003
213	17.75	0.17	0.032	(0.289)	0.029	0.003
214	17.83	0.13	0.026	(0.287)	0.023	0.003
215	17.92	0.13	0.026	(0.286)	0.023	0.003
216	18.00	0.13	0.026	(0.285)	0.023	0.003
217	18.08	0.13	0.026	(0.283)	0.023	0.003
218	18.17	0.13	0.026	(0.282)	0.023	0.003
219	18.25	0.13	0.026	(0.280)	0.023	0.003
220	18.33	0.13	0.026	(0.279)	0.023	0.003
221	18.42	0.13	0.026	(0.278)	0.023	0.003
222	18.50	0.13	0.026	(0.276)	0.023	0.003
223	18.58	0.10	0.019	(0.275)	0.017	0.002
224	18.67	0.10	0.019	(0.274)	0.017	0.002
225	18.75	0.10	0.019	(0.272)	0.017	0.002
226	18.83	0.07	0.013	(0.271)	0.012	0.001
227	18.92	0.07	0.013	(0.270)	0.012	0.001
228	19.00	0.07	0.013	(0.269)	0.012	0.001
229	19.08	0.10	0.019	(0.267)	0.017	0.002
230	19.17	0.10	0.019	(0.266)	0.017	0.002
231	19.25	0.10	0.019	(0.265)	0.017	0.002
232	19.33	0.13	0.026	(0.264)	0.023	0.003
233	19.42	0.13	0.026	(0.262)	0.023	0.003
234	19.50	0.13	0.026	(0.261)	0.023	0.003
235	19.58	0.10	0.019	(0.260)	0.017	0.002
236	19.67	0.10	0.019	(0.259)	0.017	0.002
237	19.75	0.10	0.019	(0.258)	0.017	0.002
238	19.83	0.07	0.013	(0.256)	0.012	0.001
239	19.92	0.07	0.013	(0.255)	0.012	0.001
240	20.00	0.07	0.013	(0.254)	0.012	0.001
241	20.08	0.10	0.019	(0.253)	0.017	0.002
242	20.17	0.10	0.019	(0.252)	0.017	0.002
243	20.25	0.10	0.019	(0.251)	0.017	0.002
244	20.33	0.10	0.019	(0.250)	0.017	0.002
245	20.42	0.10	0.019	(0.249)	0.017	0.002
246	20.50	0.10	0.019	(0.248)	0.017	0.002
247	20.58	0.10	0.019	(0.247)	0.017	0.002
248	20.67	0.10	0.019	(0.245)	0.017	0.002

249	20.75	0.10	0.019	(	0.244)	0.017	0.002
250	20.83	0.07	0.013	(	0.243)	0.012	0.001
251	20.92	0.07	0.013	(	0.242)	0.012	0.001
252	21.00	0.07	0.013	(	0.242)	0.012	0.001
253	21.08	0.10	0.019	(	0.241)	0.017	0.002
254	21.17	0.10	0.019	(	0.240)	0.017	0.002
255	21.25	0.10	0.019	(	0.239)	0.017	0.002
256	21.33	0.07	0.013	(	0.238)	0.012	0.001
257	21.42	0.07	0.013	(	0.237)	0.012	0.001
258	21.50	0.07	0.013	(	0.236)	0.012	0.001
259	21.58	0.10	0.019	(	0.235)	0.017	0.002
260	21.67	0.10	0.019	(	0.234)	0.017	0.002
261	21.75	0.10	0.019	(	0.233)	0.017	0.002
262	21.83	0.07	0.013	(	0.233)	0.012	0.001
263	21.92	0.07	0.013	(	0.232)	0.012	0.001
264	22.00	0.07	0.013	(	0.231)	0.012	0.001
265	22.08	0.10	0.019	(	0.230)	0.017	0.002
266	22.17	0.10	0.019	(	0.230)	0.017	0.002
267	22.25	0.10	0.019	(	0.229)	0.017	0.002
268	22.33	0.07	0.013	(	0.228)	0.012	0.001
269	22.42	0.07	0.013	(	0.227)	0.012	0.001
270	22.50	0.07	0.013	(	0.227)	0.012	0.001
271	22.58	0.07	0.013	(	0.226)	0.012	0.001
272	22.67	0.07	0.013	(	0.225)	0.012	0.001
273	22.75	0.07	0.013	(	0.225)	0.012	0.001
274	22.83	0.07	0.013	(	0.224)	0.012	0.001
275	22.92	0.07	0.013	(	0.224)	0.012	0.001
276	23.00	0.07	0.013	(	0.223)	0.012	0.001
277	23.08	0.07	0.013	(	0.223)	0.012	0.001
278	23.17	0.07	0.013	(	0.222)	0.012	0.001
279	23.25	0.07	0.013	(	0.222)	0.012	0.001
280	23.33	0.07	0.013	(	0.221)	0.012	0.001
281	23.42	0.07	0.013	(	0.221)	0.012	0.001
282	23.50	0.07	0.013	(	0.220)	0.012	0.001
283	23.58	0.07	0.013	(	0.220)	0.012	0.001
284	23.67	0.07	0.013	(	0.220)	0.012	0.001
285	23.75	0.07	0.013	(	0.219)	0.012	0.001
286	23.83	0.07	0.013	(	0.219)	0.012	0.001
287	23.92	0.07	0.013	(	0.219)	0.012	0.001
288	24.00	0.07	0.013	(	0.219)	0.012	0.001

(Loss Rate Not Used)

Sum = 100.0 Sum = 1.9

Flood volume = Effective rainfall 0.16(In)
times area 4.3(Ac.)/[(In)/(Ft.)] = 0.1(Ac.Ft)
Total soil loss = 1.44(In)
Total soil loss = 0.520(Ac.Ft)
Total rainfall = 1.60(In)
Flood volume = 2514.8 Cubic Feet
Total soil loss = 22633.6 Cubic Feet

Peak flow rate of this hydrograph = 0.095(CFS)

++

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

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	2.5	5.0	7.5	10.0
0+ 5	0.0000	0.00	Q	|	|	|	|
0+10	0.0000	0.00	Q	|	|	|	|
0+15	0.0001	0.01	Q	|	|	|	|
0+20	0.0001	0.01	Q	|	|	|	|
0+25	0.0002	0.01	Q	|	|	|	|
0+30	0.0002	0.01	Q	|	|	|	|
0+35	0.0003	0.01	Q	|	|	|	|
0+40	0.0004	0.01	Q	|	|	|	|
0+45	0.0004	0.01	Q	|	|	|	|
0+50	0.0005	0.01	Q	|	|	|	|

0+55	0.0006	0.01	Q	|	|	|	|
1+ 0	0.0006	0.01	Q	|	|	|	|
1+ 5	0.0007	0.01	Q	|	|	|	|
1+10	0.0008	0.01	Q	|	|	|	|
1+15	0.0008	0.01	Q	|	|	|	|
1+20	0.0009	0.01	Q	|	|	|	|
1+25	0.0009	0.01	Q	|	|	|	|
1+30	0.0010	0.01	Q	|	|	|	|
1+35	0.0011	0.01	Q	|	|	|	|
1+40	0.0011	0.01	Q	|	|	|	|
1+45	0.0012	0.01	Q	|	|	|	|
1+50	0.0012	0.01	Q	|	|	|	|
1+55	0.0013	0.01	Q	|	|	|	|
2+ 0	0.0014	0.01	Q	|	|	|	|
2+ 5	0.0015	0.01	QV	|	|	|	|
2+10	0.0015	0.01	QV	|	|	|	|
2+15	0.0016	0.01	QV	|	|	|	|
2+20	0.0017	0.01	QV	|	|	|	|
2+25	0.0018	0.01	QV	|	|	|	|
2+30	0.0018	0.01	QV	|	|	|	|
2+35	0.0019	0.01	QV	|	|	|	|
2+40	0.0020	0.01	QV	|	|	|	|
2+45	0.0021	0.01	QV	|	|	|	|
2+50	0.0022	0.01	QV	|	|	|	|
2+55	0.0023	0.01	QV	|	|	|	|
3+ 0	0.0024	0.01	QV	|	|	|	|
3+ 5	0.0025	0.01	QV	|	|	|	|
3+10	0.0026	0.01	QV	|	|	|	|
3+15	0.0027	0.01	QV	|	|	|	|
3+20	0.0028	0.01	QV	|	|	|	|
3+25	0.0029	0.01	Q V	|	|	|	|
3+30	0.0030	0.01	Q V	|	|	|	|
3+35	0.0031	0.01	Q V	|	|	|	|
3+40	0.0032	0.01	Q V	|	|	|	|
3+45	0.0033	0.01	Q V	|	|	|	|
3+50	0.0034	0.02	Q V	|	|	|	|
3+55	0.0035	0.02	Q V	|	|	|	|
4+ 0	0.0036	0.02	Q V	|	|	|	|
4+ 5	0.0037	0.02	Q V	|	|	|	|
4+10	0.0038	0.02	Q V	|	|	|	|
4+15	0.0040	0.02	Q V	|	|	|	|
4+20	0.0041	0.02	Q V	|	|	|	|
4+25	0.0042	0.02	Q V	|	|	|	|
4+30	0.0043	0.02	Q V	|	|	|	|
4+35	0.0045	0.02	Q V	|	|	|	|
4+40	0.0046	0.02	Q V	|	|	|	|
4+45	0.0047	0.02	Q V	|	|	|	|
4+50	0.0049	0.02	Q V	|	|	|	|
4+55	0.0050	0.02	Q V	|	|	|	|
5+ 0	0.0052	0.02	Q V	|	|	|	|
5+ 5	0.0053	0.02	Q V	|	|	|	|
5+10	0.0054	0.02	Q V	|	|	|	|
5+15	0.0056	0.02	Q V	|	|	|	|
5+20	0.0057	0.02	Q V	|	|	|	|
5+25	0.0058	0.02	Q V	|	|	|	|
5+30	0.0060	0.02	Q V	|	|	|	|
5+35	0.0061	0.02	Q V	|	|	|	|
5+40	0.0063	0.02	Q V	|	|	|	|
5+45	0.0064	0.02	Q V	|	|	|	|
5+50	0.0066	0.02	Q V	|	|	|	|
5+55	0.0067	0.02	Q V	|	|	|	|
6+ 0	0.0069	0.02	Q V	|	|	|	|
6+ 5	0.0070	0.02	Q V	|	|	|	|
6+10	0.0072	0.02	Q V	|	|	|	|
6+15	0.0074	0.03	Q V	|	|	|	|
6+20	0.0075	0.03	Q V	|	|	|	|
6+25	0.0077	0.03	Q V	|	|	|	|
6+30	0.0079	0.03	Q V	|	|	|	|
6+35	0.0081	0.03	Q V	|	|	|	|
6+40	0.0083	0.03	Q V	|	|	|	|
6+45	0.0085	0.03	Q V	|	|	|	|

6+50	0.0086	0.03	Q	V	|	|	|	|
6+55	0.0088	0.03	Q	V	|	|	|	|
7+ 0	0.0090	0.03	Q	V	|	|	|	|
7+ 5	0.0092	0.03	Q	V	|	|	|	|
7+10	0.0094	0.03	Q	V	|	|	|	|
7+15	0.0096	0.03	Q	V	|	|	|	|
7+20	0.0098	0.03	Q	V	|	|	|	|
7+25	0.0100	0.03	Q	V	|	|	|	|
7+30	0.0102	0.03	Q	V	|	|	|	|
7+35	0.0104	0.03	Q	V	|	|	|	|
7+40	0.0107	0.03	Q	V	|	|	|	|
7+45	0.0109	0.03	Q	V	|	|	|	|
7+50	0.0111	0.03	Q	V	|	|	|	|
7+55	0.0114	0.04	Q	V	|	|	|	|
8+ 0	0.0116	0.04	Q	V	|	|	|	|
8+ 5	0.0119	0.04	Q	V	|	|	|	|
8+10	0.0122	0.04	Q	V	|	|	|	|
8+15	0.0125	0.04	Q	V	|	|	|	|
8+20	0.0128	0.04	Q	V	|	|	|	|
8+25	0.0131	0.04	Q	V	|	|	|	|
8+30	0.0133	0.04	Q	V	|	|	|	|
8+35	0.0136	0.04	Q	V	|	|	|	|
8+40	0.0139	0.04	Q	V	|	|	|	|
8+45	0.0142	0.04	Q	V	|	|	|	|
8+50	0.0146	0.05	Q	V	|	|	|	|
8+55	0.0149	0.05	Q	V	|	|	|	|
9+ 0	0.0152	0.05	Q	V	|	|	|	|
9+ 5	0.0156	0.05	Q	V	|	|	|	|
9+10	0.0159	0.05	Q	|	V	|	|	|
9+15	0.0163	0.05	Q	|	V	|	|	|
9+20	0.0167	0.05	Q	|	V	|	|	|
9+25	0.0170	0.06	Q	|	V	|	|	|
9+30	0.0174	0.06	Q	|	V	|	|	|
9+35	0.0178	0.06	Q	|	V	|	|	|
9+40	0.0182	0.06	Q	|	V	|	|	|
9+45	0.0186	0.06	Q	|	V	|	|	|
9+50	0.0190	0.06	Q	|	V	|	|	|
9+55	0.0195	0.06	Q	|	V	|	|	|
10+ 0	0.0199	0.06	Q	|	V	|	|	|
10+ 5	0.0202	0.05	Q	|	V	|	|	|
10+10	0.0205	0.04	Q	|	V	|	|	|
10+15	0.0208	0.04	Q	|	V	|	|	|
10+20	0.0211	0.04	Q	|	V	|	|	|
10+25	0.0214	0.04	Q	|	V	|	|	|
10+30	0.0217	0.04	Q	|	V	|	|	|
10+35	0.0220	0.05	Q	|	V	|	|	|
10+40	0.0224	0.05	Q	|	V	|	|	|
10+45	0.0228	0.06	Q	|	V	|	|	|
10+50	0.0232	0.06	Q	|	V	|	|	|
10+55	0.0236	0.06	Q	|	V	|	|	|
11+ 0	0.0239	0.06	Q	|	V	|	|	|
11+ 5	0.0243	0.05	Q	|	V	|	|	|
11+10	0.0247	0.05	Q	|	V	|	|	|
11+15	0.0251	0.05	Q	|	V	|	|	|
11+20	0.0254	0.05	Q	|	V	|	|	|
11+25	0.0258	0.05	Q	|	V	|	|	|
11+30	0.0262	0.05	Q	|	V	|	|	|
11+35	0.0265	0.05	Q	|	V	|	|	|
11+40	0.0268	0.05	Q	|	V	|	|	|
11+45	0.0272	0.05	Q	|	V	|	|	|
11+50	0.0275	0.05	Q	|	V	|	|	|
11+55	0.0278	0.05	Q	|	V	|	|	|
12+ 0	0.0282	0.05	Q	|	V	|	|	|
12+ 5	0.0286	0.06	Q	|	V	|	|	|
12+10	0.0291	0.07	Q	|	V	|	|	|
12+15	0.0295	0.07	Q	|	V	|	|	|
12+20	0.0300	0.07	Q	|	V	|	|	|
12+25	0.0305	0.07	Q	|	V	|	|	|
12+30	0.0310	0.07	Q	|	V	|	|	|
12+35	0.0315	0.07	Q	|	V	|	|	|
12+40	0.0321	0.08	Q	|	V	|	|	|

12+45	0.0326	0.08	Q	|	| V	|	|
12+50	0.0331	0.08	Q	|	| V	|	|
12+55	0.0337	0.08	Q	|	| V	|	|
13+ 0	0.0343	0.08	Q	|	| V	|	|
13+ 5	0.0349	0.09	Q	|	| V	|	|
13+10	0.0355	0.09	Q	|	| V	|	|
13+15	0.0361	0.09	Q	|	| V	|	|
13+20	0.0368	0.09	Q	|	| V	|	|
13+25	0.0375	0.10	Q	|	| V	|	|
13+30	0.0381	0.10	Q	|	| V	|	|
13+35	0.0387	0.08	Q	|	| V	|	|
13+40	0.0391	0.07	Q	|	| V	|	|
13+45	0.0396	0.07	Q	|	| V	|	|
13+50	0.0400	0.06	Q	|	| V	|	|
13+55	0.0405	0.06	Q	|	| V	|	|
14+ 0	0.0409	0.06	Q	|	| V	|	|
14+ 5	0.0414	0.07	Q	|	| V	|	|
14+10	0.0419	0.07	Q	|	| V	|	|
14+15	0.0424	0.07	Q	|	| V	|	|
14+20	0.0429	0.07	Q	|	| V	|	|
14+25	0.0434	0.07	Q	|	| V	|	|
14+30	0.0439	0.07	Q	|	| V	|	|
14+35	0.0444	0.07	Q	|	| V	|	|
14+40	0.0449	0.07	Q	|	| V	|	|
14+45	0.0454	0.07	Q	|	| V	|	|
14+50	0.0459	0.07	Q	|	| V	|	|
14+55	0.0464	0.07	Q	|	| V	|	|
15+ 0	0.0469	0.07	Q	|	| V	|	|
15+ 5	0.0474	0.07	Q	|	| V	|	|
15+10	0.0478	0.07	Q	|	| V	|	|
15+15	0.0483	0.07	Q	|	| V	|	|
15+20	0.0488	0.07	Q	|	| V	|	|
15+25	0.0492	0.06	Q	|	| V	|	|
15+30	0.0496	0.06	Q	|	| V	|	|
15+35	0.0501	0.06	Q	|	| V	|	|
15+40	0.0504	0.05	Q	|	| V	|	|
15+45	0.0508	0.05	Q	|	| V	|	|
15+50	0.0512	0.05	Q	|	| V	|	|
15+55	0.0515	0.05	Q	|	| V	|	|
16+ 0	0.0519	0.05	Q	|	| V	|	|
16+ 5	0.0521	0.04	Q	|	| V	|	|
16+10	0.0523	0.02	Q	|	| V	|	|
16+15	0.0524	0.01	Q	|	| V	|	|
16+20	0.0524	0.01	Q	|	| V	|	|
16+25	0.0525	0.01	Q	|	| V	|	|
16+30	0.0526	0.01	Q	|	| V	|	|
16+35	0.0527	0.01	Q	|	| V	|	|
16+40	0.0527	0.01	Q	|	| V	|	|
16+45	0.0528	0.01	Q	|	| V	|	|
16+50	0.0528	0.01	Q	|	| V	|	|
16+55	0.0529	0.01	Q	|	| V	|	|
17+ 0	0.0530	0.01	Q	|	| V	|	|
17+ 5	0.0530	0.01	Q	|	| V	|	|
17+10	0.0531	0.01	Q	|	| V	|	|
17+15	0.0532	0.01	Q	|	| V	|	|
17+20	0.0533	0.01	Q	|	| V	|	|
17+25	0.0534	0.01	Q	|	| V	|	|
17+30	0.0535	0.01	Q	|	| V	|	|
17+35	0.0536	0.01	Q	|	| V	|	|
17+40	0.0537	0.01	Q	|	| V	|	|
17+45	0.0538	0.01	Q	|	| V	|	|
17+50	0.0539	0.01	Q	|	| V	|	|
17+55	0.0540	0.01	Q	|	| V	|	|
18+ 0	0.0540	0.01	Q	|	| V	|	|
18+ 5	0.0541	0.01	Q	|	| V	|	|
18+10	0.0542	0.01	Q	|	| V	|	|
18+15	0.0543	0.01	Q	|	| V	|	|
18+20	0.0543	0.01	Q	|	| V	|	|
18+25	0.0544	0.01	Q	|	| V	|	|
18+30	0.0545	0.01	Q	|	| V	|	|
18+35	0.0546	0.01	Q	|	| V	|	|

18+40	0.0546	0.01	Q	|	|	|	V |
18+45	0.0547	0.01	Q	|	|	|	V |
18+50	0.0547	0.01	Q	|	|	|	V |
18+55	0.0548	0.01	Q	|	|	|	V |
19+ 0	0.0548	0.01	Q	|	|	|	V |
19+ 5	0.0549	0.01	Q	|	|	|	V |
19+10	0.0549	0.01	Q	|	|	|	V |
19+15	0.0550	0.01	Q	|	|	|	V |
19+20	0.0550	0.01	Q	|	|	|	V |
19+25	0.0551	0.01	Q	|	|	|	V |
19+30	0.0552	0.01	Q	|	|	|	V |
19+35	0.0553	0.01	Q	|	|	|	V |
19+40	0.0553	0.01	Q	|	|	|	V |
19+45	0.0554	0.01	Q	|	|	|	V |
19+50	0.0554	0.01	Q	|	|	|	V |
19+55	0.0555	0.01	Q	|	|	|	V |
20+ 0	0.0555	0.01	Q	|	|	|	V |
20+ 5	0.0556	0.01	Q	|	|	|	V |
20+10	0.0556	0.01	Q	|	|	|	V |
20+15	0.0557	0.01	Q	|	|	|	V |
20+20	0.0557	0.01	Q	|	|	|	V |
20+25	0.0558	0.01	Q	|	|	|	V |
20+30	0.0558	0.01	Q	|	|	|	V |
20+35	0.0559	0.01	Q	|	|	|	V |
20+40	0.0560	0.01	Q	|	|	|	V |
20+45	0.0560	0.01	Q	|	|	|	V |
20+50	0.0561	0.01	Q	|	|	|	V |
20+55	0.0561	0.01	Q	|	|	|	V |
21+ 0	0.0561	0.01	Q	|	|	|	V |
21+ 5	0.0562	0.01	Q	|	|	|	V |
21+10	0.0562	0.01	Q	|	|	|	V |
21+15	0.0563	0.01	Q	|	|	|	V|
21+20	0.0564	0.01	Q	|	|	|	V|
21+25	0.0564	0.01	Q	|	|	|	V|
21+30	0.0564	0.01	Q	|	|	|	V|
21+35	0.0565	0.01	Q	|	|	|	V|
21+40	0.0565	0.01	Q	|	|	|	V|
21+45	0.0566	0.01	Q	|	|	|	V|
21+50	0.0566	0.01	Q	|	|	|	V|
21+55	0.0567	0.01	Q	|	|	|	V|
22+ 0	0.0567	0.01	Q	|	|	|	V|
22+ 5	0.0568	0.01	Q	|	|	|	V|
22+10	0.0568	0.01	Q	|	|	|	V|
22+15	0.0569	0.01	Q	|	|	|	V|
22+20	0.0569	0.01	Q	|	|	|	V|
22+25	0.0570	0.01	Q	|	|	|	V|
22+30	0.0570	0.01	Q	|	|	|	V|
22+35	0.0570	0.01	Q	|	|	|	V|
22+40	0.0571	0.01	Q	|	|	|	V|
22+45	0.0571	0.01	Q	|	|	|	V|
22+50	0.0572	0.01	Q	|	|	|	V|
22+55	0.0572	0.01	Q	|	|	|	V|
23+ 0	0.0572	0.01	Q	|	|	|	V|
23+ 5	0.0573	0.01	Q	|	|	|	V|
23+10	0.0573	0.01	Q	|	|	|	V|
23+15	0.0574	0.01	Q	|	|	|	V|
23+20	0.0574	0.01	Q	|	|	|	V|
23+25	0.0574	0.01	Q	|	|	|	V|
23+30	0.0575	0.01	Q	|	|	|	V|
23+35	0.0575	0.01	Q	|	|	|	V|
23+40	0.0575	0.01	Q	|	|	|	V|
23+45	0.0576	0.01	Q	|	|	|	V|
23+50	0.0576	0.01	Q	|	|	|	V|
23+55	0.0577	0.01	Q	|	|	|	V|
24+ 0	0.0577	0.01	Q	|	|	|	V|
24+ 5	0.0577	0.00	Q	|	|	|	V|
24+10	0.0577	0.00	Q	|	|	|	V|
24+15	0.0577	0.00	Q	|	|	|	V|
24+20	0.0577	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 01/04/22 File: 19004UNDEVHYD2410.out

++

Riverside County Synthetic Unit Hydrology Method
RCFC & WCD Manual date - April 1978

Program License Serial Number 6106

English (in-lb) Input Units Used
English Rainfall Data (Inches) Input Values Used

English Units used in output format

19-004 UNDEVELOPED CONDITION HYDROGRAPHY METHOD 10 YEAR 24 HOUR EVENT

Drainage Area = 4.33(Ac.) = 0.007 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 4.33(Ac.) = 0.007 Sq. Mi.
Length along longest watercourse = 604.20(Ft.)
Length along longest watercourse measured to centroid = 369.00(Ft.)
Length along longest watercourse = 0.114 Mi.
Length along longest watercourse measured to centroid = 0.070 Mi.
Difference in elevation = 19.00(Ft.)
Slope along watercourse = 166.0377 Ft./Mi.
Average Manning's 'N' = 0.030
Lag time = 0.044 Hr.
Lag time = 2.61 Min.
25% of lag time = 0.65 Min.
40% of lag time = 1.04 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]
4.33	1.60	6.93

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
4.33	4.10	17.75

STORM EVENT (YEAR) = 10.00
Area Averaged 2-Year Rainfall = 1.600(In)
Area Averaged 100-Year Rainfall = 4.100(In)

Point rain (area averaged) = 2.629(In)
Areal adjustment factor = 100.00 %
Adjusted average point rain = 2.628(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
4.330	80.00	0.000

Total Area Entered = 4.33(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
80.0	80.0	0.244	0.000	0.244	1.000	0.244
					Sum (F) =	0.244

Area averaged mean soil loss (F) (In/Hr) = 0.244
Minimum soil loss rate ((In/Hr)) = 0.122
(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	191.518	41.897	1.828
2	0.167	383.035	43.964	1.918
3	0.250	574.553	9.149	0.399
4	0.333	766.070	3.628	0.158
5	0.417	957.588	1.363	0.059
			Sum = 100.000 Sum=	4.364

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	0.021	(0.433)	0.019	0.002
2	0.17	0.07	0.021	(0.431)	0.019	0.002
3	0.25	0.07	0.021	(0.429)	0.019	0.002
4	0.33	0.10	0.032	(0.428)	0.028	0.003
5	0.42	0.10	0.032	(0.426)	0.028	0.003
6	0.50	0.10	0.032	(0.424)	0.028	0.003
7	0.58	0.10	0.032	(0.423)	0.028	0.003
8	0.67	0.10	0.032	(0.421)	0.028	0.003
9	0.75	0.10	0.032	(0.419)	0.028	0.003
10	0.83	0.13	0.042	(0.418)	0.038	0.004
11	0.92	0.13	0.042	(0.416)	0.038	0.004
12	1.00	0.13	0.042	(0.414)	0.038	0.004
13	1.08	0.10	0.032	(0.413)	0.028	0.003
14	1.17	0.10	0.032	(0.411)	0.028	0.003
15	1.25	0.10	0.032	(0.409)	0.028	0.003
16	1.33	0.10	0.032	(0.408)	0.028	0.003
17	1.42	0.10	0.032	(0.406)	0.028	0.003
18	1.50	0.10	0.032	(0.405)	0.028	0.003
19	1.58	0.10	0.032	(0.403)	0.028	0.003
20	1.67	0.10	0.032	(0.401)	0.028	0.003
21	1.75	0.10	0.032	(0.400)	0.028	0.003
22	1.83	0.13	0.042	(0.398)	0.038	0.004
23	1.92	0.13	0.042	(0.396)	0.038	0.004
24	2.00	0.13	0.042	(0.395)	0.038	0.004
25	2.08	0.13	0.042	(0.393)	0.038	0.004
26	2.17	0.13	0.042	(0.392)	0.038	0.004
27	2.25	0.13	0.042	(0.390)	0.038	0.004
28	2.33	0.13	0.042	(0.389)	0.038	0.004
29	2.42	0.13	0.042	(0.387)	0.038	0.004
30	2.50	0.13	0.042	(0.385)	0.038	0.004
31	2.58	0.17	0.053	(0.384)	0.047	0.005
32	2.67	0.17	0.053	(0.382)	0.047	0.005
33	2.75	0.17	0.053	(0.381)	0.047	0.005
34	2.83	0.17	0.053	(0.379)	0.047	0.005
35	2.92	0.17	0.053	(0.378)	0.047	0.005
36	3.00	0.17	0.053	(0.376)	0.047	0.005

37	3.08	0.17	0.053	(0.374)	0.047	0.005
38	3.17	0.17	0.053	(0.373)	0.047	0.005
39	3.25	0.17	0.053	(0.371)	0.047	0.005
40	3.33	0.17	0.053	(0.370)	0.047	0.005
41	3.42	0.17	0.053	(0.368)	0.047	0.005
42	3.50	0.17	0.053	(0.367)	0.047	0.005
43	3.58	0.17	0.053	(0.365)	0.047	0.005
44	3.67	0.17	0.053	(0.364)	0.047	0.005
45	3.75	0.17	0.053	(0.362)	0.047	0.005
46	3.83	0.20	0.063	(0.361)	0.057	0.006
47	3.92	0.20	0.063	(0.359)	0.057	0.006
48	4.00	0.20	0.063	(0.357)	0.057	0.006
49	4.08	0.20	0.063	(0.356)	0.057	0.006
50	4.17	0.20	0.063	(0.354)	0.057	0.006
51	4.25	0.20	0.063	(0.353)	0.057	0.006
52	4.33	0.23	0.074	(0.351)	0.066	0.007
53	4.42	0.23	0.074	(0.350)	0.066	0.007
54	4.50	0.23	0.074	(0.348)	0.066	0.007
55	4.58	0.23	0.074	(0.347)	0.066	0.007
56	4.67	0.23	0.074	(0.345)	0.066	0.007
57	4.75	0.23	0.074	(0.344)	0.066	0.007
58	4.83	0.27	0.084	(0.342)	0.076	0.008
59	4.92	0.27	0.084	(0.341)	0.076	0.008
60	5.00	0.27	0.084	(0.340)	0.076	0.008
61	5.08	0.20	0.063	(0.338)	0.057	0.006
62	5.17	0.20	0.063	(0.337)	0.057	0.006
63	5.25	0.20	0.063	(0.335)	0.057	0.006
64	5.33	0.23	0.074	(0.334)	0.066	0.007
65	5.42	0.23	0.074	(0.332)	0.066	0.007
66	5.50	0.23	0.074	(0.331)	0.066	0.007
67	5.58	0.27	0.084	(0.329)	0.076	0.008
68	5.67	0.27	0.084	(0.328)	0.076	0.008
69	5.75	0.27	0.084	(0.326)	0.076	0.008
70	5.83	0.27	0.084	(0.325)	0.076	0.008
71	5.92	0.27	0.084	(0.324)	0.076	0.008
72	6.00	0.27	0.084	(0.322)	0.076	0.008
73	6.08	0.30	0.095	(0.321)	0.085	0.009
74	6.17	0.30	0.095	(0.319)	0.085	0.009
75	6.25	0.30	0.095	(0.318)	0.085	0.009
76	6.33	0.30	0.095	(0.316)	0.085	0.009
77	6.42	0.30	0.095	(0.315)	0.085	0.009
78	6.50	0.30	0.095	(0.314)	0.085	0.009
79	6.58	0.33	0.105	(0.312)	0.095	0.011
80	6.67	0.33	0.105	(0.311)	0.095	0.011
81	6.75	0.33	0.105	(0.309)	0.095	0.011
82	6.83	0.33	0.105	(0.308)	0.095	0.011
83	6.92	0.33	0.105	(0.307)	0.095	0.011
84	7.00	0.33	0.105	(0.305)	0.095	0.011
85	7.08	0.33	0.105	(0.304)	0.095	0.011
86	7.17	0.33	0.105	(0.302)	0.095	0.011
87	7.25	0.33	0.105	(0.301)	0.095	0.011
88	7.33	0.37	0.116	(0.300)	0.104	0.012
89	7.42	0.37	0.116	(0.298)	0.104	0.012
90	7.50	0.37	0.116	(0.297)	0.104	0.012
91	7.58	0.40	0.126	(0.296)	0.114	0.013
92	7.67	0.40	0.126	(0.294)	0.114	0.013
93	7.75	0.40	0.126	(0.293)	0.114	0.013
94	7.83	0.43	0.137	(0.291)	0.123	0.014
95	7.92	0.43	0.137	(0.290)	0.123	0.014
96	8.00	0.43	0.137	(0.289)	0.123	0.014
97	8.08	0.50	0.158	(0.287)	0.142	0.016
98	8.17	0.50	0.158	(0.286)	0.142	0.016
99	8.25	0.50	0.158	(0.285)	0.142	0.016
100	8.33	0.50	0.158	(0.283)	0.142	0.016
101	8.42	0.50	0.158	(0.282)	0.142	0.016
102	8.50	0.50	0.158	(0.281)	0.142	0.016
103	8.58	0.53	0.168	(0.279)	0.151	0.017
104	8.67	0.53	0.168	(0.278)	0.151	0.017
105	8.75	0.53	0.168	(0.277)	0.151	0.017
106	8.83	0.57	0.179	(0.276)	0.161	0.018
107	8.92	0.57	0.179	(0.274)	0.161	0.018

108	9.00	0.57	0.179	(0.273)	0.161	0.018
109	9.08	0.63	0.200	(0.272)	0.180	0.020
110	9.17	0.63	0.200	(0.270)	0.180	0.020
111	9.25	0.63	0.200	(0.269)	0.180	0.020
112	9.33	0.67	0.210	(0.268)	0.189	0.021
113	9.42	0.67	0.210	(0.266)	0.189	0.021
114	9.50	0.67	0.210	(0.265)	0.189	0.021
115	9.58	0.70	0.221	(0.264)	0.199	0.022
116	9.67	0.70	0.221	(0.263)	0.199	0.022
117	9.75	0.70	0.221	(0.261)	0.199	0.022
118	9.83	0.73	0.231	(0.260)	0.208	0.023
119	9.92	0.73	0.231	(0.259)	0.208	0.023
120	10.00	0.73	0.231	(0.258)	0.208	0.023
121	10.08	0.50	0.158	(0.256)	0.142	0.016
122	10.17	0.50	0.158	(0.255)	0.142	0.016
123	10.25	0.50	0.158	(0.254)	0.142	0.016
124	10.33	0.50	0.158	(0.253)	0.142	0.016
125	10.42	0.50	0.158	(0.251)	0.142	0.016
126	10.50	0.50	0.158	(0.250)	0.142	0.016
127	10.58	0.67	0.210	(0.249)	0.189	0.021
128	10.67	0.67	0.210	(0.248)	0.189	0.021
129	10.75	0.67	0.210	(0.247)	0.189	0.021
130	10.83	0.67	0.210	(0.245)	0.189	0.021
131	10.92	0.67	0.210	(0.244)	0.189	0.021
132	11.00	0.67	0.210	(0.243)	0.189	0.021
133	11.08	0.63	0.200	(0.242)	0.180	0.020
134	11.17	0.63	0.200	(0.241)	0.180	0.020
135	11.25	0.63	0.200	(0.239)	0.180	0.020
136	11.33	0.63	0.200	(0.238)	0.180	0.020
137	11.42	0.63	0.200	(0.237)	0.180	0.020
138	11.50	0.63	0.200	(0.236)	0.180	0.020
139	11.58	0.57	0.179	(0.235)	0.161	0.018
140	11.67	0.57	0.179	(0.234)	0.161	0.018
141	11.75	0.57	0.179	(0.232)	0.161	0.018
142	11.83	0.60	0.189	(0.231)	0.170	0.019
143	11.92	0.60	0.189	(0.230)	0.170	0.019
144	12.00	0.60	0.189	(0.229)	0.170	0.019
145	12.08	0.83	0.263	0.228	(0.237)	0.035
146	12.17	0.83	0.263	0.227	(0.237)	0.036
147	12.25	0.83	0.263	0.225	(0.237)	0.037
148	12.33	0.87	0.273	0.224	(0.246)	0.049
149	12.42	0.87	0.273	0.223	(0.246)	0.050
150	12.50	0.87	0.273	0.222	(0.246)	0.051
151	12.58	0.93	0.294	0.221	(0.265)	0.073
152	12.67	0.93	0.294	0.220	(0.265)	0.075
153	12.75	0.93	0.294	0.219	(0.265)	0.076
154	12.83	0.97	0.305	0.218	(0.274)	0.087
155	12.92	0.97	0.305	0.217	(0.274)	0.088
156	13.00	0.97	0.305	0.215	(0.274)	0.089
157	13.08	1.13	0.357	0.214	(0.322)	0.143
158	13.17	1.13	0.357	0.213	(0.322)	0.144
159	13.25	1.13	0.357	0.212	(0.322)	0.145
160	13.33	1.13	0.357	0.211	(0.322)	0.146
161	13.42	1.13	0.357	0.210	(0.322)	0.147
162	13.50	1.13	0.357	0.209	(0.322)	0.148
163	13.58	0.77	0.242	0.208	(0.218)	0.034
164	13.67	0.77	0.242	0.207	(0.218)	0.035
165	13.75	0.77	0.242	0.206	(0.218)	0.036
166	13.83	0.77	0.242	0.205	(0.218)	0.037
167	13.92	0.77	0.242	0.204	(0.218)	0.038
168	14.00	0.77	0.242	0.203	(0.218)	0.039
169	14.08	0.90	0.284	0.202	(0.255)	0.082
170	14.17	0.90	0.284	0.201	(0.255)	0.083
171	14.25	0.90	0.284	0.200	(0.255)	0.084
172	14.33	0.87	0.273	0.199	(0.246)	0.075
173	14.42	0.87	0.273	0.198	(0.246)	0.076
174	14.50	0.87	0.273	0.197	(0.246)	0.077
175	14.58	0.87	0.273	0.196	(0.246)	0.078
176	14.67	0.87	0.273	0.195	(0.246)	0.079
177	14.75	0.87	0.273	0.194	(0.246)	0.080
178	14.83	0.83	0.263	0.193	(0.237)	0.070

179	14.92	0.83	0.263	0.192	(0.237)	0.071
180	15.00	0.83	0.263	0.191	(0.237)	0.072
181	15.08	0.80	0.252	0.190	(0.227)	0.063
182	15.17	0.80	0.252	0.189	(0.227)	0.064
183	15.25	0.80	0.252	0.188	(0.227)	0.065
184	15.33	0.77	0.242	0.187	(0.218)	0.055
185	15.42	0.77	0.242	0.186	(0.218)	0.056
186	15.50	0.77	0.242	0.185	(0.218)	0.057
187	15.58	0.63	0.200	(0.184)	0.180	0.020
188	15.67	0.63	0.200	(0.183)	0.180	0.020
189	15.75	0.63	0.200	(0.182)	0.180	0.020
190	15.83	0.63	0.200	(0.181)	0.180	0.020
191	15.92	0.63	0.200	(0.180)	0.180	0.020
192	16.00	0.63	0.200	0.179	(0.180)	0.021
193	16.08	0.13	0.042	(0.178)	0.038	0.004
194	16.17	0.13	0.042	(0.177)	0.038	0.004
195	16.25	0.13	0.042	(0.176)	0.038	0.004
196	16.33	0.13	0.042	(0.176)	0.038	0.004
197	16.42	0.13	0.042	(0.175)	0.038	0.004
198	16.50	0.13	0.042	(0.174)	0.038	0.004
199	16.58	0.10	0.032	(0.173)	0.028	0.003
200	16.67	0.10	0.032	(0.172)	0.028	0.003
201	16.75	0.10	0.032	(0.171)	0.028	0.003
202	16.83	0.10	0.032	(0.170)	0.028	0.003
203	16.92	0.10	0.032	(0.169)	0.028	0.003
204	17.00	0.10	0.032	(0.169)	0.028	0.003
205	17.08	0.17	0.053	(0.168)	0.047	0.005
206	17.17	0.17	0.053	(0.167)	0.047	0.005
207	17.25	0.17	0.053	(0.166)	0.047	0.005
208	17.33	0.17	0.053	(0.165)	0.047	0.005
209	17.42	0.17	0.053	(0.164)	0.047	0.005
210	17.50	0.17	0.053	(0.164)	0.047	0.005
211	17.58	0.17	0.053	(0.163)	0.047	0.005
212	17.67	0.17	0.053	(0.162)	0.047	0.005
213	17.75	0.17	0.053	(0.161)	0.047	0.005
214	17.83	0.13	0.042	(0.160)	0.038	0.004
215	17.92	0.13	0.042	(0.159)	0.038	0.004
216	18.00	0.13	0.042	(0.159)	0.038	0.004
217	18.08	0.13	0.042	(0.158)	0.038	0.004
218	18.17	0.13	0.042	(0.157)	0.038	0.004
219	18.25	0.13	0.042	(0.156)	0.038	0.004
220	18.33	0.13	0.042	(0.156)	0.038	0.004
221	18.42	0.13	0.042	(0.155)	0.038	0.004
222	18.50	0.13	0.042	(0.154)	0.038	0.004
223	18.58	0.10	0.032	(0.153)	0.028	0.003
224	18.67	0.10	0.032	(0.153)	0.028	0.003
225	18.75	0.10	0.032	(0.152)	0.028	0.003
226	18.83	0.07	0.021	(0.151)	0.019	0.002
227	18.92	0.07	0.021	(0.150)	0.019	0.002
228	19.00	0.07	0.021	(0.150)	0.019	0.002
229	19.08	0.10	0.032	(0.149)	0.028	0.003
230	19.17	0.10	0.032	(0.148)	0.028	0.003
231	19.25	0.10	0.032	(0.148)	0.028	0.003
232	19.33	0.13	0.042	(0.147)	0.038	0.004
233	19.42	0.13	0.042	(0.146)	0.038	0.004
234	19.50	0.13	0.042	(0.146)	0.038	0.004
235	19.58	0.10	0.032	(0.145)	0.028	0.003
236	19.67	0.10	0.032	(0.144)	0.028	0.003
237	19.75	0.10	0.032	(0.144)	0.028	0.003
238	19.83	0.07	0.021	(0.143)	0.019	0.002
239	19.92	0.07	0.021	(0.142)	0.019	0.002
240	20.00	0.07	0.021	(0.142)	0.019	0.002
241	20.08	0.10	0.032	(0.141)	0.028	0.003
242	20.17	0.10	0.032	(0.140)	0.028	0.003
243	20.25	0.10	0.032	(0.140)	0.028	0.003
244	20.33	0.10	0.032	(0.139)	0.028	0.003
245	20.42	0.10	0.032	(0.139)	0.028	0.003
246	20.50	0.10	0.032	(0.138)	0.028	0.003
247	20.58	0.10	0.032	(0.137)	0.028	0.003
248	20.67	0.10	0.032	(0.137)	0.028	0.003
249	20.75	0.10	0.032	(0.136)	0.028	0.003

250	20.83	0.07	0.021	(0.136)	0.019	0.002
251	20.92	0.07	0.021	(0.135)	0.019	0.002
252	21.00	0.07	0.021	(0.135)	0.019	0.002
253	21.08	0.10	0.032	(0.134)	0.028	0.003
254	21.17	0.10	0.032	(0.134)	0.028	0.003
255	21.25	0.10	0.032	(0.133)	0.028	0.003
256	21.33	0.07	0.021	(0.133)	0.019	0.002
257	21.42	0.07	0.021	(0.132)	0.019	0.002
258	21.50	0.07	0.021	(0.132)	0.019	0.002
259	21.58	0.10	0.032	(0.131)	0.028	0.003
260	21.67	0.10	0.032	(0.131)	0.028	0.003
261	21.75	0.10	0.032	(0.130)	0.028	0.003
262	21.83	0.07	0.021	(0.130)	0.019	0.002
263	21.92	0.07	0.021	(0.129)	0.019	0.002
264	22.00	0.07	0.021	(0.129)	0.019	0.002
265	22.08	0.10	0.032	(0.128)	0.028	0.003
266	22.17	0.10	0.032	(0.128)	0.028	0.003
267	22.25	0.10	0.032	(0.128)	0.028	0.003
268	22.33	0.07	0.021	(0.127)	0.019	0.002
269	22.42	0.07	0.021	(0.127)	0.019	0.002
270	22.50	0.07	0.021	(0.126)	0.019	0.002
271	22.58	0.07	0.021	(0.126)	0.019	0.002
272	22.67	0.07	0.021	(0.126)	0.019	0.002
273	22.75	0.07	0.021	(0.125)	0.019	0.002
274	22.83	0.07	0.021	(0.125)	0.019	0.002
275	22.92	0.07	0.021	(0.125)	0.019	0.002
276	23.00	0.07	0.021	(0.124)	0.019	0.002
277	23.08	0.07	0.021	(0.124)	0.019	0.002
278	23.17	0.07	0.021	(0.124)	0.019	0.002
279	23.25	0.07	0.021	(0.124)	0.019	0.002
280	23.33	0.07	0.021	(0.123)	0.019	0.002
281	23.42	0.07	0.021	(0.123)	0.019	0.002
282	23.50	0.07	0.021	(0.123)	0.019	0.002
283	23.58	0.07	0.021	(0.123)	0.019	0.002
284	23.67	0.07	0.021	(0.122)	0.019	0.002
285	23.75	0.07	0.021	(0.122)	0.019	0.002
286	23.83	0.07	0.021	(0.122)	0.019	0.002
287	23.92	0.07	0.021	(0.122)	0.019	0.002
288	24.00	0.07	0.021	(0.122)	0.019	0.002

(Loss Rate Not Used)

Sum = 100.0 Sum = 5.1

Flood volume = Effective rainfall 0.43(In)
times area 4.3(Ac.)/[(In)/(Ft.)] = 0.2(Ac.Ft)
Total soil loss = 2.20(In)
Total soil loss = 0.795(Ac.Ft)
Total rainfall = 2.63(In)
Flood volume = 6689.0 Cubic Feet
Total soil loss = 34625.4 Cubic Feet

Peak flow rate of this hydrograph = 0.645(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	0.0010	0.02	Q	|	|	|	|
1+ 5	0.0012	0.02	Q	|	|	|	|
1+10	0.0013	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	0.0023	0.02	Q	|	|	|	|
2+ 5	0.0024	0.02	Q	|	|	|	|
2+10	0.0025	0.02	Q	|	|	|	|
2+15	0.0027	0.02	Q	|	|	|	|
2+20	0.0028	0.02	Q	|	|	|	|
2+25	0.0029	0.02	Q	|	|	|	|
2+30	0.0030	0.02	Q	|	|	|	|
2+35	0.0032	0.02	Q	|	|	|	|
2+40	0.0033	0.02	Q	|	|	|	|
2+45	0.0035	0.02	Q	|	|	|	|
2+50	0.0036	0.02	Q	|	|	|	|
2+55	0.0038	0.02	Q	|	|	|	|
3+ 0	0.0040	0.02	QV	|	|	|	|
3+ 5	0.0041	0.02	QV	|	|	|	|
3+10	0.0043	0.02	QV	|	|	|	|
3+15	0.0044	0.02	QV	|	|	|	|
3+20	0.0046	0.02	QV	|	|	|	|
3+25	0.0047	0.02	QV	|	|	|	|
3+30	0.0049	0.02	QV	|	|	|	|
3+35	0.0051	0.02	QV	|	|	|	|
3+40	0.0052	0.02	QV	|	|	|	|
3+45	0.0054	0.02	QV	|	|	|	|
3+50	0.0055	0.02	QV	|	|	|	|
3+55	0.0057	0.03	QV	|	|	|	|
4+ 0	0.0059	0.03	QV	|	|	|	|
4+ 5	0.0061	0.03	QV	|	|	|	|
4+10	0.0063	0.03	QV	|	|	|	|
4+15	0.0065	0.03	QV	|	|	|	|
4+20	0.0067	0.03	QV	|	|	|	|
4+25	0.0069	0.03	QV	|	|	|	|
4+30	0.0071	0.03	QV	|	|	|	|
4+35	0.0074	0.03	QV	|	|	|	|
4+40	0.0076	0.03	QV	|	|	|	|
4+45	0.0078	0.03	Q V	|	|	|	|
4+50	0.0080	0.03	Q V	|	|	|	|
4+55	0.0083	0.04	Q V	|	|	|	|
5+ 0	0.0085	0.04	Q V	|	|	|	|
5+ 5	0.0088	0.03	Q V	|	|	|	|
5+10	0.0090	0.03	Q V	|	|	|	|
5+15	0.0091	0.03	Q V	|	|	|	|
5+20	0.0093	0.03	Q V	|	|	|	|
5+25	0.0096	0.03	Q V	|	|	|	|
5+30	0.0098	0.03	Q V	|	|	|	|
5+35	0.0100	0.03	Q V	|	|	|	|
5+40	0.0103	0.04	Q V	|	|	|	|
5+45	0.0105	0.04	Q V	|	|	|	|
5+50	0.0108	0.04	Q V	|	|	|	|
5+55	0.0110	0.04	Q V	|	|	|	|
6+ 0	0.0113	0.04	Q V	|	|	|	|
6+ 5	0.0115	0.04	Q V	|	|	|	|
6+10	0.0118	0.04	Q V	|	|	|	|
6+15	0.0121	0.04	Q V	|	|	|	|
6+20	0.0124	0.04	Q V	|	|	|	|
6+25	0.0127	0.04	Q V	|	|	|	|
6+30	0.0130	0.04	Q V	|	|	|	|
6+35	0.0133	0.04	Q V	|	|	|	|
6+40	0.0136	0.05	Q V	|	|	|	|
6+45	0.0139	0.05	Q V	|	|	|	|
6+50	0.0142	0.05	Q V	|	|	|	|

6+55	0.0145	0.05	Q V	|	|	|	|
7+ 0	0.0148	0.05	Q V	|	|	|	|
7+ 5	0.0151	0.05	Q V	|	|	|	|
7+10	0.0155	0.05	Q V	|	|	|	|
7+15	0.0158	0.05	Q V	|	|	|	|
7+20	0.0161	0.05	Q V	|	|	|	|
7+25	0.0165	0.05	Q V	|	|	|	|
7+30	0.0168	0.05	Q V	|	|	|	|
7+35	0.0172	0.05	Q V	|	|	|	|
7+40	0.0175	0.05	Q V	|	|	|	|
7+45	0.0179	0.05	Q V	|	|	|	|
7+50	0.0183	0.06	Q V	|	|	|	|
7+55	0.0187	0.06	Q V	|	|	|	|
8+ 0	0.0191	0.06	Q V	|	|	|	|
8+ 5	0.0196	0.06	Q V	|	|	|	|
8+10	0.0200	0.07	Q V	|	|	|	|
8+15	0.0205	0.07	Q V	|	|	|	|
8+20	0.0210	0.07	Q V	|	|	|	|
8+25	0.0214	0.07	Q V	|	|	|	|
8+30	0.0219	0.07	Q V	|	|	|	|
8+35	0.0224	0.07	Q V	|	|	|	|
8+40	0.0229	0.07	Q V	|	|	|	|
8+45	0.0234	0.07	Q V	|	|	|	|
8+50	0.0239	0.08	Q V	|	|	|	|
8+55	0.0245	0.08	Q V	|	|	|	|
9+ 0	0.0250	0.08	Q V	|	|	|	|
9+ 5	0.0256	0.08	Q V	|	|	|	|
9+10	0.0262	0.09	Q V	|	|	|	|
9+15	0.0267	0.09	Q V	|	|	|	|
9+20	0.0274	0.09	Q V	|	|	|	|
9+25	0.0280	0.09	Q V	|	|	|	|
9+30	0.0286	0.09	Q V	|	|	|	|
9+35	0.0293	0.09	Q V	|	|	|	|
9+40	0.0299	0.10	Q V	|	|	|	|
9+45	0.0306	0.10	Q V	|	|	|	|
9+50	0.0313	0.10	Q V	|	|	|	|
9+55	0.0320	0.10	Q V	|	|	|	|
10+ 0	0.0326	0.10	Q V	|	|	|	|
10+ 5	0.0333	0.09	Q V	|	|	|	|
10+10	0.0338	0.07	Q V	|	|	|	|
10+15	0.0342	0.07	Q V	|	|	|	|
10+20	0.0347	0.07	Q V	|	|	|	|
10+25	0.0352	0.07	Q V	|	|	|	|
10+30	0.0357	0.07	Q V	|	|	|	|
10+35	0.0362	0.08	Q V	|	|	|	|
10+40	0.0368	0.09	Q V	|	|	|	|
10+45	0.0374	0.09	Q V	|	|	|	|
10+50	0.0381	0.09	Q V	|	|	|	|
10+55	0.0387	0.09	Q V	|	|	|	|
11+ 0	0.0393	0.09	Q V	|	|	|	|
11+ 5	0.0400	0.09	Q V	|	|	|	|
11+10	0.0406	0.09	Q V	|	|	|	|
11+15	0.0412	0.09	Q V	|	|	|	|
11+20	0.0418	0.09	Q V	|	|	|	|
11+25	0.0424	0.09	Q V	|	|	|	|
11+30	0.0430	0.09	Q V	|	|	|	|
11+35	0.0435	0.08	Q V	|	|	|	|
11+40	0.0441	0.08	Q V	|	|	|	|
11+45	0.0446	0.08	Q V	|	|	|	|
11+50	0.0452	0.08	Q V	|	|	|	|
11+55	0.0457	0.08	Q V	|	|	|	|
12+ 0	0.0463	0.08	Q V	|	|	|	|
12+ 5	0.0471	0.11	Q V	|	|	|	|
12+10	0.0481	0.15	Q V	|	|	|	|
12+15	0.0492	0.16	Q V	|	|	|	|
12+20	0.0504	0.18	Q V	|	|	|	|
12+25	0.0519	0.21	Q V	|	|	|	|
12+30	0.0534	0.22	Q V	|	|	|	|
12+35	0.0552	0.26	Q V	|	|	|	|
12+40	0.0573	0.31	Q V	|	|	|	|
12+45	0.0595	0.32	Q V	|	|	|	|

12+50	0.0619	0.35	|Q	|	V	|	|	|
12+55	0.0645	0.38	|Q	|	V	|	|	|
13+ 0	0.0671	0.38	|Q	|	V	|	|	|
13+ 5	0.0705	0.49	|Q	|	V	|	|	|
13+10	0.0746	0.59	| Q	|	V	|	|	|
13+15	0.0788	0.62	| Q	|	V	|	|	|
13+20	0.0832	0.63	| Q	|	V	|	|	|
13+25	0.0876	0.64	| Q	|	V	|	|	|
13+30	0.0920	0.64	| Q	|	V	|	|	|
13+35	0.0951	0.44	|Q	|	V	|	|	|
13+40	0.0966	0.22	Q	|	V	|	|	|
13+45	0.0978	0.18	Q	|	V	|	|	|
13+50	0.0989	0.17	Q	|	V	|	|	|
13+55	0.1001	0.16	Q	|	V	|	|	|
14+ 0	0.1012	0.17	Q	|	V	|	|	|
14+ 5	0.1029	0.25	Q	|	V	|	|	|
14+10	0.1052	0.33	|Q	|	V	|	|	|
14+15	0.1077	0.36	|Q	|	V	|	|	|
14+20	0.1101	0.35	|Q	|	V	|	|	|
14+25	0.1124	0.33	|Q	|	V	|	|	|
14+30	0.1147	0.33	|Q	|	V	|	|	|
14+35	0.1170	0.34	|Q	|	V	|	|	|
14+40	0.1193	0.34	|Q	|	V	|	|	|
14+45	0.1217	0.35	|Q	|	V	|	|	|
14+50	0.1240	0.33	|Q	|	V	|	|	|
14+55	0.1262	0.31	|Q	|	V	|	|	|
15+ 0	0.1283	0.31	|Q	|	V	|	|	|
15+ 5	0.1304	0.30	|Q	|	V	|	|	|
15+10	0.1323	0.28	|Q	|	V	|	|	|
15+15	0.1342	0.28	|Q	|	V	|	|	|
15+20	0.1361	0.26	|Q	|	V	|	|	|
15+25	0.1378	0.25	Q	|	V	|	|	|
15+30	0.1395	0.25	Q	|	V	|	|	|
15+35	0.1407	0.18	Q	|	V	|	|	|
15+40	0.1415	0.11	Q	|	V	|	|	|
15+45	0.1421	0.10	Q	|	V	|	|	|
15+50	0.1428	0.09	Q	|	V	|	|	|
15+55	0.1434	0.09	Q	|	V	|	|	|
16+ 0	0.1440	0.09	Q	|	V	|	|	|
16+ 5	0.1444	0.06	Q	|	V	|	|	|
16+10	0.1446	0.03	Q	|	V	|	|	|
16+15	0.1447	0.02	Q	|	V	|	|	|
16+20	0.1449	0.02	Q	|	V	|	|	|
16+25	0.1450	0.02	Q	|	V	|	|	|
16+30	0.1451	0.02	Q	|	V	|	|	|
16+35	0.1452	0.02	Q	|	V	|	|	|
16+40	0.1453	0.01	Q	|	V	|	|	|
16+45	0.1454	0.01	Q	|	V	|	|	|
16+50	0.1455	0.01	Q	|	V	|	|	|
16+55	0.1456	0.01	Q	|	V	|	|	|
17+ 0	0.1457	0.01	Q	|	V	|	|	|
17+ 5	0.1458	0.02	Q	|	V	|	|	|
17+10	0.1460	0.02	Q	|	V	|	|	|
17+15	0.1461	0.02	Q	|	V	|	|	|
17+20	0.1463	0.02	Q	|	V	|	|	|
17+25	0.1464	0.02	Q	|	V	|	|	|
17+30	0.1466	0.02	Q	|	V	|	|	|
17+35	0.1468	0.02	Q	|	V	|	|	|
17+40	0.1469	0.02	Q	|	V	|	|	|
17+45	0.1471	0.02	Q	|	V	|	|	|
17+50	0.1472	0.02	Q	|	V	|	|	|
17+55	0.1474	0.02	Q	|	V	|	|	|
18+ 0	0.1475	0.02	Q	|	V	|	|	|
18+ 5	0.1476	0.02	Q	|	V	|	|	|
18+10	0.1477	0.02	Q	|	V	|	|	|
18+15	0.1479	0.02	Q	|	V	|	|	|
18+20	0.1480	0.02	Q	|	V	|	|	|
18+25	0.1481	0.02	Q	|	V	|	|	|
18+30	0.1482	0.02	Q	|	V	|	|	|
18+35	0.1484	0.02	Q	|	V	|	|	|
18+40	0.1485	0.01	Q	|	V	|	|	|

18+45	0.1486	0.01	Q				V
18+50	0.1486	0.01	Q				V
18+55	0.1487	0.01	Q				V
19+ 0	0.1488	0.01	Q				V
19+ 5	0.1488	0.01	Q				V
19+10	0.1489	0.01	Q				V
19+15	0.1490	0.01	Q				V
19+20	0.1491	0.02	Q				V
19+25	0.1493	0.02	Q				V
19+30	0.1494	0.02	Q				V
19+35	0.1495	0.02	Q				V
19+40	0.1496	0.01	Q				V
19+45	0.1497	0.01	Q				V
19+50	0.1498	0.01	Q				V
19+55	0.1498	0.01	Q				V
20+ 0	0.1499	0.01	Q				V
20+ 5	0.1500	0.01	Q				V
20+10	0.1501	0.01	Q				V
20+15	0.1502	0.01	Q				V
20+20	0.1503	0.01	Q				V
20+25	0.1504	0.01	Q				V
20+30	0.1504	0.01	Q				V
20+35	0.1505	0.01	Q				V
20+40	0.1506	0.01	Q				V
20+45	0.1507	0.01	Q				V
20+50	0.1508	0.01	Q				V
20+55	0.1509	0.01	Q				V
21+ 0	0.1509	0.01	Q				V
21+ 5	0.1510	0.01	Q				V
21+10	0.1511	0.01	Q				V
21+15	0.1512	0.01	Q				V
21+20	0.1513	0.01	Q				V
21+25	0.1514	0.01	Q				V
21+30	0.1514	0.01	Q				V
21+35	0.1515	0.01	Q				V
21+40	0.1516	0.01	Q				V
21+45	0.1517	0.01	Q				V
21+50	0.1518	0.01	Q				V
21+55	0.1518	0.01	Q				V
22+ 0	0.1519	0.01	Q				V
22+ 5	0.1520	0.01	Q				V
22+10	0.1521	0.01	Q				V
22+15	0.1522	0.01	Q				V
22+20	0.1522	0.01	Q				V
22+25	0.1523	0.01	Q				V
22+30	0.1524	0.01	Q				V
22+35	0.1524	0.01	Q				V
22+40	0.1525	0.01	Q				V
22+45	0.1526	0.01	Q				V
22+50	0.1526	0.01	Q				V
22+55	0.1527	0.01	Q				V
23+ 0	0.1528	0.01	Q				V
23+ 5	0.1528	0.01	Q				V
23+10	0.1529	0.01	Q				V
23+15	0.1529	0.01	Q				V
23+20	0.1530	0.01	Q				V
23+25	0.1531	0.01	Q				V
23+30	0.1531	0.01	Q				V
23+35	0.1532	0.01	Q				V
23+40	0.1533	0.01	Q				V
23+45	0.1533	0.01	Q				V
23+50	0.1534	0.01	Q				V
23+55	0.1534	0.01	Q				V
24+ 0	0.1535	0.01	Q				V
24+ 5	0.1535	0.01	Q				V
24+10	0.1536	0.00	Q				V
24+15	0.1536	0.00	Q				V
24+20	0.1536	0.00	Q				V

APPENDIX G

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 01/04/22 File: 19004DEVHYD242.out

++

Riverside County Synthetic Unit Hydrology Method
RCFC & WCD Manual date - April 1978

Program License Serial Number 6106

English (in-lb) Input Units Used
English Rainfall Data (Inches) Input Values Used

English Units used in output format

19-004 DEVELOPED CONDITION HYDROGRAPH METHOD 2 YEAR 24 HOUR EVENT

Drainage Area = 4.33(Ac.) = 0.007 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 4.33(Ac.) = 0.007 Sq. Mi.
Length along longest watercourse = 812.30(Ft.)
Length along longest watercourse measured to centroid = 207.60(Ft.)
Length along longest watercourse = 0.154 Mi.
Length along longest watercourse measured to centroid = 0.039 Mi.
Difference in elevation = 4.47(Ft.)
Slope along watercourse = 29.0553 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time = 0.027 Hr.
Lag time = 1.63 Min.
25% of lag time = 0.41 Min.
40% of lag time = 0.65 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]
4.33	1.60	6.93

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
4.33	4.10	17.75

STORM EVENT (YEAR) = 2.00
Area Averaged 2-Year Rainfall = 1.600(In)
Area Averaged 100-Year Rainfall = 4.100(In)

Point rain (area averaged) = 1.600(In)
Areal adjustment factor = 100.00 %
Adjusted average point rain = 1.600(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %

4.330	75.00	0.880

Total Area Entered = 4.33(Ac.)

RI AMC2	RI AMC-1	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
75.0	57.0	0.501	0.880	0.104	1.000	0.104
					Sum (F) =	0.104

Area averaged mean soil loss (F) (In/Hr) = 0.104
Minimum soil loss rate ((In/Hr)) = 0.052
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.200

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	305.838	57.272	2.499
2	0.167	611.677	36.809	1.606
3	0.250	917.515	5.919	0.258
			Sum = 100.000 Sum=	4.364

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	0.013	(0.185)	0.003	0.010
2	0.17	0.07	0.013	(0.184)	0.003	0.010
3	0.25	0.07	0.013	(0.183)	0.003	0.010
4	0.33	0.10	0.019	(0.182)	0.004	0.015
5	0.42	0.10	0.019	(0.182)	0.004	0.015
6	0.50	0.10	0.019	(0.181)	0.004	0.015
7	0.58	0.10	0.019	(0.180)	0.004	0.015
8	0.67	0.10	0.019	(0.180)	0.004	0.015
9	0.75	0.10	0.019	(0.179)	0.004	0.015
10	0.83	0.13	0.026	(0.178)	0.005	0.020
11	0.92	0.13	0.026	(0.178)	0.005	0.020
12	1.00	0.13	0.026	(0.177)	0.005	0.020
13	1.08	0.10	0.019	(0.176)	0.004	0.015
14	1.17	0.10	0.019	(0.175)	0.004	0.015
15	1.25	0.10	0.019	(0.175)	0.004	0.015
16	1.33	0.10	0.019	(0.174)	0.004	0.015
17	1.42	0.10	0.019	(0.173)	0.004	0.015
18	1.50	0.10	0.019	(0.173)	0.004	0.015
19	1.58	0.10	0.019	(0.172)	0.004	0.015
20	1.67	0.10	0.019	(0.171)	0.004	0.015
21	1.75	0.10	0.019	(0.171)	0.004	0.015
22	1.83	0.13	0.026	(0.170)	0.005	0.020
23	1.92	0.13	0.026	(0.169)	0.005	0.020
24	2.00	0.13	0.026	(0.169)	0.005	0.020
25	2.08	0.13	0.026	(0.168)	0.005	0.020
26	2.17	0.13	0.026	(0.167)	0.005	0.020
27	2.25	0.13	0.026	(0.166)	0.005	0.020
28	2.33	0.13	0.026	(0.166)	0.005	0.020
29	2.42	0.13	0.026	(0.165)	0.005	0.020
30	2.50	0.13	0.026	(0.164)	0.005	0.020
31	2.58	0.17	0.032	(0.164)	0.006	0.026
32	2.67	0.17	0.032	(0.163)	0.006	0.026
33	2.75	0.17	0.032	(0.162)	0.006	0.026
34	2.83	0.17	0.032	(0.162)	0.006	0.026
35	2.92	0.17	0.032	(0.161)	0.006	0.026
36	3.00	0.17	0.032	(0.160)	0.006	0.026
37	3.08	0.17	0.032	(0.160)	0.006	0.026

38	3.17	0.17	0.032	(0.159)	0.006	0.026
39	3.25	0.17	0.032	(0.158)	0.006	0.026
40	3.33	0.17	0.032	(0.158)	0.006	0.026
41	3.42	0.17	0.032	(0.157)	0.006	0.026
42	3.50	0.17	0.032	(0.156)	0.006	0.026
43	3.58	0.17	0.032	(0.156)	0.006	0.026
44	3.67	0.17	0.032	(0.155)	0.006	0.026
45	3.75	0.17	0.032	(0.155)	0.006	0.026
46	3.83	0.20	0.038	(0.154)	0.008	0.031
47	3.92	0.20	0.038	(0.153)	0.008	0.031
48	4.00	0.20	0.038	(0.153)	0.008	0.031
49	4.08	0.20	0.038	(0.152)	0.008	0.031
50	4.17	0.20	0.038	(0.151)	0.008	0.031
51	4.25	0.20	0.038	(0.151)	0.008	0.031
52	4.33	0.23	0.045	(0.150)	0.009	0.036
53	4.42	0.23	0.045	(0.149)	0.009	0.036
54	4.50	0.23	0.045	(0.149)	0.009	0.036
55	4.58	0.23	0.045	(0.148)	0.009	0.036
56	4.67	0.23	0.045	(0.147)	0.009	0.036
57	4.75	0.23	0.045	(0.147)	0.009	0.036
58	4.83	0.27	0.051	(0.146)	0.010	0.041
59	4.92	0.27	0.051	(0.146)	0.010	0.041
60	5.00	0.27	0.051	(0.145)	0.010	0.041
61	5.08	0.20	0.038	(0.144)	0.008	0.031
62	5.17	0.20	0.038	(0.144)	0.008	0.031
63	5.25	0.20	0.038	(0.143)	0.008	0.031
64	5.33	0.23	0.045	(0.142)	0.009	0.036
65	5.42	0.23	0.045	(0.142)	0.009	0.036
66	5.50	0.23	0.045	(0.141)	0.009	0.036
67	5.58	0.27	0.051	(0.141)	0.010	0.041
68	5.67	0.27	0.051	(0.140)	0.010	0.041
69	5.75	0.27	0.051	(0.139)	0.010	0.041
70	5.83	0.27	0.051	(0.139)	0.010	0.041
71	5.92	0.27	0.051	(0.138)	0.010	0.041
72	6.00	0.27	0.051	(0.137)	0.010	0.041
73	6.08	0.30	0.058	(0.137)	0.012	0.046
74	6.17	0.30	0.058	(0.136)	0.012	0.046
75	6.25	0.30	0.058	(0.136)	0.012	0.046
76	6.33	0.30	0.058	(0.135)	0.012	0.046
77	6.42	0.30	0.058	(0.134)	0.012	0.046
78	6.50	0.30	0.058	(0.134)	0.012	0.046
79	6.58	0.33	0.064	(0.133)	0.013	0.051
80	6.67	0.33	0.064	(0.133)	0.013	0.051
81	6.75	0.33	0.064	(0.132)	0.013	0.051
82	6.83	0.33	0.064	(0.131)	0.013	0.051
83	6.92	0.33	0.064	(0.131)	0.013	0.051
84	7.00	0.33	0.064	(0.130)	0.013	0.051
85	7.08	0.33	0.064	(0.130)	0.013	0.051
86	7.17	0.33	0.064	(0.129)	0.013	0.051
87	7.25	0.33	0.064	(0.128)	0.013	0.051
88	7.33	0.37	0.070	(0.128)	0.014	0.056
89	7.42	0.37	0.070	(0.127)	0.014	0.056
90	7.50	0.37	0.070	(0.127)	0.014	0.056
91	7.58	0.40	0.077	(0.126)	0.015	0.061
92	7.67	0.40	0.077	(0.126)	0.015	0.061
93	7.75	0.40	0.077	(0.125)	0.015	0.061
94	7.83	0.43	0.083	(0.124)	0.017	0.067
95	7.92	0.43	0.083	(0.124)	0.017	0.067
96	8.00	0.43	0.083	(0.123)	0.017	0.067
97	8.08	0.50	0.096	(0.123)	0.019	0.077
98	8.17	0.50	0.096	(0.122)	0.019	0.077
99	8.25	0.50	0.096	(0.122)	0.019	0.077
100	8.33	0.50	0.096	(0.121)	0.019	0.077
101	8.42	0.50	0.096	(0.120)	0.019	0.077
102	8.50	0.50	0.096	(0.120)	0.019	0.077
103	8.58	0.53	0.102	(0.119)	0.020	0.082
104	8.67	0.53	0.102	(0.119)	0.020	0.082
105	8.75	0.53	0.102	(0.118)	0.020	0.082
106	8.83	0.57	0.109	(0.118)	0.022	0.087
107	8.92	0.57	0.109	(0.117)	0.022	0.087
108	9.00	0.57	0.109	(0.116)	0.022	0.087

109	9.08	0.63	0.122	(0.116)	0.024	0.097
110	9.17	0.63	0.122	(0.115)	0.024	0.097
111	9.25	0.63	0.122	(0.115)	0.024	0.097
112	9.33	0.67	0.128	(0.114)	0.026	0.102
113	9.42	0.67	0.128	(0.114)	0.026	0.102
114	9.50	0.67	0.128	(0.113)	0.026	0.102
115	9.58	0.70	0.134	(0.113)	0.027	0.108
116	9.67	0.70	0.134	(0.112)	0.027	0.108
117	9.75	0.70	0.134	(0.112)	0.027	0.108
118	9.83	0.73	0.141	(0.111)	0.028	0.113
119	9.92	0.73	0.141	(0.110)	0.028	0.113
120	10.00	0.73	0.141	(0.110)	0.028	0.113
121	10.08	0.50	0.096	(0.109)	0.019	0.077
122	10.17	0.50	0.096	(0.109)	0.019	0.077
123	10.25	0.50	0.096	(0.108)	0.019	0.077
124	10.33	0.50	0.096	(0.108)	0.019	0.077
125	10.42	0.50	0.096	(0.107)	0.019	0.077
126	10.50	0.50	0.096	(0.107)	0.019	0.077
127	10.58	0.67	0.128	(0.106)	0.026	0.102
128	10.67	0.67	0.128	(0.106)	0.026	0.102
129	10.75	0.67	0.128	(0.105)	0.026	0.102
130	10.83	0.67	0.128	(0.105)	0.026	0.102
131	10.92	0.67	0.128	(0.104)	0.026	0.102
132	11.00	0.67	0.128	(0.104)	0.026	0.102
133	11.08	0.63	0.122	(0.103)	0.024	0.097
134	11.17	0.63	0.122	(0.103)	0.024	0.097
135	11.25	0.63	0.122	(0.102)	0.024	0.097
136	11.33	0.63	0.122	(0.102)	0.024	0.097
137	11.42	0.63	0.122	(0.101)	0.024	0.097
138	11.50	0.63	0.122	(0.101)	0.024	0.097
139	11.58	0.57	0.109	(0.100)	0.022	0.087
140	11.67	0.57	0.109	(0.100)	0.022	0.087
141	11.75	0.57	0.109	(0.099)	0.022	0.087
142	11.83	0.60	0.115	(0.099)	0.023	0.092
143	11.92	0.60	0.115	(0.098)	0.023	0.092
144	12.00	0.60	0.115	(0.098)	0.023	0.092
145	12.08	0.83	0.160	(0.097)	0.032	0.128
146	12.17	0.83	0.160	(0.097)	0.032	0.128
147	12.25	0.83	0.160	(0.096)	0.032	0.128
148	12.33	0.87	0.166	(0.096)	0.033	0.133
149	12.42	0.87	0.166	(0.095)	0.033	0.133
150	12.50	0.87	0.166	(0.095)	0.033	0.133
151	12.58	0.93	0.179	(0.094)	0.036	0.143
152	12.67	0.93	0.179	(0.094)	0.036	0.143
153	12.75	0.93	0.179	(0.093)	0.036	0.143
154	12.83	0.97	0.186	(0.093)	0.037	0.148
155	12.92	0.97	0.186	(0.092)	0.037	0.148
156	13.00	0.97	0.186	(0.092)	0.037	0.148
157	13.08	1.13	0.218	(0.091)	0.044	0.174
158	13.17	1.13	0.218	(0.091)	0.044	0.174
159	13.25	1.13	0.218	(0.091)	0.044	0.174
160	13.33	1.13	0.218	(0.090)	0.044	0.174
161	13.42	1.13	0.218	(0.090)	0.044	0.174
162	13.50	1.13	0.218	(0.089)	0.044	0.174
163	13.58	0.77	0.147	(0.089)	0.029	0.118
164	13.67	0.77	0.147	(0.088)	0.029	0.118
165	13.75	0.77	0.147	(0.088)	0.029	0.118
166	13.83	0.77	0.147	(0.087)	0.029	0.118
167	13.92	0.77	0.147	(0.087)	0.029	0.118
168	14.00	0.77	0.147	(0.086)	0.029	0.118
169	14.08	0.90	0.173	(0.086)	0.035	0.138
170	14.17	0.90	0.173	(0.086)	0.035	0.138
171	14.25	0.90	0.173	(0.085)	0.035	0.138
172	14.33	0.87	0.166	(0.085)	0.033	0.133
173	14.42	0.87	0.166	(0.084)	0.033	0.133
174	14.50	0.87	0.166	(0.084)	0.033	0.133
175	14.58	0.87	0.166	(0.083)	0.033	0.133
176	14.67	0.87	0.166	(0.083)	0.033	0.133
177	14.75	0.87	0.166	(0.083)	0.033	0.133
178	14.83	0.83	0.160	(0.082)	0.032	0.128
179	14.92	0.83	0.160	(0.082)	0.032	0.128

180	15.00	0.83	0.160	(0.081)	0.032	0.128
181	15.08	0.80	0.154	(0.081)	0.031	0.123
182	15.17	0.80	0.154	(0.080)	0.031	0.123
183	15.25	0.80	0.154	(0.080)	0.031	0.123
184	15.33	0.77	0.147	(0.080)	0.029	0.118
185	15.42	0.77	0.147	(0.079)	0.029	0.118
186	15.50	0.77	0.147	(0.079)	0.029	0.118
187	15.58	0.63	0.122	(0.078)	0.024	0.097
188	15.67	0.63	0.122	(0.078)	0.024	0.097
189	15.75	0.63	0.122	(0.078)	0.024	0.097
190	15.83	0.63	0.122	(0.077)	0.024	0.097
191	15.92	0.63	0.122	(0.077)	0.024	0.097
192	16.00	0.63	0.122	(0.076)	0.024	0.097
193	16.08	0.13	0.026	(0.076)	0.005	0.020
194	16.17	0.13	0.026	(0.076)	0.005	0.020
195	16.25	0.13	0.026	(0.075)	0.005	0.020
196	16.33	0.13	0.026	(0.075)	0.005	0.020
197	16.42	0.13	0.026	(0.075)	0.005	0.020
198	16.50	0.13	0.026	(0.074)	0.005	0.020
199	16.58	0.10	0.019	(0.074)	0.004	0.015
200	16.67	0.10	0.019	(0.073)	0.004	0.015
201	16.75	0.10	0.019	(0.073)	0.004	0.015
202	16.83	0.10	0.019	(0.073)	0.004	0.015
203	16.92	0.10	0.019	(0.072)	0.004	0.015
204	17.00	0.10	0.019	(0.072)	0.004	0.015
205	17.08	0.17	0.032	(0.072)	0.006	0.026
206	17.17	0.17	0.032	(0.071)	0.006	0.026
207	17.25	0.17	0.032	(0.071)	0.006	0.026
208	17.33	0.17	0.032	(0.070)	0.006	0.026
209	17.42	0.17	0.032	(0.070)	0.006	0.026
210	17.50	0.17	0.032	(0.070)	0.006	0.026
211	17.58	0.17	0.032	(0.069)	0.006	0.026
212	17.67	0.17	0.032	(0.069)	0.006	0.026
213	17.75	0.17	0.032	(0.069)	0.006	0.026
214	17.83	0.13	0.026	(0.068)	0.005	0.020
215	17.92	0.13	0.026	(0.068)	0.005	0.020
216	18.00	0.13	0.026	(0.068)	0.005	0.020
217	18.08	0.13	0.026	(0.067)	0.005	0.020
218	18.17	0.13	0.026	(0.067)	0.005	0.020
219	18.25	0.13	0.026	(0.067)	0.005	0.020
220	18.33	0.13	0.026	(0.066)	0.005	0.020
221	18.42	0.13	0.026	(0.066)	0.005	0.020
222	18.50	0.13	0.026	(0.066)	0.005	0.020
223	18.58	0.10	0.019	(0.065)	0.004	0.015
224	18.67	0.10	0.019	(0.065)	0.004	0.015
225	18.75	0.10	0.019	(0.065)	0.004	0.015
226	18.83	0.07	0.013	(0.065)	0.003	0.010
227	18.92	0.07	0.013	(0.064)	0.003	0.010
228	19.00	0.07	0.013	(0.064)	0.003	0.010
229	19.08	0.10	0.019	(0.064)	0.004	0.015
230	19.17	0.10	0.019	(0.063)	0.004	0.015
231	19.25	0.10	0.019	(0.063)	0.004	0.015
232	19.33	0.13	0.026	(0.063)	0.005	0.020
233	19.42	0.13	0.026	(0.062)	0.005	0.020
234	19.50	0.13	0.026	(0.062)	0.005	0.020
235	19.58	0.10	0.019	(0.062)	0.004	0.015
236	19.67	0.10	0.019	(0.062)	0.004	0.015
237	19.75	0.10	0.019	(0.061)	0.004	0.015
238	19.83	0.07	0.013	(0.061)	0.003	0.010
239	19.92	0.07	0.013	(0.061)	0.003	0.010
240	20.00	0.07	0.013	(0.060)	0.003	0.010
241	20.08	0.10	0.019	(0.060)	0.004	0.015
242	20.17	0.10	0.019	(0.060)	0.004	0.015
243	20.25	0.10	0.019	(0.060)	0.004	0.015
244	20.33	0.10	0.019	(0.059)	0.004	0.015
245	20.42	0.10	0.019	(0.059)	0.004	0.015
246	20.50	0.10	0.019	(0.059)	0.004	0.015
247	20.58	0.10	0.019	(0.059)	0.004	0.015
248	20.67	0.10	0.019	(0.058)	0.004	0.015
249	20.75	0.10	0.019	(0.058)	0.004	0.015
250	20.83	0.07	0.013	(0.058)	0.003	0.010

251	20.92	0.07	0.013	(0.058)	0.003	0.010
252	21.00	0.07	0.013	(0.057)	0.003	0.010
253	21.08	0.10	0.019	(0.057)	0.004	0.015
254	21.17	0.10	0.019	(0.057)	0.004	0.015
255	21.25	0.10	0.019	(0.057)	0.004	0.015
256	21.33	0.07	0.013	(0.057)	0.003	0.010
257	21.42	0.07	0.013	(0.056)	0.003	0.010
258	21.50	0.07	0.013	(0.056)	0.003	0.010
259	21.58	0.10	0.019	(0.056)	0.004	0.015
260	21.67	0.10	0.019	(0.056)	0.004	0.015
261	21.75	0.10	0.019	(0.056)	0.004	0.015
262	21.83	0.07	0.013	(0.055)	0.003	0.010
263	21.92	0.07	0.013	(0.055)	0.003	0.010
264	22.00	0.07	0.013	(0.055)	0.003	0.010
265	22.08	0.10	0.019	(0.055)	0.004	0.015
266	22.17	0.10	0.019	(0.055)	0.004	0.015
267	22.25	0.10	0.019	(0.054)	0.004	0.015
268	22.33	0.07	0.013	(0.054)	0.003	0.010
269	22.42	0.07	0.013	(0.054)	0.003	0.010
270	22.50	0.07	0.013	(0.054)	0.003	0.010
271	22.58	0.07	0.013	(0.054)	0.003	0.010
272	22.67	0.07	0.013	(0.054)	0.003	0.010
273	22.75	0.07	0.013	(0.053)	0.003	0.010
274	22.83	0.07	0.013	(0.053)	0.003	0.010
275	22.92	0.07	0.013	(0.053)	0.003	0.010
276	23.00	0.07	0.013	(0.053)	0.003	0.010
277	23.08	0.07	0.013	(0.053)	0.003	0.010
278	23.17	0.07	0.013	(0.053)	0.003	0.010
279	23.25	0.07	0.013	(0.053)	0.003	0.010
280	23.33	0.07	0.013	(0.053)	0.003	0.010
281	23.42	0.07	0.013	(0.053)	0.003	0.010
282	23.50	0.07	0.013	(0.052)	0.003	0.010
283	23.58	0.07	0.013	(0.052)	0.003	0.010
284	23.67	0.07	0.013	(0.052)	0.003	0.010
285	23.75	0.07	0.013	(0.052)	0.003	0.010
286	23.83	0.07	0.013	(0.052)	0.003	0.010
287	23.92	0.07	0.013	(0.052)	0.003	0.010
288	24.00	0.07	0.013	(0.052)	0.003	0.010

(Loss Rate Not Used)

Sum = 100.0 Sum = 15.4

Flood volume = Effective rainfall 1.28(In)
times area 4.3(Ac.)/[(In)/(Ft.)] = 0.5(Ac.Ft)
Total soil loss = 0.32(In)
Total soil loss = 0.115(Ac.Ft)
Total rainfall = 1.60(In)
Flood volume = 20118.7 Cubic Feet
Total soil loss = 5029.7 Cubic Feet

Peak flow rate of this hydrograph = 0.760(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	0.0005	0.04	Q	|	|	|	|
0+15	0.0008	0.04	Q	|	|	|	|
0+20	0.0012	0.06	Q	|	|	|	|
0+25	0.0016	0.07	Q	|	|	|	|
0+30	0.0021	0.07	Q	|	|	|	|
0+35	0.0025	0.07	Q	|	|	|	|
0+40	0.0030	0.07	Q	|	|	|	|
0+45	0.0035	0.07	Q	|	|	|	|
0+50	0.0040	0.08	Q	|	|	|	|
0+55	0.0046	0.09	Q	|	|	|	|
1+ 0	0.0052	0.09	Q	|	|	|	|

1+ 5	0.0058	0.08	Q	|	|	|	|
1+10	0.0062	0.07	Q	|	|	|	|
1+15	0.0067	0.07	Q	|	|	|	|
1+20	0.0072	0.07	Q	|	|	|	|
1+25	0.0076	0.07	Q	|	|	|	|
1+30	0.0081	0.07	Q	|	|	|	|
1+35	0.0086	0.07	Q	|	|	|	|
1+40	0.0090	0.07	Q	|	|	|	|
1+45	0.0095	0.07	Q	|	|	|	|
1+50	0.0100	0.08	Q	|	|	|	|
1+55	0.0106	0.09	Q	|	|	|	|
2+ 0	0.0112	0.09	Q	|	|	|	|
2+ 5	0.0119	0.09	QV	|	|	|	|
2+10	0.0125	0.09	QV	|	|	|	|
2+15	0.0131	0.09	QV	|	|	|	|
2+20	0.0137	0.09	QV	|	|	|	|
2+25	0.0143	0.09	QV	|	|	|	|
2+30	0.0149	0.09	QV	|	|	|	|
2+35	0.0156	0.10	QV	|	|	|	|
2+40	0.0164	0.11	QV	|	|	|	|
2+45	0.0172	0.11	QV	|	|	|	|
2+50	0.0179	0.11	QV	|	|	|	|
2+55	0.0187	0.11	QV	|	|	|	|
3+ 0	0.0195	0.11	QV	|	|	|	|
3+ 5	0.0203	0.11	QV	|	|	|	|
3+10	0.0210	0.11	QV	|	|	|	|
3+15	0.0218	0.11	QV	|	|	|	|
3+20	0.0226	0.11	QV	|	|	|	|
3+25	0.0233	0.11	Q V	|	|	|	|
3+30	0.0241	0.11	Q V	|	|	|	|
3+35	0.0249	0.11	Q V	|	|	|	|
3+40	0.0256	0.11	Q V	|	|	|	|
3+45	0.0264	0.11	Q V	|	|	|	|
3+50	0.0273	0.12	Q V	|	|	|	|
3+55	0.0282	0.13	Q V	|	|	|	|
4+ 0	0.0291	0.13	Q V	|	|	|	|
4+ 5	0.0300	0.13	Q V	|	|	|	|
4+10	0.0310	0.13	Q V	|	|	|	|
4+15	0.0319	0.13	Q V	|	|	|	|
4+20	0.0329	0.15	Q V	|	|	|	|
4+25	0.0340	0.16	Q V	|	|	|	|
4+30	0.0350	0.16	Q V	|	|	|	|
4+35	0.0361	0.16	Q V	|	|	|	|
4+40	0.0372	0.16	Q V	|	|	|	|
4+45	0.0383	0.16	Q V	|	|	|	|
4+50	0.0394	0.17	Q V	|	|	|	|
4+55	0.0407	0.18	Q V	|	|	|	|
5+ 0	0.0419	0.18	Q V	|	|	|	|
5+ 5	0.0429	0.15	Q V	|	|	|	|
5+10	0.0439	0.14	Q V	|	|	|	|
5+15	0.0448	0.13	Q V	|	|	|	|
5+20	0.0458	0.15	Q V	|	|	|	|
5+25	0.0469	0.16	Q V	|	|	|	|
5+30	0.0480	0.16	Q V	|	|	|	|
5+35	0.0491	0.17	Q V	|	|	|	|
5+40	0.0504	0.18	Q V	|	|	|	|
5+45	0.0516	0.18	Q V	|	|	|	|
5+50	0.0528	0.18	Q V	|	|	|	|
5+55	0.0541	0.18	Q V	|	|	|	|
6+ 0	0.0553	0.18	Q V	|	|	|	|
6+ 5	0.0566	0.19	Q V	|	|	|	|
6+10	0.0580	0.20	Q V	|	|	|	|
6+15	0.0594	0.20	Q V	|	|	|	|
6+20	0.0608	0.20	Q V	|	|	|	|
6+25	0.0621	0.20	Q V	|	|	|	|
6+30	0.0635	0.20	Q V	|	|	|	|
6+35	0.0650	0.21	Q V	|	|	|	|
6+40	0.0665	0.22	Q V	|	|	|	|
6+45	0.0681	0.22	Q V	|	|	|	|
6+50	0.0696	0.22	Q V	|	|	|	|
6+55	0.0711	0.22	Q V	|	|	|	|

7+ 0	0.0727	0.22	Q	V	|	|	|	|
7+ 5	0.0742	0.22	Q	V	|	|	|	|
7+10	0.0758	0.22	Q	V	|	|	|	|
7+15	0.0773	0.22	Q	V	|	|	|	|
7+20	0.0789	0.24	Q	V	|	|	|	|
7+25	0.0806	0.24	Q	V	|	|	|	|
7+30	0.0823	0.25	Q	V	|	|	|	|
7+35	0.0841	0.26	|Q	V	|	|	|	|
7+40	0.0859	0.27	|Q	V	|	|	|	|
7+45	0.0878	0.27	|Q	V	|	|	|	|
7+50	0.0897	0.28	|Q	V	|	|	|	|
7+55	0.0917	0.29	|Q	V	|	|	|	|
8+ 0	0.0937	0.29	|Q	V	|	|	|	|
8+ 5	0.0959	0.32	|Q	V	|	|	|	|
8+10	0.0982	0.33	|Q	V	|	|	|	|
8+15	0.1005	0.34	|Q	V	|	|	|	|
8+20	0.1028	0.34	|Q	V	|	|	|	|
8+25	0.1051	0.34	|Q	V	|	|	|	|
8+30	0.1074	0.34	|Q	V	|	|	|	|
8+35	0.1098	0.35	|Q	V	|	|	|	|
8+40	0.1123	0.36	|Q	V	|	|	|	|
8+45	0.1147	0.36	|Q	V	|	|	|	|
8+50	0.1173	0.37	|Q	V	|	|	|	|
8+55	0.1199	0.38	|Q	V	|	|	|	|
9+ 0	0.1225	0.38	|Q	V	|	|	|	|
9+ 5	0.1253	0.41	|Q	V	|	|	|	|
9+10	0.1282	0.42	|Q	|V	|	|	|	|
9+15	0.1311	0.42	|Q	|V	|	|	|	|
9+20	0.1341	0.44	|Q	|V	|	|	|	|
9+25	0.1372	0.45	|Q	|V	|	|	|	|
9+30	0.1403	0.45	|Q	| V	|	|	|	|
9+35	0.1435	0.46	|Q	| V	|	|	|	|
9+40	0.1467	0.47	|Q	| V	|	|	|	|
9+45	0.1499	0.47	|Q	| V	|	|	|	|
9+50	0.1532	0.48	|Q	| V	|	|	|	|
9+55	0.1566	0.49	|Q	| V	|	|	|	|
10+ 0	0.1600	0.49	|Q	| V	|	|	|	|
10+ 5	0.1628	0.40	|Q	| V	|	|	|	|
10+10	0.1651	0.34	|Q	| V	|	|	|	|
10+15	0.1675	0.34	|Q	| V	|	|	|	|
10+20	0.1698	0.34	|Q	| V	|	|	|	|
10+25	0.1721	0.34	|Q	| V	|	|	|	|
10+30	0.1744	0.34	|Q	| V	|	|	|	|
10+35	0.1771	0.40	|Q	| V	|	|	|	|
10+40	0.1802	0.44	|Q	| V	|	|	|	|
10+45	0.1832	0.45	|Q	| V	|	|	|	|
10+50	0.1863	0.45	|Q	| V	|	|	|	|
10+55	0.1894	0.45	|Q	| V	|	|	|	|
11+ 0	0.1925	0.45	|Q	| V	|	|	|	|
11+ 5	0.1955	0.43	|Q	| V	|	|	|	|
11+10	0.1984	0.43	|Q	| V	|	|	|	|
11+15	0.2013	0.42	|Q	| V	|	|	|	|
11+20	0.2043	0.42	|Q	| V	|	|	|	|
11+25	0.2072	0.42	|Q	| V	|	|	|	|
11+30	0.2101	0.42	|Q	| V	|	|	|	|
11+35	0.2129	0.40	|Q	| V	|	|	|	|
11+40	0.2155	0.38	|Q	| V	|	|	|	|
11+45	0.2181	0.38	|Q	| V	|	|	|	|
11+50	0.2208	0.39	|Q	| V	|	|	|	|
11+55	0.2236	0.40	|Q	| V	|	|	|	|
12+ 0	0.2264	0.40	|Q	| V	|	|	|	|
12+ 5	0.2297	0.49	|Q	| V	|	|	|	|
12+10	0.2335	0.55	| Q	| V	|	|	|	|
12+15	0.2374	0.56	| Q	| V	|	|	|	|
12+20	0.2413	0.57	| Q	| V	|	|	|	|
12+25	0.2453	0.58	| Q	| V	|	|	|	|
12+30	0.2493	0.58	| Q	| V	|	|	|	|
12+35	0.2535	0.61	| Q	| V	|	|	|	|
12+40	0.2578	0.62	| Q	| V	|	|	|	|
12+45	0.2621	0.63	| Q	| V	|	|	|	|
12+50	0.2665	0.64	| Q	| V	|	|	|	|

12+55	0.2709	0.65	Q		V		
13+ 0	0.2754	0.65	Q		V		
13+ 5	0.2803	0.71	Q		V		
13+10	0.2855	0.75	Q		V		
13+15	0.2907	0.76	Q		V		
13+20	0.2960	0.76	Q		V		
13+25	0.3012	0.76	Q		V		
13+30	0.3064	0.76	Q		V		
13+35	0.3107	0.62	Q		V		
13+40	0.3143	0.53	Q		V		
13+45	0.3179	0.51	Q		V		
13+50	0.3214	0.51	Q		V		
13+55	0.3250	0.51	Q		V		
14+ 0	0.3285	0.51	Q		V		
14+ 5	0.3324	0.57	Q		V		
14+10	0.3365	0.60	Q		V		
14+15	0.3407	0.60	Q		V		
14+20	0.3447	0.59	Q		V		
14+25	0.3488	0.58	Q		V		
14+30	0.3528	0.58	Q		V		
14+35	0.3568	0.58	Q		V		
14+40	0.3608	0.58	Q		V		
14+45	0.3648	0.58	Q		V		
14+50	0.3687	0.57	Q		V		
14+55	0.3725	0.56	Q		V		
15+ 0	0.3764	0.56	Q		V		
15+ 5	0.3802	0.55	Q		V		
15+10	0.3839	0.54	Q		V		
15+15	0.3876	0.54	Q		V		
15+20	0.3912	0.52	Q		V		
15+25	0.3947	0.52	Q		V		
15+30	0.3983	0.51	Q		V		
15+35	0.4014	0.46	Q		V		
15+40	0.4044	0.43	Q		V		
15+45	0.4073	0.42	Q		V		
15+50	0.4103	0.42	Q		V		
15+55	0.4132	0.42	Q		V		
16+ 0	0.4161	0.42	Q		V		
16+ 5	0.4177	0.23	Q		V		
16+10	0.4185	0.11	Q		V		
16+15	0.4191	0.09	Q		V		
16+20	0.4197	0.09	Q		V		
16+25	0.4203	0.09	Q		V		
16+30	0.4209	0.09	Q		V		
16+35	0.4214	0.08	Q		V		
16+40	0.4219	0.07	Q		V		
16+45	0.4224	0.07	Q		V		
16+50	0.4228	0.07	Q		V		
16+55	0.4233	0.07	Q		V		
17+ 0	0.4238	0.07	Q		V		
17+ 5	0.4244	0.09	Q		V		
17+10	0.4252	0.11	Q		V		
17+15	0.4259	0.11	Q		V		
17+20	0.4267	0.11	Q		V		
17+25	0.4275	0.11	Q		V		
17+30	0.4282	0.11	Q		V		
17+35	0.4290	0.11	Q		V		
17+40	0.4298	0.11	Q		V		
17+45	0.4305	0.11	Q		V		
17+50	0.4312	0.10	Q		V		
17+55	0.4319	0.09	Q		V		
18+ 0	0.4325	0.09	Q		V		
18+ 5	0.4331	0.09	Q		V		
18+10	0.4337	0.09	Q		V		
18+15	0.4343	0.09	Q		V		
18+20	0.4349	0.09	Q		V		
18+25	0.4355	0.09	Q		V		
18+30	0.4362	0.09	Q		V		
18+35	0.4367	0.08	Q		V		
18+40	0.4372	0.07	Q		V		
18+45	0.4376	0.07	Q		V		

18+50	0.4380	0.05	Q	|	|	|	V |
18+55	0.4383	0.05	Q	|	|	|	V |
19+ 0	0.4386	0.04	Q	|	|	|	V |
19+ 5	0.4390	0.06	Q	|	|	|	V |
19+10	0.4395	0.07	Q	|	|	|	V |
19+15	0.4399	0.07	Q	|	|	|	V |
19+20	0.4405	0.08	Q	|	|	|	V |
19+25	0.4411	0.09	Q	|	|	|	V |
19+30	0.4417	0.09	Q	|	|	|	V |
19+35	0.4422	0.08	Q	|	|	|	V |
19+40	0.4427	0.07	Q	|	|	|	V |
19+45	0.4432	0.07	Q	|	|	|	V |
19+50	0.4435	0.05	Q	|	|	|	V |
19+55	0.4439	0.05	Q	|	|	|	V |
20+ 0	0.4442	0.04	Q	|	|	|	V |
20+ 5	0.4446	0.06	Q	|	|	|	V |
20+10	0.4450	0.07	Q	|	|	|	V |
20+15	0.4455	0.07	Q	|	|	|	V |
20+20	0.4459	0.07	Q	|	|	|	V |
20+25	0.4464	0.07	Q	|	|	|	V |
20+30	0.4469	0.07	Q	|	|	|	V |
20+35	0.4473	0.07	Q	|	|	|	V |
20+40	0.4478	0.07	Q	|	|	|	V |
20+45	0.4482	0.07	Q	|	|	|	V |
20+50	0.4486	0.05	Q	|	|	|	V |
20+55	0.4489	0.05	Q	|	|	|	V |
21+ 0	0.4492	0.04	Q	|	|	|	V |
21+ 5	0.4496	0.06	Q	|	|	|	V |
21+10	0.4501	0.07	Q	|	|	|	V |
21+15	0.4506	0.07	Q	|	|	|	V|
21+20	0.4509	0.05	Q	|	|	|	V|
21+25	0.4512	0.05	Q	|	|	|	V|
21+30	0.4516	0.04	Q	|	|	|	V|
21+35	0.4519	0.06	Q	|	|	|	V|
21+40	0.4524	0.07	Q	|	|	|	V|
21+45	0.4529	0.07	Q	|	|	|	V|
21+50	0.4532	0.05	Q	|	|	|	V|
21+55	0.4536	0.05	Q	|	|	|	V|
22+ 0	0.4539	0.04	Q	|	|	|	V|
22+ 5	0.4543	0.06	Q	|	|	|	V|
22+10	0.4547	0.07	Q	|	|	|	V|
22+15	0.4552	0.07	Q	|	|	|	V|
22+20	0.4555	0.05	Q	|	|	|	V|
22+25	0.4559	0.05	Q	|	|	|	V|
22+30	0.4562	0.04	Q	|	|	|	V|
22+35	0.4565	0.04	Q	|	|	|	V|
22+40	0.4568	0.04	Q	|	|	|	V|
22+45	0.4571	0.04	Q	|	|	|	V|
22+50	0.4574	0.04	Q	|	|	|	V|
22+55	0.4577	0.04	Q	|	|	|	V|
23+ 0	0.4580	0.04	Q	|	|	|	V|
23+ 5	0.4583	0.04	Q	|	|	|	V|
23+10	0.4586	0.04	Q	|	|	|	V|
23+15	0.4589	0.04	Q	|	|	|	V|
23+20	0.4592	0.04	Q	|	|	|	V|
23+25	0.4596	0.04	Q	|	|	|	V|
23+30	0.4599	0.04	Q	|	|	|	V|
23+35	0.4602	0.04	Q	|	|	|	V|
23+40	0.4605	0.04	Q	|	|	|	V|
23+45	0.4608	0.04	Q	|	|	|	V|
23+50	0.4611	0.04	Q	|	|	|	V|
23+55	0.4614	0.04	Q	|	|	|	V|
24+ 0	0.4617	0.04	Q	|	|	|	V|
24+ 5	0.4618	0.02	Q	|	|	|	V|
24+10	0.4619	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 01/04/22 File: 19004DEVHYD2410.out

++

Riverside County Synthetic Unit Hydrology Method
RCFC & WCD Manual date - April 1978

Program License Serial Number 6106

English (in-lb) Input Units Used
English Rainfall Data (Inches) Input Values Used

English Units used in output format

19-004 DEVELOPED CONDITION HYDROGRAPH METHOD 10 YEAR 24 HOUR EVENT

Drainage Area = 4.33(Ac.) = 0.007 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 4.33(Ac.) = 0.007 Sq. Mi.
Length along longest watercourse = 812.30(Ft.)
Length along longest watercourse measured to centroid = 207.60(Ft.)
Length along longest watercourse = 0.154 Mi.
Length along longest watercourse measured to centroid = 0.039 Mi.
Difference in elevation = 4.47(Ft.)
Slope along watercourse = 29.0553 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time = 0.027 Hr.
Lag time = 1.63 Min.
25% of lag time = 0.41 Min.
40% of lag time = 0.65 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]
4.33	1.60	6.93

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
4.33	4.10	17.75

STORM EVENT (YEAR) = 10.00
Area Averaged 2-Year Rainfall = 1.600(In)
Area Averaged 100-Year Rainfall = 4.100(In)

Point rain (area averaged) = 2.629(In)
Areal adjustment factor = 100.00 %
Adjusted average point rain = 2.628(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %

4.330	75.00	0.880

Total Area Entered = 4.33(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
75.0	75.0	0.303	0.880	0.063	1.000	0.063
					Sum (F) =	0.063

Area averaged mean soil loss (F) (In/Hr) = 0.063
Minimum soil loss rate ((In/Hr)) = 0.032
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.200

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	305.838	57.272	2.499
2	0.167	611.677	36.809	1.606
3	0.250	917.515	5.919	0.258
			Sum = 100.000 Sum=	4.364

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	0.021	(0.112)	0.004	0.017
2	0.17	0.07	0.021	(0.111)	0.004	0.017
3	0.25	0.07	0.021	(0.111)	0.004	0.017
4	0.33	0.10	0.032	(0.110)	0.006	0.025
5	0.42	0.10	0.032	(0.110)	0.006	0.025
6	0.50	0.10	0.032	(0.110)	0.006	0.025
7	0.58	0.10	0.032	(0.109)	0.006	0.025
8	0.67	0.10	0.032	(0.109)	0.006	0.025
9	0.75	0.10	0.032	(0.108)	0.006	0.025
10	0.83	0.13	0.042	(0.108)	0.008	0.034
11	0.92	0.13	0.042	(0.107)	0.008	0.034
12	1.00	0.13	0.042	(0.107)	0.008	0.034
13	1.08	0.10	0.032	(0.107)	0.006	0.025
14	1.17	0.10	0.032	(0.106)	0.006	0.025
15	1.25	0.10	0.032	(0.106)	0.006	0.025
16	1.33	0.10	0.032	(0.105)	0.006	0.025
17	1.42	0.10	0.032	(0.105)	0.006	0.025
18	1.50	0.10	0.032	(0.104)	0.006	0.025
19	1.58	0.10	0.032	(0.104)	0.006	0.025
20	1.67	0.10	0.032	(0.104)	0.006	0.025
21	1.75	0.10	0.032	(0.103)	0.006	0.025
22	1.83	0.13	0.042	(0.103)	0.008	0.034
23	1.92	0.13	0.042	(0.102)	0.008	0.034
24	2.00	0.13	0.042	(0.102)	0.008	0.034
25	2.08	0.13	0.042	(0.102)	0.008	0.034
26	2.17	0.13	0.042	(0.101)	0.008	0.034
27	2.25	0.13	0.042	(0.101)	0.008	0.034
28	2.33	0.13	0.042	(0.100)	0.008	0.034
29	2.42	0.13	0.042	(0.100)	0.008	0.034
30	2.50	0.13	0.042	(0.100)	0.008	0.034
31	2.58	0.17	0.053	(0.099)	0.011	0.042
32	2.67	0.17	0.053	(0.099)	0.011	0.042
33	2.75	0.17	0.053	(0.098)	0.011	0.042
34	2.83	0.17	0.053	(0.098)	0.011	0.042
35	2.92	0.17	0.053	(0.098)	0.011	0.042
36	3.00	0.17	0.053	(0.097)	0.011	0.042
37	3.08	0.17	0.053	(0.097)	0.011	0.042

38	3.17	0.17	0.053	(0.096)	0.011	0.042
39	3.25	0.17	0.053	(0.096)	0.011	0.042
40	3.33	0.17	0.053	(0.096)	0.011	0.042
41	3.42	0.17	0.053	(0.095)	0.011	0.042
42	3.50	0.17	0.053	(0.095)	0.011	0.042
43	3.58	0.17	0.053	(0.094)	0.011	0.042
44	3.67	0.17	0.053	(0.094)	0.011	0.042
45	3.75	0.17	0.053	(0.094)	0.011	0.042
46	3.83	0.20	0.063	(0.093)	0.013	0.050
47	3.92	0.20	0.063	(0.093)	0.013	0.050
48	4.00	0.20	0.063	(0.092)	0.013	0.050
49	4.08	0.20	0.063	(0.092)	0.013	0.050
50	4.17	0.20	0.063	(0.092)	0.013	0.050
51	4.25	0.20	0.063	(0.091)	0.013	0.050
52	4.33	0.23	0.074	(0.091)	0.015	0.059
53	4.42	0.23	0.074	(0.090)	0.015	0.059
54	4.50	0.23	0.074	(0.090)	0.015	0.059
55	4.58	0.23	0.074	(0.090)	0.015	0.059
56	4.67	0.23	0.074	(0.089)	0.015	0.059
57	4.75	0.23	0.074	(0.089)	0.015	0.059
58	4.83	0.27	0.084	(0.088)	0.017	0.067
59	4.92	0.27	0.084	(0.088)	0.017	0.067
60	5.00	0.27	0.084	(0.088)	0.017	0.067
61	5.08	0.20	0.063	(0.087)	0.013	0.050
62	5.17	0.20	0.063	(0.087)	0.013	0.050
63	5.25	0.20	0.063	(0.087)	0.013	0.050
64	5.33	0.23	0.074	(0.086)	0.015	0.059
65	5.42	0.23	0.074	(0.086)	0.015	0.059
66	5.50	0.23	0.074	(0.085)	0.015	0.059
67	5.58	0.27	0.084	(0.085)	0.017	0.067
68	5.67	0.27	0.084	(0.085)	0.017	0.067
69	5.75	0.27	0.084	(0.084)	0.017	0.067
70	5.83	0.27	0.084	(0.084)	0.017	0.067
71	5.92	0.27	0.084	(0.084)	0.017	0.067
72	6.00	0.27	0.084	(0.083)	0.017	0.067
73	6.08	0.30	0.095	(0.083)	0.019	0.076
74	6.17	0.30	0.095	(0.082)	0.019	0.076
75	6.25	0.30	0.095	(0.082)	0.019	0.076
76	6.33	0.30	0.095	(0.082)	0.019	0.076
77	6.42	0.30	0.095	(0.081)	0.019	0.076
78	6.50	0.30	0.095	(0.081)	0.019	0.076
79	6.58	0.33	0.105	(0.081)	0.021	0.084
80	6.67	0.33	0.105	(0.080)	0.021	0.084
81	6.75	0.33	0.105	(0.080)	0.021	0.084
82	6.83	0.33	0.105	(0.080)	0.021	0.084
83	6.92	0.33	0.105	(0.079)	0.021	0.084
84	7.00	0.33	0.105	(0.079)	0.021	0.084
85	7.08	0.33	0.105	(0.078)	0.021	0.084
86	7.17	0.33	0.105	(0.078)	0.021	0.084
87	7.25	0.33	0.105	(0.078)	0.021	0.084
88	7.33	0.37	0.116	(0.077)	0.023	0.093
89	7.42	0.37	0.116	(0.077)	0.023	0.093
90	7.50	0.37	0.116	(0.077)	0.023	0.093
91	7.58	0.40	0.126	(0.076)	0.025	0.101
92	7.67	0.40	0.126	(0.076)	0.025	0.101
93	7.75	0.40	0.126	(0.076)	0.025	0.101
94	7.83	0.43	0.137	(0.075)	0.027	0.109
95	7.92	0.43	0.137	(0.075)	0.027	0.109
96	8.00	0.43	0.137	(0.075)	0.027	0.109
97	8.08	0.50	0.158	(0.074)	0.032	0.126
98	8.17	0.50	0.158	(0.074)	0.032	0.126
99	8.25	0.50	0.158	(0.074)	0.032	0.126
100	8.33	0.50	0.158	(0.073)	0.032	0.126
101	8.42	0.50	0.158	(0.073)	0.032	0.126
102	8.50	0.50	0.158	(0.073)	0.032	0.126
103	8.58	0.53	0.168	(0.072)	0.034	0.135
104	8.67	0.53	0.168	(0.072)	0.034	0.135
105	8.75	0.53	0.168	(0.072)	0.034	0.135
106	8.83	0.57	0.179	(0.071)	0.036	0.143
107	8.92	0.57	0.179	(0.071)	0.036	0.143
108	9.00	0.57	0.179	(0.070)	0.036	0.143

109	9.08	0.63	0.200	(0.070)	0.040	0.160
110	9.17	0.63	0.200	(0.070)	0.040	0.160
111	9.25	0.63	0.200	(0.069)	0.040	0.160
112	9.33	0.67	0.210	(0.069)	0.042	0.168
113	9.42	0.67	0.210	(0.069)	0.042	0.168
114	9.50	0.67	0.210	(0.069)	0.042	0.168
115	9.58	0.70	0.221	(0.068)	0.044	0.177
116	9.67	0.70	0.221	(0.068)	0.044	0.177
117	9.75	0.70	0.221	(0.068)	0.044	0.177
118	9.83	0.73	0.231	(0.067)	0.046	0.185
119	9.92	0.73	0.231	(0.067)	0.046	0.185
120	10.00	0.73	0.231	(0.067)	0.046	0.185
121	10.08	0.50	0.158	(0.066)	0.032	0.126
122	10.17	0.50	0.158	(0.066)	0.032	0.126
123	10.25	0.50	0.158	(0.066)	0.032	0.126
124	10.33	0.50	0.158	(0.065)	0.032	0.126
125	10.42	0.50	0.158	(0.065)	0.032	0.126
126	10.50	0.50	0.158	(0.065)	0.032	0.126
127	10.58	0.67	0.210	(0.064)	0.042	0.168
128	10.67	0.67	0.210	(0.064)	0.042	0.168
129	10.75	0.67	0.210	(0.064)	0.042	0.168
130	10.83	0.67	0.210	(0.063)	0.042	0.168
131	10.92	0.67	0.210	(0.063)	0.042	0.168
132	11.00	0.67	0.210	(0.063)	0.042	0.168
133	11.08	0.63	0.200	(0.062)	0.040	0.160
134	11.17	0.63	0.200	(0.062)	0.040	0.160
135	11.25	0.63	0.200	(0.062)	0.040	0.160
136	11.33	0.63	0.200	(0.062)	0.040	0.160
137	11.42	0.63	0.200	(0.061)	0.040	0.160
138	11.50	0.63	0.200	(0.061)	0.040	0.160
139	11.58	0.57	0.179	(0.061)	0.036	0.143
140	11.67	0.57	0.179	(0.060)	0.036	0.143
141	11.75	0.57	0.179	(0.060)	0.036	0.143
142	11.83	0.60	0.189	(0.060)	0.038	0.151
143	11.92	0.60	0.189	(0.059)	0.038	0.151
144	12.00	0.60	0.189	(0.059)	0.038	0.151
145	12.08	0.83	0.263	(0.059)	0.053	0.210
146	12.17	0.83	0.263	(0.059)	0.053	0.210
147	12.25	0.83	0.263	(0.058)	0.053	0.210
148	12.33	0.87	0.273	(0.058)	0.055	0.219
149	12.42	0.87	0.273	(0.058)	0.055	0.219
150	12.50	0.87	0.273	(0.057)	0.055	0.219
151	12.58	0.93	0.294	0.057	(0.059)	0.237
152	12.67	0.93	0.294	0.057	(0.059)	0.238
153	12.75	0.93	0.294	0.057	(0.059)	0.238
154	12.83	0.97	0.305	0.056	(0.061)	0.249
155	12.92	0.97	0.305	0.056	(0.061)	0.249
156	13.00	0.97	0.305	0.056	(0.061)	0.249
157	13.08	1.13	0.357	0.055	(0.071)	0.302
158	13.17	1.13	0.357	0.055	(0.071)	0.302
159	13.25	1.13	0.357	0.055	(0.071)	0.303
160	13.33	1.13	0.357	0.055	(0.071)	0.303
161	13.42	1.13	0.357	0.054	(0.071)	0.303
162	13.50	1.13	0.357	0.054	(0.071)	0.303
163	13.58	0.77	0.242	(0.054)	0.048	0.193
164	13.67	0.77	0.242	(0.053)	0.048	0.193
165	13.75	0.77	0.242	(0.053)	0.048	0.193
166	13.83	0.77	0.242	(0.053)	0.048	0.193
167	13.92	0.77	0.242	(0.053)	0.048	0.193
168	14.00	0.77	0.242	(0.052)	0.048	0.193
169	14.08	0.90	0.284	0.052	(0.057)	0.232
170	14.17	0.90	0.284	0.052	(0.057)	0.232
171	14.25	0.90	0.284	0.052	(0.057)	0.232
172	14.33	0.87	0.273	0.051	(0.055)	0.222
173	14.42	0.87	0.273	0.051	(0.055)	0.222
174	14.50	0.87	0.273	0.051	(0.055)	0.223
175	14.58	0.87	0.273	0.051	(0.055)	0.223
176	14.67	0.87	0.273	0.050	(0.055)	0.223
177	14.75	0.87	0.273	0.050	(0.055)	0.223
178	14.83	0.83	0.263	0.050	(0.053)	0.213
179	14.92	0.83	0.263	0.049	(0.053)	0.213

180	15.00	0.83	0.263	0.049	(0.053)	0.214
181	15.08	0.80	0.252	0.049	(0.050)	0.203
182	15.17	0.80	0.252	0.049	(0.050)	0.204
183	15.25	0.80	0.252	0.048	(0.050)	0.204
184	15.33	0.77	0.242	0.048	(0.048)	0.194
185	15.42	0.77	0.242	0.048	(0.048)	0.194
186	15.50	0.77	0.242	0.048	(0.048)	0.194
187	15.58	0.63	0.200	(0.047)	0.040	0.160
188	15.67	0.63	0.200	(0.047)	0.040	0.160
189	15.75	0.63	0.200	(0.047)	0.040	0.160
190	15.83	0.63	0.200	(0.047)	0.040	0.160
191	15.92	0.63	0.200	(0.047)	0.040	0.160
192	16.00	0.63	0.200	(0.046)	0.040	0.160
193	16.08	0.13	0.042	(0.046)	0.008	0.034
194	16.17	0.13	0.042	(0.046)	0.008	0.034
195	16.25	0.13	0.042	(0.046)	0.008	0.034
196	16.33	0.13	0.042	(0.045)	0.008	0.034
197	16.42	0.13	0.042	(0.045)	0.008	0.034
198	16.50	0.13	0.042	(0.045)	0.008	0.034
199	16.58	0.10	0.032	(0.045)	0.006	0.025
200	16.67	0.10	0.032	(0.044)	0.006	0.025
201	16.75	0.10	0.032	(0.044)	0.006	0.025
202	16.83	0.10	0.032	(0.044)	0.006	0.025
203	16.92	0.10	0.032	(0.044)	0.006	0.025
204	17.00	0.10	0.032	(0.044)	0.006	0.025
205	17.08	0.17	0.053	(0.043)	0.011	0.042
206	17.17	0.17	0.053	(0.043)	0.011	0.042
207	17.25	0.17	0.053	(0.043)	0.011	0.042
208	17.33	0.17	0.053	(0.043)	0.011	0.042
209	17.42	0.17	0.053	(0.042)	0.011	0.042
210	17.50	0.17	0.053	(0.042)	0.011	0.042
211	17.58	0.17	0.053	(0.042)	0.011	0.042
212	17.67	0.17	0.053	(0.042)	0.011	0.042
213	17.75	0.17	0.053	(0.042)	0.011	0.042
214	17.83	0.13	0.042	(0.041)	0.008	0.034
215	17.92	0.13	0.042	(0.041)	0.008	0.034
216	18.00	0.13	0.042	(0.041)	0.008	0.034
217	18.08	0.13	0.042	(0.041)	0.008	0.034
218	18.17	0.13	0.042	(0.041)	0.008	0.034
219	18.25	0.13	0.042	(0.040)	0.008	0.034
220	18.33	0.13	0.042	(0.040)	0.008	0.034
221	18.42	0.13	0.042	(0.040)	0.008	0.034
222	18.50	0.13	0.042	(0.040)	0.008	0.034
223	18.58	0.10	0.032	(0.040)	0.006	0.025
224	18.67	0.10	0.032	(0.039)	0.006	0.025
225	18.75	0.10	0.032	(0.039)	0.006	0.025
226	18.83	0.07	0.021	(0.039)	0.004	0.017
227	18.92	0.07	0.021	(0.039)	0.004	0.017
228	19.00	0.07	0.021	(0.039)	0.004	0.017
229	19.08	0.10	0.032	(0.038)	0.006	0.025
230	19.17	0.10	0.032	(0.038)	0.006	0.025
231	19.25	0.10	0.032	(0.038)	0.006	0.025
232	19.33	0.13	0.042	(0.038)	0.008	0.034
233	19.42	0.13	0.042	(0.038)	0.008	0.034
234	19.50	0.13	0.042	(0.038)	0.008	0.034
235	19.58	0.10	0.032	(0.037)	0.006	0.025
236	19.67	0.10	0.032	(0.037)	0.006	0.025
237	19.75	0.10	0.032	(0.037)	0.006	0.025
238	19.83	0.07	0.021	(0.037)	0.004	0.017
239	19.92	0.07	0.021	(0.037)	0.004	0.017
240	20.00	0.07	0.021	(0.037)	0.004	0.017
241	20.08	0.10	0.032	(0.036)	0.006	0.025
242	20.17	0.10	0.032	(0.036)	0.006	0.025
243	20.25	0.10	0.032	(0.036)	0.006	0.025
244	20.33	0.10	0.032	(0.036)	0.006	0.025
245	20.42	0.10	0.032	(0.036)	0.006	0.025
246	20.50	0.10	0.032	(0.036)	0.006	0.025
247	20.58	0.10	0.032	(0.036)	0.006	0.025
248	20.67	0.10	0.032	(0.035)	0.006	0.025
249	20.75	0.10	0.032	(0.035)	0.006	0.025
250	20.83	0.07	0.021	(0.035)	0.004	0.017

251	20.92	0.07	0.021	(0.035)	0.004	0.017
252	21.00	0.07	0.021	(0.035)	0.004	0.017
253	21.08	0.10	0.032	(0.035)	0.006	0.025
254	21.17	0.10	0.032	(0.035)	0.006	0.025
255	21.25	0.10	0.032	(0.034)	0.006	0.025
256	21.33	0.07	0.021	(0.034)	0.004	0.017
257	21.42	0.07	0.021	(0.034)	0.004	0.017
258	21.50	0.07	0.021	(0.034)	0.004	0.017
259	21.58	0.10	0.032	(0.034)	0.006	0.025
260	21.67	0.10	0.032	(0.034)	0.006	0.025
261	21.75	0.10	0.032	(0.034)	0.006	0.025
262	21.83	0.07	0.021	(0.034)	0.004	0.017
263	21.92	0.07	0.021	(0.033)	0.004	0.017
264	22.00	0.07	0.021	(0.033)	0.004	0.017
265	22.08	0.10	0.032	(0.033)	0.006	0.025
266	22.17	0.10	0.032	(0.033)	0.006	0.025
267	22.25	0.10	0.032	(0.033)	0.006	0.025
268	22.33	0.07	0.021	(0.033)	0.004	0.017
269	22.42	0.07	0.021	(0.033)	0.004	0.017
270	22.50	0.07	0.021	(0.033)	0.004	0.017
271	22.58	0.07	0.021	(0.033)	0.004	0.017
272	22.67	0.07	0.021	(0.032)	0.004	0.017
273	22.75	0.07	0.021	(0.032)	0.004	0.017
274	22.83	0.07	0.021	(0.032)	0.004	0.017
275	22.92	0.07	0.021	(0.032)	0.004	0.017
276	23.00	0.07	0.021	(0.032)	0.004	0.017
277	23.08	0.07	0.021	(0.032)	0.004	0.017
278	23.17	0.07	0.021	(0.032)	0.004	0.017
279	23.25	0.07	0.021	(0.032)	0.004	0.017
280	23.33	0.07	0.021	(0.032)	0.004	0.017
281	23.42	0.07	0.021	(0.032)	0.004	0.017
282	23.50	0.07	0.021	(0.032)	0.004	0.017
283	23.58	0.07	0.021	(0.032)	0.004	0.017
284	23.67	0.07	0.021	(0.032)	0.004	0.017
285	23.75	0.07	0.021	(0.032)	0.004	0.017
286	23.83	0.07	0.021	(0.032)	0.004	0.017
287	23.92	0.07	0.021	(0.032)	0.004	0.017
288	24.00	0.07	0.021	(0.032)	0.004	0.017

(Loss Rate Not Used)

Sum = 100.0 Sum = 25.4

Flood volume = Effective rainfall 2.12(In)
times area 4.3(Ac.)/[(In)/(Ft.)] = 0.8(Ac.Ft)
Total soil loss = 0.51(In)
Total soil loss = 0.184(Ac.Ft)
Total rainfall = 2.63(In)
Flood volume = 33283.5 Cubic Feet
Total soil loss = 8031.0 Cubic Feet

Peak flow rate of this hydrograph = 1.324(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	0.0003	0.04	Q	|	|	|	|
0+10	0.0008	0.07	Q	|	|	|	|
0+15	0.0013	0.07	Q	|	|	|	|
0+20	0.0019	0.09	Q	|	|	|	|
0+25	0.0027	0.11	Q	|	|	|	|
0+30	0.0034	0.11	Q	|	|	|	|
0+35	0.0042	0.11	Q	|	|	|	|
0+40	0.0049	0.11	Q	|	|	|	|
0+45	0.0057	0.11	Q	|	|	|	|
0+50	0.0066	0.13	Q	|	|	|	|
0+55	0.0076	0.14	Q	|	|	|	|
1+ 0	0.0086	0.15	Q	|	|	|	|

1+ 5	0.0095	0.13	Q	|	|	|	|
1+10	0.0103	0.11	Q	|	|	|	|
1+15	0.0110	0.11	Q	|	|	|	|
1+20	0.0118	0.11	Q	|	|	|	|
1+25	0.0125	0.11	Q	|	|	|	|
1+30	0.0133	0.11	Q	|	|	|	|
1+35	0.0140	0.11	Q	|	|	|	|
1+40	0.0148	0.11	Q	|	|	|	|
1+45	0.0156	0.11	Q	|	|	|	|
1+50	0.0165	0.13	Q	|	|	|	|
1+55	0.0175	0.14	Q	|	|	|	|
2+ 0	0.0185	0.15	Q	|	|	|	|
2+ 5	0.0195	0.15	QV	|	|	|	|
2+10	0.0205	0.15	QV	|	|	|	|
2+15	0.0215	0.15	QV	|	|	|	|
2+20	0.0225	0.15	QV	|	|	|	|
2+25	0.0235	0.15	QV	|	|	|	|
2+30	0.0245	0.15	QV	|	|	|	|
2+35	0.0257	0.17	QV	|	|	|	|
2+40	0.0270	0.18	QV	|	|	|	|
2+45	0.0282	0.18	QV	|	|	|	|
2+50	0.0295	0.18	QV	|	|	|	|
2+55	0.0307	0.18	QV	|	|	|	|
3+ 0	0.0320	0.18	QV	|	|	|	|
3+ 5	0.0333	0.18	QV	|	|	|	|
3+10	0.0345	0.18	QV	|	|	|	|
3+15	0.0358	0.18	QV	|	|	|	|
3+20	0.0371	0.18	QV	|	|	|	|
3+25	0.0383	0.18	Q V	|	|	|	|
3+30	0.0396	0.18	Q V	|	|	|	|
3+35	0.0409	0.18	Q V	|	|	|	|
3+40	0.0421	0.18	Q V	|	|	|	|
3+45	0.0434	0.18	Q V	|	|	|	|
3+50	0.0448	0.20	Q V	|	|	|	|
3+55	0.0463	0.22	Q V	|	|	|	|
4+ 0	0.0478	0.22	Q V	|	|	|	|
4+ 5	0.0493	0.22	Q V	|	|	|	|
4+10	0.0509	0.22	Q V	|	|	|	|
4+15	0.0524	0.22	Q V	|	|	|	|
4+20	0.0540	0.24	Q V	|	|	|	|
4+25	0.0558	0.25	|QV	|	|	|	|
4+30	0.0576	0.26	|Q V	|	|	|	|
4+35	0.0593	0.26	|Q V	|	|	|	|
4+40	0.0611	0.26	|Q V	|	|	|	|
4+45	0.0629	0.26	|Q V	|	|	|	|
4+50	0.0648	0.28	|Q V	|	|	|	|
4+55	0.0668	0.29	|Q V	|	|	|	|
5+ 0	0.0688	0.29	|Q V	|	|	|	|
5+ 5	0.0706	0.25	|Q V	|	|	|	|
5+10	0.0721	0.22	Q V	|	|	|	|
5+15	0.0736	0.22	Q V	|	|	|	|
5+20	0.0753	0.24	Q V	|	|	|	|
5+25	0.0770	0.25	|Q V	|	|	|	|
5+30	0.0788	0.26	|Q V	|	|	|	|
5+35	0.0807	0.28	|Q V	|	|	|	|
5+40	0.0827	0.29	|Q V	|	|	|	|
5+45	0.0848	0.29	|Q V	|	|	|	|
5+50	0.0868	0.29	|Q V	|	|	|	|
5+55	0.0888	0.29	|Q V	|	|	|	|
6+ 0	0.0908	0.29	|Q V	|	|	|	|
6+ 5	0.0930	0.31	|Q V	|	|	|	|
6+10	0.0953	0.33	|Q V	|	|	|	|
6+15	0.0975	0.33	|Q V	|	|	|	|
6+20	0.0998	0.33	|Q V	|	|	|	|
6+25	0.1021	0.33	|Q V	|	|	|	|
6+30	0.1044	0.33	|Q V	|	|	|	|
6+35	0.1068	0.35	|Q V	|	|	|	|
6+40	0.1093	0.37	|Q V	|	|	|	|
6+45	0.1118	0.37	|Q V	|	|	|	|
6+50	0.1144	0.37	|Q V	|	|	|	|
6+55	0.1169	0.37	|Q V	|	|	|	|

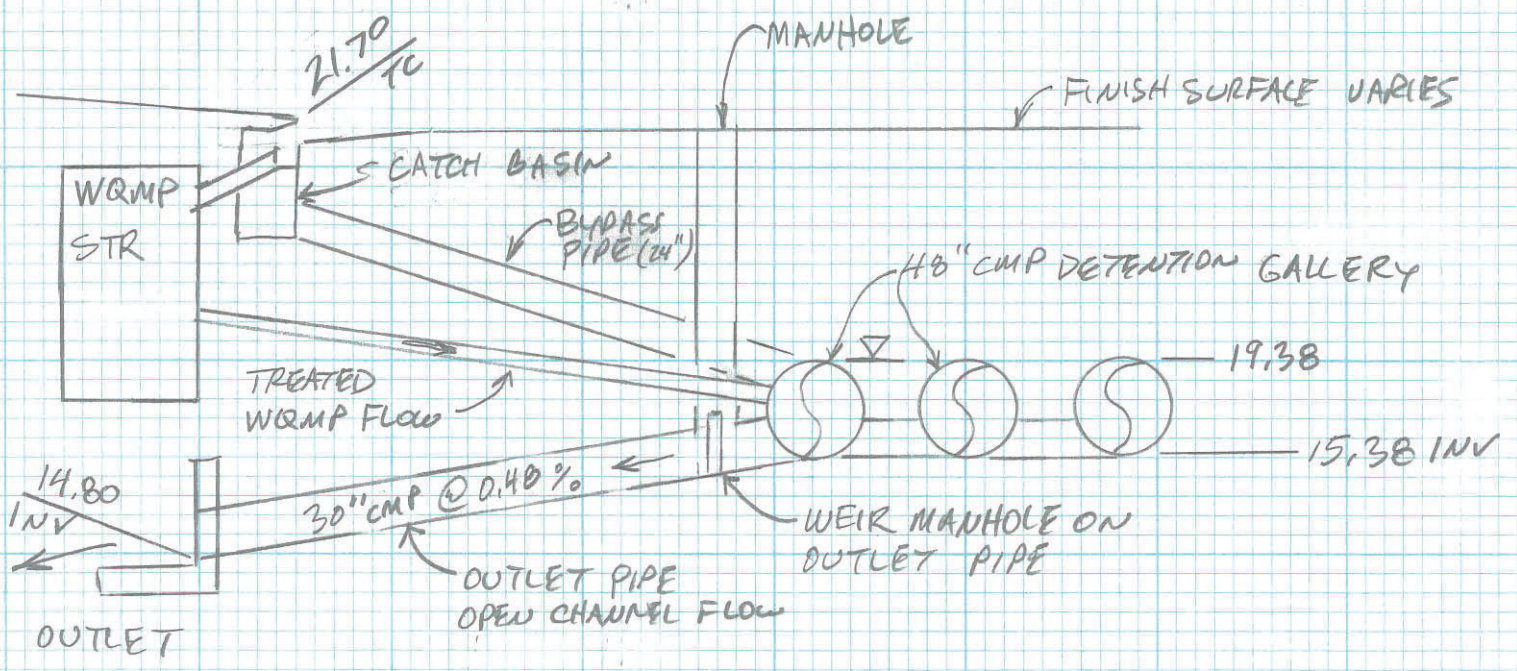
7+ 0	0.1194	0.37	|Q V |	|	|	|	|
7+ 5	0.1219	0.37	|Q V |	|	|	|	|
7+10	0.1245	0.37	|Q V |	|	|	|	|
7+15	0.1270	0.37	|Q V |	|	|	|	|
7+20	0.1297	0.39	|Q V |	|	|	|	|
7+25	0.1324	0.40	|Q V |	|	|	|	|
7+30	0.1352	0.40	|Q V |	|	|	|	|
7+35	0.1382	0.42	|Q V |	|	|	|	|
7+40	0.1412	0.44	|Q V |	|	|	|	|
7+45	0.1442	0.44	|Q V |	|	|	|	|
7+50	0.1474	0.46	|Q V |	|	|	|	|
7+55	0.1507	0.48	|Q V |	|	|	|	|
8+ 0	0.1539	0.48	|Q V |	|	|	|	|
8+ 5	0.1575	0.52	| Q V |	|	|	|	|
8+10	0.1613	0.55	| Q V |	|	|	|	|
8+15	0.1651	0.55	| Q V |	|	|	|	|
8+20	0.1689	0.55	| Q V |	|	|	|	|
8+25	0.1727	0.55	| Q V|	|	|	|	|
8+30	0.1765	0.55	| Q V|	|	|	|	|
8+35	0.1804	0.57	| Q V|	|	|	|	|
8+40	0.1844	0.59	| Q V|	|	|	|	|
8+45	0.1885	0.59	| Q V|	|	|	|	|
8+50	0.1927	0.61	| Q V	|	|	|	|
8+55	0.1970	0.62	| Q V	|	|	|	|
9+ 0	0.2013	0.62	| Q V	|	|	|	|
9+ 5	0.2058	0.67	| Q V	|	|	|	|
9+10	0.2106	0.69	| Q |V	|	|	|	|
9+15	0.2154	0.70	| Q |V	|	|	|	|
9+20	0.2204	0.72	| Q |V	|	|	|	|
9+25	0.2254	0.73	| Q |V	|	|	|	|
9+30	0.2305	0.73	| Q | V	|	|	|	|
9+35	0.2357	0.76	| Q | V	|	|	|	|
9+40	0.2410	0.77	| Q | V	|	|	|	|
9+45	0.2463	0.77	| Q | V	|	|	|	|
9+50	0.2517	0.79	| Q | V	|	|	|	|
9+55	0.2573	0.81	| Q | V	|	|	|	|
10+ 0	0.2629	0.81	| Q | V	|	|	|	|
10+ 5	0.2674	0.66	| Q | V	|	|	|	|
10+10	0.2713	0.57	| Q | V	|	|	|	|
10+15	0.2751	0.55	| Q | V	|	|	|	|
10+20	0.2789	0.55	| Q | V	|	|	|	|
10+25	0.2827	0.55	| Q | V	|	|	|	|
10+30	0.2865	0.55	| Q | V	|	|	|	|
10+35	0.2910	0.66	| Q | V	|	|	|	|
10+40	0.2960	0.72	| Q | V	|	|	|	|
10+45	0.3010	0.73	| Q | V	|	|	|	|
10+50	0.3061	0.73	| Q | V	|	|	|	|
10+55	0.3112	0.73	| Q | V	|	|	|	|
11+ 0	0.3162	0.73	| Q | V	|	|	|	|
11+ 5	0.3211	0.71	| Q | V	|	|	|	|
11+10	0.3260	0.70	| Q | V	|	|	|	|
11+15	0.3308	0.70	| Q | V	|	|	|	|
11+20	0.3356	0.70	| Q | V	|	|	|	|
11+25	0.3404	0.70	| Q | V	|	|	|	|
11+30	0.3452	0.70	| Q | V	|	|	|	|
11+35	0.3497	0.66	| Q | V	|	|	|	|
11+40	0.3540	0.63	| Q | V	|	|	|	|
11+45	0.3583	0.62	| Q | V	|	|	|	|
11+50	0.3628	0.65	| Q | V	|	|	|	|
11+55	0.3673	0.66	| Q | V	|	|	|	|
12+ 0	0.3719	0.66	| Q | V	|	|	|	|
12+ 5	0.3774	0.81	| Q | V	|	|	|	|
12+10	0.3836	0.90	| Q | V	|	|	|	|
12+15	0.3900	0.92	| Q | V	|	|	|	|
12+20	0.3964	0.94	| Q | V	|	|	|	|
12+25	0.4030	0.95	| Q | V	|	|	|	|
12+30	0.4096	0.95	| Q | V	|	|	|	|
12+35	0.4165	1.00	| Q | V	|	|	|	|
12+40	0.4236	1.03	| Q | V	|	|	|	|
12+45	0.4307	1.04	| Q | V	|	|	|	|
12+50	0.4381	1.07	| Q | V	|	|	|	|

12+55	0.4455	1.08	Q		V	
13+ 0	0.4530	1.09	Q		V	
13+ 5	0.4614	1.22	Q		V	
13+10	0.4704	1.31	Q		V	
13+15	0.4795	1.32	Q		V	
13+20	0.4886	1.32	Q		V	
13+25	0.4977	1.32	Q		V	
13+30	0.5068	1.32	Q		V	
13+35	0.5141	1.05	Q		V	
13+40	0.5201	0.87	Q		V	
13+45	0.5259	0.84	Q		V	
13+50	0.5317	0.84	Q		V	
13+55	0.5375	0.84	Q		V	
14+ 0	0.5434	0.84	Q		V	
14+ 5	0.5498	0.94	Q		V	
14+10	0.5567	1.00	Q		V	
14+15	0.5637	1.01	Q		V	
14+20	0.5705	0.99	Q		V	
14+25	0.5772	0.97	Q		V	
14+30	0.5839	0.97	Q		V	
14+35	0.5906	0.97	Q		V	
14+40	0.5973	0.97	Q		V	
14+45	0.6040	0.97	Q		V	
14+50	0.6106	0.95	Q		V	
14+55	0.6170	0.93	Q		V	
15+ 0	0.6234	0.93	Q		V	
15+ 5	0.6297	0.91	Q		V	
15+10	0.6358	0.89	Q		V	
15+15	0.6419	0.89	Q		V	
15+20	0.6479	0.86	Q		V	
15+25	0.6537	0.85	Q		V	
15+30	0.6596	0.85	Q		V	
15+35	0.6648	0.76	Q		V	
15+40	0.6697	0.71	Q		V	
15+45	0.6745	0.70	Q		V	
15+50	0.6793	0.70	Q		V	
15+55	0.6841	0.70	Q		V	
16+ 0	0.6889	0.70	Q		V	
16+ 5	0.6915	0.38	Q		V	
16+10	0.6928	0.18	Q		V	
16+15	0.6938	0.15	Q		V	
16+20	0.6948	0.15	Q		V	
16+25	0.6958	0.15	Q		V	
16+30	0.6968	0.15	Q		V	
16+35	0.6977	0.13	Q		V	
16+40	0.6985	0.11	Q		V	
16+45	0.6992	0.11	Q		V	
16+50	0.7000	0.11	Q		V	
16+55	0.7007	0.11	Q		V	
17+ 0	0.7015	0.11	Q		V	
17+ 5	0.7025	0.15	Q		V	
17+10	0.7038	0.18	Q		V	
17+15	0.7050	0.18	Q		V	
17+20	0.7063	0.18	Q		V	
17+25	0.7076	0.18	Q		V	
17+30	0.7088	0.18	Q		V	
17+35	0.7101	0.18	Q		V	
17+40	0.7114	0.18	Q		V	
17+45	0.7126	0.18	Q		V	
17+50	0.7138	0.16	Q		V	
17+55	0.7148	0.15	Q		V	
18+ 0	0.7158	0.15	Q		V	
18+ 5	0.7168	0.15	Q		V	
18+10	0.7178	0.15	Q		V	
18+15	0.7188	0.15	Q		V	
18+20	0.7198	0.15	Q		V	
18+25	0.7208	0.15	Q		V	
18+30	0.7219	0.15	Q		V	
18+35	0.7227	0.13	Q		V	
18+40	0.7235	0.11	Q		V	
18+45	0.7243	0.11	Q		V	

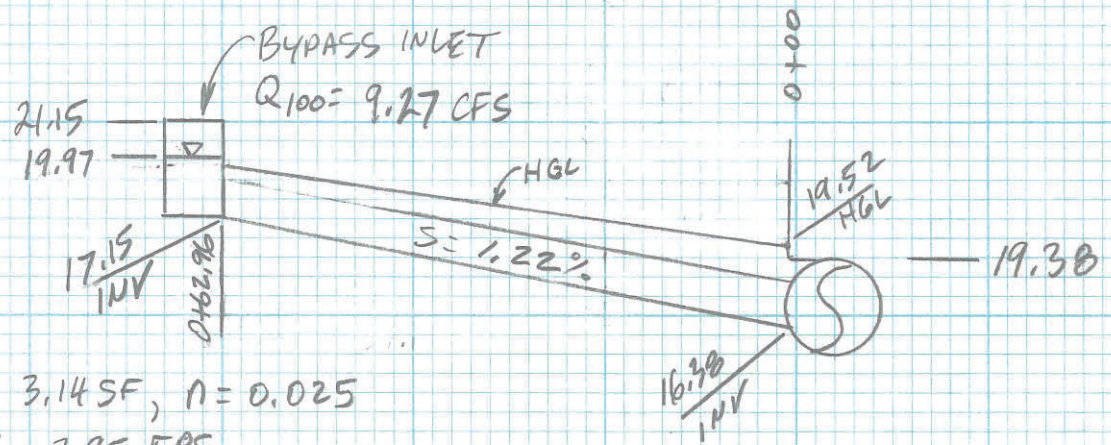
18+50	0.7249	0.09	Q	|	|	|	V |
18+55	0.7254	0.08	Q	|	|	|	V |
19+ 0	0.7259	0.07	Q	|	|	|	V |
19+ 5	0.7266	0.09	Q	|	|	|	V |
19+10	0.7273	0.11	Q	|	|	|	V |
19+15	0.7281	0.11	Q	|	|	|	V |
19+20	0.7290	0.13	Q	|	|	|	V |
19+25	0.7300	0.14	Q	|	|	|	V |
19+30	0.7310	0.15	Q	|	|	|	V |
19+35	0.7318	0.13	Q	|	|	|	V |
19+40	0.7326	0.11	Q	|	|	|	V |
19+45	0.7334	0.11	Q	|	|	|	V |
19+50	0.7340	0.09	Q	|	|	|	V |
19+55	0.7345	0.08	Q	|	|	|	V |
20+ 0	0.7350	0.07	Q	|	|	|	V |
20+ 5	0.7357	0.09	Q	|	|	|	V |
20+10	0.7364	0.11	Q	|	|	|	V |
20+15	0.7372	0.11	Q	|	|	|	V |
20+20	0.7379	0.11	Q	|	|	|	V |
20+25	0.7387	0.11	Q	|	|	|	V |
20+30	0.7394	0.11	Q	|	|	|	V |
20+35	0.7402	0.11	Q	|	|	|	V |
20+40	0.7410	0.11	Q	|	|	|	V |
20+45	0.7417	0.11	Q	|	|	|	V |
20+50	0.7423	0.09	Q	|	|	|	V |
20+55	0.7428	0.08	Q	|	|	|	V |
21+ 0	0.7434	0.07	Q	|	|	|	V |
21+ 5	0.7440	0.09	Q	|	|	|	V |
21+10	0.7447	0.11	Q	|	|	|	V |
21+15	0.7455	0.11	Q	|	|	|	V|
21+20	0.7461	0.09	Q	|	|	|	V|
21+25	0.7466	0.08	Q	|	|	|	V|
21+30	0.7471	0.07	Q	|	|	|	V|
21+35	0.7478	0.09	Q	|	|	|	V|
21+40	0.7485	0.11	Q	|	|	|	V|
21+45	0.7493	0.11	Q	|	|	|	V|
21+50	0.7499	0.09	Q	|	|	|	V|
21+55	0.7504	0.08	Q	|	|	|	V|
22+ 0	0.7509	0.07	Q	|	|	|	V|
22+ 5	0.7516	0.09	Q	|	|	|	V|
22+10	0.7523	0.11	Q	|	|	|	V|
22+15	0.7531	0.11	Q	|	|	|	V|
22+20	0.7537	0.09	Q	|	|	|	V|
22+25	0.7542	0.08	Q	|	|	|	V|
22+30	0.7547	0.07	Q	|	|	|	V|
22+35	0.7552	0.07	Q	|	|	|	V|
22+40	0.7557	0.07	Q	|	|	|	V|
22+45	0.7563	0.07	Q	|	|	|	V|
22+50	0.7568	0.07	Q	|	|	|	V|
22+55	0.7573	0.07	Q	|	|	|	V|
23+ 0	0.7578	0.07	Q	|	|	|	V|
23+ 5	0.7583	0.07	Q	|	|	|	V|
23+10	0.7588	0.07	Q	|	|	|	V|
23+15	0.7593	0.07	Q	|	|	|	V|
23+20	0.7598	0.07	Q	|	|	|	V|
23+25	0.7603	0.07	Q	|	|	|	V|
23+30	0.7608	0.07	Q	|	|	|	V|
23+35	0.7613	0.07	Q	|	|	|	V|
23+40	0.7618	0.07	Q	|	|	|	V|
23+45	0.7623	0.07	Q	|	|	|	V|
23+50	0.7628	0.07	Q	|	|	|	V|
23+55	0.7633	0.07	Q	|	|	|	V|
24+ 0	0.7638	0.07	Q	|	|	|	V|
24+ 5	0.7641	0.03	Q	|	|	|	V|
24+10	0.7641	0.00	Q	|	|	|	V

APPENDIX H

BASIN HYDRAULICS



24" BYPASS PIPE HYDRAULICS



24" A = 3.14 SF, n = 0.025

$V = \frac{9.27}{3.14} = 2.95$ FPS

$\frac{V^2}{2g} = \frac{(2.95)^2}{64.4} = 0.14$

FOR n = 0.013 $K_{24} = 226$

FOR n = .025 (CMP): $K = \frac{.013}{.025}(226) = 117.5$

$Sf = \left(\frac{Q}{K}\right)^2 = \left(\frac{9.27}{117.5}\right)^2 = 0.006$

ENTRANCE LOSS = $0.5\frac{V^2}{2g} = 0.5(.14) = 0.07'$

EXIT LOSS = $1.0\frac{V^2}{2g} = 0.14'$

HGL CALCULATIONS

AT 0+00 HGL = 19.38 + 0.14 = 19.52

AT 0+62.96 JUST OUTSIDE THE CATCH BASIN

HGL = 19.52 + (62.96)(.006) = 19.90 VS 19.15 SOFFIT

INSIDE BYPASS BOX HGL = 19.90 ± 0.07 = 19.97 ±

BASIN STORAGE REQUIREMENTS

10 YEAR DEVELOPED VOLUME = 0.7641 AF

10 YEAR UNDEVELOPED VOLUME = 0.1536 AF

Δ = 0.6105 AF × 43560 = 26,594 CF STORAGE REQUIRED

USING 48" ϕ CMP PIPE A = 12.57 FT²/FT

USE 2116 LF

VOLUME PROVIDED = 2116 × 12.57 = 26598 CF > 26,594 CF O.K.

30" BASIN OUTLET PIPE OPEN CHANNEL FLOW

```
*************************************************************************
                  ****** PIPE FLOW CALCULATIONS ******
              Copyright (c) 1988, CivilDesign Software, Inc.

*************************************************************************


*************************************************************************
*
 For: For Licensed CivilDesign User

*************************************************************************
*
         ***** NON-PRESSURE, OPEN CHANNEL CALCULATIONS ****

   CALCULATE DEPTH OF FLOW GIVEN:
   Channel Slope =    -.004800 (Ft./Ft.) =     -.4800 %
   Invert elevation at pipe INLET =          .480 (Ft.)
   Invert elevation at pipe OUTLET =         .000 (Ft.)
   Length of pipe =      100.000 (Ft.)
   Given Flow Rate =     9.27 Cubic Feet/Second



         *** PIPE OPEN CHANNEL FLOW ***


   Mannings "n" =  .025
   No. of pipes =   1   Velocity (Ft./Sec.) =     3.18
   Given Pipe Diameter(In.) =     30.00
   Individual pipe flow =    9.270     (CFS)
        "      "     "  =    4161.     (GPM)
        "      "     "  =    5.991     (MGD)
   Total pipe area =       706.86 (In2)
   Total perimeter of pipe =        94.25 (In.)
   Normal flow depth in pipe =     17.22 (In.)
   Flow top width inside pipe =     29.67 (In.)
   Area of flow =     419.7482 (In2)
   Wetted Perimeter =    51.58 (In.)
   Critical Depth in Pipe =      12.19 (In.)
   Total flow of pipe(s) =    9.270     (CFS)
     "     "   "    "    =    4161.     (GPM)
     "     "   "    "    =    5.991     (MGD)
```

24" BASIN BYPASS PIPE OPEN CHANNEL FLOW

```
*************************************************************************
                  ****** PIPE FLOW CALCULATIONS ******
              Copyright (c) 1988, CivilDesign Software, Inc.
*************************************************************************

*************************************************************************
*
 For: For Licensed CivilDesign User

*************************************************************************
*
         ***** NON-PRESSURE, OPEN CHANNEL CALCULATIONS ****

   CALCULATE DEPTH OF FLOW GIVEN:
   Channel Slope =    -.012200 (Ft./Ft.) =    -1.2200 %
   Invert elevation at pipe INLET =        1.220 (Ft.)
   Invert elevation at pipe OUTLET =         .000 (Ft.)
   Length of pipe =      100.000 (Ft.)
   Given Flow Rate =     9.27 Cubic Feet/Second



         *** PIPE OPEN CHANNEL FLOW ***


   Mannings "n" =  .025
   No. of pipes =   1  Velocity (Ft./Sec.) =     4.49
   Given Pipe Diameter(In.) =     24.00
   Individual pipe flow =    9.270     (CFS)
        "      "     "  =    4161.     (GPM)
        "      "     "  =    5.991     (MGD)
   Total pipe area =       452.39 (In2)
   Total perimeter of pipe =        75.40 (In.)
   Normal flow depth in pipe =     14.98 (In.)
   Flow top width inside pipe =     23.25 (In.)
   Area of flow =     297.0743 (In2)
   Wetted Perimeter =    43.73 (In.)
   Critical Depth in Pipe =      13.05 (In.)
   Total flow of pipe(s) =    9.270     (CFS)
     "     "   "    "    =    4161.     (GPM)
     "     "   "    "    =    5.991     (MGD)
```

8" WQMP PIPE FROM BIO FILTER TO DETENTION STRUCTURE OPEN CHANNEL

```
*************************************************************************
**
                  ****** PIPE FLOW CALCULATIONS ******
               Copyright (c) 1988, CivilDesign Software, Inc.

*************************************************************************
**

*************************************************************************
****
 For: For Licensed CivilDesign User

*************************************************************************
****
          ***** NON-PRESSURE, OPEN CHANNEL CALCULATIONS ****

   CALCULATE DEPTH OF FLOW GIVEN:
   Channel Slope =    -.015300 (Ft./Ft.) =    -1.5300 %
   Invert elevation at pipe INLET =        1.530 (Ft.)
   Invert elevation at pipe OUTLET =         .000 (Ft.)
   Length of pipe =      100.000 (Ft.)
   Given Flow Rate =      .90 Cubic Feet/Second



          *** PIPE OPEN CHANNEL FLOW ***


   Mannings "n" =  .013
   No. of pipes =   1   Velocity (Ft./Sec.) =     4.48
   Given Pipe Diameter(In.) =      8.00
   Individual pipe flow =    .9000     (CFS)
        "      "     "  =    403.9     (GPM)
        "      "     "  =    .5817     (MGD)
   Total pipe area =        50.27 (In2)
   Total perimeter of pipe =        25.13 (In.)
   Normal flow depth in pipe =      4.48 (In.)
   Flow top width inside pipe =      7.94 (In.)
   Area of flow =      28.9362 (In2)
   Wetted Perimeter =    13.52 (In.)
   Critical Depth in Pipe =       5.39 (In.)
   Total flow of pipe(s) =    .9000     (CFS)
     "     "   "    "    =    403.9     (GPM)
     "     "   "    "    =    .5817     (MGD)
```

APPENDIX I

Earth Strata Geotechnical Services, Inc.
Geotechnical, Environmental and Materials Testing Consultants

November 8, 2021 Project No. 192851-12A

Dr. Milan Chakrabarty
CHAKRABARTY, LLC
1003 East Florida Avenue, Suite 101
Hemet, CA 92543

Subject: **Infiltration Testing for Water Quality Treatment Areas, Proposed Commercial Development, Assessor Parcel Number 476-010-060, Located on the South West Corner of Winchester Road and Keller Road, City of Winchester, Riverside County, California**

INTRODUCTION

Earth Strata Geotechnical Services is pleased to present this infiltration feasibility report for the proposed commercial development, located on the southwest corner of Winchester Road and Keller Road, Assessor Parcel Number 476-010-060, in the City of Winchester, Riverside County, California. The purpose of our study was to determine the infiltration rates and physical characteristics of the subsurface earth materials at the approximate depth of the proposed WQMP area within the proposed development. This feasibility report provides the infiltration rates to be used for the design and the development of the water quality management plan, where applicable.

PROPERTY DESCRIPTION

The subject property is located on the southwest corner of Winchester Road and Keller Road in the City of Winchester, Riverside County, California. The approximate location of the site is shown on the Vicinity Map, Figure 1.

The subject property is comprised of approximately 5.25 acres of undeveloped land. The site has not been graded. Topographic relief at the subject property is relatively low with the terrain being generally flat. Elevations at the site range from approximately 1,413 to 1,428 feet above mean sea level (msl), for a difference of about 15± feet across the entire site. Drainage within the subject property generally flows to the northeast.

The site is currently bordered by a residential development to the west, Winchester Road to the south and east, and Keller Road to the north. Most of the vegetation on the site consists of light to moderate amounts of annual weeds/grasses throughout the subject site.

PROPOSED CONSTRUCTION

Based on the proposed development as illustrated on the conceptual grading plans will consist of a RV and Self-Storage development complete with interior streets, utilities, driveways, park, and an onsite water quality treatment basin.

SUBSURFACE EXPLORATION

Subsurface Exploration

Subsurface exploration within the subject site was performed on November 2, 2021, for the exploratory excavations. A truck mounted hollow-stem-auger drill rig was utilized to drill one (1) boring to a maximum depth of 20 feet. The exploratory holes were excavated for geotechnical evaluation purposes with respect to the proposed developments and to interpret whether groundwater or impermeable soil layers were present. An underground utilities clearance was obtained from Underground Service Alert of Southern California, prior to the subsurface exploration. The approximate locations of the exploratory excavations are shown on the attached Infiltration Location Map, Plate 1 and descriptive logs are presented in Appendix A.

Earth materials encountered during exploration were classified and logged in general accordance with the Standard Practice for Description and Identification of Soils (Visual-Manual Procedure) of ASTM D 2488. Upon completion of laboratory testing, exploratory logs and sample descriptions may have been reconciled to reflect laboratory test results with regard to ASTM D 2487.

Earth Materials

A general description of the earth materials observed on site is provided below.

Quaternary Alluvium (Qa): Quaternary Alluvium was encountered directly from the surface to a maximum depth of 5 feet. These materials were found to be light brown and in a dry, dense state.

Metasedimentary Rocks (ms): The bedrock deposits were encountered below the alluvium materials to the full depth of the excavation. This bedrock unit consists predominately of interbedded light to medium brown, fine to medium grained silty sand, fine to coarse grained sandstone, with occasional siltstone and claystone layers.

INFILTRATION TESTING

The double ring infiltrometer test method was utilized to perform a total of four (4) infiltration tests on November 3, 2021 to evaluate near surface infiltration rates in order to estimate the amount of storm water runoff that can infiltrate into the onsite water quality treatment plan areas. The infiltration tests were performed in general accordance with the requirements of double ring infiltration testing, ASTM D3385 and Appendix A of the Riverside County Flood Control and Water Conservation District.

The infiltration tests were performed using double ring infiltrometer and Mariotte tubes at a depth of 6 feet below existing grades. The locations of the infiltration tests are indicated on the attached infiltration Location Map, Plate 1. The double ring infiltrometer tests were located by property boundary measurement on the site plan and by using geographic features. Infiltration test data recorded in the field are summarized in the following table and is included within Appendix B including the graph of Infiltration Rate versus Elapsed Time.

Infiltration Test Summary

TEST NUMBER	INFILTRATION HOLE DEPTH (ft.)	INFILTRATION RATE (in/hr)	DESCRIPTION
DR-1	5	0.0	CLAY
DR-2	5	0.0	CLAY
DR-3	5	0.0	CLAY
DR-4	5	0.0	CLAY

The infiltration test rates were documented to be 0.0 inches per hour (in/hr). The observed hard compacted clay and bedrock material caused the infiltration testing to fail.

CONCLUSIONS AND RECOMMENDATIONS

General

From geotechnical and engineering geologic points of view, the proposed WQMP areas, where tested, is considered unsuitable for infiltration for the proposed development.

Groundwater

Groundwater was not observed during our subsurface exploration to a total depth of 20 feet.

Based on the data presented in this report and the recommendations set forth herein, it is the opinion of Earth Strata Geotechnical Services that a WQMP area cannot be utilized for infiltration at the subject site.

GRADING PLAN REVIEW AND CONSTRUCTION SERVICES

This report has been prepared for the exclusive use of **Mr. Milan Chakrabarty** and their authorized representative. It likely does not contain sufficient information for other parties or other uses. Earth Strata should be engaged to review the final design plans and specifications prior to construction. This is to verify that the recommendations contained in this report have been properly incorporated into the project plans and specifications. Should Earth Strata not be accorded the opportunity to review the project plans and specifications, we are not responsibility for misinterpretation of our recommendations.
Earth Strata should be retained to provide observations during construction to validate this report. In order to allow for design changes in the event that the subsurface conditions differ from those anticipated prior to construction.

Earth Strata should review any changes in the project and modify and approve in writing the conclusions and recommendations of this report. This report and the drawings contained within are intended for design input purposes only and are not intended to act as construction drawings or specifications. In the event that conditions encountered during grading or construction operations appear to be different than those indicated in this report, this office should be notified immediately, as revisions may be required.

REPORT LIMITATIONS

Our services were performed using the degree of care and skill ordinarily exercised, under similar circumstances, by reputable soils engineers and geologists, practicing at the time and location this report was prepared. No other warranty, expressed or implied, is made as to the conclusions and professional advice included in this report.

Earth materials vary in type, strength, and other geotechnical properties between points of observation and exploration. Groundwater and moisture conditions can also vary due to natural processes or the works of man on this or adjacent properties. As a result, we do not and cannot have complete knowledge of the subsurface conditions beneath the subject property. No practical study can completely eliminate uncertainty with regard to the anticipated geotechnical conditions in connection with a subject property.

The conclusions and recommendations within this report are based upon the findings at the points of observation and are subject to confirmation by Earth Strata during construction. This report is considered valid for a period of one year from the time the report was issued.

This report was prepared with the understanding that it is the responsibility of the owner or their representative, to ensure that the conclusions and recommendations contained herein are brought to the attention of the other project consultants and are incorporated into the plans and specifications. The owners' contractor should properly implement the conclusions and recommendations during grading and construction, and notify the owner if they consider any of the recommendations presented herein to be unsafe or unsuitable.

Respectfully submitted,

EARTH STRATA GEOTECHNICAL SERVICES

Stephen M. Poole, PE 40219
President
Principal Engineer

REGISTERED PROFESSIONAL ENGINEER
STEPHEN MICHAEL POOLE
No. 692
GEOTECHNICAL
STATE OF CALIFORNIA

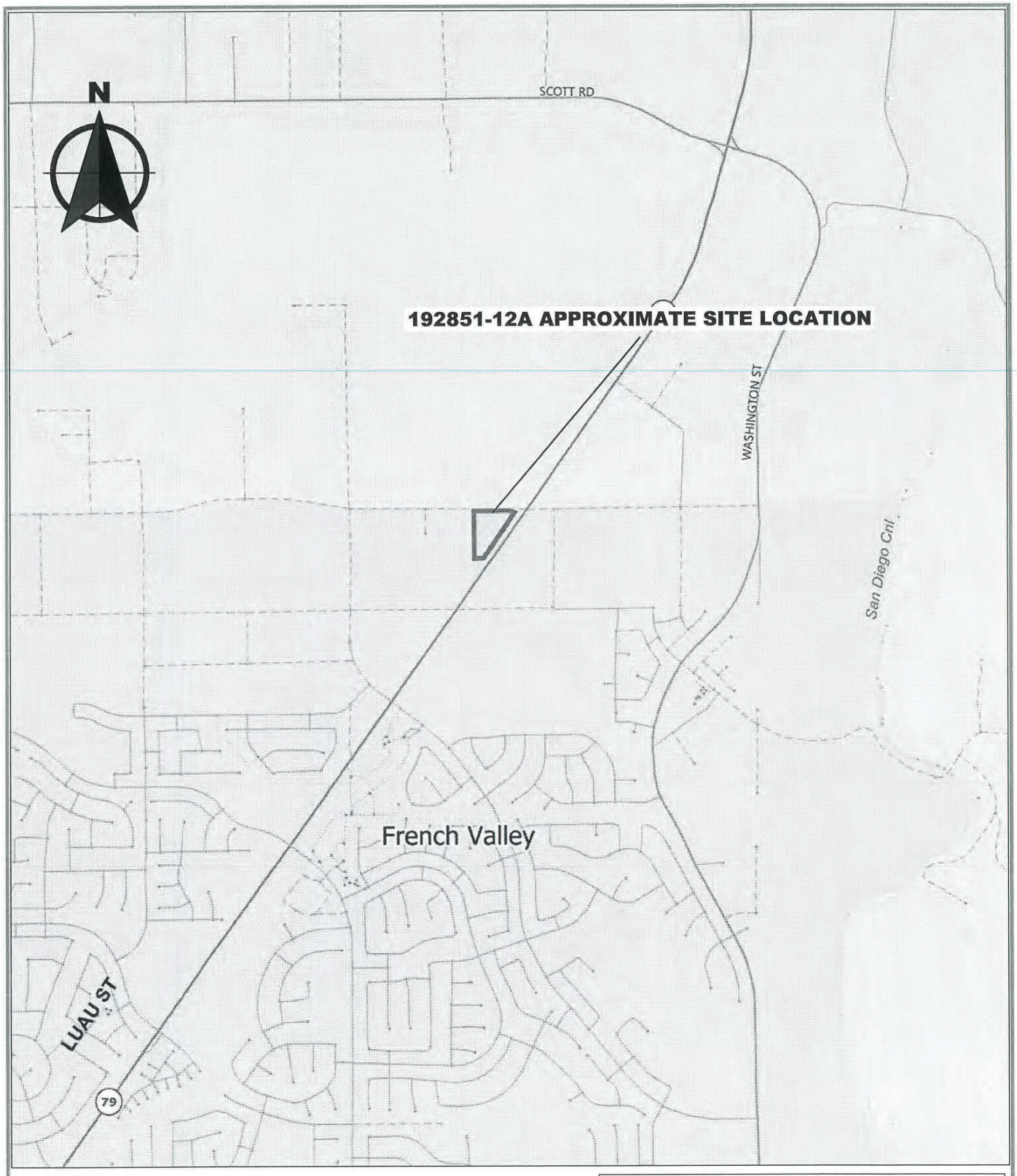
SMP/jmr

Distribution: (1) Addressee

Attachments: Figure 1 – Vicinity Map *(Rear of Text)*
Appendix A – Exploratory Logs *(Rear of Text)*
Appendix B – Infiltration Test Sheets *(Rear of Text)*
Plate 1 – Infiltration Location Map *(Rear of Text)*

FIGURE 1

VICINITY MAP



SCALE
0 1,000 2,000 3,000
Feet

Earth Strata Geotechnical Services, Inc.
Geotechnical, Environmental and Materials Testing Consultants
www.ESGSINC.com (951) 397-8315

PROPOSED SINGLE FAMILY RESIDENCE		192851-12A
VICINITY MAP	SEE BAR SCALE	
	NOV 2021	FIGURE 1

APPENDIX A

EXPLORATORY LOGS

Geotechnical Log MW-1

Date: May 13, 2021	Project Name: Winchester and Keller - Winchester Page: 1 of 1
Project Number: 192851-11A	Logged By: JMR
Drilling Company: Drilling IT	Type of Rig: B-61
Drive Weight (lbs): -	Drop (in): - Hole Diameter (in): -
Top of Hole Elevation (ft): See Map	Hole Location: See Geotechnical Map

Depth (ft)	Blow Count Per Foot	Sample Depth	Dry Density (pcf)	Moisture (%)	Classification Symbol	MATERIAL DESCRIPTION
0						**Quaternary Alluvium (Qa):**
					SM	Silty SAND; light brown, dry, dense, fine to carse sand with gravel
						Metasedimentary Rocks (ms):
					CL	yellowish brown, dry, hard, fine to coarse grained, breaks down to clay
5						
						very hard
10						
15						
20						Total Depth: 20 feet
25						
30						

42184 Remington Avenue, Temecula, CA 92590

Earth Strata Geotechnical Services, Inc.
Geotechnical, Environmental and Materials Testing Consultants
www.ESGSINC.com (951) 397-8315

APPENDIX B

INFILTRATION TEST SHEETS

Test No.	DR-1	Location	See Map

Turf-Tec International - Record Chart for IN10-W - (12 & 24 Inch Infiltration Rings)

Earth Strata Geotechnical Services, Inc.
Geotechnical, Environmental and Materials Testing Consultants
www.ESGSINC.com (951) 397-8315

Project Identification:	192851-12A					Constants	Area cm2	Depth of Liquid (cm)	Liquid Container Number		Marriotte Tube Volume		
Test Location:	DR-1					Inner Ring	729	10.0	1		10000		
Liquid Used:	TAP WATE	pH:	8.0			Annular Ring	2189	10.0	2		10000		
Tested By:	JMR/GG		Date	11/3/2021		Liquid level maintained	(X) Flow Valve	( ) Float Valve	( ) Mariotte Tubes				
Depth to water table:	400		Depth of Test	6'		Penetration Depth of Outer Ring:		9 cm	Other				

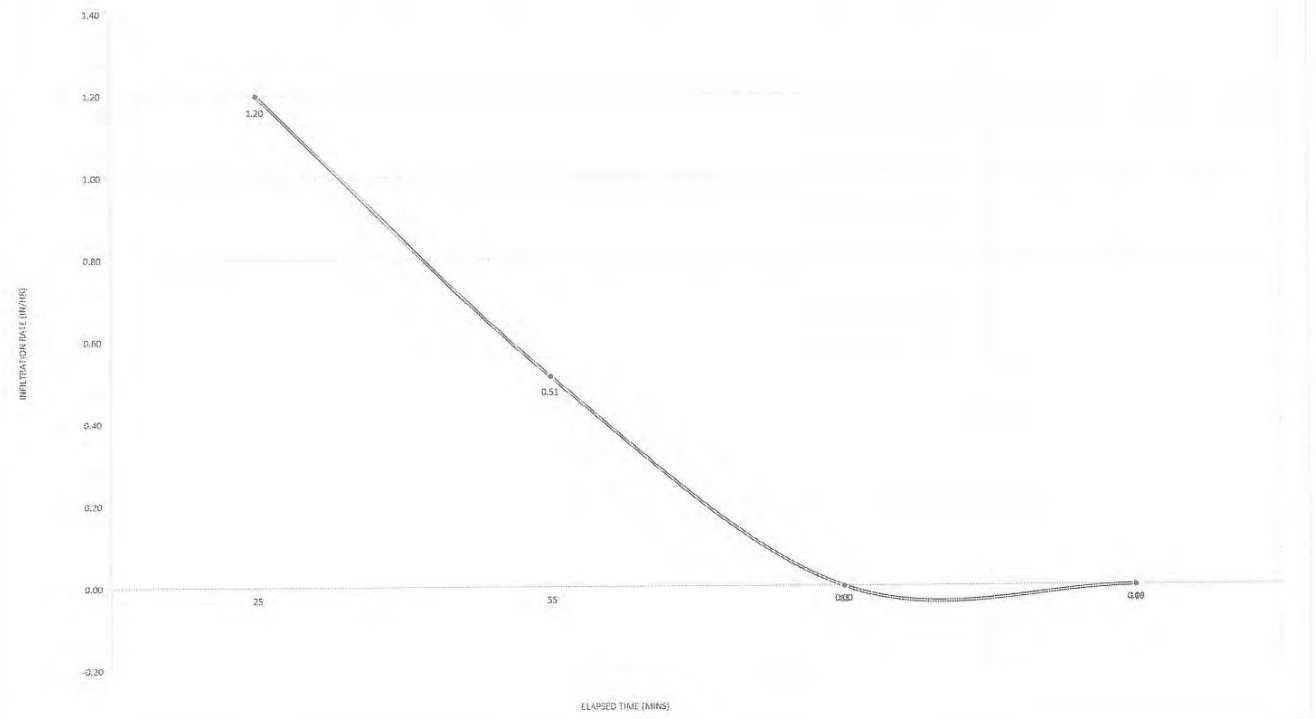
Trial #	Start / End	Date MM/DD/YY	Time HR:MIN	Time Increment /(Total)	Elapsed Time (Min)	Flow Readings				Liquid Temp °F	Infiltration Rates				Ground Temperature		Remarks
						Inner Ring Reading cm	Inner Marotte Tube Flow (ml)	Annular Space Reading cm	Annular Space Marriotte Tube Flow (ml)		Inner Infiltration Rate cm/h	Inner Infiltration Rate In/h	Annular Infiltration Rate cm/h	Annular Infiltration Rate In/h	Ground Temp Depth (cm)	Temp at Depth (c)	Weather conditions Etc...
	Start Test	11/3/2021	8:30	0:25	25												
1	End Test	11/3/2021	8:55	0:25			925		1400		3.05	1.20	1.53	0.60			
	Start Test	11/3/2021	8:56	0:30	55												
2	End Test	11/3/2021	9:26	0:55			475		575		1.30	0.51	0.53	0.21			
	Start Test	11/3/2021	9:27	0:30	85												
3	End Test	11/3/2021	9:57	1:25			0		0		0.00	0.00	0.00	0.00			
	Start Test	11/3/2021	10:00	0:30	115												
4	End Test	11/3/2021	10:30	1:55			0		0		0.00	0.00	0.00	0.00			

Turf-Tec International

Project Identification:	192851-12A		
Test Location:	DR-1		
Liquid Used:	TAP WAT	pH:	8.0
Tested By:	JMR/GG		
Depth to water table:	400		

Earth Strata Geotechnical Services, Inc.
Geotechnical, Environmental and Materials Testing Consultants
www.ESGSINC.com (951) 397-8315

ELAPSED TIME VS. INFILTRATION RATE



Test No.	DR-2	Location	See Map

Turf-Tec International - Record Chart for IN10-W - (12 & 24 Inch Infiltration Rings)

Earth Strata Geotechnical Services, Inc.
Geotechnical, Environmental and Materials Testing Consultants
www.ESGSINC.com (951) 397-4315

Project Identification:	192851-12A				Constants	Area cm2	Depth of Liquid (cm)	Liquid Container Number		Marriotte Tube Volume		
Test Location:	DR-2				Inner Ring	729	10.0	1		10000		
Liquid Used:	TAP WATE	pH:	8.0		Annular Ring	2189	10.0	2		10000		
Tested By:	JMR/GG		Date	11/3/2021		Liquid level maintained	(X) Flow Valve	( ) Float Valve	( ) Mariotte Tubes			
Depth to water table:	400		Depth of Test	6'		Penetration Depth of Outer Ring:		9 cm	Other			

Trial #	Start / End	Date MM/DD/YY	Time HR:MIN	Time Increment /(Total)	Elapsed Time (Min)	Flow Readings				Liquid Temp °F	Infiltration Rates				Ground Temperature		Remarks
						Inner Ring Reading cm	Inner Marotte Tube Flow (ml)	Annular Space Reading cm	Annular Space Marriotte Tube Flow (ml)		Inner Infiltration Rate cm/h	Inner Infiltration Rate In/h	Annular Infiltration Rate cm/h	Annular Infiltration Rate In/h	Ground Temp Depth (cm)	Temp at Depth (c)	Weather conditions Etc...
	Start Test	11/3/2021	8:32	0:25	25												
1	End Test	11/3/2021	8:57	0:25			1750		1400		5.76	**2.27**	1.53	**0.60**			
	Start Test	11/3/2021	8:56	0:30	55												
2	End Test	11/3/2021	9:26	0:55			450		575		1.23	**0.49**	0.53	**0.21**			
	Start Test	11/3/2021	9:29	0:30	85												
3	End Test	11/3/2021	9:59	1:25			0		0		0.00	**0.00**	0.00	**0.00**			
	Start Test	11/3/2021	10:01	0:30	115												
4	End Test	11/3/2021	10:31	1:55			0		0		0.00	**0.00**	0.00	**0.00**			

Turf-Tec International

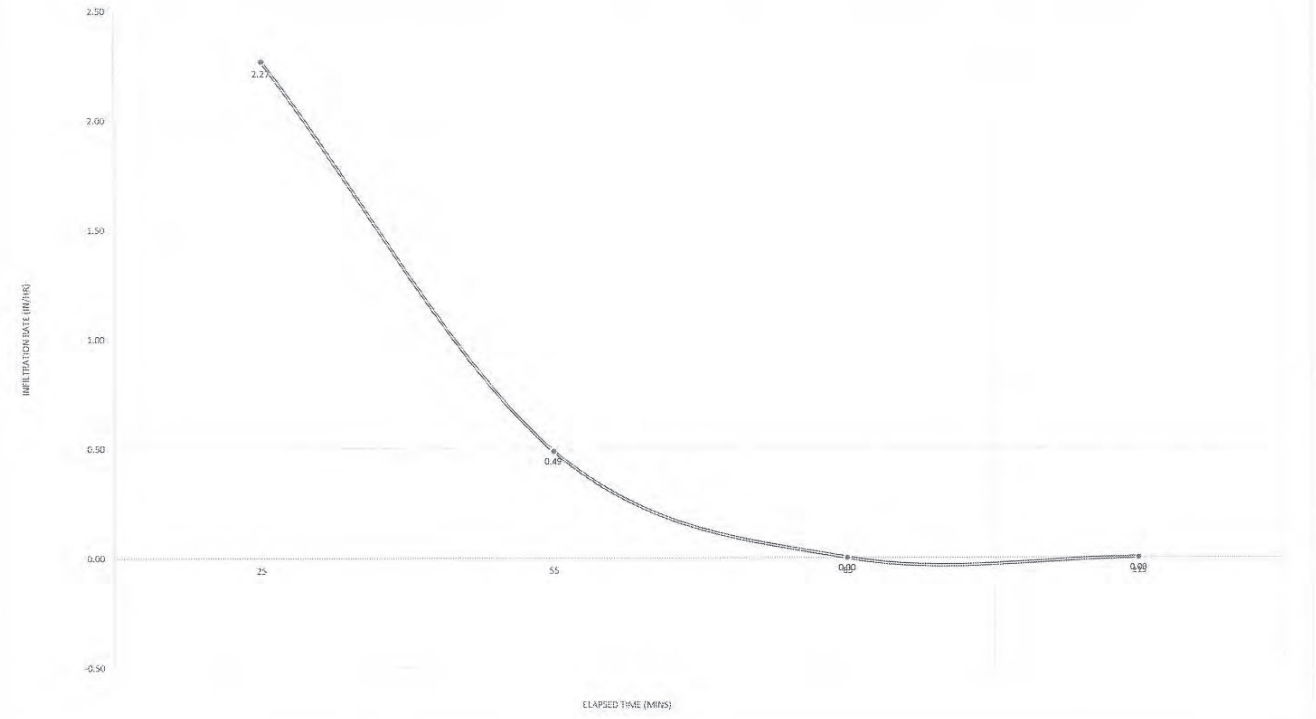
Project Identification:	192851-12A		
Test Location:	DR-2		
Liquid Used:	TAP WAT	pH:	8.0
Tested By:	JMR/GG		
Depth to water table:			400

Earth Strata Geotechnical Services, Inc.

Geotechnical, Environmental and Materials Testing Consultants

www.ESGSINC.com (951) 397-8315

ELAPSED TIME VS. INFILTRATION RATE



Test No.	DR-3	Location	See Map

Turf-Tec International - Record Chart for IN10-W - (12 & 24 Inch Infiltration Rings)

Earth Strata Geotechnical Services, Inc.
Geotechnical, Environmental and Materials Testing Consultants
www.ESGSINC.com (951) 397-8315

Project Identification:	192851-12A				Constants	Area cm2	Depth of Liquid (cm)	Liquid Container Number		Marriotte Tube Volume	
Test Location:	DR-3				Inner Ring	729	10.0	1		10000	
Liquid Used:	TAP WATE	pH:	8.0		Annular Ring	2189	10.0	2		10000	
Tested By:	JMR/GG		Date	11/3/2021	Liquid level maintained	(X) Flow Valve	( ) Float Valve	( ) Mariotte Tubes			
Depth to water table:	400		Depth of Test	6'	Penetration Depth of Outer Ring:		9 cm		Other		

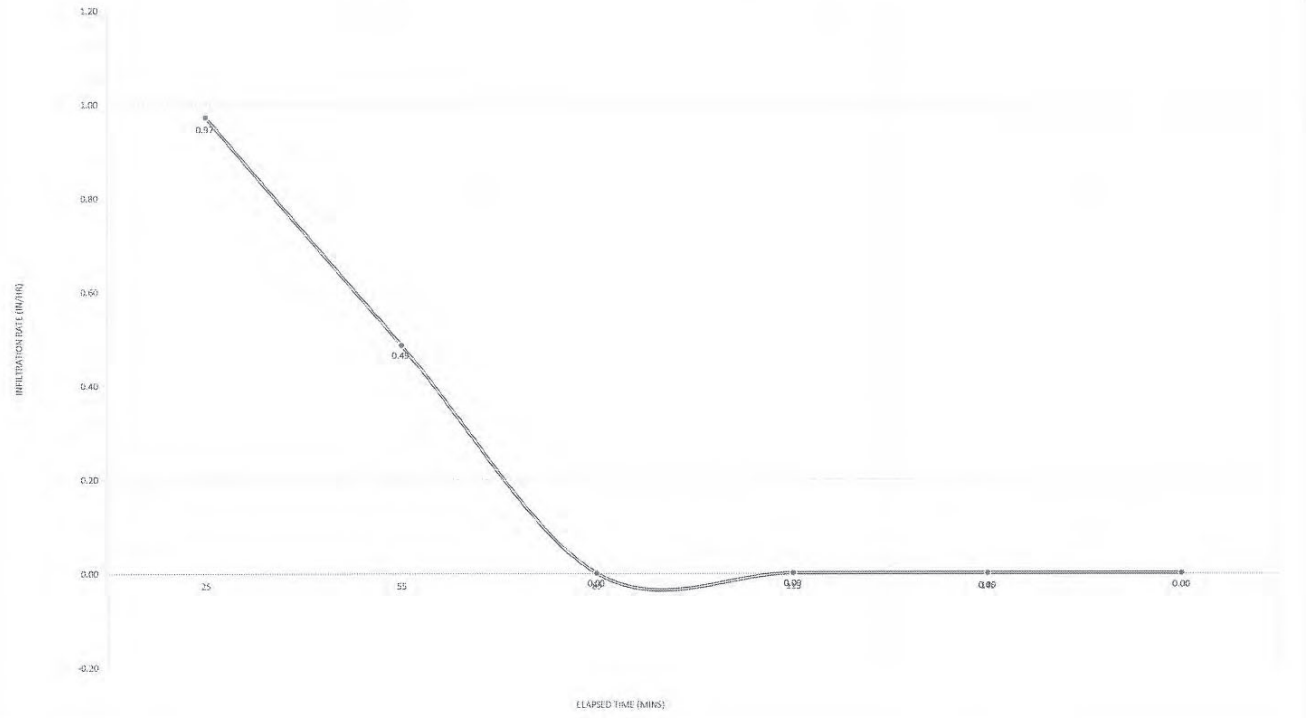
						Flow Readings					Infiltration Rates				Ground Temperature		Remarks
Trial #	Start / End	Date MM/DD/YY	Time HR:MIN	Time Increment /(Total)	Elapsed Time (Min)	Inner Ring Reading cm	Inner Maroitte Tube Flow (ml)	Annular Space Reading cm	Annular Space Marriotte Tube Flow (ml)	Liquid Temp °F	Inner Infiltration Rate cm/h	Inner Infiltration Rate In/h	Annular Infiltration Rate cm/h	Annular Infiltration Rate In/h	Ground Temp Depth (cm)	Temp at Depth (c)	Weather conditions Etc...
	Start Test	11/3/2021	11:00	0:25	25												
1	End Test	11/3/2021	11:25	0:25			750		1250		2.47	0.97	1.37	0.54			
	Start Test	11/3/2021	11:26	0:30	55												
2	End Test	11/3/2021	11:56	0:55			450		950		1.23	0.49	0.87	0.34			
	Start Test	11/3/2021	11:57	0:30	85												
3	End Test	11/3/2021	12:27	1:25			0		600		0.00	0.00	0.55	0.22			
	Start Test	11/3/2021	12:28	0:30	115												
4	End Test	11/3/2021	12:58	1:55			0		0		0.00	0.00	0.00	0.00			
	Start Test	11/3/2021	12:59	0:30	145												
5	End Test	11/3/2021	13:29	2:25			0		0		0.00	0.00	0.00	0.00			

Turf-Tec International

Project Identification:	192851-12A		
Test Location:	DR-3		
Liquid Used:	TAP WAT	pH:	8.0
Tested By:	JMR/GG		
Depth to water table:	400		

Earth Strata Geotechnical Services, Inc.
Geotechnical, Environmental and Materials Testing Consultants
www.ESGSINC.com (951) 397-8315

ELAPSED TIME VS. INFILTRATION RATE



Test No.	DR-4	Location	See Map

Turf-Tec International - Record Chart for IN10-W - (12 & 24 Inch Infiltration Rings)

Earth Strata Geotechnical Services, Inc.
Geotechnical, Environmental and Materials Testing Consultants
www.ESGINC.com (951) 397-4315

Project Identification:	192851-12A				Constants	Area cm2	Depth of Liquid (cm)	Liquid Container Number		Marriotte Tube Volume		
Test Location:	DR-4				Inner Ring	729	10.0	1		10000		
Liquid Used:	TAP WATE	pH:	8.0		Annular Ring	2189	10.0	2		10000		
Tested By:	JMR/GG		Date	11/3/2021		Liquid level maintained	(X) Flow Valve	( ) Float Valve	( ) Mariotte Tubes			
Depth to water table:	400		Depth of Test	6'		Penetration Depth of Outer Ring:		9 cm	Other			

Trial #	Start / End	Date MM/DD/YY	Time HR:MIN	Time Increment /(Total)	Elapsed Time (Min)	Flow Readings: Inner Ring Reading cm	Flow Readings: Inner Maroitte Tube Flow (ml)	Flow Readings: Annular Space Reading cm	Flow Readings: Annular Space Marriotte Tube Flow (ml)	Liquid Temp °F	Infiltration Rates: Inner Infiltration Rate cm/h	Infiltration Rates: Inner Infiltration Rate In/h	Infiltration Rates: Annular Infiltration Rate cm/h	Infiltration Rates: Annular Infiltration Rate In/h	Ground Temperature: Ground Temp Depth (cm)	Ground Temperature: Temp at Depth (c)	Remarks: Weather conditions Etc...
	Start Test	11/3/2021	11:02	0:25	25												
1	End Test	11/3/2021	11:27	0:25			700		1400		2.30	0.91	1.53	0.60			
	Start Test	11/3/2021	11:28	0:30	55												
2	End Test	11/3/2021	11:58	0:55			450		600		1.23	0.49	0.55	0.22			
	Start Test	11/3/2021	11:59	0:30	85												
3	End Test	11/3/2021	12:29	1:25			350		0		0.96	0.38	0.00	0.00			
	Start Test	11/3/2021	12:30	0:30	115												
4	End Test	11/3/2021	13:00	1:55			0		0		0.00	0.00	0.00	0.00			
	Start Test	11/3/2021	13:01	0:30	145												
5	End Test	11/3/2021	13:31	2:25			0		0		0.00	0.00	0.00	0.00			

Turf-Tec International

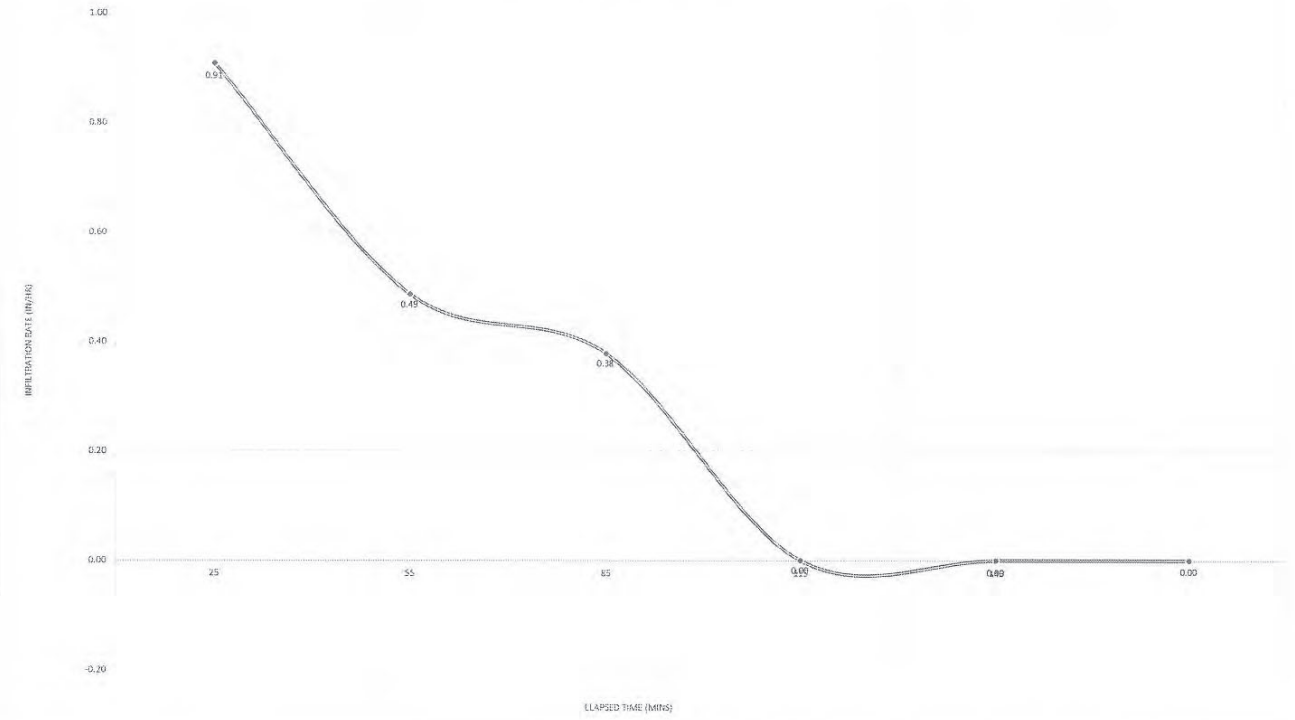
Project identification:	192851-12A		
Test Location:	DR-4		
Liquid Used:	TAP WATE	pH:	8.0
Tested By:	JMR/GG		
Depth to water table:			400

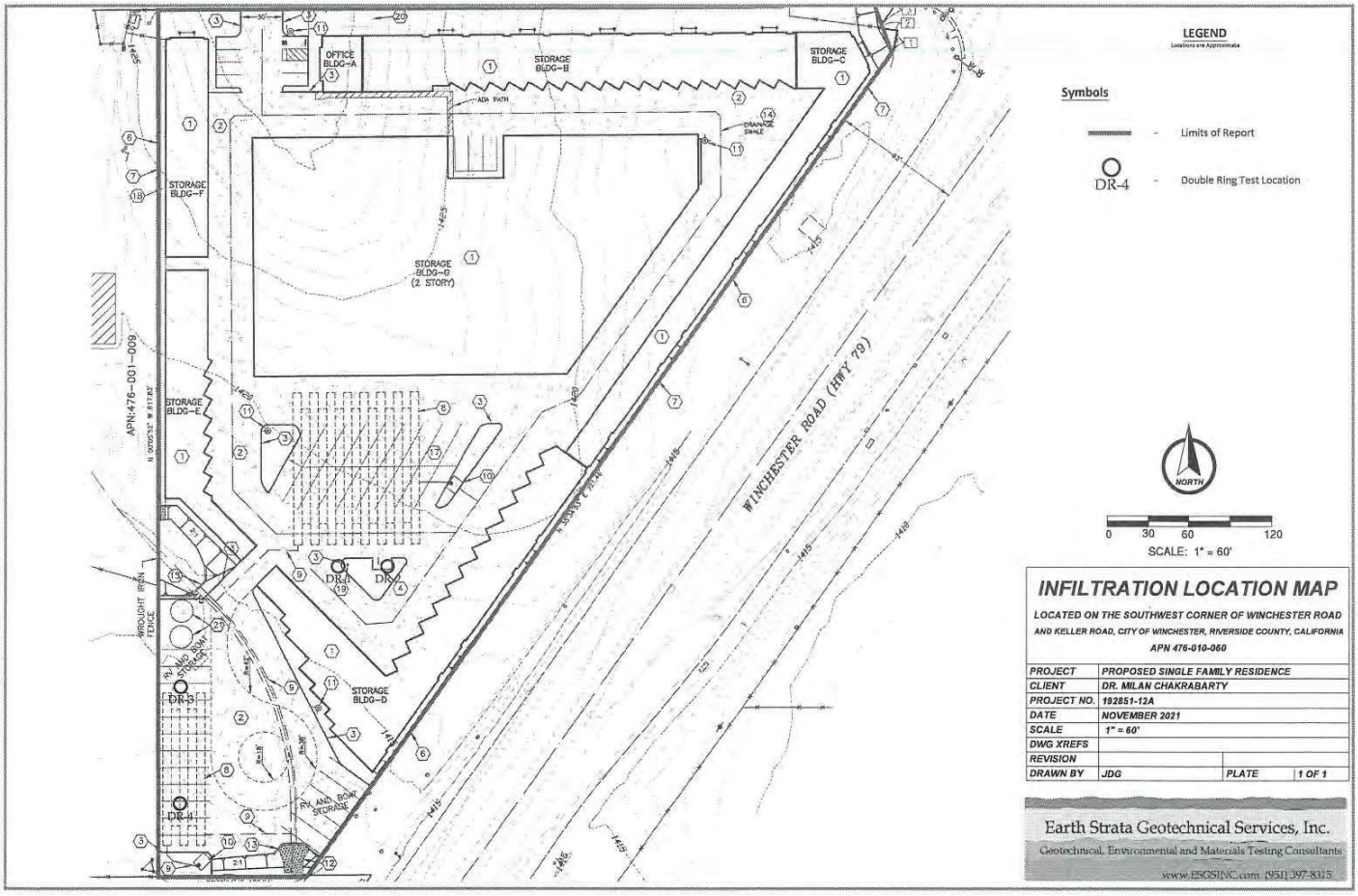
Earth Strata Geotechnical Services, Inc.

Geotechnical, Environmental and Materials Testing Consultants

www.ESGSINC.com (951) 397-8315

ELAPSED TIME VS. INFILTRATION RATE





INFILTRATION LOCATION MAP

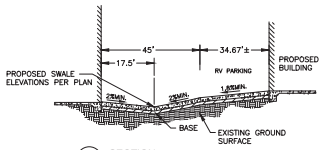
LOCATED ON THE SOUTHWEST CORNER OF WINCHESTER ROAD AND KELLER ROAD, CITY OF WINCHESTER, RIVERSIDE COUNTY, CALIFORNIA
APN 476-010-060

PROJECT	PROPOSED SINGLE FAMILY RESIDENCE		
CLIENT	DR. MILAN CHAKRABARTY		
PROJECT NO.	192851-12A		
DATE	NOVEMBER 2021		
SCALE	1" = 60'		
DWG XREFS			
REVISION			
DRAWN BY	JDG	PLATE	1 OF 1

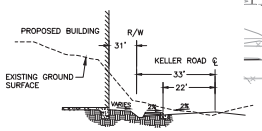
Earth Strata Geotechnical Services, Inc.
Geotechnical, Environmental and Materials Testing Consultants
www.ESGSINC.com (951) 397-8315

APPENDIX J

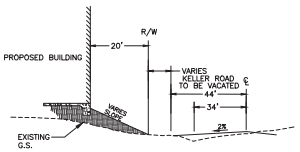
TEMECULA VALLEY SELF STORAGE PRELIMINARY GRADING PLAN



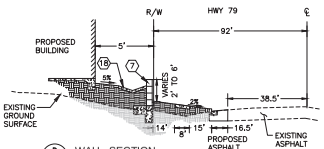
A SECTION N.T.S.



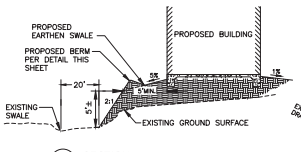
B SECTION N.T.S.



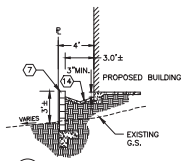
C WALL SECTION N.T.S.



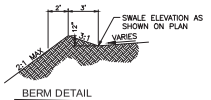
D WALL SECTION N.T.S.



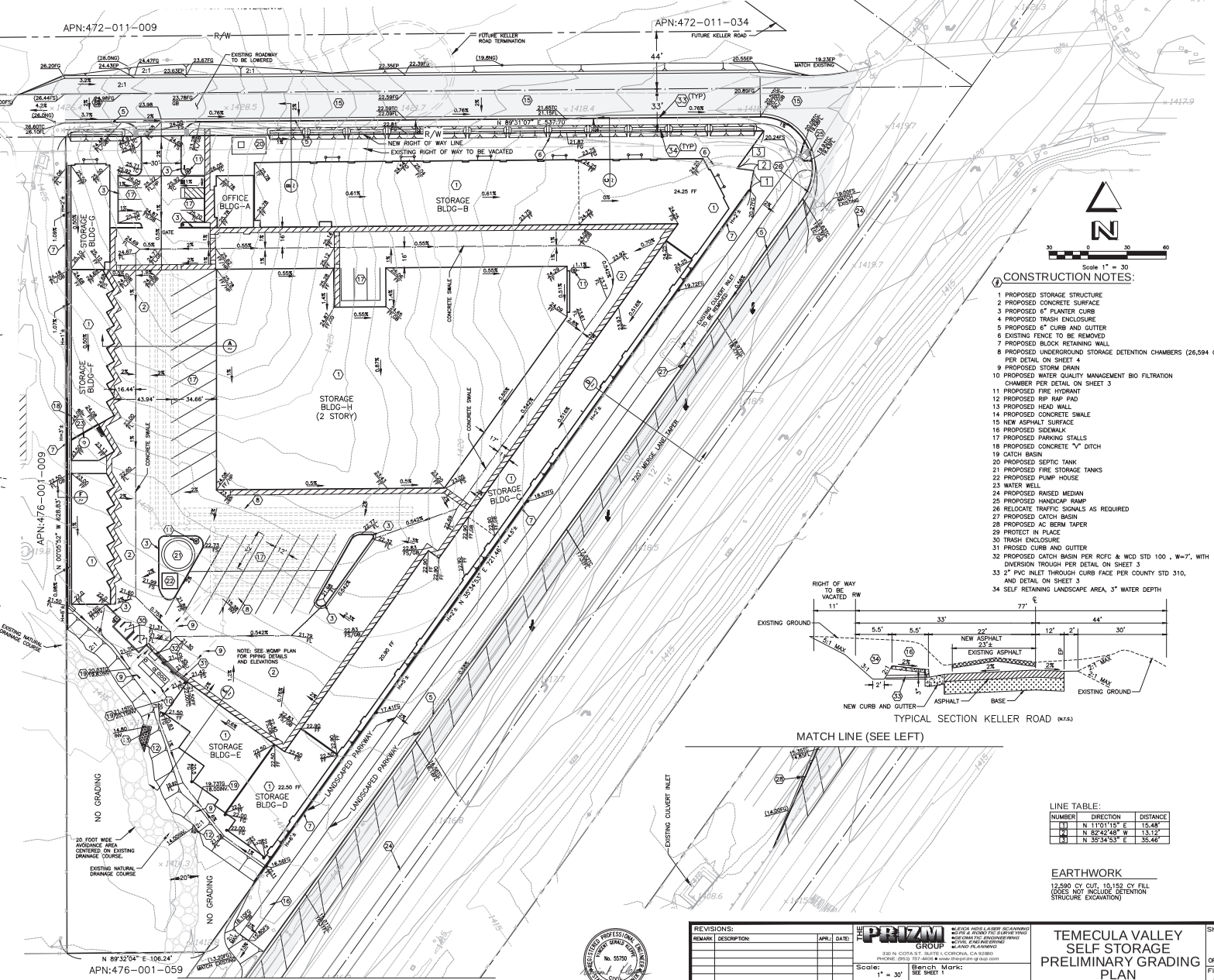
E SECTION N.T.S.



F SECTION N.T.S.



BERM DETAIL N.T.S.



Scale 1" = 30

CONSTRUCTION NOTES:

1 PROPOSED STORAGE STRUCTURE
2 PROPOSED CONCRETE SURFACE
3 PROPOSED 6" PLANTER CURB
4 PROPOSED TRASH ENCLOSURE
5 PROPOSED 6" CURB AND GUTTER
6 EXISTING FENCE TO BE REMOVED
7 PROPOSED BLOCK RETAINING WALL
8 PROPOSED UNDERGROUND STORAGE DETENTION CHAMBERS (26,594 CF) PER DETAIL ON SHEET 4
9 PROPOSED STORM DRAIN
10 PROPOSED WATER QUALITY MANAGEMENT BIO FILTRATION CHAMBER PER DETAIL ON SHEET 3
11 PROPOSED FIRE HYDRANT
12 PROPOSED RIP RAP PAD
13 PROPOSED HEAD WALL
14 PROPOSED CONCRETE SWALE
15 NEW ASPHALT SURFACE
16 PROPOSED SIDEWALK
17 PROPOSED PARKING STALLS
18 PROPOSED CONCRETE "V" DITCH
19 CATCH BASIN
20 PROPOSED SEPTIC TANK
21 PROPOSED FIRE STORAGE TANKS
22 PROPOSED PUMP HOUSE
23 WATER WELL
24 PROPOSED RAISED MEDIAN
25 PROPOSED HANDICAP RAMP
26 RELOCATE TRAFFIC SIGNALS AS REQUIRED
27 PROPOSED CATCH BASIN
28 PROPOSED AC BERM TAPER
29 PROTECT IN PLACE
30 TRASH ENCLOSURE
31 PROSED CURB AND GUTTER
32 PROPOSED CATCH BASIN PER RCFC & WCD STD 100 , W=7', WITH DIVERSION TROUGH PER DETAIL ON SHEET 3
33 2" PVC INLET THROUGH CURB FACE PER COUNTY STD 310, AND DETAIL ON SHEET 3
34 SELF RETAINING LANDSCAPE AREA, 3" WATER DEPTH

TYPICAL SECTION KELLER ROAD (N.T.S.)

LINE TABLE:

NUMBER	DIRECTION	DISTANCE
L1	N 11°01'15" E	15.48'
L2	N 82°42'48" W	13.12'
L3	N 35°34'53" E	35.46'

EARTHWORK

12,590 CY CUT, 10,152 CY FILL
(DOES NOT INCLUDE DETENTION STRUCURE EXCAVATION)

REGISTERED PROFESSIONAL ENGINEER VERNON GERALD KLOPP No. 55750 CIVIL STATE OF CALIFORNIA

REVISIONS:			
REMARK	DESCRIPTION:	APR.:	DATE:
DESIGNED: VGK	DRAWN: BM	CHECKED: VGK	

THE PRIZM GROUP
330 N. COTA ST. SUITE I, CORONA, CA 92880
PHONE: (951) 737-4400 ● www.theprizm.group.com

LEICA NOS LASER SCANNING
GPS & ROBOTIC SURVEYING
GEOMATIC ENGINEERING
CIVIL ENGINEERING
LAND PLANNING

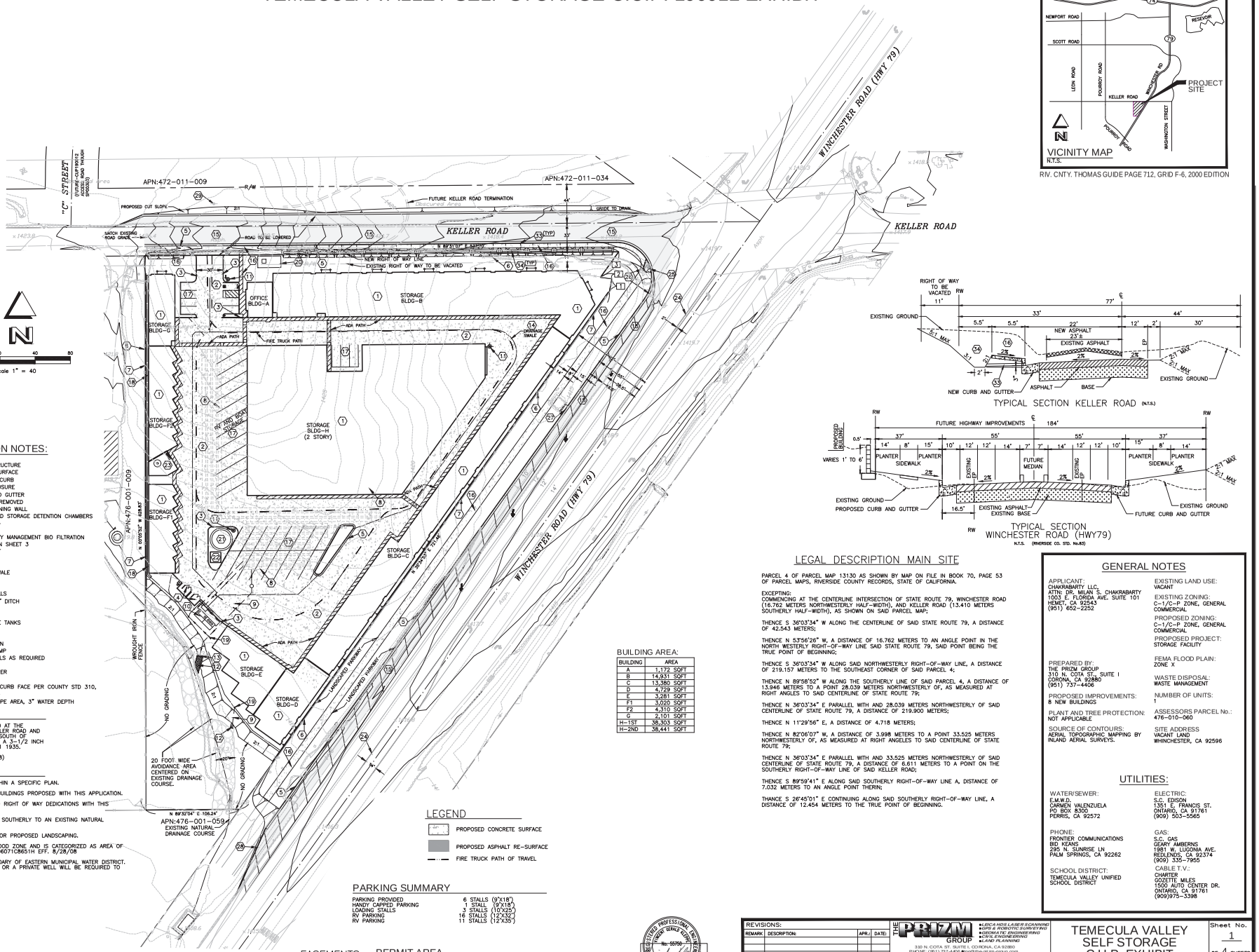
Scale: 1" = 30'
Bench Mark: SEE SHEET 1
Date: 4-6-22

TEMECULA VALLEY SELF STORAGE PRELIMINARY GRADING PLAN

Sheet No. 2 OF 4 SHEETS
FILE NO. 19-004

File name: P:\TPG\19\19-004\GP\19-004PGP02.dwg

TEMECULA VALLEY SELF STORAGE C.U.P. 190012 EXHIBIT



RIV. CNTY. THOMAS GUIDE PAGE 712, GRID F-6, 2000 EDITION

TYPICAL SECTION KELLER ROAD (N.T.S.)

TYPICAL SECTION
WINCHESTER ROAD (HWY79)
N.T.S. (RIVERSIDE CO. STD. No.83)

CONSTRUCTION NOTES:

1 PROPOSED STORAGE STRUCTURE
2 PROPOSED CONCRETE SURFACE
3 PROPOSED 6" PLANTER CURB
4 PROPOSED TRASH ENCLOSURE
5 PROPOSED 6" CURB AND GUTTER
6 EXISTING FENCE TO BE REMOVED
7 PROPOSED BLOCK RETAINING WALL
8 PROPOSED UNDERGROUND STORAGE DETENTION CHAMBERS PER DETAIL ON SHEET 4
9 PROPOSED STORM DRAIN
10 PROPOSED WATER QUALITY MANAGEMENT BIO FILTRATION CHAMBER PER DETAIL ON SHEET 3
11 PROPOSED FIRE HYDRANT
12 PROPOSED RIP RAP PAD
13 PROPOSED HEAD WALL
14 PROPOSED CONCRETE SWALE
15 NEW ASPHALT SURFACE
16 PROPOSED SIDEWALK
17 PROPOSED PARKING STALLS
18 PROPOSED CONCRETE "V" DITCH
19 CATCH BASIN
20 PROPOSED SEPTIC TANK
21 PROPOSED FIRE STORAGE TANKS
22 PROPOSED PUMP HOUSE
23 WATER WELL
24 PROPOSED RAISED MEDIAN
25 PROPOSED HANDICAP RAMP
26 RELOCATE TRAFFIC SIGNALS AS REQUIRED
27 PROPOSED CATCH BASIN
28 PROPOSED AC BERM TAPER
29 PROTECT IN PLACE
33 2" PVC INLET THROUGH CURB FACE PER COUNTY STD 310, AND DETAIL ON SHEET 3
34 SELF RETAINING LANDSCAPE AREA, 3" WATER DEPTH

BENCHMARK

NGS CONTROL POINT DX1680 AT THE NORTHWEST CORNER OF KELLER ROAD AND WASHINGTON STREET, 8.8FT SOUTH OF POWER POLE No. 20758606, A 3-1/2 INCH BRASS DISK, STAMPED X 311 1935.

ELEVATION: 1433.58' (NAVD88)

NOTES

1. THIS PROJECT IS NOT WITHIN A SPECIFIC PLAN.
2. THERE ARE 8 NEW NEW BUILDINGS PROPOSED WITH THIS APPLICATION.
3. THERE ARE NO PROPOSED RIGHT OF WAY DEDICATIONS WITH THIS APPLICATION.
4. ALL STORM WATER FLOWS SOUTHERLY TO AN EXISTING NATURAL DRAINAGE PATH.
5. SEE LANDSCAPING PLAN FOR PROPOSED LANDSCAPING.
6. THE SITE IS IN THE X FLOOD ZONE AND IS CATEGORIZED AS AREA OF MINIMAL FLOOD HAZARD. 06071C8651H EFF. 8/28/08
7. SITE IS WITHIN THE BOUNDARY OF EASTERN MUNICIPAL WATER DISTRICT. A WATER MAIN EXTENSION OR A PRIVATE WELL WILL BE REQUIRED TO SERVE THE SITE.

BUILDING AREA:

BUILDING	AREA
A	1,172 SQFT
B	14,931 SQFT
C	13,380 SQFT
D	4,729 SQFT
E	3,281 SQFT
F1	3,020 SQFT
F2	4,310 SQFT
G	2,101 SQFT
H-1ST	38,303 SQFT
H-2ND	38,441 SQFT

LEGEND

PROPOSED CONCRETE SURFACE
PROPOSED ASPHALT RE-SURFACE
FIRE TRUCK PATH OF TRAVEL

PARKING SUMMARY

PARKING PROVIDED	6 STALLS (9'X18')
HANDY CAPPED PARKING	1 STALL (9'X18')
LOADING STALLS	3 STALLS (10'X25')
RV PARKING	16 STALLS (12'X32')
RV PARKING	11 STALLS (12'X35')

EASEMENTS

NONE

PERMIT AREA

THE PROPOSED PERMIT AREA COVERS APPROXIMATELY 4.6 ACRES.

LEGAL DESCRIPTION MAIN SITE

PARCEL 4 OF PARCEL MAP 13130 AS SHOWN BY MAP ON FILE IN BOOK 70, PAGE 53 OF PARCEL MAPS, RIVERSIDE COUNTY RECORDS, STATE OF CALIFORNIA.

EXCEPTING:
COMMENCING AT THE CENTERLINE INTERSECTION OF STATE ROUTE 79, WINCHESTER ROAD (16.762 METERS NORTHWESTERLY HALF-WIDTH), AND KELLER ROAD (13.410 METERS SOUTHERLY HALF-WIDTH), AS SHOWN ON SAID PARCEL MAP;

THENCE S 36°03'34" W ALONG THE CENTERLINE OF SAID STATE ROUTE 79, A DISTANCE OF 42.543 METERS;

THENCE N 53°56'26" W, A DISTANCE OF 16.762 METERS TO AN ANGLE POINT IN THE NORTH WESTERLY RIGHT-OF-WAY LINE SAID STATE ROUTE 79, SAID POINT BEING THE TRUE POINT OF BEGINNING;

THENCE S 36°03'34" W ALONG SAID NORTHWESTERLY RIGHT-OF-WAY LINE, A DISTANCE OF 219.157 METERS TO THE SOUTHEAST CORNER OF SAID PARCEL 4;

THENCE N 89°58'52" W ALONG THE SOUTHERLY LINE OF SAID PARCEL 4, A DISTANCE OF 13.946 METERS TO A POINT 28.039 METERS NORTHWESTERLY OF, AS MEASURED AT RIGHT ANGLES TO SAID CENTERLINE OF STATE ROUTE 79;

THENCE N 36°03'34" E PARALLEL WITH AND 28.039 METERS NORTHWESTERLY OF SAID CENTERLINE OF STATE ROUTE 79, A DISTANCE OF 219.900 METERS;

THENCE N 11°29'56" E, A DISTANCE OF 4.718 METERS;

THENCE N 82°06'07" W, A DISTANCE OF 3.998 METERS TO A POINT 33.525 METERS NORTHWESTERLY OF, AS MEASURED AT RIGHT ANGLES TO SAID CENTERLINE OF STATE ROUTE 79;

THENCE N 36°03'34" E PARALLEL WITH AND 33.525 METERS NORTHWESTERLY OF SAID CENTERLINE OF STATE ROUTE 79, A DISTANCE OF 6.611 METERS TO A POINT ON THE SOUTHERLY RIGHT-OF-WAY LINE OF SAID KELLER ROAD;

THENCE S 89°59'41" E ALONG SAID SOUTHERLY RIGHT-OF-WAY LINE A, DISTANCE OF 7.032 METERS TO AN ANGLE POINT THERIN;

THANCE S 26°45'01" E CONTINUING ALONG SAID SOUTHERLY RIGHT-OF-WAY LINE, A DISTANCE OF 12.454 METERS TO THE TRUE POINT OF BEGINNING.

GENERAL NOTES

APPLICANT:
CHAKRABARTY LLC,
ATTN: DR. MILAN S. CHAKRABARTY
1003 E. FLORIDA AVE. SUITE 101
HEMET, CA 92543
(951) 652-2252

EXISTING LAND USE:
VACANT

EXISTING ZONING:
C-1/C-P ZONE, GENERAL COMMERCIAL

PROPOSED ZONING:
C-1/C-P ZONE, GENERAL COMMERCIAL

PROPOSED PROJECT:
STORAGE FACILITY

PREPARED BY:
THE PRIZM GROUP
310 N. COTA ST., SUITE I
CORONA, CA 92880
(951) 737-4406

FEMA FLOOD PLAIN:
ZONE X

WASTE DISPOSAL:
WASTE MANAGEMENT

PROPOSED IMPROVEMENTS:
8 NEW BUILDINGS

NUMBER OF UNITS:
1

PLANT AND TREE PROTECTION:
NOT APPLICABLE

ASSESSORS PARCEL No.:
476-010-060

SOURCE OF CONTOURS:
AERIAL TOPOGRAPHIC MAPPING BY INLAND AERIAL SURVEYS.

SITE ADDRESS
VACANT LAND
WHINCHESTER, CA 92596

UTILITIES:

WATER/SEWER:
E.M.W.D.
CARMEN VALENZUELA
PO BOX 8300
PERRIS, CA 92572

ELECTRIC:
S.C. EDISON
1351 E. FRANCIS ST.
ONTARIO, CA 91761
(909) 503-5565

PHONE:
FRONTIER COMMUNICATIONS
BID KEANS
295 N. SUNRISE LN
PALM SPRINGS, CA 92262

GAS:
S.C. GAS
GEARY AMBERNS
1981 W. LUGONIA AVE.
REDLENDS, CA 92374
(909) 335-7955

SCHOOL DISTRICT:
TEMECULA VALLEY UNIFIED SCHOOL DISTRICT

CABLE T.V.:
CHARTER
GOZETTE MILES
1500 AUTO CENTER DR.
ONTARIO, CA 91761
(909)975-3398

REGISTERED PROFESSIONAL ENGINEER — No. 55750 — CIVIL — STATE OF CALIFORNIA

REVISIONS:			
REMARK	DESCRIPTION:	APR.:	DATE:

DESIGNED: VGK | DRAWN: LO | CHECKED: VGK

THE PRIZM GROUP
•LEICA HDS LASER SCANNING •GPS & ROBOTIC SURVEYING •GEOMATIC ENGINEERING •CIVIL ENGINEERING •LAND PLANNING
330 N. COTA ST. SUITE I, CORONA, CA 92880
PHONE: (951) 737-4406 •inquiry@the-prizm-group.com

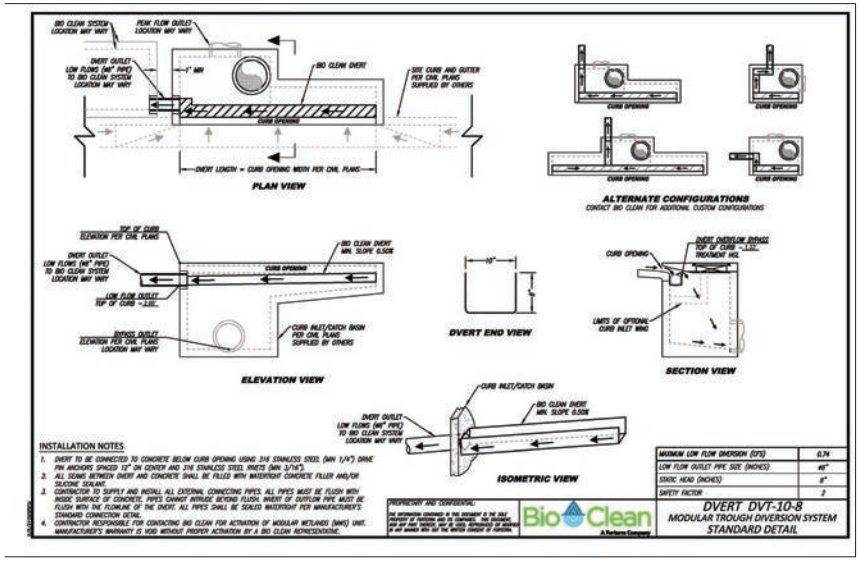
Scale: 1" = 40'
Bench Mark: SEE THIS SHEET
Date: 4-6-22

TEMECULA VALLEY SELF STORAGE C.U.P. EXHIBIT TITLE SHEET

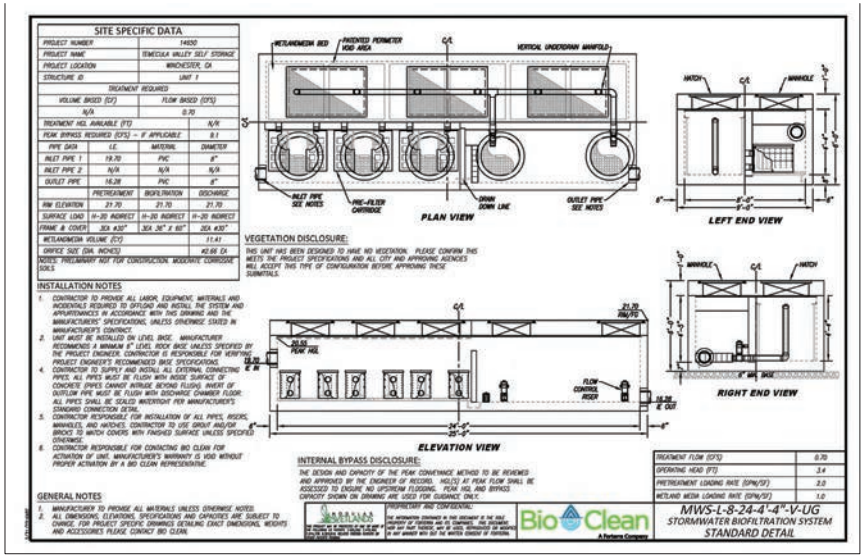
Sheet No. 1 OF 4 SHEETS
FILE NO. 19-004

File name: P:\TPG\19\19-004\CUP\19-004 CUP01.dwg

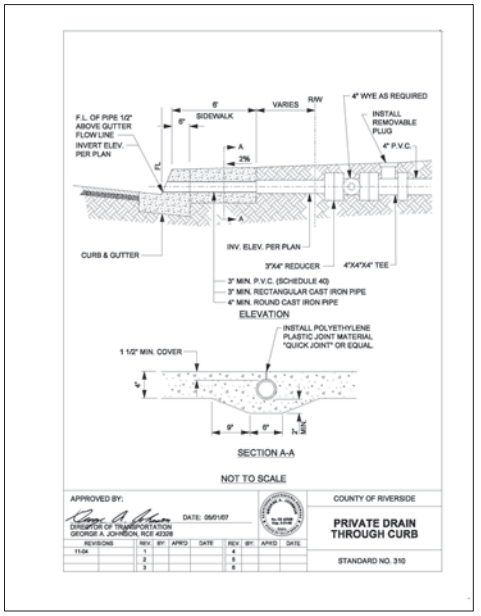
TEMECULA VALLEY SELF STORAGE DETAILS



33 DIVERSION TROUGH DETAIL
N.T.S.



10 WQMP BIOFILTRATION CHAMBER
N.T.S.



33 CURB INLET DETAIL
N.T.S.

REGISTERED PROFESSIONAL ENGINEER
VIRGIL GERALD KOPF
No. 55750
CIVIL
STATE OF CALIFORNIA

REVISIONS:

REMARK	DESCRIPTION:	APR.:	DATE:

DESIGNED: VGK | DRAWN: BM | CHECKED: VGK

THE PRIZM GROUP
330 N. COTA ST. SUITE I, CORONA, CA 92880
PHONE: (951) 737-4400 ● www.theprizm.group.com

- LEICA HDS LASER SCANNING
- GPS & ROBOTIC SURVEYING
- AERIOMATIC ENGINEERING
- CIVIL ENGINEERING
- LAND PLANNING

Scale: NONE
Bench Mark: SEE THIS SHEET
Date: 4-6-22

TEMECULA VALLEY SELF STORAGE DETAILS

Sheet No. 3 OF 4 SHEETS
FILE NO. 19-004

File name: P:\TPG\19\19-004\GP\19-004PGP03.dwg

TEMECULA VALLEY SELF STORAGE DETAILS

DESIGN INFORMATION

- MATERIAL FINISH = GALVANIZED
- PIPE GAUGE = 16GA.
- PERFORATED = NO
- DIAMETER = 48"
- LOADING = H20/H25
- SYSTEM INVERT = 15.38

HEAVY CONSTRUCTION

For temporary construction vehicle loads (100 kips/axle load), put at least four feet of compacted cover on top of the pipe (but not exceeding the maximum allowable cover over the pipe).

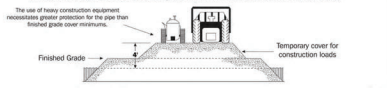
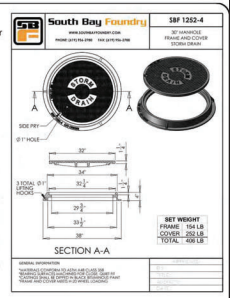


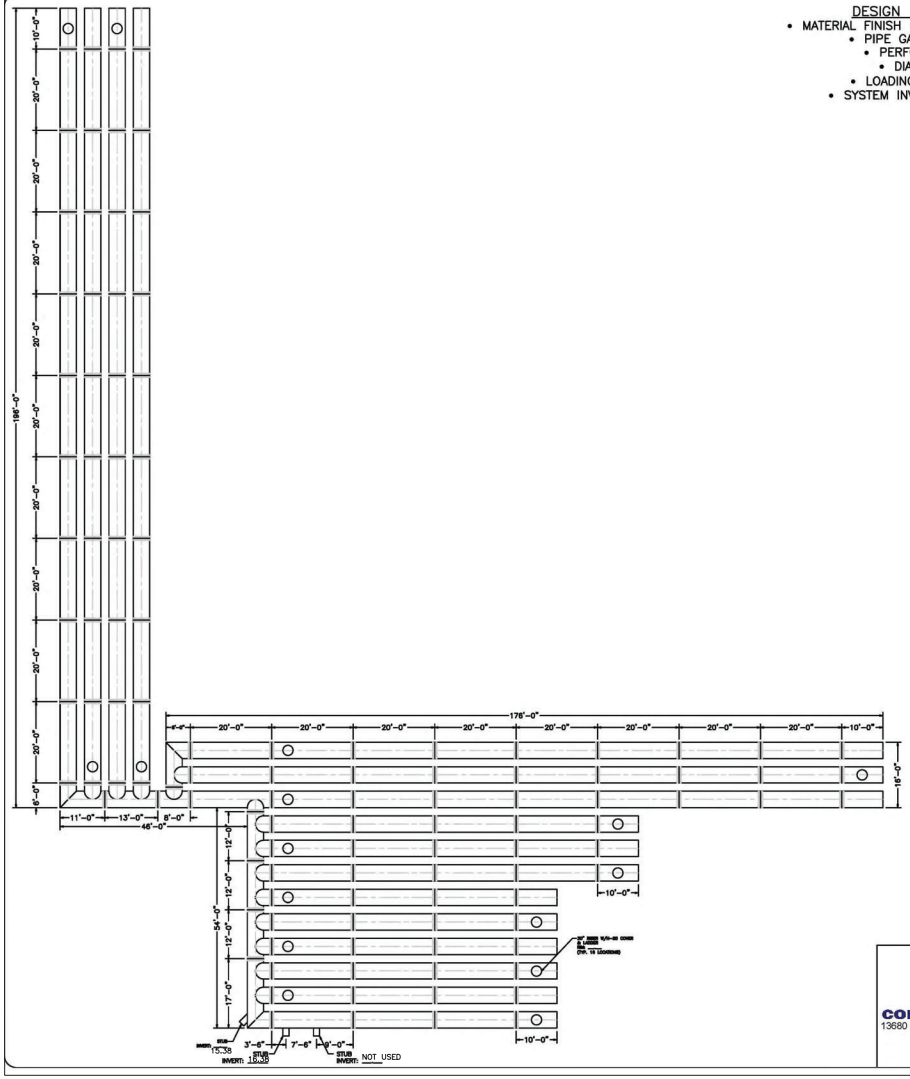
Table 7.8

General guidelines for minimum cover required for heavy off-road construction equipment

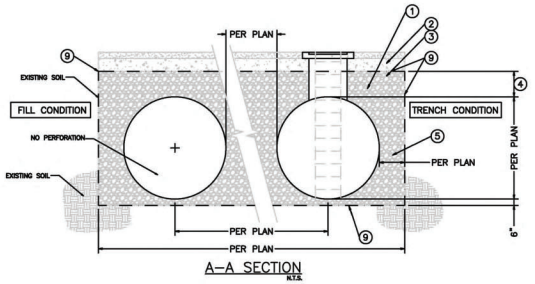
Pipe Span, in.	Minimum Cover (ft) for Indicted Axle Loads (kips)*			
	18-50	50-75	75- 110	110- 150
12-42	2.0	2.5	3.0	3.0
48-72	3.0	3.0	3.5	4.0
78-120	3.0	3.5	4.0	4.0
126-144	3.5	4.0	4.5	4.5

* 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.





8 UNDERGROUND DETENTION CHAMBER
N.T.S.

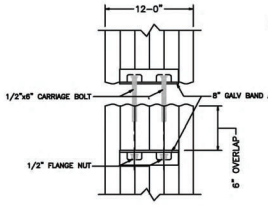


A–A SECTION
N.T.S.

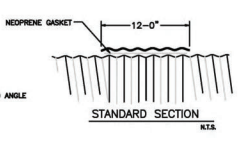
NOTES:
1. TOP 12" OF COVER IS TO BE 1" GRAVEL.
2. SOIL MEDIA
3. NORMAL ROADWAY EMBANKMENT FILL PLACED IN 8" LIFTS AND COMPACTED TO MIN. 90% STANDARD DENSITY PER AASHTO T-99.
4. 12" MIN. FOR DIAMETERS THROUGH 96", 15" MIN. FOR DIAMETERS FROM 102" AND UP. MEASURE FROM TOP OF PIPE TO BOTTOM OF FLEXIBLE PAVEMENT OR TOP OF PIPE TO TOP OF RIGID PAVEMENT.
5. FREE DRAINING ANGULAR WASHED STONE 3/4" – 2" AROUND PIPE ENVELOPE AS SHOWN OR OTHERWISE NOTED.
6. CSP GAGE PER AASHTO SECTION12.
7. NOT USED
8. LISTED SPACING CHART IS FOR MULTIPLE PIPE INSTALLATION. FOR SINGLE RUN, THE TRENCH REQUIRES ONLY THE BOTTOM WIDTH OF THE PIPE'S SPAN, PLUS ROOM FOR COMPACTION EQUIPMENT.

SPACING CHART PER AISI AND NCSPA GUIDELINES	
DIAMETER	REQUIRED SPACING
UP TO 24"	12"
24" – 72"	1/2 PIPE DIA.
72" AND UP	36"

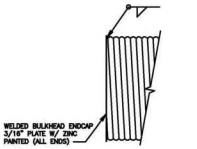
9. 4 oz. NON WOVEN GEOTEXTILE FABRIC TERRATEX NO4E (OR EQUAL).
10. RELATIVELY LOOSE GRANULAR BEDDING ROUGHLY SHAPED TO FIT BOTTOM OF PIPE, 4" TO 6" IN DEPTH. (#57 OR #8 OR OTHER SUITABLE GRANULAR).



ANNULAR BAND DETAIL
N.T.S.



STANDARD SECTION
N.T.S.



B–B
TYPICAL BULKHEAD

GENERAL NOTES:
1. BANDS ARE FURNISHED AS FOLLOWS:
   12" THRU 48" – 1–PIECE
   54" THRU 96" – 2 PIECE
   102" THRU 144" – 3 PIECE
2. GALV BAND ANGLES ARE ATTACHED WITH SPOT WELDS, RIVETS OR HAND WELDED.
3. DIMMENSIONS ARE SUBJECT TO MANUFACTURING TOLERANCES.
4. DIMPLE BANDS FOR ARCHED PIPE ARE THE SAME AS FOR EQUIVALENT ROUND PIPE DIAMETER.

PACIFIC CORRUGATED PIPE CO.®
13680 SLOVER AVENUE FONTANA, CA 92337
800.338.5858 * 909.829.4235
Fx: 909.829.8035
SOCAL@PCPIPE.COM

NOTE:
THE SUITABILITY OF THE INFORMATION PRESENTED FOR USE ON ANY PARTICULAR PROJECT SHOULD BE DETERMINED BY THE ENGINEER RESPONSIBLE FOR THE DESIGN.

PROJECT NAME: TEMECULA VALLEY SELF STORAGE
PROJECT #:

SIGN & DATE TO RELEASE FOR MANUFACTURE (SUBJECT TO PRICE VERIFICATION)
PLANS APPROVED
☐ (AS NOTED) ☐ (W/CHANGES)
DATE SIGNATURE

REV.	DESCRIPTION	DATE
1		

DRAWN BY: J. BROWN
SCALE: AS NOTED
DATE: 03.31.22
SHEET NO: 1 OF 1

REGISTERED PROFESSIONAL ENGINEER VINCENT GERALD KOSAR No. 55750 CIVIL STATE OF CALIFORNIA

REVISIONS:			
REMARK	DESCRIPTION:	APR.:	DATE:

DESIGNED: VGK DRAWN: BM CHECKED: VGK

THE PRIZM GROUP
310 N. COTA ST. SUITE I, CORONA, CA 92880
PHONE: (951) 737-4400 ● www.the-prizm-group.com

•LEICA HDS LASER SCANNING •GPS & ROBOTIC SURVEYING •GEOMATIC ENGINEERING •CIVIL ENGINEERING •LAND PLANNING

Scale: NONE
Bench Mark: SEE SHEET 1
Date: 4-6-22

TEMECULA VALLEY SELF STORAGE DETAILS

Sheet No. 4 OF 4 SHEETS
FILE NO. 19-004

File name: P:\TPG\19\19-004\GP\19-004PGP04.dwg

It is expressly agreed and understood by the USER of this Excel Spreadsheet file (file) released hereby (whether released in digital or hard copy form) that Riverside County (County) makes no representation as to its accuracy. Further, it is the intent of the parties hereto that the USER shall review and verify calculations, analyze results, and/or independently determine the accuracy thereof prior to placing any reliance whatsoever on the information. Further, the USER shall hold the County, together with the officers, agents and employees of each, free and harmless from any liability whatsoever, including wrongful death, based or asserted upon any act or omission of the District or County, their officers, agents, employees or subcontractors, relating to or in any way connected with the unauthorized use of these files or information; and USER agrees to protect and defend, including all attorney fees and other expenses, each of the foregoing bodies and persons in any legal action based or asserted upon any such acts or omissions. USER also agrees not to sell, reproduce or release these files to others for any purpose whatsoever, except those incidental uses for which the files were acquired, verified and combined with USER'S own work product. Reasonable effort was made to fully comply with the San Diego MS4 Permit requirements using the methods found in the Riverside County Hydrology Manual. If the user finds an error in any way, please contact the County so that the error can be corrected. Any direct tampering of the equations in this spreadsheet would be considered extremely inappropriate, and potentially fraudulent.

Santa Margarita Region - County HydroMod Iterative Spreadsheet Model

Only for use the unincorporated portions of Riverside County, unless otherwise approved by the Co-Permittee

Development Project Number(s):	Temecula Valley Storage	Rain Gauge	Eastern Slopes
Latitude (decimal format):	33.626448°	BMP Type (per WQMP):	Biofiltration
Longitude (decimal format):	117.095224°	BMP Number (Sequential):	1

Pre-Development - Hydrology Information

DRAINAGE AREA (ACRES) - 10 acre max[1]	4.18	2-YEAR, 1-HOUR INTENSITY (IN/HR) - Plate D-4.3	1.2
LONGEST WATERCOURSE (FT) - 1,000' max[1]	604	10-YEAR, 1-HOUR INTENSITY (IN/HR) - Plate D-4.1 or D-4.5	0.88
UPSTREAM ELEVATION OF WATERCOURSE (FT)	1433	SLOPE OF THE INTENSITY DURATION - Plate D-4.6	0.55
DOWNSTREAM ELEV. OF WATERCOURSE (FT)	1414	CLOSEST IMPERVIOUS PERCENTAGE (%)	0% Undeveloped - Good Cover
EXISTING IMPERVIOUS PERCENTAGE (%)	0		
Use 10% of Q2 to avoid Field Screening requirements	Yes		

Pre-Development - Soils Information

Cover Type #	Subarea Acreage	Cover Type	Vegetative Cover	Soil A %	Soil B %	Soil C %	Soil D %	RI Index AMC I	RI Index AMC II	RI Index AMC III
9	4.18 Ac.	Grass	Good Cover		100			41	61	78
								0	0	0
								0	0	0
	4.18 Ac.						**Weighted Average RI Numbers =**	41.0	61.0	78.0

Per Dr. Luis Parra, the AMC condition is based on the rainfall record. Applying NEH-4 (1964) for the non-freezing conditions in Riverside County the AMC conditions are:
AMC-I for less than 0.5" of rain the previous 5 days; AMC-II for between 0.5" to 1.1" of rain the previous 5 days; or AMC-III for more than 1.1" for the previous 5 days.

Pre-Development - Calculated Range of Flow Rates analyzed for Hydromod (Suceptible Range of Flows)

Calculated Upper Flow-rate limit	Calculated Lower Flow-rate limit
Ex. 10-year Flowrate[1] = **3.422** cfs	Ex. 10% of the 2-year Flowrate[1] = **0.376** cfs
(Co-Permitte Approval is required) User-Defined Discharge Values with accompanying Hydrology Study[1]	
Ex. 10-year Flowrate (Attach Study) = cfs	Ex. 2-year Flowrate (Attach Study) = cfs

[1]The equations used to determine the 10-year and 10% of the 2-yr are limited to 10-acres and 1,000'. Flowrates from a separate study can be used to over-ride the calculated values so that larger areas (up to 20 acres) and longer watercourse lengths can be used. All values still need to be filled out, even when there is a user-defined discharge value entered.

Post-Project - Hydrograph Information

DRAINAGE AREA (ACRES)	4.18	Go to "BMP Design" tab to design your BMP, then check results below. Print both this "HydroMod" Sheet and the "BMP Design" sheet for your submittal.
LONGEST WATERCOURSE (FT)	812	
DIFFERENCE IN ELEV (FT) - along watercourse	4.47	
PROPOSED IMPERVIOUS PERCENTAGE (%)	88	

Post-Project - Soils Information

Cover Type #	Subarea Acreage	Cover Type	Vegetative Cover	Soil A %	Soil B %	Soil C %	Soil D %	RI Index AMC I	RI Index AMC II	RI Index AMC III
22	4.18 Ac.	Urban Landscaping	Good Cover				100	57	75	88
								0	0	0
								0	0	0
	4.18 Ac.						**Weighted Average RI Numbers =**	57.0	75.0	88.0

Per Dr. Luis Parra, the AMC condition is based on the rainfall record. Applying NEH-4 (1964) for the non-freezing conditions in Riverside County the AMC conditions are:
AMC-I for less than 0.5" of rain the previous 5 days; AMC-II for between 0.5" to 1.1" of rain the previous 5 days; or AMC-III for more than 1.1" for the previous 5 days.

Results

		First result out of compliance in the rainfall record					
Hydromod Ponded depth	**1.20 feet**	Requirement		Proposed		See below for the Height in the Basin (Stage) that is causing a non-compliant result	
Hydromod Drain Time (unclogged)	**32.80 hours**						
Is the HydroMod BMP properly sized?	**Yes, this is acceptable**	—	—	—	—		
Mitigated Q < 110% of Pre-Dev. Q?	**Yes, this is acceptable**	—	—	—	—	Issue @ Stage =	—
Mitigated Duration < 110% of Pre-Dev?*	**Yes, this is acceptable**	—	—	—	—	Issue @ Stage =	—

Responsible-in-charge: _____ Date: _____

Signature: _____ Spreadsheet Developed by: Benjie Cho, P.E.

It is expressly agreed and understood by the USER of this Excel Spreadsheet file (file) released hereby (whether released in digital or hard copy form) that Riverside County (County) makes no representation as to its accuracy. Further, it is the intent of the parties hereto that the USER shall review and verify calculations, analyze results, and/or independently determine the accuracy thereof prior to placing any reliance whatsoever on the information. Further, the USER shall hold the County, together with the officers, agents and employees of each, free and harmless from any liability whatsoever, including wrongful death, based or asserted upon any act or omission of the District or County, their officers, agents, employees or subcontractors, relating to or in any way connected with the unauthorized use of these files or information; and USER agrees to protect and defend, including all attorney fees and other expenses, each of the foregoing bodies and persons in any legal action based or asserted upon any such acts or omissions. USER also agrees not to sell, reproduce or release these files to others for any purpose whatsoever, except those incidental uses for which the files were acquired, verified and combined with USER'S own work product. Reasonable effort was made to fully comply with the San Diego MS4 Permit requirements using the methods found in the Riverside County Hydrology Manual. If the user finds an error in any way, please contact the County so that the error can be corrected. Any direct tampering of the equations in this spreadsheet would be considered extremely inappropriate, and potentially fraudulent.

BMP Design

Fill in blue shaded areas

BMP Geometry & Detention Calculations

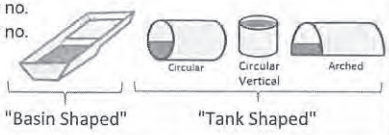
0.2	feet, Stage Intervals

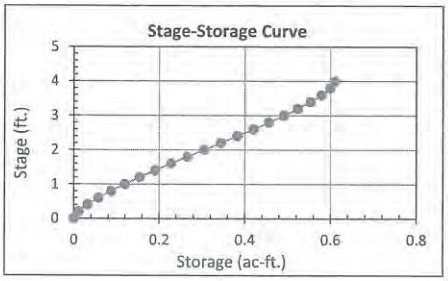
Larger Stage Intervals may incr. the Q at the bottom stg.

PROPOSED BMP DIMENSIONS

STEP1: Size the BMP, so that the Total Volume > Max HydroMod Vol. (Deeper is ok, it will be refined in the Design Geometry)

Circular Tank BMP	Is the BMP a Tank shape?	1	1 for yes; 2 for no.
	Is the BMP Arched shape?	2	1 for yes; 2 for no.
	If circular, is the tank vertical?	2	1 for yes; 2 for no.
	Is this Harvest & Reuse?	2	1 for yes; 2 for no.
	How many cells together?	1	
	Diameter (Hortz. for arch) =	48	IN
	Length (or Ht. for Vertical) =	2116	FT



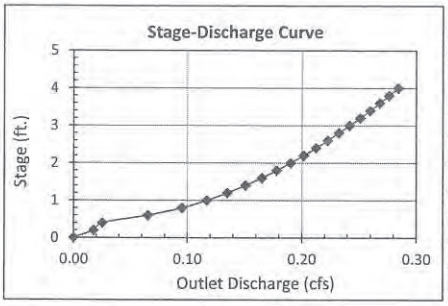


Prop Single-Circular Vol =	26,590	FT3
Total Prop. Volume[1] =	26,590	FT3
Max HydroMod Volume =	5,941	FT3
[2]		
Max HydroMod Depth[3] =	1.20	FT

[1]Does not include forebay, or low flow trench

[2]Does not account for freeboard or access roads

[3]Does not consider Increased Runoff



MINIMUM DESIGN GEOMETRY

STEP2: Delete outlets, then propose the largest lowest orifice that does not, exceed the ex. Q or Duration. If the Q is acceptable, but the duration is exceeded, try decreasing orifice, then adding a weir slightly below the stage that has an issue.

OUTLETS (for Stage-Discharge)

Orifice Outlets			Weir Outlets		
Invert Height (ft)	Diameter (inches)	No. of Orifices	Crest Height (ft)	Crest Width (ft)	No. of Weirs
0	0.50	6			
0.5	1.00	4			

Hydromod Depth =	1.20 FT
+ 1' Freeboard =	2.20 FT

Resize with Hydromod Depth +1' Freeboard

Stage-Storage-Discharge*

Stage (FT)	Storage (AC-FT)	Storage (FT3)	Q (CFS)
0	0	0	0
0.20	0.011	497	0.02
0.40	0.032	1384	0.03
0.60	0.057	2501	0.07
0.80	0.087	3786	0.10
1.00	0.119	5198	0.12
1.20	0.154	6709	0.13
1.40	0.190	8294	0.15
1.60	0.228	9932	0.16
1.80	0.266	11605	0.18
2.00	0.305	13295	0.19
2.20	0.344	14985	0.20
2.40	0.382	16658	0.21
2.60	0.420	18296	0.22
2.80	0.456	19881	0.23
3.00	0.491	21392	0.24
3.20	0.524	22805	0.25
3.40	0.553	24089	0.26
3.60	0.579	25207	0.27
3.80	0.599	26093	0.28
4.00	0.610	26590	0.28

DESIGN INFORMATION
- MATERIAL FINISH = GALVANIZED
- PIPE GAUGE = 16GA.
- PERFORATED = NO
- DIAMETER = 48"
- LOADING = H20/H25
- SYSTEM INVERT = 15.38

HEAVY CONSTRUCTION

For temporary construction vehicle loads (100 kips/axle load), put at least four feet of compacted cover on top of the pipe (but not exceeding the maximum allowable cover over the pipe).

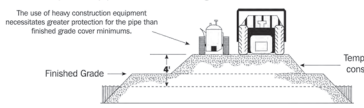
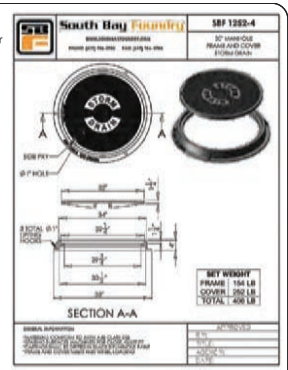


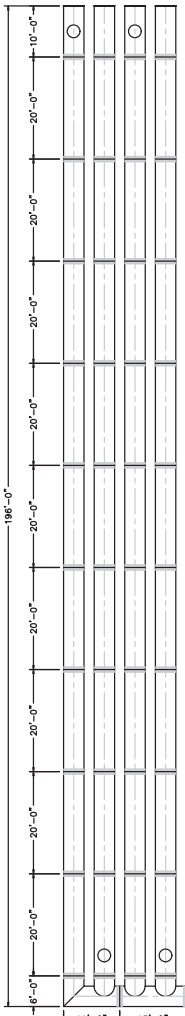
Table 7.8

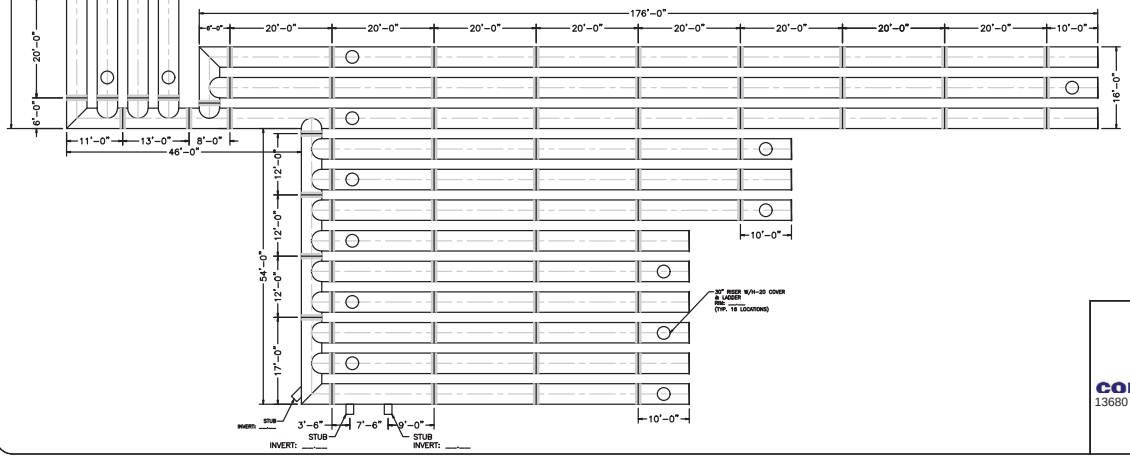
General guidelines for minimum cover required for heavy off-road construction equipment

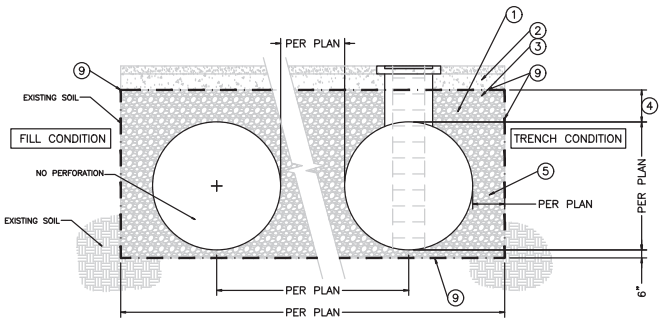
Pipe Span, in.	Minimum Cover (ft) for Indicted Axle Loads (kips)*			
	18-50	50-75	75- 110	110- 150
12-42	2.0	2.5	3.0	3.0
48-72	3.0	3.0	3.5	4.0
78-120	3.0	3.5	4.0	4.0
126-144	3.5	4.0	4.5	4.5

* 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.







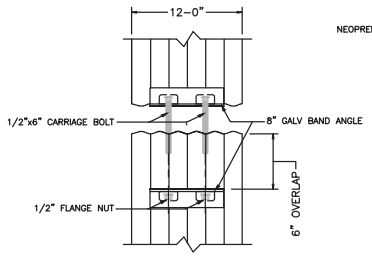


A–A SECTION
N.T.S.

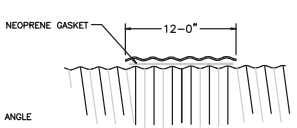
NOTES:
1. TOP 12" OF COVER IS TO BE 1" GRAVEL
2. SOIL MEDIA
3. NORMAL ROADWAY EMBANKMENT FILL PLACED IN 8" LIFTS AND COMPACTED TO MIN. 90% STANDARD DENSITY PER AASHTO T-99.
4. 12" MIN. FOR DIAMETERS THROUGH 96", 18" MIN. FOR DIAMETERS FROM 102" AND UP. MEASURE FROM TOP OF PIPE TO BOTTOM OF FLEXIBLE PAVEMENT OR TOP OF PIPE TO TOP OF RIGID PAVEMENT.
5. FREE DRAINING ANGULAR WASHED STONE 3/4" – 2" AROUND PIPE ENVELOPE AS SHOWN OR OTHERWISE NOTED.
6. CSP GAGE PER AASHTO SECTION12.
7. NOT USED
8. LISTED SPACING CHART IS FOR MULTIPLE PIPE INSTALLATION. FOR SINGLE RUN, THE TRENCH REQUIRES ONLY THE BOTTOM WIDTH OF THE PIPE'S SPAN, PLUS ROOM FOR COMPACTION EQUIPMENT.

SPACING CHART PER AISI AND NCSPA GUIDELINES	
DIAMETER	REQUIRED SPACING
UP TO 24"	12"
24" – 72"	1/2 PIPE DIA.
72" AND UP	36"

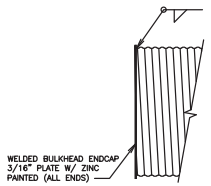
9. 4 oz. NON WOVEN GEOTEXTILE FABRIC TERRATEX N04E (OR EQUAL).
10. RELATIVELY LOOSE GRANULAR BEDDING ROUGHLY SHAPED TO FIT BOTTOM OF PIPE, 4" TO 6" IN DEPTH. (#57 OR #8 OR OTHER SUITABLE GRANULAR).



ANNULAR BAND DETAIL
N.T.S.



STANDARD SECTION
N.T.S.



B–B
TYPICAL BULKHEAD

GENERAL NOTES:
1. BANDS ARE FURNISHED AS FOLLOWS:
   12" THRU 48" – 1–PIECE
   54" THRU 96" – 2 PIECE
   102" THRU 144" – 3 PIECE
2. GALV BAND ANGLES ARE ATTACHED WITH SPOT WELDS, RIVETS OR HAND WELDED.
3. DIMMENSIONS ARE SUBJECT TO MANUFACTURING TOLERANCES.
4. DIMPLE BANDS FOR ARCHED PIPE ARE THE SAME AS FOR EQUIVALENT ROUND PIPE DIAMETER.

PACIFIC CORRUGATED PIPE CO.®
13680 SLOVER AVENUE FONTANA, CA 92337
800.338.5858 * 909.829.4235
Fx: 909.829.8035
SOCAL@PCPIPE.COM

NOTE:
THE SUITABILITY OF THE INFORMATION PRESENTED FOR USE ON ANY PARTICULAR PROJECT SHOULD BE DETERMINED BY THE ENGINEER RESPONSIBLE FOR THE DESIGN.

PROJECT NAME: TEMECULA VALLEY SELF STORAGE
PROJECT #:

SIGN & DATE TO RELEASE FOR MANUFACTURE (SUBJECT TO PRICE VERIFICATION)
PLANS APPROVED ☐ (AS NOTED) ☐ (W/CHANGES)
DATE _____ SIGNATURE _____

REV.	DESCRIPTION	DATE
1		

DRAWN BY: J. BROWN
SCALE: AS NOTED
DATE: 03.31.22
SHEET NO: 1 OF 1

Appendix 8: Source Control

Pollutant Sources/Source Control Checklist

For Final WQMP, include a copy of the completed Pollutant Sources/Source Control Checklist in the subsequent pages and summarize Source Control BMPs in Section H of this Template.

Appendix 8
STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

How to use this worksheet (also see instructions in Section H of the 2018 SMR 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 H.1 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.

Appendix 8

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**
❑ **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.	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://www.rcwatershed.org/about/materials-library/#1450469138395-bb76dd39-d810 ❑ Provide IPM information to new owners, lessees and operators.

Appendix 8

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**
❑ **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://www.rcwatershed.org/about/materials-library/#1450469201433-f5f358c9-6008
❑ **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://www.rcwatershed.org/about/materials-library/#1450389926766-61e8af0b-53a9 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

Appendix 8

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**
❑ **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://www.rcwatershed.org/about/materials-library/#1450389926766-61e8af0b-53a9
❑ **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.echealth.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

Appendix 8

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**
❑ **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://www.rcwatershed.org/about/materials-library/#1450389926766-61e8af0b-53a9 ❑ Car dealerships and similar may rinse cars with water only.

Appendix 8

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**
❑ **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; "Outdoor Cleaning Activities" and "Professional Mobile Service Providers" for many of the Potential Sources of Runoff Pollutants. Brochures can be found at: http://www.rcwatershed.org/about/materials-library/#1450389926766-61e8af0b-53a9

Appendix 8
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**
❑ 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.

Appendix 8

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**
❑ **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

Appendix 8

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**
❑ **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.	

Appendix 8
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

For the Final WQMP the following information shall be provided:

1. Maintenance Plan per Section 5.3.5 of the WQMP Guidance Document. County will regularly inspect BMPs, so BMPs without access (e.g. backyards, etc) will be rejected. Due to liability, the County does not allow for overlapping private maintenance in the public right-of-way.
2. For all projects, include one wet-signed and notarized hardcopy of the BMP Maintenance agreement. Please note, references to Exhibit A and B on Page 1can be struck out if the entire parcel is mentioned in the "Legal Description" on Page 1 of the agreement. Otherwise see below for Exhibit A and B standards. For BMP agreement, ensure that the name on the agreement matches throughout and the notary sheet, Notary shall be the latest California format, the date of the agreement is the date of the notary, all text does not exceed the margins, then the County will sign, attest & record
3. For Tracts, contact County EDA regarding maintenance determinations/formations. Include a completed Exhibit B.9 - WQMP O&M Cost Sheet.xlsx that is signed by both the preparer (to ensure quantities are correct) and the owner (to understand the maintenance obligations in perpetuity) & an Approved Maintenance Exhibit from EDA.
4. For Tracts or any project , written documentation from the maintenance entity that they are willing to maintain (e.g. CFD, CSA, L&LMD, etc.)

BMP EXHIBIT "A" STANDARDS

1. Use the legal description of the parcel as shown on the tentative exhibit. If not available, use the one in the most current title report.
2. As a backup, if the project is a map the description of the future lot may be included for reference

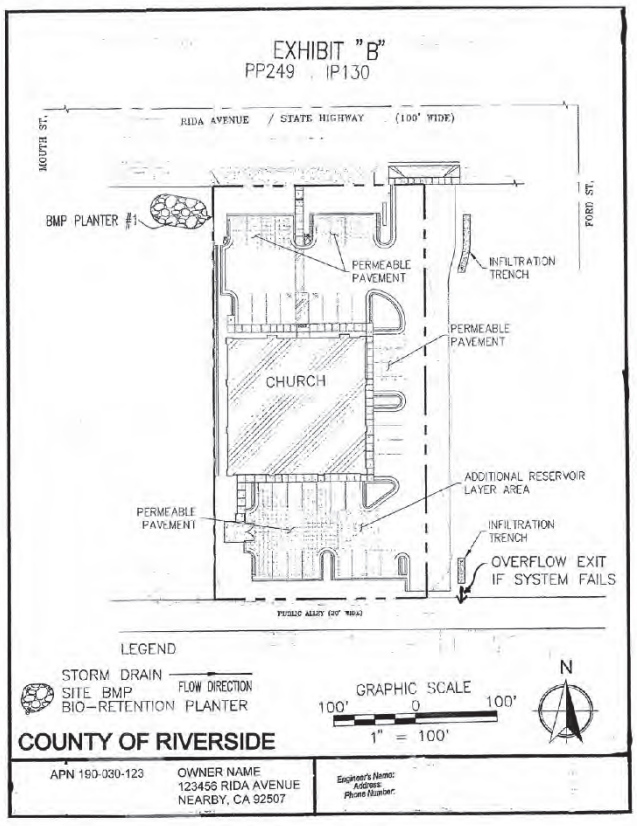
BMP EXHIBIT "B" STANDARDS

1. 0.12" minimum lettering
2. Sheet size must be 8.5" x 11"
3. Show Street names, north arrow
4. Indicate point of flow exit into street if basin system fails
5. Indicate Q100 of flow exit into street
6. Indicate direction of flow exit into street
7. Indicate by notation and/or show nearest downstream drainage facility (catch basin, culvert, riser, etc)
8. Show "Exhibit A", IP and project number (TR, PM, PUP, PP etc)
9. Title block, signature block, engineer seals, USA note is not necessary on Exhibit
10. Show scale used for drawing, provide 4" graphic scale

MAINTENANCE EXHIBIT "B" STANDARDS

1. 0.12" minimum lettering
2. Sheet size must be 8.5" x 11"
3. Show street names, north arrow
4. Show "Exhibit A", IP and project number (TR, PM, PUP, PP etc)
5. Title block, signature block, engineer seals, USA note is not necessary on Exhibit
6. Show scale used for drawing, provide 4" graphic scale

BMP EXHIBIT B EXAMPLE



Recorded at the request of:
COUNTY OF RIVERSIDE
TRANSPORTATION DEPARTMENT

THIS INSTRUMENT IS FOR THE BENEFIT
OF THE COUNTY OF RIVERSIDE AND
ENTITLED TO BE RECORDED WITHOUT
FEE.(GOV. CODE 6103)

RETURN TO:
RIVERSIDE COUNTY TRANSPORTATION
DEPARTMENT. **STOP NO. 1080**
4080 LEMON STREET
RIVERSIDE, CA 92501

COVENANT AND AGREEMENT REGARDING WATER QUALITY MANAGEMENT PLAN BMP, CONSENT TO INSPECT, MAINTENANCE AND INDEMNIFICATION

APN:_____ **PROJECT No.**_____ **IP No.**_____

OWNER(S):_____

PROPERTY ADDRESS:_____

LEGAL DESCRIPTION:_____
_____
_____

THIS AGREEMENT is made and entered into in Riverside County, California, this _____ day of _____ Year_____, by and between_____, (hereinafter referred to as "Covenantor" or "Owner") and the COUNTY OF RIVERSIDE via its Department of Transportation, a political subdivision of the State of California (hereinafter referred to as "County").

RECITALS

WHEREAS, the Covenantor owns real property ("Property") in the County of Riverside, State of California, more specifically described in Exhibit "A" and depicted in Exhibit "B", each of these exhibits is attached, and incorporated herein by this reference;

WHEREAS, the County is the owner of interests in that certain real property within the unincorporated area of the County of Riverside, State of California, containing storm drains, pipelines, and related appurtenances constituting the County's municipal separate storm sewer system (the County's "MS4");

WHEREAS, Covenantor intends to develop, improve, and/or use the Property is such a way that approval by the County for such development, improvement, and/or use is required pursuant to applicable laws;

WHEREAS, As a condition for said approval by the County, County required Covenantor, and Covenantor desires to, restrict the use of the Property according to the conditions, covenants, equitable servitudes, and restrictions contained herein for the express benefit of the County's MS4, which include requirements that the Property incorporate post construction on-site stormwater quality control measures;

WHEREAS, the Covenantor/Owner has chosen to install one or more _____, hereinafter referred to as "Device", as the on-site control measure to minimize pollutants in urban runoff;

WHEREAS, said Device has been installed in accordance with plans and specifications accepted by the County;

WHEREAS, said Device, with installation on private property and draining only private property, is a private facility with all maintenance or replacement, therefore, the sole responsibility of the Covenantor/Owner in accordance with the terms of this Agreement;

WHEREAS, the Covenantor/Owner is aware that periodic and continuous maintenance, including, but not necessarily limited to, filter material replacement and sediment removal, is required to assure peak performance of Device and that, furthermore, such maintenance activity will require compliance with all Local, State, or Federal laws and regulations, including those pertaining; to confined space and waste disposal methods, in effect at the time such maintenance occurs;

NOW THEREFORE, incorporating the foregoing Recitals and in consideration of the covenants and conditions contained herein, and for other good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, and expressly for the benefit of, and to bind, their sucessors in interest, the parties hereto agree as follows:

1. Covenantor/Owner hereby provides the County or County's designee complete access to the Device and its immediate vicinity and such access onto the property to permit access to the devise at any time, upon twenty-four *(24)* hour advance notice in writing, of any duration for the purpose of inspection, sampling and testing of the Device. County shall make every effort at all times to minimize or avoid interference with Owner's use of the Property.

2. Covenantor/Owner shall use its best efforts diligently to maintain the Device in a manner assuring peak performance at all times. All reasonable precautions shall be exercised by Owner and Owner's representative or contractor in the removal and extraction of material(s) from the Device and the ultimate disposal of the material(s) in a manner consistent with all relevant laws and regulations in effect at the time. As may be requested

from time to time by the County / Regional Water Quality Control Board (RWQCB), the Owner shall provide the RWQCB with documentation identifying the material(s) removed, the quantity, and disposal destination.

3. In the event Covenantor/Owner, or its successors or assigns, fails to accomplish the necessary maintenance contemplated by this Agreement, within five (5) days of being given written notice by the County, the County is hereby authorized to cause any maintenance necessary to be done and charge the entire cost and expense to the Owner or Owner's successors or assigns, including administrative costs and interest thereon at the maximum rate authorized by the Civil Code from the date of notice of expense until paid in full.

4. The County may require the Covenantor/Owner to post security in a form and for a time period satisfactory to the County to guarantee the performance of the obligations stated herein. Should the Owner fail to perform the obligations under this Agreement, the County may, in the case of a cash deposit, certificate of deposit or letter of credit, act for the Owner using the proceeds from it, or in the case of a surety bond, require the sureties to perform the obligations of the Agreement.

5. The County may, but shall not be obligated to, enforce this Agreement by a proceeding at law or in equity against any person or persons violating or attempting to violate any condition, covenant, equitable servitude, or restriction provided for herein, either to restrain such violation or to recover damages.

6. This Agreement constitutes the entire agreement and understanding between the parties with respect to the subject matter of this Agreement and supersedes all prior or contemporaneous agreements and understandings with respect to the subject matter hereof, whether oral or written.

7. If any part of this Agreement is declared by a final decision of a court of competent jurisdiction to be invalid for any reason, such shall not affect the validity of the rest of the Agreement. The other parts of this Agreement shall remain in effect as if this Agreement had been executed without the invalid parts(s). The parties declare that they intend and desire that the remaining parts of this Agreement continue to be effective without any part(s) that have been declared invalid.

8. This Agreement may be executed in counterparts, each of which so executed shall, irrespective of the date of its execution and delivery, be deemed an orginal, and all such counterparts together shall constitute one and the same instrument.

9. This Agreement shall be recorded in the Office of the Recorder of Riverside County, California and shall constitute notice to all successors and assigns of the title to said Property of the obligation herein set forth.

10. In the event of legal action occasioned by any default or action of the Covenantor/Owner, or its successors or assigns, then the Covenantor/Owner and its

successors or assigns agree(s) to pay all costs incurred by the County in enforcing the terms of this Agreement, including reasonable attorney's fees and costs, and that the same shall become a part of the lien against said Property.

11. Covenantor/Owner agrees to indemnify, defend, and hold harmless the County, its elected officers, employees, agents, and contractors from and against any and all liability, expense, including costs and reasonable legal fees, and claims of damage of any nature whatsoever including, but not limited to, death, bodily injury, personal injury, or property damage arising from or connected with the County inspection of the Property except where such liability, expense, or claim for damage results from the sole negligence or willful misconduct of the County.

12. It is the intent of the parties hereto that burdens and benefits herein undertaken shall constitute covenants that run with said Property and constitute a lien thereon against.

13. The obligations herein undertaken shall be binding upon the heirs, successors, executors, administrators and assigns of the parties hereto and any other present or future interest holders or estate holders in the property. The term "Owner" shall include not only the present Owner, but also its heirs, successors in interest and in title to the property, executors, administrators, and assigns. Owner shall notify any successor to title of all or part of the Property about the existence of this Agreement. Owner shall provide such notice prior to such successor obtaining an interest in all or part of the Property. Owner shall provide a copy of such notice to the County at the same time such notice is provided to the successor.

14. Time is of the essence in the performance of this Agreement.

/ / /
/ / /
/ / /
/ / /
/ / /
/ / /
/ / /
/ / /
/ / /
/ / /
/ / /
/ / /
/ / /
/ / /
/ / /
/ / /
/ / /

15. Any notice to a party required or called for in this Agreement 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 a notice address only by providing written notice thereof to the other party.

COVENANTOR/OWNER NAME:

COUNTY:

Riverside County Department of Transportation
Attn: Transportation Director
4080 Lemon Street
Riverside, CA

COUNTY OF RIVERSIDE
TRANSPORTATION DEPARTMENT

Patricia Romo, P.E.
Director of Transportation

Date

(Attest)

Date

COVENANTOR/OWNER

Signature of Covenantor/Owner

(Print Name)

(Print Title)

Attach Notary

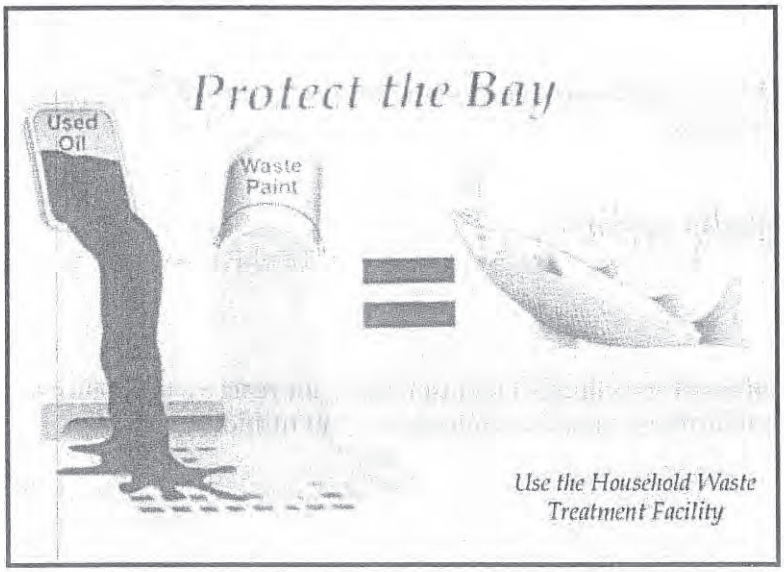
Appendix 10: Educational Materials

BMP Fact Sheets, Maintenance Guidelines and Other End-User BMP Information

For the Final WQMP, examples of material to provide in Appendix 10 may include but are not limited to the following:

- BMP Fact Sheets for proposed BMPs form Exhibit C: LID BMP Design Handbook of the SMR WQMP,
- Source control information and training material for site owners and operators,
- O&M training material,
- Other educational/training material related to site drainage and BMPs.

Non-Stormwater Discharges SC-10



Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize
- Product Substitution

Description

Non-stormwater discharges are those flows that do not consist entirely of stormwater. Some non-stormwater discharges do not include pollutants and may be discharged to the storm drain. These include uncontaminated groundwater and natural springs. There are also some non-stormwater discharges that typically do not contain pollutants and may be discharged to the storm drain with conditions. These include car washing, air conditioner condensate, etc. However there are certain non-stormwater discharges that pose environmental concern. These discharges may originate from illegal dumping or from internal floor drains, appliances, industrial processes, sinks, and toilets that are connected to the nearby storm drainage system. These discharges (which may include: process waste waters, cooling waters, wash waters, and sanitary wastewater) can carry substances such as paint, oil, fuel and other automotive fluids, chemicals and other pollutants into storm drains. They can generally be detected through a combination of detection and elimination. The ultimate goal is to effectively eliminate non-stormwater discharges to the stormwater drainage system through implementation of measures to detect, correct, and enforce against illicit connections and illegal discharges of pollutants on streets and into the storm drain system and creeks.

Targeted Constituents

Sediment	
Nutrients	✓
Trash	
Metals	✓
Bacteria	✓
Oil and Grease	✓
Organics	✓

Approach

Initially the industry must make an assessment of non-stormwater discharges to determine which types must be eliminated or addressed through BMPs. The focus of the following approach is in the elimination of non-stormwater discharges.

CASQA California Stormwater Quality Association

Pollution Prevention

- Ensure that used oil, used antifreeze, and hazardous chemical recycling programs are being implemented. Encourage litter control.

Suggested Protocols

Recommended Complaint Investigation Equipment

- Field Screening Analysis
  - pH paper or meter
  - Commercial stormwater pollutant screening kit that can detect for reactive phosphorus, nitrate nitrogen, ammonium nitrogen, specific conductance, and turbidity
  - Sample jars
  - Sample collection pole
  - A tool to remove access hole covers
- Laboratory Analysis
  - Sample cooler
  - Ice
  - Sample jars and labels
  - Chain of custody forms
- Documentation
  - Camera
  - Notebook
  - Pens
  - Notice of Violation forms
  - Educational materials

General

- Develop clear protocols and lines of communication for effectively prohibiting non-stormwater discharges, especially those that are not classified as hazardous. These are often not responded to as effectively as they need to be.
- 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 or demarcated next to them to warn against ignorant or intentional dumping of pollutants into the storm drainage system.

- See SC44 Stormwater Drainage System Maintenance for additional information.

Illicit Connections

- Locate discharges from the industrial storm drainage system to the municipal storm drain system through review of "as-built" piping schematics.
- Isolate problem areas and plug illicit discharge points.
- Locate and evaluate all discharges to the industrial storm drain system.

Visual Inspection and Inventory

- Inventory and inspect each discharge point during dry weather.
- Keep in mind that drainage from a storm event can continue for a day or two following the end of a storm and groundwater may infiltrate the underground stormwater collection system. Also, non-stormwater discharges are often intermittent and may require periodic inspections.

Review Infield Piping

- A review of the "as-built" piping schematic is a way to determine if there are any connections to the stormwater collection system.
- Inspect the path of floor drains in older buildings.

Smoke Testing

- Smoke testing of wastewater and stormwater collection systems is used to detect connections between the two systems.
- During dry weather the stormwater collection system is filled with smoke and then traced to sources. The appearance of smoke at the base of a toilet indicates that there may be a connection between the sanitary and the stormwater system.

Dye Testing

- A dye test can be performed by simply releasing a dye into either your sanitary or process wastewater system and examining the discharge points from the stormwater collection system for discoloration.

TV Inspection of Drainage System

- TV Cameras can be employed to visually identify illicit connections to the industrial storm drainage system.

Illegal Dumping

- Regularly inspect and clean up hot spots and other storm drainage areas where illegal dumping and disposal occurs.
- On paved surfaces, clean up spills with as little water as possible. Use a rag for small spills, a damp mop for general cleanup, and absorbent material for larger spills. If the spilled material is hazardous, then the used cleanup materials are also hazardous and must be sent to a certified laundry (rags) or disposed of as hazardous waste.

- Never hose down or bury dry material spills. Sweep up the material and dispose of properly.
- Use adsorbent materials on small spills rather than hosing down the spill. Remove the adsorbent materials promptly and dispose of properly.
- For larger spills, a private spill cleanup company or Hazmat team may be necessary.

Once a site has been cleaned:

- Post "No Dumping" signs with a phone number for reporting dumping and disposal.
- Landscaping and beautification efforts of hot spots may also discourage future dumping, as well as provide open space and increase property values.
- Lighting or barriers may also be needed to discourage future dumping.
- See fact sheet SC11 Spill Prevention, Control, and Cleanup.

Inspection

- Regularly inspect and clean up hot spots and other storm drainage areas where illegal dumping and disposal occurs.
- Conduct field investigations of the industrial storm drain system for potential sources of non-stormwater discharges.
- Pro-actively conduct investigations of high priority areas. Based on historical data, prioritize specific geographic areas and/or incident type for pro-active investigations.

Reporting

- A database is useful for defining and tracking the magnitude and location of the problem.
- Report prohibited non-stormwater discharges observed during the course of normal daily activities so they can be investigated, contained, and cleaned up or eliminated.
- Document that non-stormwater discharges have been eliminated by recording tests performed, methods used, dates of testing, and any on-site drainage points observed.
- Document and report annually the results of the program.
- Maintain documentation of illicit connection and illegal dumping incidents, including significant conditionally exempt discharges that are not properly managed.

Training

- Training of technical staff in identifying and documenting illegal dumping incidents is required.
- Consider posting the quick reference table near storm drains to reinforce training.
- Train employees to identify non-stormwater discharges and report discharges to the appropriate departments.

- Educate employees about spill prevention and cleanup.
- Well-trained employees can reduce human errors that lead to accidental releases or spills. The employee should have the tools and knowledge to immediately begin cleaning up a spill should one occur. Employees should be familiar with the Spill Prevention Control and Countermeasure Plan.
- Determine and implement appropriate outreach efforts to reduce non-permissible non-stormwater discharges.
- Conduct spill response drills annually (if no events occurred to evaluate your plan) in cooperation with other industries.
- When a responsible party is identified, educate the party on the impacts of his or her actions.

Spill Response and Prevention

- See SC11 Spill Prevention Control and Cleanup.

Other Considerations

- Many facilities do not have accurate, up-to-date schematic drawings.

Requirements

Costs (including capital and operation & maintenance)

- The primary cost is for staff time and depends on how aggressively a program is implemented.
- Cost for containment and disposal is borne by the discharger.
- Illicit connections can be difficult to locate especially if there is groundwater infiltration.
- Indoor floor drains may require re-plumbing if cross-connections to storm drains are detected.

Maintenance (including administrative and staffing)

- Illegal dumping and illicit connection violations requires technical staff to detect and investigate them.

Supplemental Information

Further Detail of the BMP

Illegal Dumping

- Substances illegally dumped on streets and into the storm drain systems and creeks include paints, used oil and other automotive fluids, construction debris, chemicals, fresh concrete, leaves, grass clippings, and pet wastes. All of these wastes cause stormwater and receiving water quality problems as well as clog the storm drain system itself.
- 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

One of the keys to success of reducing or eliminating illegal dumping is increasing the number of people at the facility who are aware of the problem and who have the tools to at least identify the incident, if not correct it. Therefore, train field staff to recognize and report the incidents.

What constitutes a "non-stormwater" discharge?

- Non-stormwater discharges to the stormwater collection system may include any water used directly in the manufacturing process (process wastewater), air conditioning condensate and coolant, non-contact cooling water, cooling equipment condensate, outdoor secondary containment water, vehicle and equipment wash water, sink and drinking fountain wastewater, sanitary wastes, or other wastewaters.

Permit Requirements

- Facilities subject to stormwater permit requirements must include a certification that the stormwater collection system has been tested or evaluated for the presence of non-stormwater discharges. The State's General Industrial Stormwater Permit requires that non-stormwater discharges be eliminated prior to implementation of the facility's SWPPP.

Performance Evaluation

- Review annually internal investigation results; assess whether goals were met and what changes or improvements are necessary.
- Obtain feedback from personnel assigned to respond to, or inspect for, illicit connections and illegal dumping incidents.

References and Resources

California's Nonpoint Source Program Plan http://www.swrcb.ca.gov/nps/index.html

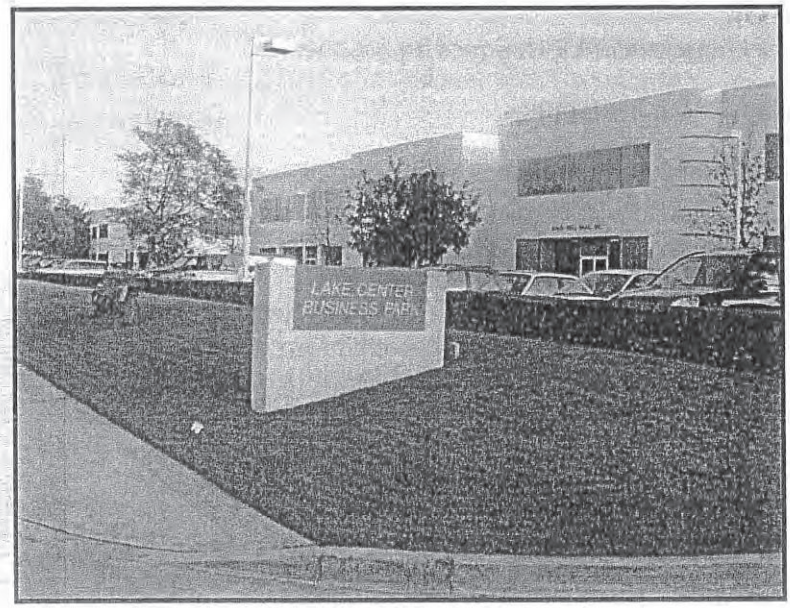
Clark County Storm Water Pollution Control Manual
http://www.co.clark.wa.us/pubworks/bmpman.pdf

King County Storm Water Pollution Control Manual http://dnr.metrokc.gov/wlr/dss/spcm.htm

Santa Clara Valley Urban Runoff Pollution Prevention Program http://www.scvurppp.org

The Storm Water Managers Resource Center http://www.stormwatercenter.net/

Building & Grounds Maintenance SC-41



Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize
- Product Substitution

Targeted Constituents

Sediment	✓
Nutrients	✓
Trash	
Metals	✓
Bacteria	✓
Oil and Grease	
Organics	

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 discharge of pollutants to stormwater 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, keeping debris from entering the storm drains, and maintaining the stormwater collection system.

Approach

Reduce potential for pollutant discharge through source control pollution prevention and BMP implementation. Successful implementation depends on effective training of employees on applicable BMPs and general pollution prevention strategies and objectives.

Pollution Prevention

- Switch to non-toxic chemicals for maintenance when possible.
- Choose cleaning agents that can be recycled.
- Encourage proper lawn management and landscaping, including use of native vegetation.

CASQA
California Stormwater Quality Association

- Encourage use of Integrated Pest Management techniques for pest control.
- Encourage proper onsite recycling of yard trimmings.
- Recycle residual paints, solvents, lumber, and other material as much as possible.

Suggested Protocols

Pressure Washing of Buildings, Rooftops, and Other Large Objects

- In situations where soaps or detergents are used and the surrounding area is paved, pressure washers must use a water collection device that enables collection of wash water and associated solids. A sump pump, wet vacuum or similarly effective device must be used to collect the runoff and loose materials. The collected runoff and solids must be disposed of properly.
- If soaps or detergents are not used, and the surrounding area is paved, wash runoff does not have to be collected but must be screened. Pressure washers must use filter fabric or some other type of screen on the ground and/or in the catch basin to trap the particles in wash water runoff.
- If you are pressure washing on a grassed area (with or without soap), runoff must be dispersed as sheet flow as much as possible, rather than as a concentrated stream. The wash runoff must remain on the grass and not drain to pavement.

Landscaping Activities

- Dispose of grass clippings, leaves, sticks, or other collected vegetation as garbage, or by composting. Do not dispose of collected vegetation into waterways or storm drainage systems.
- Use mulch or other erosion control measures on exposed soils.

Building Repair, Remodeling, and Construction

- Do not dump any toxic substance or liquid waste on the pavement, the ground, or toward a storm drain.
- Use ground or drop cloths underneath outdoor painting, scraping, and sandblasting work, and properly dispose of collected material daily.
- Use a ground cloth or oversized tub for activities such as paint mixing and tool cleaning.
- Clean paintbrushes and tools covered with water-based paints in sinks connected to sanitary sewers or in portable containers that can be dumped into a sanitary sewer drain. Brushes and tools covered with non-water-based paints, finishes, or other materials must be cleaned in a manner that enables collection of used solvents (e.g., paint thinner, turpentine, etc.) for recycling or proper disposal.
- Use a storm drain cover, filter fabric, or similarly effective runoff control mechanism if dust, grit, wash water, or other pollutants may escape the work area and enter a catch basin. This is particularly necessary on rainy days. The containment device(s) must be in place at the beginning of the work day, and accumulated dirty runoff and solids must be collected and disposed of before removing the containment device(s) at the end of the work day.

- If you need to de-water an excavation site, you may need to filter the water before discharging to a catch basin or off-site. If directed off-site, you should direct the water through hay bales and filter fabric or use other sediment filters or traps.
- Store toxic material under cover during precipitation events and when not in use. A cover would include tarps or other temporary cover material.

Mowing, Trimming, and Planting

- Dispose of leaves, sticks, or other collected vegetation as garbage, by composting or at a permitted landfill. Do not dispose of collected vegetation into waterways or storm drainage systems.
- Use mulch or other erosion control measures when soils are exposed.
- Place temporarily stockpiled material away from watercourses and drain inlets, and berm or cover stockpiles to prevent material releases to the storm drain system.
- Consider an alternative approach when bailing out muddy water: do not put it in the storm drain; pour over landscaped areas.
- Use hand weeding where practical.

Fertilizer and Pesticide Management

- Follow all federal, state, and local laws and regulations governing the use, storage, and disposal of fertilizers and pesticides and training of applicators and pest control advisors.
- Use less toxic pesticides that will do the job when applicable. Avoid use of copper-based pesticides if possible.
- Do not use pesticides if rain is expected.
- Do not mix or prepare pesticides for application near storm drains.
- Use the minimum amount needed for the job.
- Calibrate fertilizer distributors to avoid excessive application.
- Employ techniques to minimize off-target application (e.g., spray drift) of pesticides, including consideration of alternative application techniques.
- Apply pesticides only when wind speeds are low.
- Fertilizers should be worked into the soil rather than dumped or broadcast onto the surface.
- Irrigate slowly to prevent runoff and then only as much as is needed.
- Clean pavement and sidewalk if fertilizer is spilled on these surfaces before applying irrigation water.
- Dispose of empty pesticide containers according to the instructions on the container label.

- Use up the pesticides. Rinse containers, and use rinse water as product. Dispose of unused pesticide as hazardous waste.
- Implement storage requirements for pesticide products with guidance from the local fire department and County Agricultural Commissioner. Provide secondary containment for pesticides.

Inspection

- Inspect irrigation system periodically to ensure that the right amount of water is being applied and that excessive runoff is not occurring. Minimize excess watering and repair leaks in the irrigation system as soon as they are observed.

Training

- Educate and train employees on pesticide use and in pesticide application techniques to prevent pollution.
- Train employees and contractors in proper techniques for spill containment and cleanup.
- Be sure the frequency of training takes into account the complexity of the operations and the nature of the staff.

Spill Response and Prevention

- Keep your Spill Prevention Control and Countermeasure (SPCC) Plan up-to-date.
- Place a stockpile of spill cleanup materials, such as brooms, dustpans, and vacuum sweepers (if desired) near the storage area where it will be readily accessible.
- Have employees trained in spill containment and cleanup present during the loading/unloading of dangerous wastes, liquid chemicals, or other materials.
- Familiarize employees with the Spill Prevention Control and Countermeasure Plan.
- Clean up spills immediately.

Other Considerations

Alternative pest/weed controls may not be available, suitable, or effective in many cases.

Requirements

Costs

- Cost will vary depending on the type and size of facility.
- Overall costs should be low in comparison to other BMPs.

Maintenance

Sweep paved areas regularly to collect loose particles. Wipe up spills with rags and other absorbent material immediately, do not hose down the area to a storm drain.

Supplemental Information

Further Detail of the BMP

Fire Sprinkler Line Flushing

Building 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 rusting between manufacture and installation; this will contaminate the water from the first flush but not from subsequent flushes. Nitrates, poly-phosphates 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 fire sprinkler line water.

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

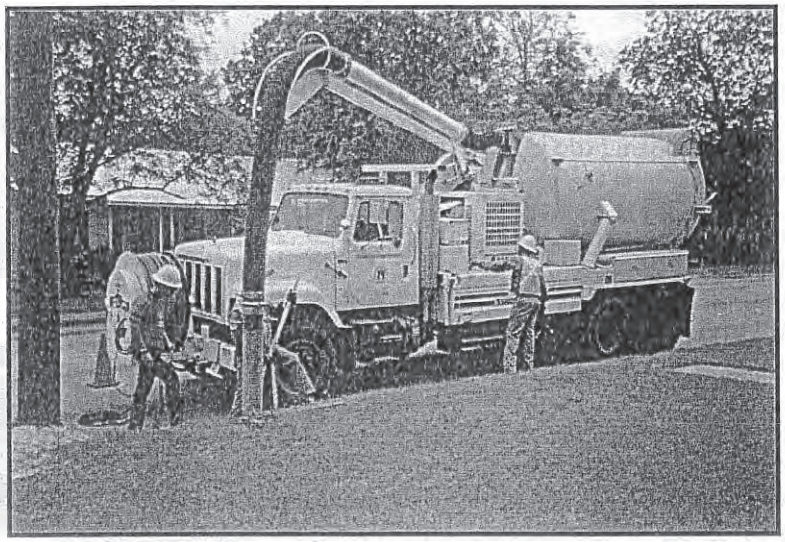
Mobile Cleaners Pilot Program: Final Report. 1997. Bay Area Stormwater Management Agencies Association (BASMAA). http://www.basmaa.org/

Pollution from Surface Cleaning Folder. 1996. Bay Area Stormwater Management Agencies Association (BASMAA). http://www.basmaa.org/

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).

CASQA California Stormwater Quality Association

- 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

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.

CASQA
CALIFORNIA STORMWATER QUALITY ASSOCIATION

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

CASQA
CALIFORNIA STORMWATER QUALITY ASSOCIATION

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

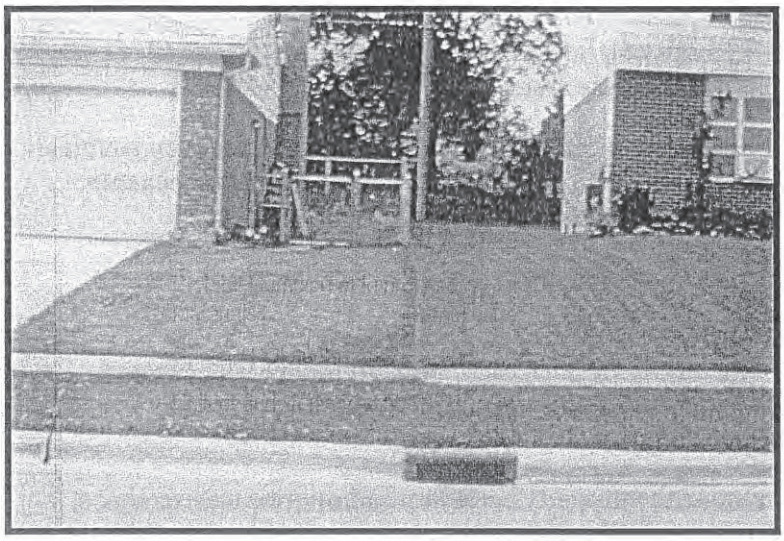
Other Resources

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.

CASQA
CALIFORNIA STORMWATER QUALITY ASSOCIATION

- 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

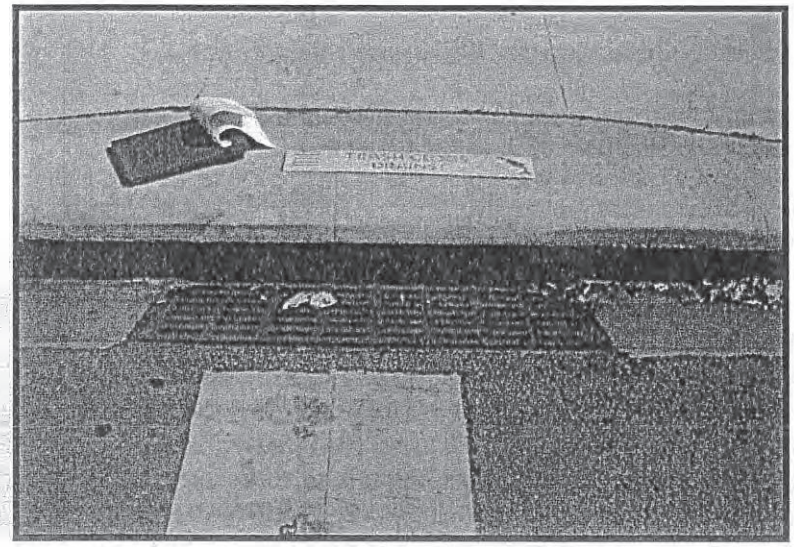
A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

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

CASQA
CALIFORNIA STORMWATER QUALITY ASSOCIATION

– 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.

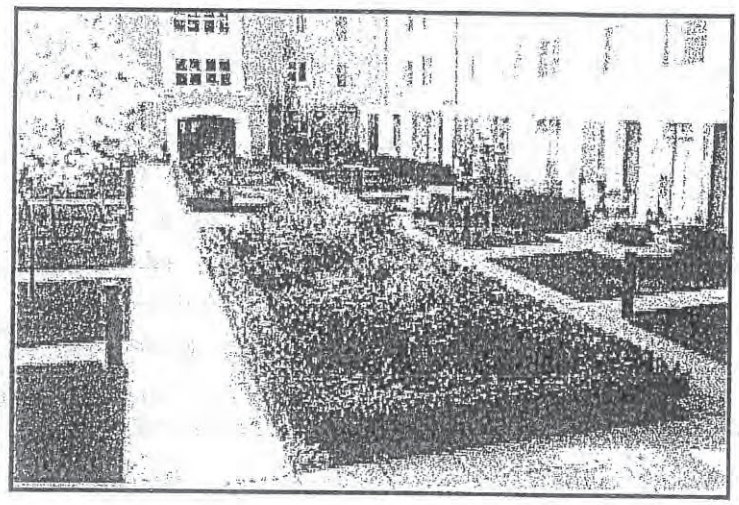
Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

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.

Bioretention

TC-32



Maintenance Concerns, Objectives, and Goals

- Clogged Soil or Outlet Structures
- Invasive Species
- Vegetation/Landscape Maintenance
- Erosion
- Channelization of Flow
- Aesthetics

General Description

The bioretention best management practice (BMP) functions as a soil and plant-based filtration device that removes pollutants through a variety of physical, biological, and chemical treatment processes. These facilities normally consist of a grass buffer strip, sand bed, ponding area, organic layer or mulch layer, planting soil, and plants. The runoff's velocity is reduced by passing over or through a sand bed and is subsequently distributed evenly along a ponding area. Exfiltration of the stored water in the bioretention area planting soil into the underlying soils occurs over a period of days.

Targeted Constituents

✓	Sediment	■
✓	Nutrients	▲
✓	Trash	■
✓	Metals	■
✓	Bacteria	■
✓	Oil and Grease	■
✓	Organics	■

Legend *(Removal Effectiveness)*

- ● Low
- ■ High
- ▲ Medium

Inspection/Maintenance Considerations

Bioretention requires frequent landscaping maintenance, including measures to ensure that the area is functioning properly, as well as maintenance of the landscaping on the practice. In many cases, bioretention areas initially require intense maintenance, but less maintenance is needed over time. In many cases, maintenance tasks can be completed by a landscaping contractor, who may already be hired at the site. In cold climates the soil may freeze, preventing runoff from infiltrating into the planting soil.

CASQA California Stormwater Quality Association

Inspection Activities	Suggested Frequency
■ Inspect soil and repair eroded areas.	Monthly
■ Inspect for erosion or damage to vegetation, preferably at the end of the wet season to schedule summer maintenance and before major fall runoff to be sure the strips are ready for winter. However, additional inspection after periods of heavy runoff is desirable.	
■ Inspect to ensure grass is well established. If not, either prepare soil and reseed or replace with alternative species. Install erosion control blanket.	Semi-annual inspection
■ Check for debris and litter, and areas of sediment accumulation.	
■ Inspect health of trees and shrubs.	

Maintenance Activities	Suggested Frequency
■ Water plants daily for 2 weeks.	At project completion
■ Remove litter and debris.	Monthly
■ Remove sediment.	
■ Remulch void areas.	
■ Treat diseased trees and shrubs.	
■ Mow turf areas.	
■ Repair erosion at inflow points.	As needed
■ Repair outflow structures.	
■ Unclog underdrain.	
■ Regulate soil pH regulation.	
■ Remove and replace dead and diseased vegetation.	Semi-annual
■ Add mulch.	Annual
■ Replace tree stakes and wires.	
■ Mulch should be replaced every 2 to 3 years or when bare spots appear. Remulch prior to the wet season.	Every 2-3 years, or as needed

Additional Information

Landscaping is critical to the function and aesthetic value of bioretention areas. It is preferable to plant the area with native vegetation, or plants that provide habitat value, where possible. Another important design feature is to select species that can withstand the hydrologic regime they will experience. At the bottom of the bioretention facility, plants that tolerate both wet and dry conditions are preferable. At the edges, which will remain primarily dry, upland species will be the most resilient. It is best to select a combination of trees, shrubs, and herbaceous materials.

References

Metropolitan Council, Urban Small Sites Best Management Practices Manual. Available at: http://www.metrocouncil.org/environment/Watershed/BMP/manual.htm

Model Urban Runoff Program: A How-To Guide for Developing Urban Runoff Programs for Small Municipalities. Prepared by City of Monterey, City of Santa Cruz, California Coastal Commission, Monterey Bay National Marine Sanctuary, Association of Monterey Bay Area Governments, Woodward-Clyde, Central Coast Regional Water Quality Control Board. July, 1998, revised February, 2002.

U.S. Environmental Protection Agency, Post-Construction Stormwater Management in New Development & Redevelopment BMP Factsheets. Available at: cfpub.epa.gov/npdes/stormwater/menuofbmps/bmp_files.cfm

Ventura Countywide Stormwater Quality Management Program, Technical Guidance Manual for Stormwater Quality Control Measures. July, 2002.

After the Storm

What is stormwater runoff?

Stormwater runoff occurs when precipitation from rain or snowmelt flows over the ground. Impervious surfaces like driveways, sidewalks, and streets prevent stormwater from naturally soaking into the ground.

Why is stormwater runoff a problem?

Stormwater can pick up debris, chemicals, dirt, and other pollutants and flow into a storm sewer system or directly to a lake, stream, river, wetland, or coastal water. Anything that enters a storm sewer system is discharged untreated into the waterbodies we use for swimming, fishing, and providing drinking water.

The effects of pollution

Polluted stormwater runoff can have many adverse effects on plants, fish, animals, and people.

- Sediment can cloud the water and make it difficult or impossible for aquatic plants to grow. Sediment also can destroy aquatic habitats.
- Excess nutrients can cause algae blooms. When algae die, they sink to the bottom and decompose in a process that removes oxygen from the water. Fish and other aquatic organisms can't exist in water with low dissolved oxygen levels.
- Bacteria and other pathogens can wash into swimming areas and create health hazards, often making beach closures necessary.
- Debris—plastic bags, six-pack rings, bottles, and cigarette butts—washed into waterbodies can choke, suffocate, or disable aquatic life like ducks, fish, turtles, and birds.
- Household hazardous wastes like insecticides, pesticides, paint, solvents, used motor oil, and other auto fluids can poison aquatic life. Land animals and people can become sick or die from eating diseased fish and shellfish or ingesting polluted water.
- Polluted stormwater often affects drinking water sources. This, in turn, can affect human health and increase drinking water treatment costs.

Stormwater Pollution Solutions



Education is essential to changing people's behavior. Signs and markers near storm drains warn residents that pollutants entering the drains will be carried untreated into a local waterbody.

Residential



Recycle or properly dispose of household products that contain chemicals, such as insecticides, pesticides, paint, solvents, and used motor oil and other auto fluids. Don't pour them onto the ground or into storm drains.

Auto care



Washing your car and degreasing auto parts at home can send detergents and other contaminants through the storm sewer system. Dumping automotive fluids into storm drains has the same result as dumping the materials directly into a waterbody.

- Use a commercial car wash that treats or recycles its wastewater, or wash your car on your yard so the water infiltrates into the ground.
- Repair leaks and dispose of used auto fluids and batteries at designated drop-off or recycling locations.

Lawn care



Excess fertilizers and pesticides applied to lawns and gardens wash off and pollute streams. In addition, yard clippings and leaves can wash into storm drains and contribute nutrients and organic matter to streams.

- Don't overwater your lawn. Consider using a soaker hose instead of a sprinkler.
- Use pesticides and fertilizers sparingly. When use is necessary, use these chemicals in the recommended amounts. Use organic mulch or safer pest control methods whenever possible.
- Compost or mulch yard waste. Don't leave it in the street or sweep it into storm drains or streams.
- Cover piles of dirt or mulch being used in landscaping projects.

Septic systems



Leaking and poorly maintained septic systems release nutrients and pathogens (bacteria and viruses) that can be picked up by stormwater and discharged into nearby waterbodies. Pathogens can cause public health problems and environmental concerns.

- Inspect your system every 3 years and pump your tank as necessary (every 3 to 5 years).
- Don't dispose of household hazardous waste in sinks or toilets.

Pet waste



Pet waste can be a major source of bacteria and excess nutrients in local waters.

- When walking your pet, remember to pick up the waste and dispose of it properly. Flushing pet waste is the best disposal method. Leaving pet waste on the ground increases public health risks by allowing harmful bacteria and nutrients to wash into the storm drain and eventually into local waterbodies.

Residential landscaping

Permeable Pavement—Traditional concrete and asphalt don't allow water to soak into the ground. Instead these surfaces rely on storm drains to divert unwanted water. Permeable pavement systems allow rain and snowmelt to soak through, decreasing stormwater runoff.



Rain Barrels—You can collect rainwater from rooftops in mosquito-proof containers. The water can be used later on lawn or garden areas.



Rain Gardens and Grassy Swales—Specially designed areas planted with native plants can provide natural places for rainwater to collect and soak into the ground. Rain from rooftop areas or paved areas can be diverted into these areas rather than into storm drains.

Vegetated Filter Strips—Filter strips are areas of native grass or plants created along roadways or streams. They trap the pollutants stormwater picks up as it flows across driveways and streets.

Commercial



Dirt, oil, and debris that collect in parking lots and paved areas can be washed into the storm sewer system and eventually enter local waterbodies.

- Sweep up litter and debris from sidewalks, driveways and parking lots, especially around storm drains.
- Cover grease storage and dumpsters and keep them clean to avoid leaks.
- Report any chemical spill to the local hazardous waste cleanup team. They'll know the best way to keep spills from harming the environment.

Construction



Erosion controls that aren't maintained can cause excessive amounts of sediment and debris to be carried into the stormwater system. Construction vehicles can leak fuel, oil, and other harmful fluids that can be picked up by stormwater and deposited into local waterbodies.

- Divert stormwater away from disturbed or exposed areas of the construction site.
- Install silt fences, vehicle mud removal areas, vegetative cover, and other sediment and erosion controls and properly maintain them, especially after rainstorms.
- Prevent soil erosion by minimizing disturbed areas during construction projects, and seed and mulch bare areas as soon as possible.

Agriculture

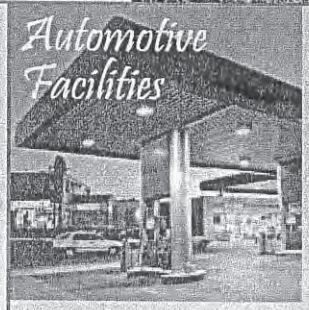


Lack of vegetation on streambanks can lead to erosion. Overgrazed pastures can also contribute excessive amounts of sediment to local waterbodies. Excess fertilizers and pesticides can poison aquatic animals and lead to destructive algae blooms. Livestock in streams can contaminate waterways with bacteria, making them unsafe for human contact.



- Keep livestock away from streambanks and provide them a water source away from waterbodies.
- Store and apply manure away from waterbodies and in accordance with a nutrient management plan.
- Vegetate riparian areas along waterways.
- Rotate animal grazing to prevent soil erosion in fields.
- Apply fertilizers and pesticides according to label instructions to save money and minimize pollution.

Automotive Facilities



Uncovered fueling stations allow spills to be washed into storm drains. Cars waiting to be repaired can leak fuel, oil, and other harmful fluids that can be picked up by stormwater.

- Clean up spills immediately and properly dispose of cleanup materials.
- Provide cover over fueling stations and design or retrofit facilities for spill containment.
- Properly maintain fleet vehicles to prevent oil, gas, and other discharges from being washed into local waterbodies.
- Install and maintain oil/water separators.

Forestry



Improperly managed logging operations can result in erosion and sedimentation.

- Conduct preharvest planning to prevent erosion and lower costs.
- Use logging methods and equipment that minimize soil disturbance.
- Plan and design skid trails, yard areas, and truck access roads to minimize stream crossings and avoid disturbing the forest floor.
- Construct stream crossings so that they minimize erosion and physical changes to streams.
- Expedite revegetation of cleared areas.

After the Storm

What is stormwater runoff?

Stormwater runoff occurs when precipitation from rain or snowmelt flows over the ground. Impervious surfaces like driveways, sidewalks, and streets prevent stormwater from naturally soaking into the ground.

Why is stormwater runoff a problem?

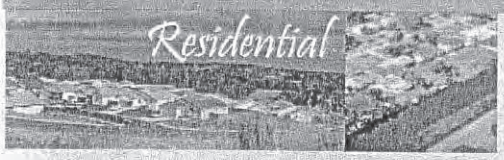
Stormwater can pick up debris, chemicals, dirt, and other pollutants and flow into a storm sewer system or directly to a lake, stream, river, wetland, or coastal water. Anything that enters a storm sewer system is discharged untreated into the waterbodies we use for swimming, fishing, and providing drinking water.

The effects of pollution

Polluted stormwater runoff can have many adverse effects on plants, fish, animals, and people.

- Sediment can cloud the water and make it difficult or impossible for aquatic plants to grow. Sediment also can destroy aquatic habitats.
- Excess nutrients can cause algae blooms. When algae die, they sink to the bottom and decompose in a process that removes oxygen from the water. Fish and other aquatic organisms can't exist in water with low dissolved oxygen levels.
- Bacteria and other pathogens can wash into swimming areas and create health hazards, often making beach closures necessary.
- Debris—plastic bags, six-pack rings, bottles, and cigarette butts—washed into waterbodies can choke, suffocate, or disable aquatic life like ducks, fish, turtles, and birds.
- Household hazardous wastes like insecticides, pesticides, paint, solvents, used motor oil, and other auto fluids can poison aquatic life. Land animals and people can become sick or die from eating diseased fish and shellfish or ingesting polluted water.
- Polluted stormwater often affects drinking water sources. This, in turn, can affect human health and increase drinking water treatment costs.

Stormwater Pollution Solutions



Residential

Recycle or properly dispose of household products that contain chemicals, such as insecticides, pesticides, paint, solvents, and used motor oil and other auto fluids. Don't pour them onto the ground or into storm drains.

Lawn care



Excess fertilizers and pesticides applied to lawns and gardens wash off and pollute streams. In addition, yard clippings and leaves can wash into storm drains and contribute nutrients and organic matter to streams.

- Don't overwater your lawn. Consider using a soaker hose instead of a sprinkler.
- Use pesticides and fertilizers sparingly. When use is necessary, use these chemicals in the recommended amounts. Use organic mulch or safer pest control methods whenever possible.
- Compost or mulch yard waste. Don't leave it in the street or sweep it into storm drains or streams.
- Cover piles of dirt or mulch being used in landscaping projects.

Auto care



Washing your car and degreasing auto parts at home can send detergents and other contaminants through the storm sewer system. Dumping automotive fluids into storm drains has the same result as dumping the materials directly into a waterbody.

- Use a commercial car wash that treats or recycles its wastewater, or wash your car on your yard so the water infiltrates into the ground.
- Repair leaks and dispose of used auto fluids and batteries at designated drop-off or recycling locations.

Septic systems



Leaking and poorly maintained septic systems release nutrients and pathogens (bacteria and viruses) that can be picked up by stormwater and discharged into nearby waterbodies. Pathogens can cause public health problems and environmental concerns.

- Inspect your system every 3 years and pump your tank as necessary (every 3 to 5 years).
- Don't dispose of household hazardous waste in sinks or toilets.

Pet waste



Pet waste can be a major source of bacteria and excess nutrients in local waters.

- When walking your pet, remember to pick up the waste and dispose of it properly. Flushing pet waste is the best disposal method. Leaving pet waste on the ground increases public health risks by allowing harmful bacteria and nutrients to wash into the storm drain and eventually into local waterbodies.



Education is essential to changing people's behavior. Signs and markers near storm drains warn residents that pollutants entering the drains will be carried untreated into a local waterbody.

Residential landscaping

Permeable Pavement—Traditional concrete and asphalt don't allow water to soak into the ground. Instead these surfaces rely on storm drains to divert unwanted water. Permeable pavement systems allow rain and snowmelt to soak through, decreasing stormwater runoff.



Rain Barrels—You can collect rainwater from rooftops in mosquito-proof containers. The water can be used later on lawn or garden areas.

Rain Gardens and Grassy Swales—Specially designed areas planted with native plants can provide natural places for rainwater to collect and soak into the ground. Rain from rooftop areas or paved areas can be diverted into these areas rather than into storm drains.



Vegetated Filter Strips—Filter strips are areas of native grass or plants created along roadways or streams. They trap the pollutants stormwater picks up as it flows across driveways and streets.



Commercial

Dirt, oil, and debris that collect in parking lots and paved areas can be washed into the storm sewer system and eventually enter local waterbodies.

- Sweep up litter and debris from sidewalks, driveways and parking lots, especially around storm drains.
- Cover grease storage and dumpsters and keep them clean to avoid leaks.
- Report any chemical spill to the local hazardous waste cleanup team. They'll know the best way to keep spills from harming the environment.



Construction

Erosion controls that aren't maintained can cause excessive amounts of sediment and debris to be carried into the stormwater system. Construction vehicles can leak fuel, oil, and other harmful fluids that can be picked up by stormwater and deposited into local waterbodies.

- Divert stormwater away from disturbed or exposed areas of the construction site.
- Install silt fences, vehicle mud removal areas, vegetative cover, and other sediment and erosion controls and properly maintain them, especially after rainstorms.
- Prevent soil erosion by minimizing disturbed areas during construction projects, and seed and mulch bare areas as soon as possible.

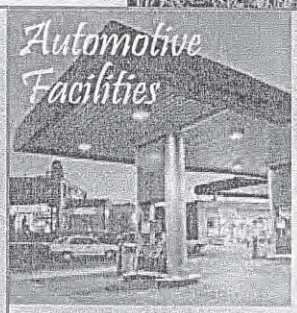


Agriculture

Lack of vegetation on streambanks can lead to erosion. Overgrazed pastures can also contribute excessive amounts of sediment to local waterbodies. Excess fertilizers and pesticides can poison aquatic animals and lead to destructive algae blooms. Livestock in streams can contaminate waterways with bacteria, making them unsafe for human contact.



- Keep livestock away from streambanks and provide them a water source away from waterbodies.
- Store and apply manure away from waterbodies and in accordance with a nutrient management plan.
- Vegetate riparian areas along waterways.
- Rotate animal grazing to prevent soil erosion in fields.
- Apply fertilizers and pesticides according to label instructions to save money and minimize pollution.



Automotive Facilities

Uncovered fueling stations allow spills to be washed into storm drains. Cars waiting to be repaired can leak fuel, oil, and other harmful fluids that can be picked up by stormwater.

- Clean up spills immediately and properly dispose of cleanup materials.
- Provide cover over fueling stations and design or retrofit facilities for spill containment.
- Properly maintain fleet vehicles to prevent oil, gas, and other discharges from being washed into local waterbodies.
- Install and maintain oil/water separators.



Forestry

Improperly managed logging operations can result in erosion and sedimentation.

- Conduct preharvest planning to prevent erosion and lower costs.
- Use logging methods and equipment that minimize soil disturbance.
- Plan and design skid trails, yard areas, and truck access roads to minimize stream crossings and avoid disturbing the forest floor.
- Construct stream crossings so that they minimize erosion and physical changes to streams.
- Expedite revegetation of cleared areas.

For Information:

For information on "closed-loop" suppliers and recycling/disposal vendors, contact:
County of Riverside
Health Services Agency
Department of Environmental Health
at (909) 358-5055.

SPILL RESPONSE AGENCY:
HAZ-MAT: (909) 358-5055
AFTER 5:00 P.M.: (909) 358-5245 OR 911

RECYCLING AND HAZARDOUS WASTE DISPOSAL: (909) 358-5055

TO REPORT ILLEGAL DUMPING OR A CLOGGED STORM DRAIN: 1-800-506-2555

To order additional brochures or to obtain information on other pollution prevention activities, call: (909) 955-1111.

The Cities and County of Riverside
StormWater/CleanWater Protection Program
1-800-506-2555

StormWater CleanWater
PROTECTION PROGRAM

Riverside County gratefully acknowledges the Santa Clara Valley Nonpoint Source Pollution Control Program and the City of Los Angeles Stormwater Management Division for information provided in this brochure.

StormWater Pollution

What you should know for...

AUTOMOTIVE MAINTENANCE & CAR CARE



Best Management Practices (BMPS) for:

- Auto Body Shops
- Auto Repair Shops
- Car Dealerships
- Gas Stations
- Fleet Service Operations

StormWater Pollution . . . What You Should Know

Riverside County has two drainage systems - sanitary sewers and storm drains. The storm drain system is designed to help prevent flooding by carrying excess rainwater away from streets. Since the storm drain system does not provide for water treatment, it also serves the *unintended* function of transporting pollutants directly to our waterways.

Unlike sanitary sewers, storm drains are not connected to a treatment plant - they flow directly to our local streams, rivers and lakes.



Rain and water runoff from automotive shops and businesses can carry pollutant material into storm drains. Examples of pollutants include oil and grease from cars, copper and asbestos from worn brake linings, zinc from tires, and toxics from spilled fluids.

Stormwater pollution causes as much as 60% of our water pollution problem. It jeopardizes the quality of our waterways and poses a threat to groundwater resources if pollutants percolate through soil.

The Cities and County of Riverside StormWater/CleanWater Protection Program

Since preventing pollution is much easier, and less costly, than cleaning up "after the fact," the Cities and County of Riverside StormWater/CleanWater Protection Program informs residents and businesses on pollution prevention activities such as the Best Management Practices (BMPs) described in this pamphlet.

The Cities and County of Riverside have adopted ordinances for stormwater management and discharge control. In accordance with state and federal law, these local stormwater ordinances **prohibit** the discharge of wastes into the storm drain system or local surface waters. This includes discharges containing oil, antifreeze, gasoline and other waste materials.

PLEASE NOTE: A common stormwater pollution problem associated with automotive shops and businesses is the hosing down of service bays, parking and other areas. Often, this activity flushes pollutants into the storm drain system. The discharges of pollutants is ***strictly prohibited*** by local ordinances and state and federal regulations.

Keep your shop in tune. Follow these Practices to help prevent stormwater pollution . . .

1. Changing Automotive Fluids

- Designate an area away from storm or sanitary drains to change automotive fluids.
- Collect, separate, and recycle motor oil, antifreeze, transmission fluid, and gear oil.
- Drain brake fluid and other non-recyclables into a proper container and handle as a hazardous waste.
- Use a radiator flushing fluid that can be recycled, and add it to the waste antifreeze



2. Working on Transmissions, Engines, and Miscellaneous Repairs

- Keep a drip pan or a wide low-rimmed container under vehicles to catch fluids whenever you unclip hoses, unscrew filters, or change parts, to contain unexpected leaks.

3. Preventing Leaks and Spills

- Avoid spills by emptying and wiping drip pans when you move them to another vehicle or when they are half-full.
- Routinely check equipment to wipe up spills and repair leaks.
- Place large pans or an inflatable portable berm under wrecked cars.
- Drain all fluids from wrecked vehicles or "parts" cars you keep on site.

4. Cleaning up Spills

- Clean up small spills immediately using shop rags.



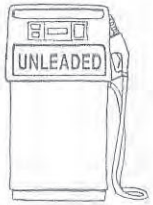
- Keep dry absorbent materials and/or a wet/dry vacuum cleaner on hand for mid-sized spills.
- Contain large spills immediately; block or shut off floor and parking lot drains and notify the authorities.
- Train employees to be familiar with hazardous spill response plans and emergency procedures.

5. Identify and Control Wastewater Discharges

- Ensure that shop sinks and floor drains are connected to the sanitary sewer. Check with the local sewer authority regarding permitting or other requirements.
- Post signs to prevent disposal of liquid wastes into sanitary drains.

6. Fueling Vehicles

- Clean-up minor spills, with a dry absorbent, rather than allowing them to evaporate. Dispose of the absorbent as a dry hazardous waste.
- Use a damp cloth and a damp mop to keep the area clean rather than a hose or a wet mop.



7. Removing and Storing Batteries

- Store batteries indoors, on an open rack.
- Return used batteries to a battery vendor.
- Contain cracked batteries to prevent hazardous spills.

8. Cleaning Parts

- Clean parts in a self-contained unit, solvent sink, or parts washer to prevent solvents and grease from entering a sewer or storm drain connection.



9. Metal Grinding and Finishing

- Catch metal filings in an enclosed unit or on a tarpaulin.
- Sweep filing area to prevent washing metals into floor drains.

10. Storing and Disposing of Waste

- Store recyclable and non-recyclable waste separately.
- Place liquid waste (hazardous or otherwise) within a bermed or secondary containment area.
- Cover outdoor storage areas to prevent contact with rain water.
- Collect used parts for delivery to a scrap metal dealer.

11. Selecting and Controlling Inventory

- Purchase recyclable or non-toxic materials.
- Select "closed-loop" suppliers and purchase supplies in bulk.



12. Outdoor Parking and Auto Maintenance

- Treat outdoor areas as an extension of your service bays or avoid using altogether.
- Sweep-up trash and dirt from outdoor parking and maintenance areas. Do not hose down areas. All non-storm water discharges are prohibited.
- Drain work areas to a sanitary drain rather than a storm drain. Contact the local sewer authority to determine if pretreatment is required.

13. Washing Vehicles, Cleaning Engines, and Other Steam Cleaning

- For occasional car exterior cleaning, minimize the water used and divert runoff to landscaped areas, keeping it out of the storm drain.
- Wash vehicles with biodegradable, phosphate-free detergent.
- Make sure no wastewater from engine or parts cleaning or steam cleaning is discharged where it may flow to a street, gutter, or storm drain.

14. Cleaning Work Areas

- Sweep or vacuum the shop floor frequently.
- Damp mop work areas - do not hose down work areas into the street or gutter.
- Do not pour mop water into the parking lot, street, gutter or storm drain.
- Use non-toxic cleaning products whenever possible.

Please remember:





RIVERSIDE COUNTY
ANIMAL SERVICES LOCATIONS:

www.rcdas.org

BLYTHE
16450 West Hobson Way
Blythe, CA 92225
760-921-7857

COACHELLA VALLEY ANIMAL CAMPUS
72-050 Petland Place
Thousand Palms, CA 92276
760-343-3644

RIVERSIDE COUNTY ANIMAL SERVICES
6851 Van Buren Blvd.
Riverside, CA 92509
951-688-4340

OTHER ANIMAL SHELTERS:

ANIMAL CARE CENTER OF INDIO
45-355 Van Buren
Indio, CA 92201
760-391-4138

ANIMAL FRIENDS OF THE VALLEYS
29001 Bastron Avenue
Lake Elsinore, CA 92530
951-674-0618
(Serving incorporated Temecula, Wildomar, Lake Elsinore, Murrieta and Canyon Lake)

MARY S. ROBERTS PET ADOPTION CENTER
6185 Industrial Avenue
Riverside, CA 92504
951-688-4340

RAMONA HUMANE SOCIETY
690 Humane Way
San Jacinto 92586
951-654-8002
(Serving Sun City, Menifee, Romoland and Homeland)

Looking to adopt a pet?
This website is linked to many animal shelters.
www.petfinder.com

To report illegal storm drain disposal, call
1-800-506-2555

Or visit our website at www.rcflood.org

E-mail fcnpdes@rcflood.org

What's the Scoop?

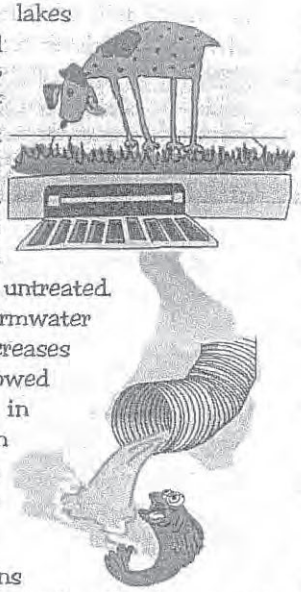


Tips for a Healthy Pet and a Healthier Environment

CREATE A HEALTHY ENVIRONMENT in and around your home by following these simple pet practices. Your pet, family and neighbors will appreciate their clean comfortable surroundings.

HOUSEHOLD PETS

We all love our pets, but pet waste is a subject everyone likes to avoid. Pet waste left on trails, sidewalks, streets and grassy areas can be washed into the nearest waterway when it rains. Even if you can't see streams or lakes near you, rainfall (stormwater) or sprinkler runoff can wash pet waste into the storm drains that carry runoff to the nearest streams or lakes untreated. The risk of stormwater contamination increases if pet waste is allowed to accumulate in outdoor animal pen areas or left on sidewalks, streets or driveways.



Pet waste contains nutrients and bacteria. Nutrients can promote the growth of algae in streams and lakes. Algae can cause fish kills and other environmental damage if it is fed too many nutrients. Pet Waste also contains e. Coli and fecal bacteria, which can cause disease in other animals and humans that come in contact with it when swimming or splashing in streams and lakes. Dogs also carry salmonella and giardia, which can make people sick.

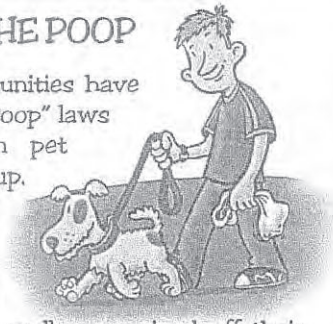
Pet waste that is not picked up and properly disposed can also increase vector problems. Flies and other insects are not only attracted to and feed on pet waste, but can also be infected with diseases and spread those diseases to humans and other animals.

WHAT CAN YOU DO?

- SCOOP up pet waste and flush it down the toilet or place in trash can.
- NEVER DUMP pet waste into a storm drain or catch basin.
- USE the complimentary bags or mutt mitts offered in dispensers at local parks.
- CARRY EXTRA BAGS when walking your dog and make them available to other pet owners who are without.
- TEACH CHILDREN how to properly clean up after a pet.
- TELL FRIENDS AND NEIGHBORS about the ill effects of animal waste on the environment. Encourage them to clean up after pets.

Call 1-800-506-2555 TOLL FREE to report illegal dumping to the storm drain, find the dates and times of local Household Hazardous Waste Collection Events, obtain additional information on stormwater problems and solutions, request presentations about stormwater pollution in your child's classroom, or learn about free grasscycling and composting workshops.

SCOOP THE POOP



Many communities have "Scoop the Poop" laws that govern pet waste cleanup. Some of these laws specifically require anyone who walks an animal off their property to carry a bag, shovel, or scooper. Any waste left by the animal must be cleaned up immediately. CALL YOUR LOCAL CODE ENFORCEMENT OFFICE to find out more about pet waste regulations.

OTHER WAYS TO PROTECT YOUR PETS AND THE ENVIRONMENT

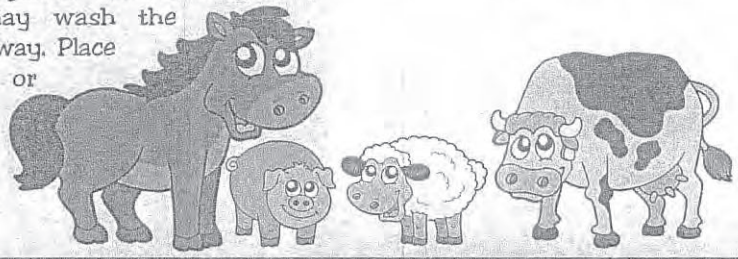
Pets are only one of many sources that contribute to water pollution. However, these other sources of water pollution cannot only harm the environment but also harm your pet. Improperly used or stored lawn fertilizers, pesticides, soaps, grease and vehicle fluids cannot only be washed into local streams and lakes, these chemicals can also harm your pet if they ingest or touch these chemicals. Call 1-800-506-2555 for information regarding how to properly dispose of household hazardous wastes such as these. You can also keep your pets and our environment healthy by properly maintaining your vehicles, and limiting use of pesticides and fertilizers to only the amount that is absolutely needed.

Make sure to not only protect your pets, but to also protect your neighbors pets. NEVER HOSE VEHICLE FLUIDS into the street or gutter. USE ABSORBENT MATERIALS such as cat litter to clean-up spills. SWEEP UP used absorbent materials and place it in the trash.

HORSES AND LIVESTOCK

Fortunate enough to own a horse or livestock? You, too, can play a part in protecting and cleaning up our water resources. The following are a few simple Best Management Practices (BMPs) specifically designed for horses and livestock.

- STORE your manure properly. Do not store unprotected piles of manure in places where stormwater runoff may wash the manure away. Place a cover or tarp over the pile to keep rainwater out.



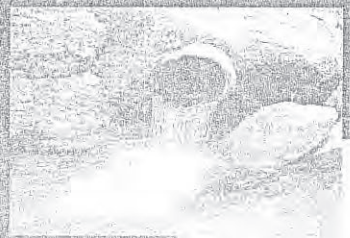
- BUILD a manure storage facility to protect your pets, property and the environment. These structures usually consist of a concrete pad to protect groundwater and a short wall on one or two sides to make manure handling easier.
- READ the Only Rain Down the Storm Drain brochure titled "Tips for Horse Care" for additional guidance and recommendations. This brochure should be available from your local city office or for download at www.rcflood.org/stormwater.
- KEEP animals out of streams - Horses and livestock can deficate in streams causing stormwater pollution. Livestock and horses in streams can also disturb sensitive habitat and vegetation, causing additional environmental damage. Keep livestock and horses away from streams and use designated stream crossings whenever possible.
- MATERIAL STORAGE SAFETY TIPS Many of the chemicals found in barns require careful handling and proper disposal. When using these chemicals, be certain to follow these common sense guidelines:
  - Buy only what you need.
  - Treat spills of hoof oils like a fuel spill. Use kitty litter to soak up the oil and dispose of it in a tightly sealed plastic bag.
  - Store pesticides in a locked, dry, well-ventilated area.
  - Protect stored fertilizer and pesticides from rain and surface water.

RESOURCE CONSERVATION DISTRICTS CAN HELP

Call 1-800-506-2555 for assistance with locating a local conservation district that can help you properly manage your manure, re-establish healthy pastures, control weeds, or identify appropriate grasses for your soils.



Thank you for doing your part to protect your watershed, the environment, your pets and your community!



Landscaping and garden maintenance activities can be major contributors to water pollution. Soils, yard wastes, over-watering and garden chemicals become part of the urban runoff mix that winds its way through streets, gutters and storm drains before entering lakes, rivers, streams, etc. Urban runoff pollution contaminates water and harms aquatic life!

In Riverside County, report illegal discharges into the storm drain, call
1-800-506-2555
"Only Rain Down the Storm Drain"

Important Links:

Riverside County Household Hazardous Waste Collection Information
1-800-304-2226 or www.rivcowm.org

Riverside County Backyard Composting Program
1-800-366-SAVE

Integrated Pest Management (IPM) Solutions
www.ipm.ucdavis.edu

California Master Gardener Programs
www.mastergardeners.org
www.camastergardeners.ucdavis.edu

California Native Plant Society
www.cnps.org

The Riverside County "Only Rain Down the Storm Drain" Pollution Prevention Program gratefully acknowledges Orange County's Storm Water Program for their contribution to this brochure.

...Only Rain Down ...the Storm Drain

What you should know for... Landscape and Gardening

Best Management tips for:

- Professionals
- Novices
- Landscapers
- Gardeners
- Cultivators

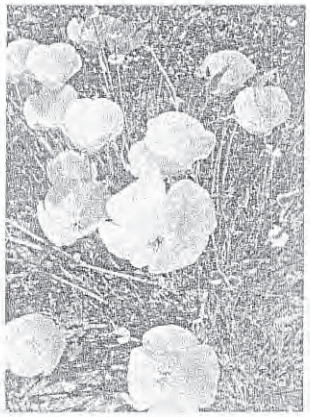


Tips for Landscape & Gardening

This brochure will help you to get the most of your lawn and gardening efforts and keep our waterways clean. Clean waterways provide recreation, establish thriving fish habitats, secure safe sanctuaries for wildlife, and add beauty to our communities. NEVER allow gardening products or waste water to enter the street, gutter or storm drain.

General Landscaping Tips

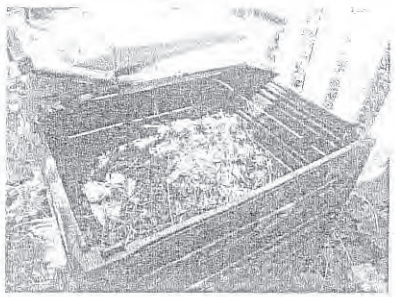
- Protect stockpiles and materials from wind and rain by storing them under tarps or secured plastic sheeting.
- Prevent erosion of slopes by planting fast-growing, dense ground covering plants. These will shield and bind the soil.



- Plant native vegetation to reduce the amount of water, fertilizers and pesticides applied to the landscape.
- Never apply pesticides or fertilizers when rain is predicted within the next 48 hours.

Garden & Lawn Maintenance

- Do not overwater. Use irrigation practices such as drip irrigation, soaker hoses or micro-spray systems. Periodically inspect and fix leaks and misdirected sprinklers.
- Do not rake or blow leaves, clippings or pruning waste into the street, gutter or storm drain. Instead, dispose of green waste by composting, hauling it to a permitted landfill, or recycling it through your city's program.



- Consider recycling your green waste and adding "nature's own fertilizer" to your lawn or garden.
- Read labels and use only as directed. Do not over-apply pesticides or fertilizers. Apply to spots as needed, rather than blanketing an entire area.
- Store pesticides, fertilizers and other chemicals in a dry covered area to prevent exposure that may result in the deterioration of containers and packaging.
- Rinse empty pesticide containers and re-use rinse water as you would use the product. Do not dump rinse water down storm drains or sewers. Dispose of empty containers in the trash.
- When available, use non-toxic alternatives to traditional pesticides, and use pesticides specifically designed to control the pest you are targeting.
- Try natural long-term common sense solutions first. Integrated Pest Management (IPM) can provide landscaping guidance and solutions, such as:
  - **Physical Controls** - Try hand picking, barriers, traps or caulking holes to control weeds and pests.
  - **Biological Controls** - Use predatory insects to control harmful pests.
  - **Chemical Controls** - Check out www.ipm.ucdavis.edu before using chemicals. Remember, all chemicals should be used cautiously and in moderation.
- If fertilizer is spilled, sweep up the spill before irrigating. If the spill is liquid, apply an absorbent material such as cat litter, and then sweep it up and dispose of it in the trash.
- Take unwanted pesticides to a Household Waste Collection Center to be recycled.
- *Dumping toxics into the street, gutter or storm drain is illegal!*

www.bewaterwise.com Great water conservation tips and drought tolerant garden designs.

www.ourwaterourworld.com Learn how to safely manage home and garden pests.

Additional information can also be found on the back of this brochure.

Helpful telephone numbers and links:

Riverside County Stormwater Protection Partners

Flood Control District	(951) 955-1200
County of Riverside	(951) 955-1000
City of Banning	(951) 922-3105
City of Beaumont	(951) 769-8520
City of Calimesa	(909) 795-9801
City of Canyon Lake	(951) 244-2955
Cathedral City	(760) 770-0327
City of Coachella	(760) 398-4978
City of Corona	(951) 736-2447
City of Desert Hot Springs	(760) 329-6411
City of Eastvale	(951) 361-0900
City of Hemet	(951) 765-2300
City of Indian Wells	(760) 346-2489
City of Indio	(760) 391-4000
City of Lake Elsinore	(951) 674-3124
City of La Quinta	(760) 777-7000
City of Menifee	(951) 672-6777
City of Moreno Valley	(951) 413-3000
City of Murrieta	(951) 304-2489
City of Norco	(951) 270-5607
City of Palm Desert	(760) 346-0611
City of Palm Springs	(760) 323-8299
City of Perris	(951) 943-6100
City of Rancho Mirage	(760) 324-4511
City of Riverside	(951) 361-0900
City of San Jacinto	(951) 654-7337
City of Temecula	(951) 694-6444
City of Wildomar	(951) 677-7751

REPORT ILLEGAL STORM DRAIN DISPOSAL
1-800-506-2555 or e-mail us at
fcnpdes@rcflood.org

- Riverside County Flood Control and Water Conservation District
  www.rcflood.org

Online resources include:

- California Storm Water Quality Association
  www.casqa.org
- State Water Resources Control Board
  www.waterboards.ca.gov
- Power Washers of North America
  www.thepwna.org

Stormwater Pollution

What you should know for...

Outdoor Cleaning Activities and Professional Mobile Service Providers



Storm drain pollution prevention information for:

- Car Washing / Mobile Detailers
- Window and Carpet Cleaners
- Power Washers
- Waterproofers / Street Sweepers
- Equipment cleaners or degreasers and all mobile service providers

Do you know where street flows actually go?

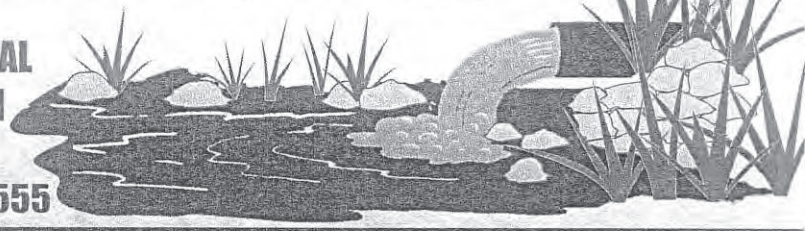
Storm drains are NOT connected to sanitary sewer systems and treatment plants!



The primary purpose of storm drains is to carry *rain* water away from developed areas to prevent flooding. Pollutants discharged to storm drains are transported directly into rivers, lakes and streams. Soaps, degreasers, automotive fluids, litter and a host of materials are washed off buildings, sidewalks, plazas and parking areas. Vehicles and equipment must be properly managed to prevent the pollution of local waterways.

Unintentional spills by mobile service operators can flow into storm drains and pollute our waterways. **Avoid mishaps.** *Always* have a **Spill Response Kit** on hand to clean up unintentional spills. Only emergency Mechanical repairs should be done in City streets, using drip pans for spills. Plumbing should be done on private property. Always store chemicals in a leak-proof container and keep covered when not in use. Window/Power Washing waste water shouldn't be released into the streets, but should be disposed of in a sanitary sewer, landscaped area or in the soil. Soiled Carpet Cleaning wash water should be filtered before being discharged into the sanitary sewer. Dispose of all filter debris properly. Car Washing/Detailing operators should wash cars on private property and use a regulated hose nozzle for water flow control and runoff prevention. Capture and dispose of waste water and chemicals properly. Remember, storm drains are for receiving rain water runoff only.

REPORT ILLEGAL STORM DRAIN DISPOSAL 1-800-506-2555



Help Protect Our Waterways!

Use these guidelines for Outdoor Cleaning Activities and Wash Water Disposal

Did you know that disposing of pollutants into the street, gutter, storm drain or body of water is *PROHIBITED* by law and can result in stiff penalties?

Best Management Practices

Waste wash water from Mechanics, Plumbers, Window/Power Washers, Carpet Cleaners, Car Washing and Mobile Detailing activities may contain significant quantities of motor oil, grease, chemicals, dirt, detergents, brake pad dust, litter and other materials.

Best Management Practices, or BMPs as they are known, are guides to prevent pollutants from entering the storm drains. *Each of us* can do our part to keep stormwater clean by using the suggested BMPs below:

Simple solutions for both light and heavy duty jobs:

Do...consider dry cleaning methods first such as a mop, broom, rag or wire brush. Always keep a spill response kit on site.

Do...prepare the work area before power cleaning by using sand bags, rubber mats, vacuum booms, containment pads or temporary berms to keep wash water away from the gutters and storm drains.

Do...use vacuums or other machines to remove and collect loose debris or litter before applying water.

Do...obtain the property owner's permission to dispose of *small amounts* of power washing waste water on to landscaped, gravel or unpaved surfaces.

Do...check your local sanitary sewer agency's policies on wash water disposal regulations before disposing of wash water into the sewer. (See list on reverse side)

Do...be aware that if discharging to landscape areas, soapy wash water may damage landscaping. Residual wash water may remain on paved surfaces to evaporate. Sweep up solid residuals and dispose of properly. Vacuum booms are another option for capturing and collecting wash water.

Do...check to see if local ordinances prevent certain activities.

Do not let...wash or waste water from sidewalk, plaza or building cleaning go into a street or storm drain.



Report illegal storm drain disposal
Call Toll Free
1-800-506-2555

Using Cleaning Agents

Try using biodegradable/phosphate-free products. They are easier on the environment, but don't confuse them with being toxic free. Soapy water entering the storm drain system can impact the delicate aquatic environment.



When cleaning surfaces with a ***high-pressure washer*** or ***steam cleaner***, additional precautions should be taken to prevent the discharge of pollutants into the storm drain system. These two methods of surface cleaning can loosen additional material that can contaminate local waterways.

Think Water Conservation

Minimize water use by using high pressure, low volume nozzles. Be sure to check all hoses for leaks. Water is a precious resource, don't let it flow freely and be sure to shut it off in between uses.

Screening Wash Water

Conduct thorough dry cleanup before washing exterior surfaces, such as buildings and decks ***with loose paint***, sidewalks or plaza areas. Keep debris from entering the storm drain after cleaning by first passing the wash water through a "20 mesh" or finer screen to catch the solid materials, then dispose of the mesh in a refuse container. Do not let the remaining wash water enter a street, gutter or storm drain.

Drain Inlet Protection & Collection of Wash Water

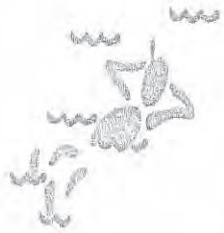
- Prior to any washing, block all storm drains with an impervious barrier such as sandbags or berms, or seal the storm drain with plugs or other appropriate materials.
- Create a containment area with berms and traps or take advantage of a low spot to keep wash water contained.
- Wash vehicles and equipment on grassy or gravel areas so that the wash water can seep into the ground.
- Pump or vacuum up all wash water in the contained area.

Concrete/Coring/Saw Cutting and Drilling Projects

Protect any down-gradient inlets by using dry activity techniques whenever possible. If water is used, minimize the amount of water used during the coring/drilling or saw cutting process. Place a barrier of sandbags and/or absorbent berms to protect the storm drain inlet or watercourse. Use a shovel or wet vacuum to remove the residue from the pavement. Do not wash residue or particulate matter into a storm drain inlet or watercourse.

Saltwater Pools

- Salt water pools, although different from regular pools, are in fact, sanitized using chlorine. A salt-chlorine generator separates the chlorine and sodium molecules in salt and reintroduces them into the pool water. The same harmful effects of chlorine still apply.
- A salt water pool is still maintained with chemicals such as Muriatic acid, soda ash and sodium carbonate to help keep a proper pH, total Alkalinity, Calcium Hardness and Stabilizer levels.



- It may be illegal to discharge salt water to land. The salt may kill plants and the build-up of salt in soil puts animals, plants, and groundwater at risk. Consult your city representatives to determine local requirements regarding salt water drainage.

NEVER put unused chemicals into the trash, onto the ground or down a storm drain.

IMPORTANT: The discharge of pollutants into the street, gutter, storm drain system or waterways - without a permit or waiver - is strictly prohibited by local ordinances, state and federal law. Violations may result in monetary fines and enforcement actions.

Helpful telephone numbers and links

Riverside County Water Agencies:

City of Banning	(951) 922-3130
City of Beaumont/Cherry Valley	(951) 845-9581
City of Blythe	(760) 922-6161
City of Coachella	(760) 398-3502
City of Corona	(951) 736-2263
City of Hemet	(951) 765-3710
City of Norco	(951) 270 5607
City of Riverside Public Works	(951) 351-6140
City of San Jacinto	(951) 654-4041
Coachella Valley Water District	(760) 398-2651
Desert Water Agency (Palm Springs)	(760) 323-4971
Eastern Municipal Water District	(951) 928-3777
Elsinore Valley Municipal Water District	(951) 674 3146
Elsinore Water District	(951) 674-2168
Farm Mutual Water Company	(951) 244-4198
Idyllwild Water District	(951) 659-2143
Indio Water Authority	(760) 391-4129
Jurupa Community Services District	(951) 685-7434
Lee Lake Water	(951) 658-3241
Mission Springs Water	(760) 329-6448
Rancho California Water District	(951) 296-6900
Ripley, CSA #62	(760) 922-4951
Riverside Co. Service Area #51	(760) 227-3203
Rubidoux Community Services District	(951) 684-7580
Valley Sanitary District	(760) 347-2356
Western Municipal Water District	(951) 789-5000
Yucaipa Valley Water District	(909) 797-5117

CALL 1-800-506-2555 to:

- Report clogged storm drains or illegal storm drain disposal from residential, industrial, construction and commercial sites into public streets, storm drains and/or water bodies.
- Find out about our various storm drain pollution prevention materials.
- Locate the dates and times of Household Hazardous Waste (HHW) Collection Events.
- Request adult, neighborhood, or classroom presentations.
- Locate other County environmental services.
- Receive grasscycling information and composting workshop information.

Or visit our
Riverside County Flood Control and Water Conservation District
website at: www.rcflood.org

Other links to additional storm drain pollution information:

- County of Riverside Environmental Health: www.rivcoeh.org
- State Water Resources Control Board: www.waterboards.ca.gov
- California Stormwater Quality Association: www.casqa.org
- United States Environmental Protection Agency (EPA): www.epa.gov/compliance/assistance (compliance assistance information)

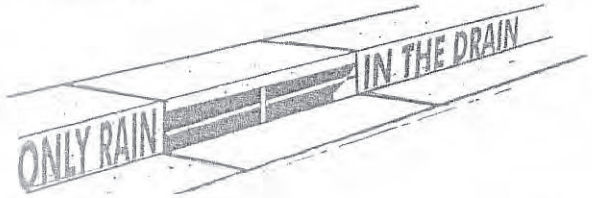
Riverside County's, "Only Rain Down the Storm Drain" Pollution Prevention Program gratefully acknowledges the Bay Area Stormwater Management Agencies Association and the Cleaning Equipment Trade Association for information provided in this brochure.

Guidelines for Maintaining your...



Swimming Pool, Jacuzzi and Garden Fountain

Where does the water go?



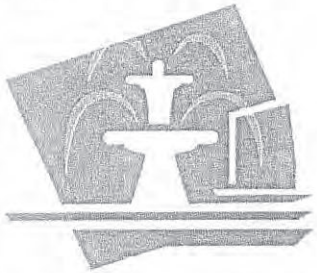
Pool, Jacuzzi and Fountain wastewater and rain water runoff (also called stormwater) that reach streets can enter the storm drain and be conveyed directly into local streams, rivers and lakes.



A storm drain's purpose is to prevent flooding by carrying rain water away from developed areas. Storm drains are not connected to sanitary sewers systems and treatment plants!

Wastewater, from residential swimming pools, Jacuzzis, fishponds and fountains, often contains chemicals used for sanitizing or cleansing purposes. Toxic chemicals (such as chlorine or copper-based algaecides) may pollute the environment when discharged into a storm drain system.

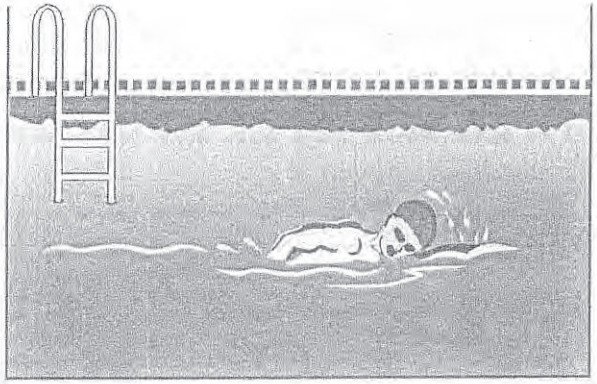
The Cities and County of Riverside have adopted ordinances that prohibit the discharge of wastewater to the street and storm drain system.



Discharge Regulations

Regulatory requirements for discharging wastewater from your pool may differ from city to city. Chlorinated water should not be discharged into the street, storm drain or surface waters. Check with your water agency to see if disposal to the sanitary sewer line is allowed for pool discharges (see reverse for Riverside County sewer agencies).

If allowed, a hose can be run from the pool Jacuzzi, or fountain to the private sewer cleanout, washing machine drain or a sink or bathtub.

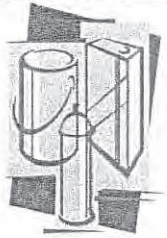


If you cannot discharge to the sewer, you may drain your fountain, pool, or jacuzzi to your landscaping by following these guidelines:

First, reduce or eliminate solids (e.g. debris, leaves or dirt) in the pool water and allow the chemicals in the pool water to dissipate before draining the pool (this could take up to 7 days, verify using a home pool test kit).

Second, slowly drain to a landscaped area away from buildings or structures. Control the flow to prevent soil erosion; it may take more than one day to empty. Do not allow sediment to enter the street, gutter or storm drain.

Maintenance & Chemicals



Cleaning Filters

Filter rinse water and backwash must be discharged to the sanitary sewer, on-site septic tank and drain field system (if properly designed and adequately sized), or a seepage pit. Alternatively, rinse water or backwash may be diverted to landscaped or dirt areas. Filter media and other non-hazardous solids should be picked up and disposed of in the trash.

Algaecides

Avoid using copper-based algaecides unless absolutely necessary. Control algae with chlorine, organic polymers or other alternatives to copper-based pool chemicals. Copper is a heavy metal that can be toxic to aquatic life when you drain your pool.

Chemical Storage and Handling

- Use only the amount indicated on product labels
- Store chlorine and other chemicals in a covered area to prevent runoff. Keep out of reach of children and pets.
- Chlorine kits, available at retail swimming pool equipment and supply stores, should be used to monitor the chlorine and pH levels before draining your pool.
- Chlorine and other pool chemicals should never be allowed to flow into the gutter or storm drain system.



Take unwanted chemicals to a Household Hazardous Waste (HHW) Collection Event. There's no cost for taking HHW items to collection events – it's FREE! Call 1-800-506-2555 for a schedule of HHW events in your community.